(No Model.) 3 Sheets—Sheet 1.

J. H. BULLARD.

MACHINE FOR BENDING THE ENDS OF KNITTING MACHINE NEEDLES.

No. 348,151. Patented Aug. 24, 1886.

Fig 1

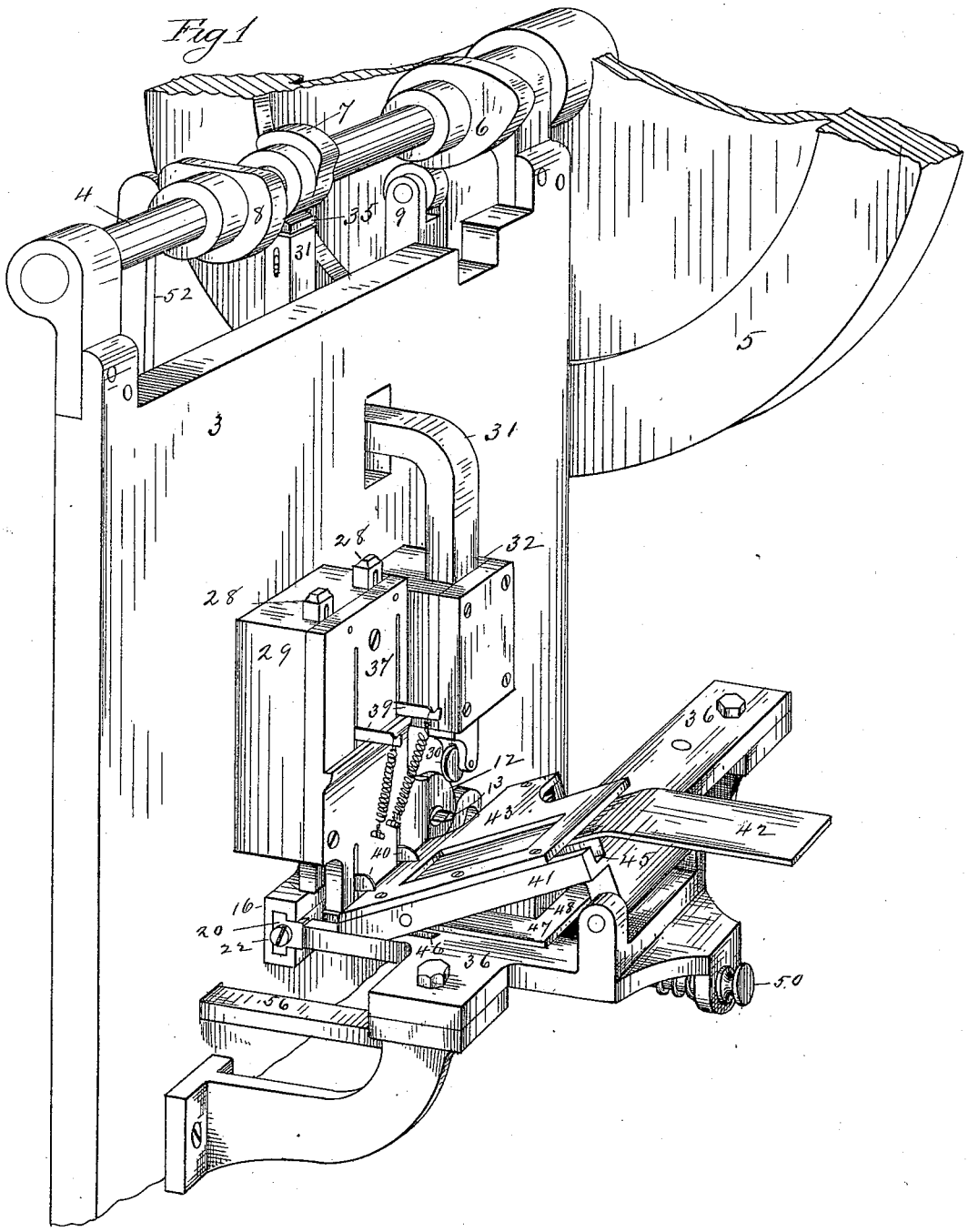

