(No Model.) 4 Sheets—Sheet 1.

J. BERRY.

NEEDLE GROOVING MACHINE.

No. 382,250. Patented May 1, 1888.

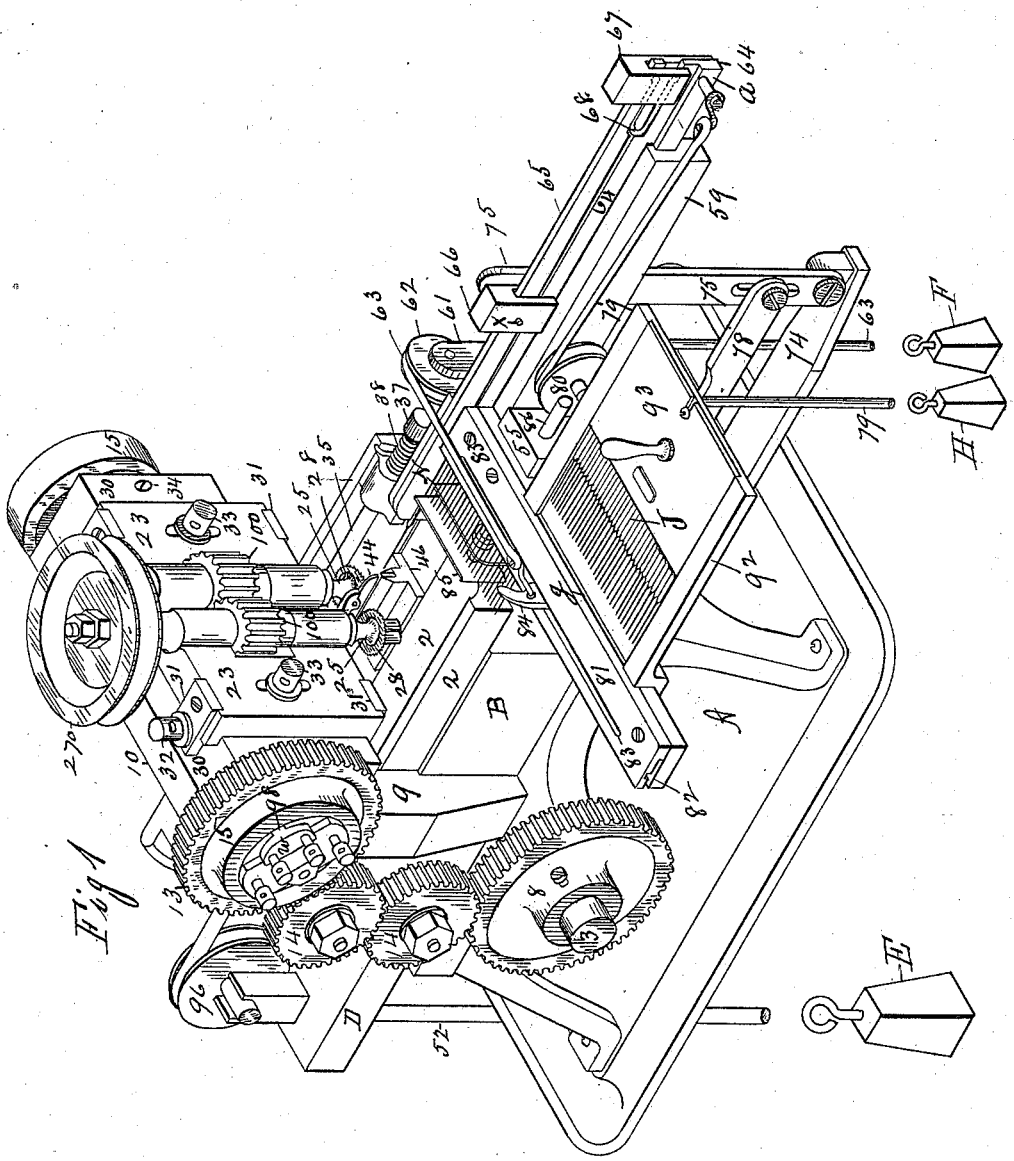

Fig 1

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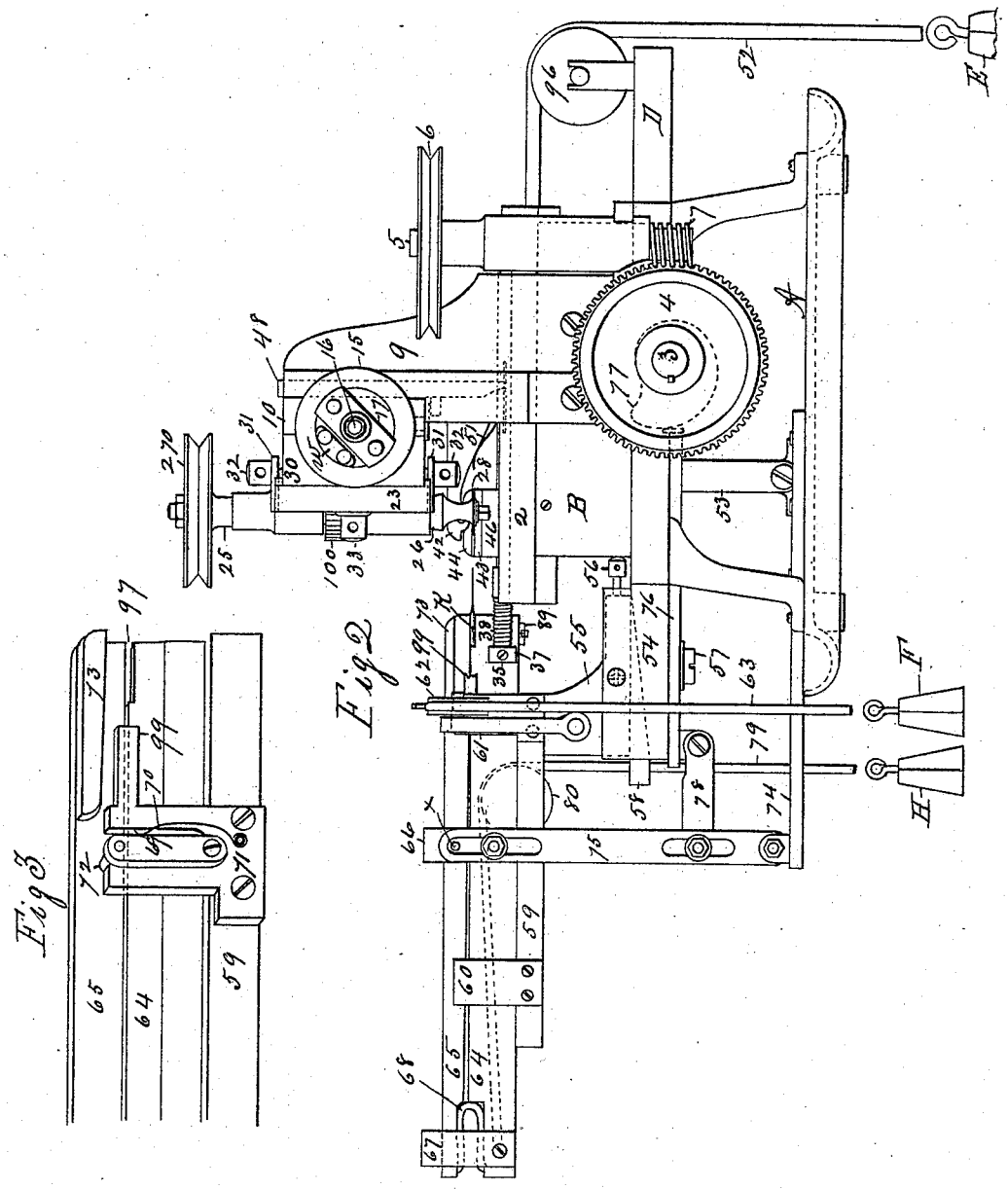

