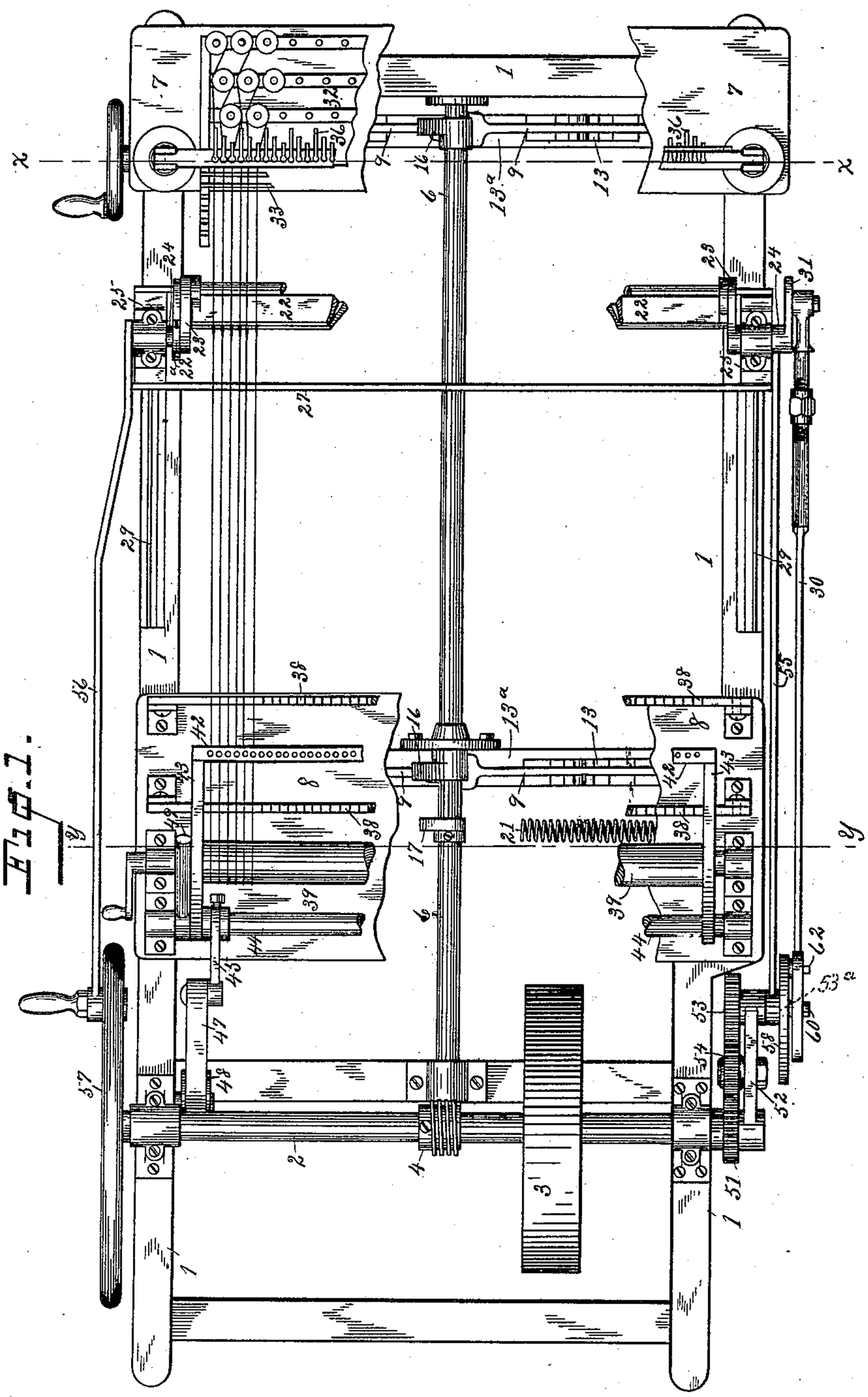
(No Model.) 4 Sheets—Sheet 1.

# P. M. BEERS.

## MACHINE FOR POLISHING THE EYES OF NEEDLES.

No. 407,324. Patented July 23, 1889.



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(No Model.)

4 Sheets—Sheet 2.

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No. 407,324. Patented July 23, 1889.

FIG. 2.