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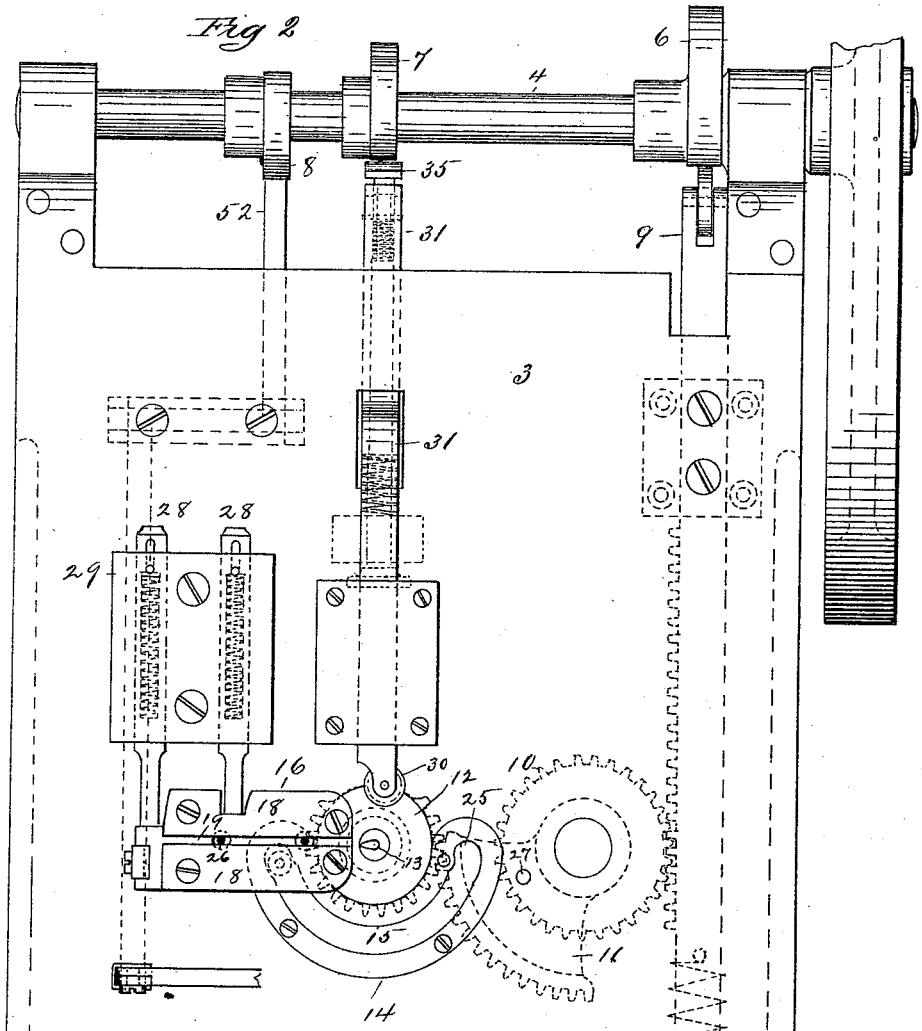
Fig 2



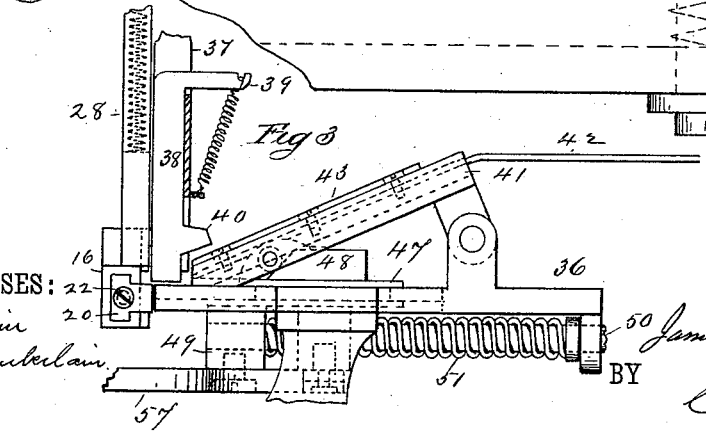


Fig 3

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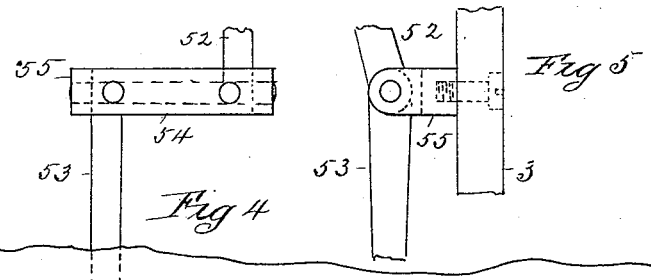