Fig 2

Fig 3

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NEEDLE GROOVING MACHINE.

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Fig 5

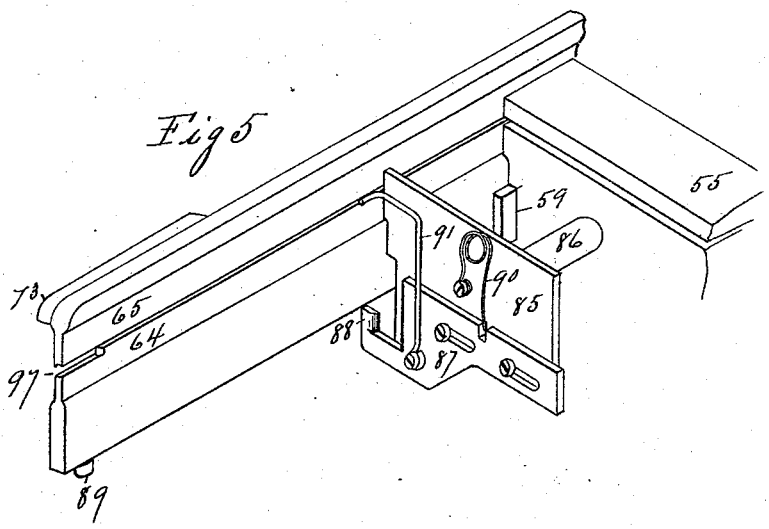

Fig 4

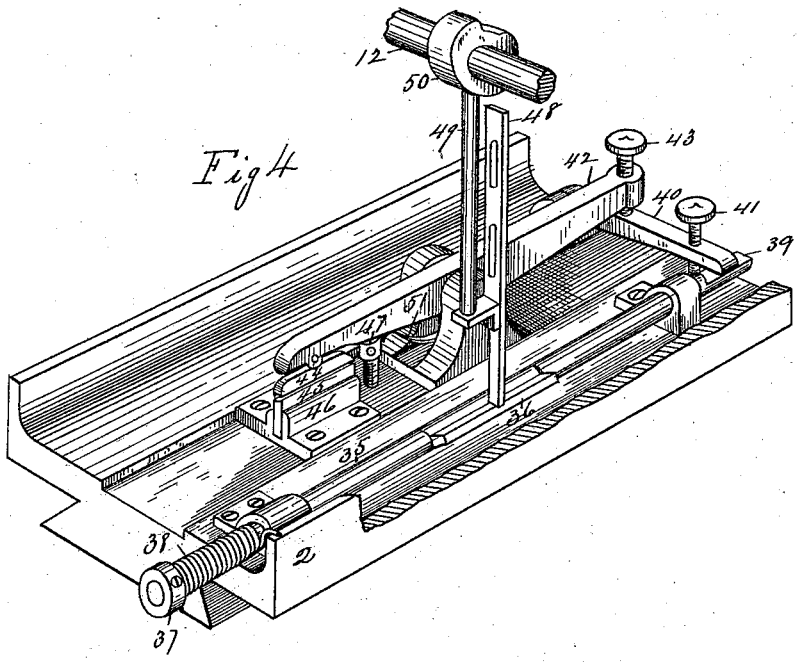

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Fig. 8.

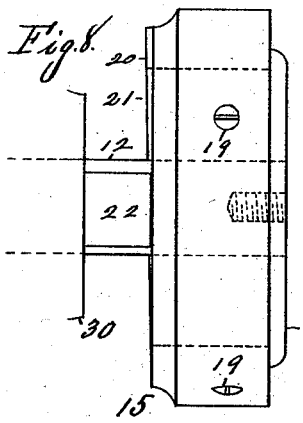


Fig. 9.

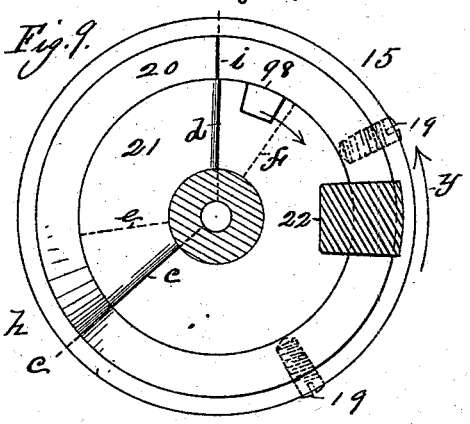


Fig. 10.