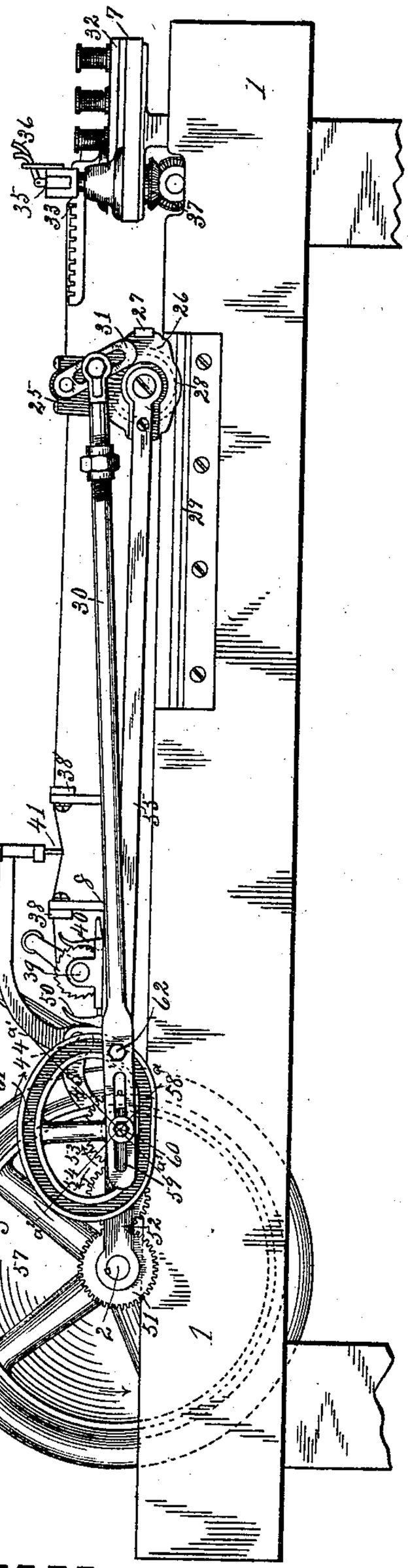
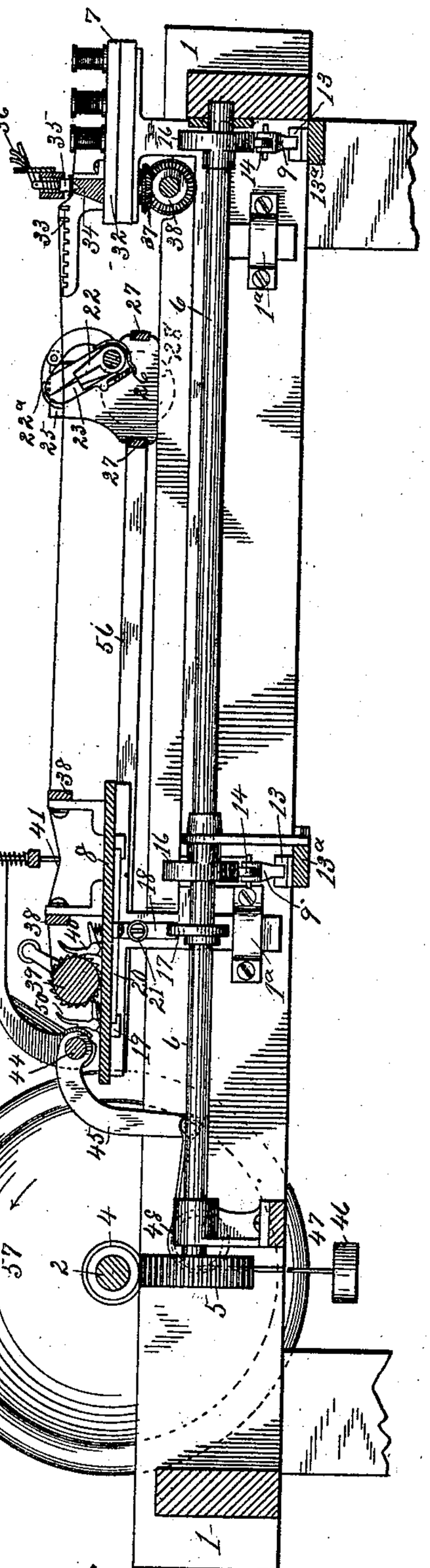


FIG. 3.



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(No Model.) 4 Sheets—Sheet 3.

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## MACHINE FOR POLISHING THE EYES OF NEEDLES.

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Fig. 4.