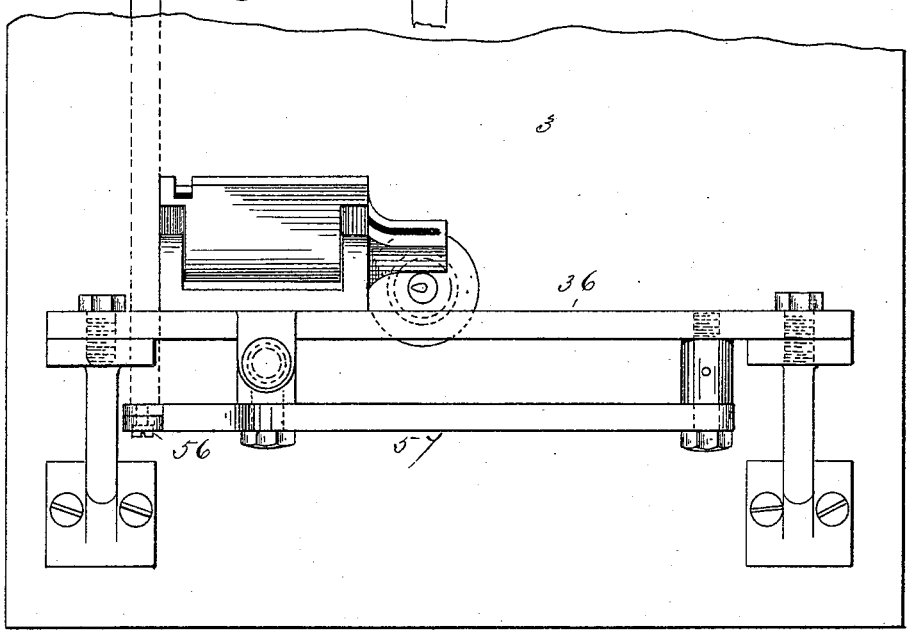

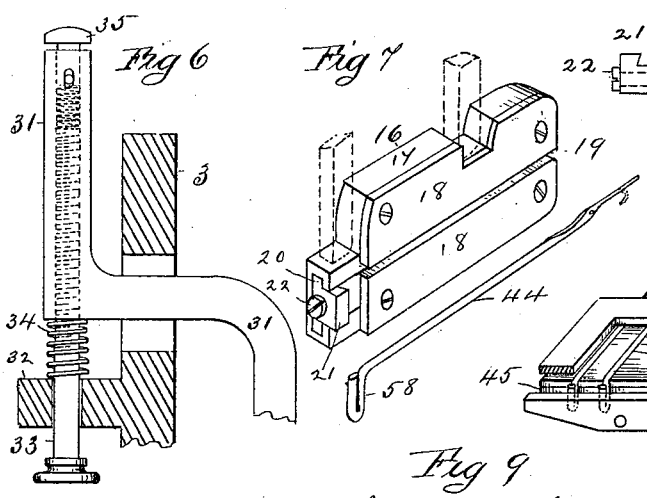

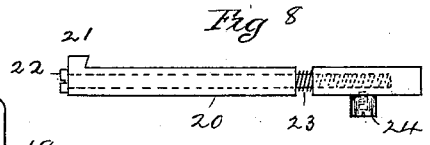

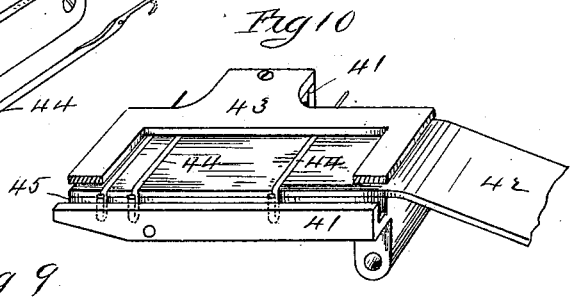

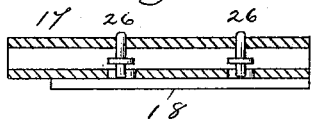

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UNITED STATES PATENT OFFICE.