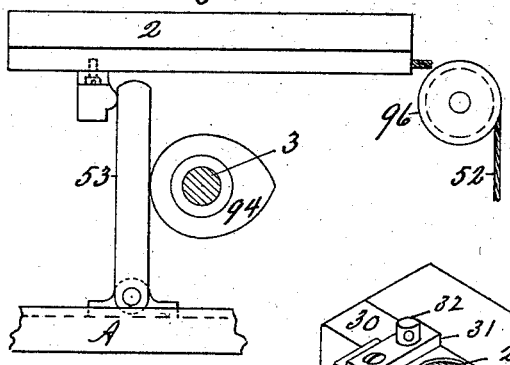


Fig. 7.

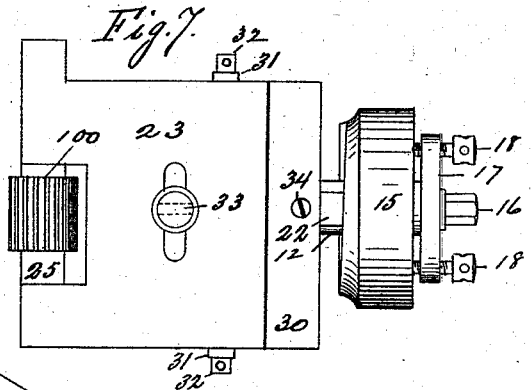


Fig. 6.

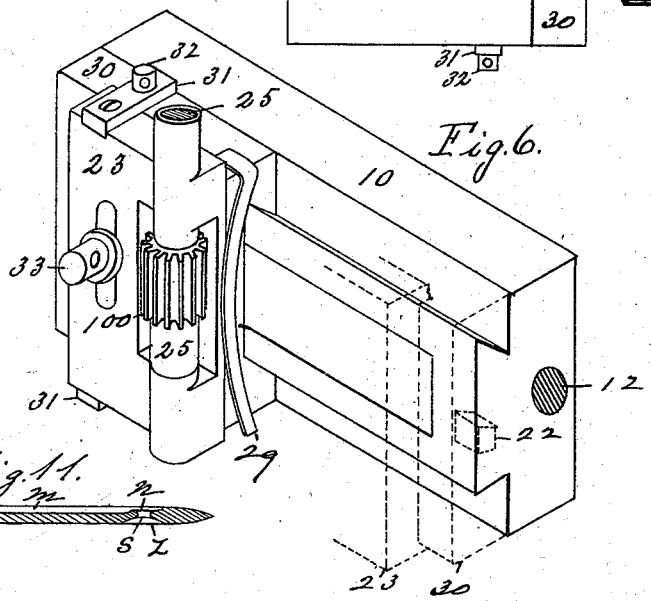
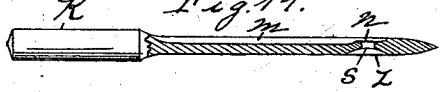


Fig. 11.



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UNITED STATES PATENT OFFICE.

JOHN BERRY, OF SPRINGFIELD, MASSACHUSETTS, ASSIGNOR TO THE NATIONAL NEEDLE COMPANY, OF SAME PLACE.

NEEDLE-GROOVING MACHINE.

SPECIFICATION forming part of Letters Patent No. 382,250, dated May 1, 1888.

Application filed October 31, 1887. Serial No. 253,931. (No model.)

To all whom it may concern:

Be it known that I, JOHN BERRY, a citizen of the United States, residing at Springfield, in the county of Hampden and State of Massachusetts, have invented new and useful Improvements in Needle-Grooving Machines, of which the following is a specification.

This invention relates to needle-grooving machines, the object thereof being to provide an improved automatically-operating machine for grooving sewing-machine and other needles—that is to say, a machine provided with devices for automatically feeding needles to the groove-cutters and retiring the same therefrom after they shall have been grooved, imparting to the devices which hold the needle while being grooved a reciprocating longitudinal motion, and for moving the cutters toward and from the sides of the needle. In other words, providing a grooving-machine adapted to receive a mass of needles which require to be grooved which automatically manipulates each needle in succession to groove it and then drops it into a receptacle therefor; and the invention consists in the peculiar construction and arrangement of the various parts of the machine, all as hereinafter fully described, and pointed out in the claims.

In the drawings forming part of this specification, Figure 1 is a perspective view, and Fig. 2 is a side elevation, of a needle-grooving machine constructed according to my invention. Fig. 3 illustrates in perspective view a portion of the needle-fingers of the feeding devices, hereinafter fully described. Fig. 4 is a perspective view of the sliding table of the machine, one border thereof being shown broken away, together with the needle-clamping devices thereon and parts of their actuating mechanism. Fig. 5 is a perspective view of parts of the needle-feeding and of the needle-ejecting devices, hereinafter fully described. Fig. 6 is a perspective view of the cross-head, one of the cutter-shaft blocks thereon, and other detail parts connected therewith, said figure showing in dotted outline the positions of other parts on the cross-head, all of which are fully described below. Fig. 7 is a front elevation of one of the cutter-shaft blocks, a shaft-pinion, one end of a slide-block, and other detail parts, hereinafter fully described. Fig. 8 is a front elevation showing a portion of a cam-bearing shaft supported in the cross-head, one of the cutter-shaft cams thereon, a stud engaging with said cam, and other detail parts, hereinafter described. Fig. 9 is a face view of one of said cutter-shaft cams, a section of the stud engaging therewith being shown in said figure. Fig. 10 is a side elevation of certain detail parts having reference to the table and means for imparting a longitudinally-reciprocating motion thereto, all as below described. Fig. 11 is a side elevation, partly in section, of a grooved sewing-machine needle somewhat enlarged.