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MACHINE FOR BENDING THE ENDS OF KNITTING-MACHINE NEEDLES.

SPECIFICATION forming part of Letters Patent No. 348,151, dated August 24, 1886.

Application filed May 24, 1886. Serial No. 203,056. (No model.)

To all whom it may concern:

Be it known that I, JAMES H. BULLARD, 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 Machines for Bending Needles, of which the following is a specification.

This invention relates to machines for bending the latch ends of knitting-machine needles, the object being to provide a machine for said purpose whereby said needles are rapidly manipulated and their latch ends are bent to the requisite uniform hook shape; and the invention consists of the peculiar construction and arrangement of the parts of the machine, as hereinafter fully described, and set forth in the claims.

In the drawings forming part of this specification, Figure 1 is a perspective view of a machine for bending the ends of knitting-machine needles, constructed according to my invention, the lower part of the frame-plate and a part of the driving-pulley being broken off. Fig. 2 is a front elevation with the needle-feeding devices removed. Fig. 3 is a side elevation of the needle-feeding devices. Fig. 4 is a front elevation of the lower end of the frame-plate and a portion of the needle-feeding devices thereon, and showing a portion of the levers above said plate which actuate a part of said feeding devices. Fig. 5 is a side elevation of the lever mechanism shown above the frame-plate in Fig. 4. Fig. 6 is a vertical section of a part of the frame-plate and a side elevation of a portion of the roller-bar hereinafter described. Fig. 7 is a perspective view of the needle-holder, showing the lower ends of the stop-bars in dotted lines and a needle before its point is bent, dotted lines on the latter indicating the hook shape which is imparted to it by the action of the machine. Fig. 8 is a side elevation of the sliding clamp of said needle-holder. Fig. 9 is a longitudinal section of the needle-holder, showing therein the ejecting-pins. Fig. 10 is a perspective view, partly in section, of the feed-table, showing several needles in position thereupon.

In the drawings, 3 is a metallic frame-plate provided with a suitable base, (not shown in the drawings,) whereby it is supported in a vertical position, and 4 is a shaft hung in suitable bearings on the upper end of the frame-plate, having secured on one end the driving-pulley 5, by which rotary motion is given to said shaft. Three cams, 6, 7, and 8, are secured on said shaft and operate the several parts of the machine, as hereinafter described. A rack-bar, 9, is attached to the rear side of the frame-plate 3, by suitable supports, in which it has a vertical reciprocating motion. Said bar is moved downward by the cam 6 on shaft 4, and in the opposite direction by a spring at its lower end, as shown in dotted lines in Fig. 2, in which said rack-bar is also shown, mainly in dotted lines. A pinion, 10, having attached thereto a segment, 11, (both of which are shown in dotted lines in Fig. 2,) is hung to rotate in engagement with the rack-bar 9 on the rear side of said frame-plate. A short shaft, 12, is hung to rotate in said frame-plate, the forward end of which projects slightly beyond the front side of the latter, and has fixed therein the former 13, around which the end of the needle is bent, and by which the requisite form is given thereto. The rear end of shaft 12, back of the frame-plate, as shown by dotted lines in Fig. 2, has thereon a broken-geared pinion, with which the said geared segment 11 engages. By the said vertical reciprocating movements of the rack-bar 9 a reciprocating rotary motion is imparted to the shaft 12 and to the former 13 thereon. A cam-plate, 14, is secured on the frame-plate under the shaft 12, having therein a slot, 15, which is concentric with the center of said shaft, excepting at each end, where said slot for a short distance is eccentric thereto. A needle-holder, 16, is secured by one end to the end of said reciprocally-rotating shaft 12, and consists of a block, 17, having a longitudinal groove on its rear side, two plates, 18, secured on its front side, between which is a groove, 19, and a needle-clamp, 20, adapted to slide in said groove in the rear side of the block 17, and having a jaw, 21, thereon, which operates opposite the end of one of plates 18 to clamp one end of the needle therebetween, as hereinafter described. Said sliding clamp 20 is made in two parts, as shown in Fig. 8, which are united by a screw, 22, and between

said two parts on the screw is placed a spiral spring, 23, which acts to keep the jaw end of the clamp against the head of said screw. The rear part of said clamp has a stud, 24, on its rear side, which engages with the aforesaid cam-groove 15 in the cam-plate 14 on the front side of the frame-plate 3.

The purpose of the screw 22 in the clamp 20 is to provide means for varying the operative positions of the jaw 21 relative to the end of one of plates 18, to accommodate the clamp to various widths of the part of the needle which is secured between said jaw and the end of said plate. When the needle-holder 16 stands in the positions shown in Figs. 1 and 2—that is to say, ready to receive a needle from the feeding devices, hereinafter described—the stud 24 on said sliding clamp is in the eccentric portion of the slot 15 in said cam-plate at one end thereof, as shown in Fig. 2, whereby said clamp is caused to slide in a direction from the center of shaft 12, thereby moving jaw 21 away from the end of plate 18, to permit of the free introduction therebetween of the part of the needle which is to be clamped, as aforesaid, and after the needle has been placed therein and the needle-holder is swung slightly downward from the horizontal position shown in Fig. 2, the stud 24 is brought into engagement with the said concentric portion of the said cam-slot 15, and thereby the clamp 20 is caused to slide inward, drawing the jaw 21 thereon toward the end of plate 18 and clamping said needle part therebetween, and so holding the needle while its point is being bent, as hereinafter described. When the needle-holder carrying the needle swings around far enough to bring the stud 24 to the opposite end of the slot 14, from whence it started, said stud runs into the said eccentric part of the slot, whereby the clamp is again freed and permitted to slide sufficiently to disengage the jaw 21 from the needle, so that the latter can be thrown out of the holder, as below described, before the latter swings back to take another needle. The said eccentric part of the slot 15 is designated by 25. The block 17 of the needle-holder is perforated transversely to receive two pins, 26, as shown in Fig. 9, the heads of which are behind the edges of the plates 18, and whose forward ends occupy a position at the base of the slot 19, between said plates, as shown in Fig. 2, and their rear ends project beyond the rear side of the needle-holder when a needle is in place in the latter, as above described; and when the needle-holder swings around to bend the point of the needle, the said rear ends of the ejecting-pins 26 engage with the projecting ends of two pins, 27, fixed in the front side of the frame-plate 3, causing the pins 26 to be suddenly moved endwise against the needle in the holder, thereby throwing the needle out of the latter. Two needle-stops, 28, are hung in a supporting-block, 29, on the front side of the frame-plate 3, each of which stops is provided with a spiral spring, as shown in Fig. 2 in dotted lines, whereby their lower ends are held against the upper edge of the needle-holder, and the said stops are caused to follow the downward movement of the latter to bring the lower ends of said stops at the edge of a table, hereinafter described, from which the needles slide into the groove 19 in the holder, said stops serving to retain a needle on said table should one have been accidentally left there after the holder has swung downward below the edge of the table. When the needle-holder swings back to its horizontal position, it encounters the lower ends of said stops and again moves them upward to the positions shown in Fig. 2. The notches shown in the upper edge of the needle holder, in which the lower ends of the stops 28 rest, are provided for the purpose of reducing the extent of movement of said stops, which is requisite to bring them before the edge of said table. The point of the needle, when it is bent, is compressed between said former 13 on the end of shaft 12 and the roller 30, hung in the end of the vertically-moving roller-bar 31. Said roller-bar is supported in the block 32 on the frame-plate 3, and passes through an opening in the latter to the rear side of said plate and then extends upward, terminating beneath the cam 7 on shaft 4.

Fig. 6 illustrates in detail the construction of that part of said roller-bar behind the frame-plate and a certain connection which it has with the latter, as follows: Through a projection, 32, on the rear side of the frame-plate a screw, 33, extends upward into said roller-bar. A spiral spring, 34, is placed between the projection 32 and the roller-bar on the screw 33, which serves to lift the roller-bar upward, holding its upper end against its operating-cam, and thereby lifting the roller 30 away from the needle-point former 13 after the needle has been bent. The upper end of the roller-bar 31 is provided with a yielding bearing-block, 35, having a shank which enters the end of said bar, as shown, and between the lower end of said shank and the upper end of the screw 33 is placed a spiral spring, as shown in Fig. 6.