Needle-grooving machines as heretofore made have required the constant care of an operator to put needles into them, to start and stop them, and to take out the needles after the cutters had operated to groove them, and to perform other details relating to the oversight of the machines and their work, each machine thereby requiring so much of the time of said operator as to make the labor cost for grooving the needles quite considerable. The machine herein shown and described is provided with devices for holding a mass of needles, (sufficient in number to supply the machine uninterruptedly for a long time,) which are one by one, by the automatic action of feeding devices, put into and taken out of the machine, the machine meanwhile operating to cut a longitudinal groove in the opposite sides of a needle of such length as may be desired or as the machine may be adjusted to, all of the operations of the machine being performed without the intervention of the operator. In consequence of said improvements the cost of labor involved in said grooving is reduced to a minimum, and more uniform and better work is the result.

In practice the herein-described machine is placed on a suitable table and the legs thereof, as shown in Figs. 1 and 2, are attached to an iron pan, A, which is interposed between the machine and the table and serves to catch any drippings of oil or any steel cuttings that may fall from the machine.

B is the bed of the machine, resting upon the above-mentioned legs, having the horizontal extensions D and 54, respectively, on the rear and front ends of the machine.

A main shaft, 3, is hung in suitable bearings in a transverse position under the bed of the machine, having fixed on one end thereof a gear, 4, and on its opposite end a gear, 8. (See Figs. 1 and 2.) A vertical shaft, 5, is supported in suitable bearings on the machine, and has fixed on its upper end a driving-pulley, 6, and on its lower end a worm, 7, which engages with the aforesaid gear 4. A suitable driving-belt having connection with a pulley on any suitable shaft in proximity to the machine is connected with said pulley 6, and thereby the main shaft 3 is given the requisite rotary motion.

Upright pieces 9 are secured on the sides of the bed B, and to said uprights a cross-head, 10, is secured. (See Figs. 1, 2, and 6.) Said cross-head is made hollow on its rear side and has a longitudinal rib with undercut edges on its front side, as shown in Fig. 6. A shaft, 12, extends longitudinally through said cross-head and has bearings in the ends thereof.

Two compound cams, 15, are attached to said shaft 12—one on each end thereof and near the end of said cross-head. A gear, 13, is formed on the periphery of one of said cams 15, as shown in Fig. 1. The shaft 12 is given a rotary motion by means of its connection with the main shaft 3 through the gear 8 on the latter, the intermediate gears, 14, and the engagement of the latter with the said geared periphery of one of the cams 15. Each of said compound cams 15 (see Figs. 7, 8, and 9) consists of a metal disk 21, having a cam projection on its face or side adjoining the end of the cross-head, as indicated in Fig. 8, the extent of said cam projection on the face of the disk 21 being about equal to the segmental portion thereof comprised between the dotted line *e* and the full line *d* in Fig. 9. The plane of said segmental portion of the disk 21 is in practice about one thirty-second of an inch above the plane of the remaining part of the face of said disk, the said raised portion terminating abruptly at said full line *d*. The disk 21 is provided with a flange, *h*, on its outer end, and is attached to the shaft 12 by means of a bolt, 16, passing through the yoke 17 and entering the end of said shaft, two screws, 18, passing through the opposite ends of said yoke and engaging with said disk, whereby the latter is made capable of longitudinal adjustment on the end of said shaft. The second element of said compound cam consists of a ring, 20, having a cam projection on its inner face substantially in the plane with the aforesaid cam projection on the disk 21. The said ring fits onto said disk in the position shown in Fig. 9, and is secured thereon by the set-screws 19, which pass through said ring. The extent of the said cam projection on the ring 20 is represented, substantially, by the segmental portion of said ring between the dotted line *c* and the full line *i*, Fig. 9, the end of said projection near the line *c* being beveled off in practice and terminating abruptly at said line *i*. The said ring 20 is placed on the disk 21, with one side close against the flange *h* on said disk, and thereby the surfaces of said two cam projections on the ring and on the disk are brought to the same plane, and are so secured by said screws 19.

In Fig. 9 is shown the end of a stud, 98. Said stud is of a piece with the yoke *w*, (see Figs. 1 and 2,) and has a position in a groove in the periphery of the cam-disk 21 in a line with the shaft 12. Two screws (shown in said last-named figures) pass through the ends of the yoke *w* into the side of said cam-disk and serve to connect said stud and yoke with said disk, and to furnish means for adjusting said stud endwise therein, so as to bring the end thereof which is shown in Fig. 9 to a plane below that of the faces of the said cam projections on the disk 21 and on the ring 20 for a purpose below described. The part 22 (shown in section in Fig. 9) indicates the position of the end of a stud relative to the portions of the faces of the said disk 21 and ring 20, on which are the aforesaid cam projections. Said stud 22 (see Figs. 7 and 8 and dotted-line indication in Fig. 6) is adjustably secured in the end of a block, 30, by a screw, 34, at the side of and in a line with the aforesaid shaft 12 is the cross head 10, and the end of said stud operates in engagement with said two cams while the latter rotate to cause the needle-grooving cutters to engage with the needle and to permit them to recede therefrom after the grooves are cut, as below described. The object of the construction of said compound cams is to provide means for holding said grooving-cutters in contact with the side or sides of the needle to cause grooves of greater or less length to be cut therein, it being understood that the needle is made to move longitudinally between the cutters. Thus, it being understood that the end of stud 22 is bearing against the faces of the disk 21 and ring 20, as shown in Fig. 9, and that said ring is so adjusted on the disk that the lines *d* and *i*, which indicate the terminations of said two cam projections, are in coincidence, and that the cams be rotated in the direction indicated by the arrow *y*, Fig. 9, the ends of said cams at the lines *c* and *e* will press against the end of the stud 22, moving the latter and the block 30, to which it is connected, longitudinally and retaining said block in such position on the cross-head 10 so long as the end of the stud 22 rests against said cams; but when said projections (one or both) pass from under the end of said stud, it and its directly-connected parts, as below described, move longitudinally toward the cam 15 equal to the thickness of said projections, the end of the stud then resting against the parts of the disk 21 and ring 20 not covered by the cams.