The points of the needles, herein described, which are to be bent by the bending-machine, are of varying diameters, and hence are more or less rigid; and to provide means for adjusting the pressure of roller 30 upon the needle-point according to the resistance that may be required to bend the latter, the said spring is placed between the compression-block and screw 33, and can by the latter be compressed or elongated to vary its resistance, thereby varying the pressure which is exerted against said needle-point while the latter is being bent.

On the front side of the block 29, in which the stops 28 operate, is secured in front of the latter the plate 37, whose lower end extends downward to a point just above the slot 19 in the needle-holder 16, and in said plate 37 are placed two vertically-operating gates, 38, each having an arm, 39, projecting through

slots in the upper part of said plate, to which spiral springs are connected, as shown, the lower ends of the latter being secured to pins in plate 37. Said springs serve to draw said gates downward to the position shown in Figs. 1 and 3. Said gates 38 have each an arm, 40, thereon, near their lower ends, which project through said plate 37, near the lower end of the latter.

The gates 38 co operate with the needle-feeding devices hereinafter described.

On suitable arms projecting from the front side of the frame-plate 3 is secured a table, 36, on which are supported the below-described needle-feeding devices. Between suitable upright supports on said table 36 is pivoted the feed-table 41, having thereon the apron 42. The detail construction of said table is illustrated in Fig. 10. Said apron extends over the top of the table, from end to end, and has the perforated cover 43 secured over it, but raised above it sufficiently to permit the needles 44 to pass between said cover and the apron as they are fed downward toward the needle-holder. A groove, 45, is formed in the table 41 at the edge of said apron, which receives the bent shanks of the needles, as shown in Fig. 10. The cover 43 serves to keep the needles side by side in proper position as they move downward on the inclined portion of the apron 42. The lower end of the table 41 rests on said table 36, and extends nearly to the front side of the plate 37, in which are supported the aforesaid gates 38, room being left between the end of the table 41 and the latter to allow one needle at a time from the apron 42 to drop onto table 36, in front of said gates. The table 36 has in it a slot, 46, which corresponds with the line of the slot 45 in the table 41, so that the bent shanks of the needles which fall on table 36 drop into said slot in the latter. A pusher-plate, 47, is arranged to operate on table 36, under the feed-table 41, to push the needles which fall upon table 36, as aforesaid, into the needle-groove 19 in the needle-holder, and also to lift up the lower end of the feed-table 41 and the gates 38. A block, 48, on the top side of said pusher-plate strikes the under side of the table 41 when it moves toward the end of the latter, thereby lifting the end of said table as aforesaid, and on the under side of said pusher-plate is a block, 49, in which the end of a pin, 50, is guided or supported, the opposite end of said pin being supported in a down-hanging lip under the end of table 36. A spiral spring, 51, is placed on the pin 50 between a collar thereon and the block 49 on the pusher-plate, and said spring serves to move the latter toward the needle holder when free to do so. Said block 49 on the pusher-plate has a free movement back and forth on the end of the pin 50. The pusher-plate 47 is moved away from the needle-holder (at the same time compressing spring 51) by means of vibrating levers 52 and 53, which are pivoted to the rear side of the frame-plate 3, (see Figs. 1, 2, and 4,) both of said arms being connected to a sleeve, 54, which is hung on a pivot between the arms of a support, 55, the latter being secured to said frame-plate. The upper end of lever 52 engages with the rear side of the cam 8 on shaft 4, and the lower end of lever 53 is connected by a rod, 56, which passes through the frame-plate, with the end of a horizontally-vibrating lever, 57, under the table 36, which is pivoted by one end to the latter, and a bolt passing through lever 57 into block 49 on the pusher-plate connects said lever with the latter, and therefore by the combined means of the levers 52 53 57, the cam 8, and the spring 51, said pusher-plate is given its requisite motions toward and from the needle-holder. It will be seen that the positive motion which the lever 52 and 53 impart to the pusher-plate is the rearward one, and that its movement toward the needle-holder is imparted to it by the spring 51, the latter incidentally serving to hold the end of lever 52 against the edge of the cam 8. The pusher-plate is moved, preferably, by a spring toward the needle-holder, (which spring is of sufficient strength to carry a needle into the holder when not accidentally obstructed,) in order to prevent the accidental breaking of any parts should any needles become caught between the pusher-plate and the needle-holder. The needles preparatory to having their latch ends bent, as aforesaid, are finished to the condition shown in Fig. 7, having the bent shank 58 thereon, which is the part of the needle which is clamped, as above described, between the jaw of the slide 20 of the needle-holder and the end of one of plates 18 thereon, that part of the needle between said bent shank and its pointed portion being mainly within the slot 19 in said holder while the point is being bent.

The operation of the above described machine is as follows: A series of needles, 44, is placed on the inclined apron on the feed-table 41, in the position shown in Fig. 10, on which table the needles slide downward by gravitation and are carried one by one onto the horizontal table 36 in front of the gates 38. The lower end of the feed-table is then lifted up by the movement of the block 48 against its under side, the pusher-plate at the same time moving toward the needle-holder. When the end of the feed-table is lifted up, it engages with the arm 40 on the said gates, lifting up the latter and leaving the needle dropped from the feed-table onto the table 36 before said gates, free to be moved by the pusher-plate into the groove 19 in the needle-holder, its bent shank 58 being brought into position to be clamped, as aforesaid, the point of the needle extending over the upper side of the point-former 13, in the center of the end of the shaft 12. The roller-bar 31 then moves down, carrying roller 30 against the sides of the pointed end of the needle and holding it firmly against the point-former, and then the rack-rod 9 moves downward, swinging the segment 11, and thus rotating shaft 12 and the point-

former, and swinging the needle-holder and the needle around in a vertical plane, bringing the holder nearly to such a position on the opposite side of shaft 12 as it is shown to occupy in Fig. 2 relative thereto, or to such a degree as causes the pointed end of the needle to be bent around the former 13 and brought to the shape shown in dotted lines in Fig. 7. The action of the cam-slot 15 upon the sliding clamp of the needle-holder to clamp and unclamp the needle is described above. When the point of the needle has been bent by the movement of the needle-holder, as described, the needle is thrown out of the holder by the ejecting-pins 26, whose rear ends strike the projecting pins 27 on the frame-plate, and the needle holder then swings back to the position shown in Fig. 2, to receive another needle, and the bending operations are repeated.

What I claim as my invention is—

1. A machine for bending the points of needles, consisting of the following elements: an inclined feed-table on which the needles to be bent are placed, a needle-holder opposite the end of said feed-table having a groove in its face to receive and hold a needle, a pusher-plate located under said feed-table and capable of a reciprocating movement toward and from said needle-holder, a shaft capable of reciprocating rotary motion, having said needle-holder secured thereto and having a needle-point former projecting therefrom opposite the end of said groove in the needle-holder, a roller-bar carrying a needle-point roller to bear on the side of the needle while it lies across said point-former, and means, substantially as described, for imparting a reciprocating rotary motion to said shaft, point-former, and needle-holder, a reciprocating horizontal motion to said pusher-plate, and a reciprocating vertical motion to said roller-bar, combined and operating substantially as set forth.

2. In a needle-point-bending machine, a shaft having a needle-point former projecting from the end thereof, a needle-holder having a groove in its face to receive and hold a needle, secured to the end of said shaft at right angles to the axis of the latter, a roller-bar carrying a needle-point roller to bear on the side of the needle while the latter is being bent, a horizontal table secured opposite the grooved side of the needle-holder, an inclined feed-table pivoted on the last-named table and having its free end resting on the latter, a sliding needle-pushing plate attached to said horizontal table between the latter and said feed-table and engaging with the latter to swing its free end, two gates supported vertically between the end of said feed-table and the needle-holder, having arms thereon with which the feed table engages when its end swings upward, and means, substantially as described, for imparting a reciprocating rotary motion to said shaft, point-former, and needle-holder, a reciprocating horizontal motion to said needle-pushing plate, and a vertical reciprocating motion to said roller-bar, combined and operating substantially as set forth.

3. In combination, in a machine for bending the points of needles, a needle-holder having a groove in its face to receive and hold a needle and secured to the end of a reciprocally-rotating shaft at right angles to the axis of the latter, a horizontal table secured opposite the grooved side of the needle-holder, an inclined feed-table pivoted on the last-named table and having its free end resting on the latter, two vertically-operating needle-stops supported over said needle-holder and resting on the latter and capable of dropping down opposite the end of said horizontal table when the needle-holder swings from under them, and means, substantially as described, for imparting a reciprocating rotary motion to said shaft and needle-holder, substantially as set forth.