Since the aforesaid groove cutters are held in engagement with a longitudinally-moving needle so long as the end of the stud 22 is engaged with a cam or cams, as above described, it is obvious that when the extent of the engaging cams is increased or diminished, the

groove cut in the needle will be correspondingly longer or shorter. Therefore, to elongate or increase the length of the cam-surface on which the end of the stud 22 bears, the ring 20 is turned on the disk 21 in the direction indicated by the arrow *y*, bringing the end of the cam on said ring—say, at the line *c*—nearer to the stud 22 and correspondingly separating said terminal lines *d* and *i*. After such adjustment of the compound cam, the end of said stud rides first on one end of the cam on the ring 20, then on the latter and on the cam on disk 21, and finally only on the cam on said disk to and off the end of the latter at *d*.

The depth of the groove cut in the needle is determined by the extent of the longitudinal movement given to said stud 22 by said cams, and since it is desirable that the long groove of the needle be cut of less depth opposite the eye thereof than between the eye and the shank the said stud 98 is provided in the disk 21 in proximity to the end *d* of the cam on said disk, and the end of said stud being adjusted to a plane a little below that of the last-named cam the end thereof passes from under the end of stud 22 and brings the end of stud 98 opposite the end of stud 22, letting the latter move against it and permitting a correspondingly slight movement of the long groove-cutter away from the needle opposite the eye of the latter, and thus making a shallow cut at that point. When stud 98 passes from under the end of stud 22, the latter is free to move sufficiently to let said cutter separate entirely from the needle.

In practice the machine is generally constructed to begin to cut the needle-grooves from the shank toward the point, and the said longitudinal movement of the needle and the rotary movement of the cams 15 are so timed as to provide for the above-described successive action of the parts referred to.

Fig. 11 is a somewhat enlarged side elevation of a sewing-machine needle of the class above referred to, of which K is the shank, the body of the needle being shown in longitudinal section, and in said figure *m* indicates the before-mentioned long groove between the shank and the eye *s*, and *n* indicates the shallow portion of said long groove opposite the eye of the needle, and *z* indicates a short groove on the opposite side of the needle at the eye thereof.

The manufacture of sewing-machine needles for all classes of sewing-machines obliges manufacturers to provide needles of a great variety of form and manner of grooving. The needle shown in Fig. 11 illustrates one of the many styles of needles that have to be made. As before mentioned, a compound cam, 15, is placed on both ends of the shaft 12 when the grooving on the opposite sides of the needles to be operated upon requires the above-described action of said compound cams; but when, as in the needle illustrated in Fig. 11, only a single short cut is to be made on one side of the needle, which is illustrated by the groove *z* opposite the eye in said figure, a cam is employed on one end of the shaft 12 to operate the stud 22, whereby one of the cutters of the machine will be engaged with the needle at the moment the eye thereof comes opposite the edge of said cutter, and the said cam which so operates on the said stud 22 in forming the short groove *z* has but a momentary engagement with said stud, causing said cutter to move against and immediately recede from the needle.

The above-referred-to mechanism for holding and operating the groove-cutters, in conjunction with the said cam or cams 15 and the stud 22, is constructed and operates as follows:

Referring to Figs. 1, 2, 6, and 7, Fig. 6 illustrates the cross-head 10 of the machine in perspective view. On said cross-head are placed two blocks, 30, both having an engagement with the borders of said rib thereon and capable of a longitudinally-sliding movement on said rib. On each of said blocks 30 is secured a block, 23, having bearings thereon for a cutter-shaft, 25. The block 23 is secured to the block 30 by the straps 31, which are screwed by one end to block 23 and are adjustably attached by their opposite ends to the block 30 by bolts 32, which provide for the vertical adjustment of block 23 and the cutters 28, which are attached to said cutter-shafts. Each of said shafts has a pinion, 100, fixed thereon, which pinions are capable of interengagement, as shown in Fig. 1. In said Fig. 6 the lower end of shaft 25 is not shown at the lower end of block 23. Fig. 7 illustrates in side elevation one of said blocks 23 (one end also of block 30 being shown) separate from the other block on the cross-head 10; but both of said blocks are shown in operative relation in Fig. 1. In Fig. 6 the ends of the removed blocks 30 and 23 are indicated in dotted lines, as also is the above-referred-to stud 22, and said figure does not show the end of the cutter-shaft 25 projecting below the lower edge of block 23, as it does in practice, as shown in Figs. 1 and 2. One of the cutter-shafts 25 projects above the upper edge of the block 23 on which it is hung, and, as shown in Figs. 1 and 2, has fixed on its upper end a driving-pulley, 270, with which a belt from any suitable driving-shaft is connected, whereby rotary motion is given to the cutter-shafts and to the cutters 28, secured to the lower ends thereof, independently of the movements of other parts of the machine which are derived from the aforesaid driving-shaft 5.

A spring, 29, (see Fig. 6,) is interposed between the sliding blocks 30 on the cross-head to separate said blocks, and consequently the grooving-cutters 28, when such motion of said blocks is permitted by the position of the above-described cams on shaft 12 acting against the ends of the studs 22 to move said blocks and cutters temporarily toward each other. A table, 2, (shown separate from the machine in Figs. 4 and 10,) is adapted to have a reciprocating longitudinal motion on the bed B under

said cross-head 10, and has attached thereto a slotted base, 46, for the fixed needle-clamp jaw 45, said jaw being of a part with said base or fixed in a slot therein. A needle-clamping lever, 42, is pivoted on said table, as shown, having a needle-clamping jaw, 44, pivotally attached thereto in a position directly over said fixed jaw 45. An adjusting-screw, 47, is placed in the table 2, under said lever 42, near the base 46, to regulate the degree of the vibratory motion of the end of said lever, to which the jaw 44 is pivoted, according to the thickness of the needle to be clamped and held between said jaws while being grooved. A second lever, 40, is pivoted by one end on the table 2 in a position at right angles to and under the rear end of said lever 42, and has an adjusting-screw, 41, through it near its free end, whose point has a bearing against said table. The end of said clamping-lever 42, which extends over said lever 40, has an adjusting-screw, 43, through said end whose point has a bearing against the upper side of said lever 40.

A rocking bar, 35, is supported in a longitudinal position on table 2 in suitable bearings, whose rear end, 39, is flattened and extends under the end of said lever 40. The normal plane of the face of said flattened portion 39 of bar 35 is that of the part of said lever 40 directly above it, and which is adapted to bear thereon.

A collar, 37, is secured on the front of the rock-bar 35, with a coil-spring, 38, placed on the latter between said collar and the adjoining bearing of said bar, one end of said spring being engaged with said collar and the opposite end with the table, as shown, and by turning said collar on the bar to a certain position and there securing it a tension is imparted to the spring 38, which causes it to rock the bar 35, (when free to be so rocked,) thus engaging one edge of its flattened end with lever 40, raising the end of the latter, and so operating lever 42 as to force the jaw 44 on one end of said lever against a needle placed between the latter-named jaw and the fixed jaw 45, and rigidly holding it while the grooves are being cut therein. The end of the spring which is attached to said collar 37 may be attached directly to the bar 35; but by so doing the means for adjusting said spring to the required tension which said collar provides would be lacking. The said rocking bar 35 has a wing, 36, thereon extending laterally from the side of said bar and of such length that the bar may be moved longitudinally to a certain extent under the end of a vertical post, 48, but keeping the end of said post engaged with the wing during said longitudinal movement. Said post (see Fig. 2) is attached to the upright part of the machine within the parts 9, and is capable of a reciprocating motion. Its downward motion is imparted thereto by a cam, 50, on the shaft 12, which acts against the end of a bar, 49, which is attached to an arm on said post. The upward motion of post 48 is derived from said spring 38 through the engagement of said post with said wing 36. The aforesaid longitudinal movement of the table 2 on the bed of the machine is imparted thereto in one direction by a weight, E, attached to one end of a cord or chain, 52, whose other end is connected to said table, said cord running over a pulley, 96, which is supported on the said rearward extension D of bed B. The movement of said table in the opposite direction is imparted thereto by a cam, 94, on the shaft 3, (see Fig. 10,) which acts against a vertical vibratory lever, 53, which is pivoted by one end to said pan A, which has its free end engaging with a block secured on the under side of said table, as shown in said figure. Said weight E acts to hold said lever 53 constantly against cam 94, and hence the longitndinal movements of the table are regular and are governed by said cam.

As shown in Figs. 1 and 2, the relative operative positions of the cutters 28 and the opening between the clamp-jaws 44 and 45 are such that a needle placed between said jaws has its axial line opposite the cutting-points of the teeth of the said cutters. It is obvious that in operating cutters against the sides of an object of so small a diameter as a needle to cut grooves therein along a longitudinal center line, and having a predetermined depth, said cutters must be capable of delicate adjustments both vertically and laterally from the sides of said clamp-jaws. To this end, to accomplish said vertical adjustment, the blocks 23, on which the cutter-shafts 25 are supported, are attached to the sliding blocks 30 by the above-described straps 31 and bolts 32 and 33; and to provide means for said lateral adjustment the cams 15 are made adjustable longitudinally on the ends of the shaft 12, as above described, relative to said stud 22, which is attached to said sliding block 30.

The action of the above-described parts of the machine, which contribute to the movements of the cutters toward and from the sides of the needle and to the said longitudinal reciprocating movements of the table 2, is so timed that when a needle is to be placed between the clamp-jaws 43 and 44 the table is at rest at the end of its rearward movement and the cutters occupy their extreme separated positions.

When the table and the cutters occupy the last-described relative positions, the cam 50 on shaft 12 (see Fig. 4) is in such position as causes it to force the bar 48 downward against the wing 36 on the rock-bar 35, thereby bringing the plane of the flattened end of said bar and the under side of lever 40 to coinciding positions, and allowing lever 42 to swing by the action of a spring, 51, thereunder and open the needle-clamping jaws.

The above-referred-to automatic needle-feeding devices are constructed and operate as follows: A standard, 55, is secured by a screw, 57, to the extension 54 on bed B, an adjusting-wedge, 58, being interposed between

the base of said standard and said extension to aid in the exact adjustment vertically of said standard and the needle-feed parts supported thereby, as below described. The screw 56 aids in adjusting standard 55 horizontally on the extension 54. To said extension 55 is attached a horizontally-extending arm, 59, having thereon a post, 60, which serves as a guide for one side of two needle-fingers, 64 and 65. A pulley-supporting standard, 61, is attached to said standard 55 and arm 59, in which is hung a pulley, 62, over which a cord, 63, runs, having a weight, F, attached to one end thereof, and its opposite end is connected to the needle-follower 84, below described. One of said needle-fingers, 64, has a longitudinal rib, *a*, on one side, (see Fig. 1,) which enters a groove in the adjoining side of said arm 59, said fingers being supported in their said reciprocating motions between arm 59 and post 60. Two finger-guides, 66 and 67, are secured to the side of the finger 64, each having a slot through it, as shown, to receive the finger 65 and support it in a position above the edge of finger 64. Said finger 65 is pivoted to the finger-guide 66 at *x* and is capable of a vibratory motion. A recess is formed between the ends of the needle-fingers, in which is placed a U-shaped spring, 68, whereby the opposite ends of said fingers are held in a normally-closed position. The said needle-fingers are supported on the said arm 59 in a line with said needle-holding jaws on the table 2, and a weight, H, attached to the end of a cord, 79, running over a pulley, 80, having its opposite end connected with the finger 64, serves to slide said fingers toward the needle-holding clamps. The needle-fingers are given a movement from said needle-clamps by means of a cam, 77, (shown in dotted lines in Fig. 2,) on the shaft 3, said cam acting against the end of a sliding bar, 76, under the bed of the machine, having a connection by a link, 78, with a vibratory lever, 75, which is pivoted by its lower end to an arm, 74, under the machine. The upper end of the lever, 75, is slotted, as shown, and a bolt passes through said slot into the side of the finger-guide 66, and thereby lever 77 is so connected to said guide that the needle-fingers are given said movement from the needle-clamps. The said weight H acts constantly to hold the end of the bar 76 in contact with said cam 77. A recess, 97, is made in the end of the needle-finger 64 to receive the shank K of the needle and to bring the latter to the proper position when held by the fingers—that is to say, the end of the shank should abut against the end of said recess, as shown in Fig. 2, when held by the fingers—and the said spring 68 serves to force the end of finger 65 against the needle-shank, thereby clamping the latter between both fingers and holding it in a line with the clamping-jaws on table 2, as illustrated in Fig. 2.