4. In combination, in a machine for bending the points of needles, a needle-holder having a groove in its face to receive and hold a needle and secured to the end of a reciprocally-rotating shaft at right angles to the axis of the latter, a horizontal table secured opposite the grooved side of the needle-holder, an inclined feed-table pivoted on the last-named table and having its free end resting on the latter, a sliding needle-pushing plate attached to said horizontal table under said feed-table and engaging with the latter to swing its free end, two vertically-operating needle-stops supported over and resting on said needle-holder and capable of dropping down opposite the end of said horizontal table when the needle-holder swings from under them, two gates supported vertically between the end of said feed-table and said needle-holder, having arms thereon with which the feed-table engages when its end swings upward, and means, substantially as described, for imparting a reciprocating rotary motion to said shaft and needle-holder and a reciprocating horizontal motion to said needle-pushing plate, substantially as set forth.

5. In combination, a needle-holder for a machine for bending needles, consisting of a block, substantially as described, having a longitudinal groove in its front side to receive a needle, a similar groove in its rear side to receive a needle-clamp, a needle clamp having an endwise motion in said last-named groove, and having a laterally-projecting head thereon and a stud on its rear side, a reciprocally-rotating shaft, to the end of which said needle-holder is secured at right angles to the axial line thereof, a cam-plate fixed near the end of said shaft having a groove therein which is concentric with the center of the latter, excepting at each end thereof, in which groove said stud engages, and means, substantially as described, for imparting a reciprocating rotary motion to said shaft, substantially as set forth.

6. In combination, the rack-bar 9, having a longitudinally-reciprocating motion by means substantially as described, a geared segment secured to a pinion engaging with said rack-bar, the shaft 12, having a pinion thereon en-

gaging with said segment, the plate 14, provided with the cam-groove 15, and the needle-holder 16, secured to said shaft and having a sliding clamp provided with a stud which engages with said cam-groove, substantially as set forth.

7. In combination, the needle-holder 16, provided with the sliding clamp having a stud on its rear side, the shaft 12, having said needle-holder attached thereto, the point-former 13, secured on said shaft, the plate 14, having the cam-grcove 15 therein, with which said clamp-stud engages, the roller-bar 31, the roller 30, to bear on said point-former, and means, substantially as described, for imparting to said shaft a reciprocating rotary motion and to said roller-bar a longitudinally-reciprocating motion, substantially as set forth.

8. In combination, the table 36, secured in front of the needle-holder, provided with the groove 46, the feed-table pivoted by one end to said table 36 and provided with the groove 45, and having the apron 42 secured thereon, and the perforated cover 43, secured above the latter, substantially as set forth.

9. In combination, the table 36, the pusher-plate 47, having the block 48 on its upper side, and the block 19 on its lower side, the pin 50, having one end engaging with said table 36, and its opposite end entering said block 19, the spring 51 on said pin, the feed-table 41, the lever 57, pivoted under table 36, and having a pivotal engagement with said block 19, and means, substantially as described, for imparting a vibratory motion to said lever, substantially as set forth.

10. In combination, the needle-holder 16, the ejecting-pins 26 therein, the pins 27, fixed in the frame-plate 3, and means, substantially as described, for rotating said needle-holder, whereby the ends of said ejecting-pins are brought into engagement with said pins 27, substantially as set forth.

11. In combination, the needle-holder block 17, the clamp 20, sliding in said block, consisting of two parts united by the adjusting-screw 22, and the spring 23, interposed between said clamp parts, substantially as set forth.

12. In combination, the frame-plate 3, having the projection 32 thereon, the roller-bar 31, the screw 33, passing freely through said projection into said roller-bar, the spring 34, located between said projection and roller-bar, the yielding bearing-block 35, having a shank entering the end of said roller-bar, a spring located between the end of said shank and the end of screw 33, the cam 7, the roller 30, and the point-former 13, substantially as set forth.

13. In combination, the point-former 13, the roller 30, the roller-bar 31, the bearing-block 35, having a shank entering the end of said bar, a spring located beneath the end of said shank, and the cam 7, substantially as set forth.

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