For the purpose of lifting finger 65 off from the needle-shank, so that the needle after having been grooved may be thrown out of the fingers and another be taken thereby, the below-described devices are provided. A slotted plate, 71, (see Fig. 3,) is attached to the side of the arm 59 and extends upward by the side of the needle-fingers. A finger-lifter, 69, is pivoted by one end on said plate in front of the slot therein, and has a pin, 72, in its free end extending between the sides of the upper end of said slot, the width of the latter serving to limit the vibratory motion of the upper end of said lifter. The side of said pin, however, projects above the end of the plate 71, in order to form a movable engaging-point for the cam strip or piece 73, fixed on the side of the upper finger, 65, having its under edge inclined from the end of the finger upward. A spring, 70, acting against the lifter 69, holds it normally in the position shown in Fig. 3. When the fingers draw away from the clamp-jaws on table 2, holding a needle, as shown in Fig. 2, said cam strip 73 rides on the pin 72 of the cam-lifter and causes the end of the finger on which it is to be lifted off from the shank of the needle, and the latter is, as below described, then ejected from the fingers. Upon the return movement of the needle-fingers the frictional contact of the strip 73 with the pin 72 (caused by the action of spring 68 on finger 65) causes the free end of the lifter 69 to swing with the movement of said finger, and thereby permit the end of the needle-finger 65 to move toward the finger 64. Said action of the swinging lifter 69, whereby the ends of the needle-fingers are allowed to come together, results from the difference in the direction of the lines radiating from the pivot-point of said lifter, as described by the latter when standing, as in Fig. 3, nearly perpendicular, and when swung to more or less of an incline by said finger. An arm, 99, (shown broken off in Fig. 2,) extends from one edge of the plate 71 opposite the opening between the needle-fingers. Said arm serves to stop the needle when it is placed by a lateral movement between the needle-fingers, and prevents it from being carried therebeyond, as below described.

A needle-receiver, 81, consisting of a metallic bar (in two pieces united by screws, as shown) having a slot, 82, therein from end to end thereof, one edge of which slot is open, is rigidly secured to said standard 55 by one end in a position at right angles to the side of said needle-fingers. Said receiver has also a longitudinal slot, 83 and *g*, through the top and the front edge, respectively, thereof communicating with said slot 82. A needle-follower, 84, having a foot of flat form capable of entering and sliding in said groove 82, and having an arm attached to said foot, which projects through said slot 83, is placed in said receiver 81. Said follower is given a movement toward the side of said needle-fingers by a weight, F, which is attached to a cord, 63, the latter running over a pulley, 62, and having one end connected by said follower.

A needle-table, 92, is attached to the receiver 81, having a metal top, which is arranged in a

plane corresponding to the line of said slot *g* through the front edge of the receiver. The width of said table is such that it permits of placing thereon a group of needles, J, containing such a number as may be at one time put into the receiver. A plate, 93, having a handle thereon, as shown, is placed on said table 92 (said needles J being placed between the end of said plate and the receiver) and serves as a pusher-plate to move said group of needles from the table through said slot *g* into the needle-receiver. Prior to passing said group of needles into the receiver the needle-follower 84 is drawn toward the outer end thereof, and the needles are then pushed forward until they project through slot 82, as shown in Fig. 1, their shanks being held in said slot in the receiver, and then said follower is let go and allowed to bear (by action of the weight F) against said shanks to move the needles toward the fingers 64 and 65, the needle nearest the fingers bearing against the latter.

In order to guard against the accidental displacement of any one or more of the needles of the group of the receiver and to keep their points in line, a gage-plate, 85, (see Figs. 1 and 5,) is supported in front of the receiver 81 in a position at right angles to the needle-fingers. Said gage-plate is fixed on one end of a shank, 86, which enters a perforation in a part of said standard 55, and thereby said plate is supported in the position shown and is capable of being moved toward and from the open edge of said receiver to bring it to such positions as the various lengths of needles may require.

Referring to Fig. 1, there is there shown under the group of needles in the receiver a plate, N, also on said shank 86, the upper edge of which is lower than the upper edge of said gage-plate. The purpose served by the plate N is to support or guide the needles, which extend across the edge and keep them in a uniform horizontal plane as they move toward said needle-fingers.

As above described, when the needle-fingers retire from the clamp-jaws on table 2, having a grooved needle between their ends, as shown in Fig. 2, the end of the upper finger is lifted to free the needle-shank; but owing to the position of said shank between the fingers it does not easily drop therefrom, and, furthermore, it is desirable that the needle be so ejected from the fingers that it will drop clear of any of the operating parts of the machine. To this end an ejector-slide, 87, is attached to the outer side of the gage-plate 85 (see Fig. 5) by screws passing through slots in said slide into said plate, whereby the slide is permitted to move toward and from the sides of the needle-fingers 64 and 65. A spring, 90, attached to the gage-plate, has one end engaging with the slide 87, whereby the latter is moved away from said fingers and retained in the position shown in said figure. The said slide has an arm on one end, which extends under the lower needle finger, on which is an upright stud, 88. An ejector-arm, 91, of suitable wire, is attached to the side of the slide 87 and its upper end terminates near to and opposite the dividing-line between said needle-fingers, and is bent in a line with the latter, as shown.

An ejector-operating stud, 89, is attached to or formed on the under edge of the finger 64, which, when the needle-fingers retire with a needle between them, as aforesaid, strikes said stud 88 and moves slide 87 and the arm 91 toward the side of said fingers and causes the end of said arm to strike the shank of the needle and drive the latter from between said fingers, and the grooved needle drops into any suitable receptacle near the side of the fingers.

The general operation of the needle-fingers in conjunction with the table 2, the clamp-jaws thereon, and the cutters in the grooving operation is as follows: Let it be understood that the needle-fingers occupy a rearward position about as shown in Fig. 2 and have just taken a needle from the receiver, and that the table 2 is in such position (and momentarily at rest) as brings the outer ends of the clamping-jaws thereon between the cutters. The needle-fingers move toward said clamping-jaws and carry the needle between them, and it is then locked there, as described. The cutters (one or both, or one after the other) are engaged with the needle, and the fingers and the table then move together (actuated conjointly by their respective cams) in a direction from the cross-head, the groove or grooves being meanwhile cut from the shank toward the eye of the needle. Nearly or quite at the end of said grooving movement the movement of the fingers is accelerated by the cam controlling them, so that they may be relieved of the grooved needle, as described, and may receive and carry another needle to the clamps while the table momentarily waits to receive it, the operation being then repeated.

What I claim as my invention is—

1. In a machine for grooving needles, a sliding table on the bed of the machine, a cam and weight, substantially as described, for imparting a horizontal reciprocating motion to said table, and needle-clamping jaws secured to said table, combined with two needle holding and carrying fingers, substantially as described, supported opposite the end of said table, and a cam and a weight connected with said fingers, whereby they are given an endwise motion in one direction corresponding with that of said table and an endwise motion in the opposite direction, first corresponding with and then more rapid than that of said table, substantially as set forth.

2. In a needle-grooving machine, the herein-described needle-feeding devices, consisting of two needle-fingers capable of longitudinal reciprocating movements, having a pivoted connection, whereby their ends are separable to receive therebetween the shank of a needle, a spring to close said ends, a finger-lifter located at the side of said fingers, with which

one thereof engages, whereby their needle-receiving ends are caused to open, combined with the table of the machine, having longitudinal reciprocating movements in like direction to said needle-fingers, and needle-clamping jaws attached to said table to receive a needle held by said fingers, substantially as set forth.

3. In a machine for grooving needles, mechanism for manipulating the needles, whereby they are taken one by one from a group thereof and presented to the groove-cutters, and after having been grooved are removed from said cutters, two needle-fingers capable of longitudinal reciprocating movements toward and from said cutters, having a pivoted connection, whereby their ends are separable to receive therebetween the shank of a needle, a spring to close said ends, a finger lifter located at the side of said fingers to open their needle-receiving ends, a needle-receiver holding a group of needles by the side of and in a line with the direction of movement of said fingers, and a needle-follower moving said group toward the side of said fingers, substantially as set forth.

4. The needle-receiver having the internal longitudinal slot, 82, capable of receiving the shanks of the needles, and the slot *g*, communicating therewith, combined with a needle-table on which to place a group of needles in the plane of said slot *g*, and a needle-pusher capable of a sliding motion against said group, substantially as set forth.

5. The needle-receiver having an internal longitudinal slot, 82, capable of receiving the shanks of a group of needles whose points project from said slot, and a needle-follower, 84, having a movement in said slot against said shanks, combined with a gage-plate, 85, supported opposite the points of said needles, and a guide-plate, N, near said gage-plate, over whose upper edge the needles extend, substantially as set forth.

6. The needle-fingers capable of longitudinal reciprocating movements at right angles to the end of the gage-plate 85 and of holding a needle by its shank, combined with an ejector-slide, 87, supported on said plate and having an engagement with said fingers, whereby it is given a movement toward them, an ejector-arm attached to said slide, and a spring to move the slide from said fingers, substantially as set forth.

7. In combination, the needle-fingers, the needle-receiver 81, the needle-follower having a longitudinal movement in said receiver against a group of needles therein, whereby they are forced against said fingers, and the stop-arm 99, supported at the side of said fingers opposite that against which said needles are forced, substantially as set forth.

8. The needle-fingers capable of longitudinal reciprocating movements, having a pivoted connection, whereby their ends are separable to receive therebetween the shank of a needle, one of which fingers has thereon the finger-lifter cam 73, and a spring to close said ends, combined with the finger-lifter 69, pivoted to vibrate in a vertical plane at the side of said fingers and capable of engagement with said cam, and a spring acting against one side of said lifter, substantially as set forth.

9. The needle-fingers, the vibratory lever 75, pivoted by one end and having an engagement with said fingers, a cam on the main shaft, a slide-bar, 76, connected with said lever and having an engagement with said cam, and a weight, F, connected by a cord with said fingers, combined and operating substantially as set forth.

10. The table 2, capable of a longitudinal reciprocating movement on the grooving-machine, and the shaft 12, extending across said table and having a cam, 50, thereon, combined with a lever, 42, pivoted to said table, having a needle-clamp jaw pivoted thereto, a lever, 40, pivoted to said table by one end and engaging with one end of said first-named lever, a rock-bar, 35, having an end engaging with said lever 40 and having a laterally-extending wing, 36, a spring, 38, connected to said bar, and a vertically-moving bar, 48, having one end engaging with said wing and actuated by said cam, substantially as set forth.

11. In combination, a rotating cam, 50, a bar, 48, capable of a vertical movement and actuated in one direction by said cam, and the table 2, capable of a longitudinally-reciprocating movement under the end of said bar, combined with the rock-bar 35, having a wing, 36, thereon whose length is equal to or in excess of said table movement, and a flattened end, 39, a spring attached to said rock-bar and rocking said wing against the end of said vertical bar, the levers 40 and 42, pivoted on said table and actuated by said rock-bar, as described, the jaw 46, fixed on said table, the jaw 44, pivoted on lever 42, and a spring, 51, under said last-named lever, substantially as set forth.

12. The table 2, the lever 42, pivoted on said table, and the clamp-jaw 46, fixed thereon, combined with the clamp-jaw 44, pivotally attached to said lever, and the screw 47, adjustable vertically under the jaw-bearing end of the lever, all as set forth.

13. The cross-head 10, the shaft 12, extending across the machine in a line with said head, the blocks 30, capable of sliding horizontally on the cross-head, each having a stud, 22, connected thereto and extending toward the end of said shaft, and a spring interposed between said blocks to separate them, combined with a cam, substantially as described, on one or both ends of said shaft engaging with said stud to move one or both of said blocks toward the center of the cross-head, capable of having the extent of its cam-surface which acts on said stud elongated or shortened, and a cutter-shaft having a needle-grooving cutter attached thereto attached to each of said horizontally-sliding blocks, substantially as set forth.

14. The combination, with the bearing-