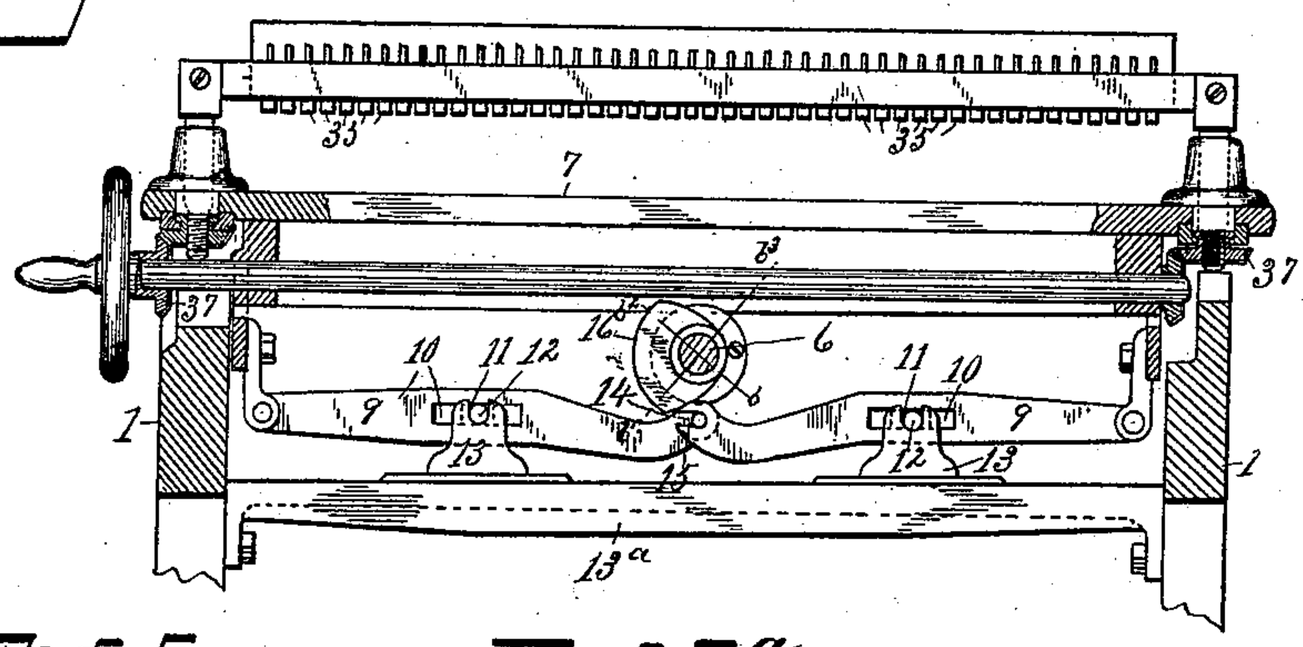



Fig. 5.

Fig. 4a



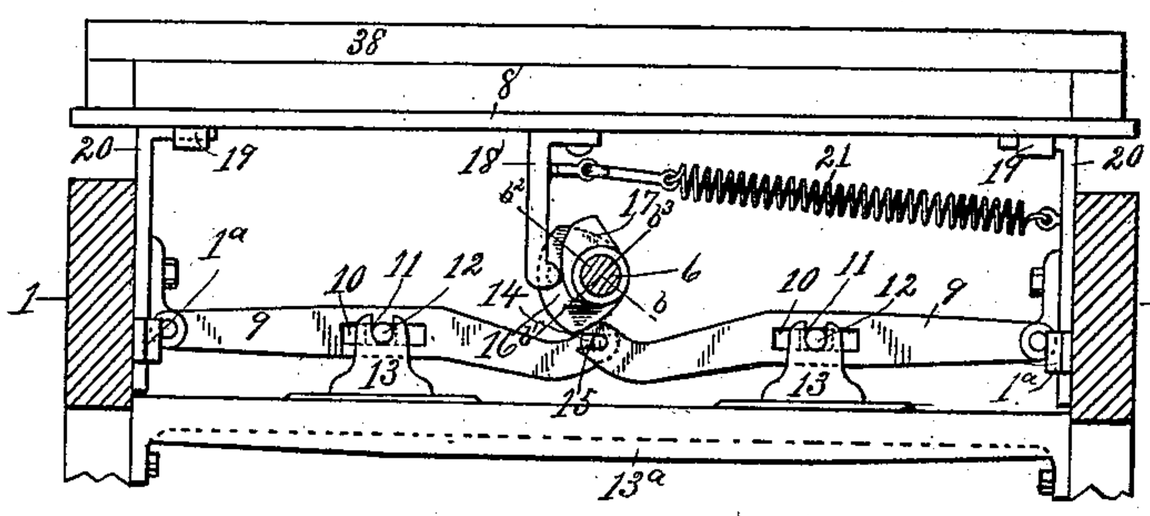



Fig. 6.

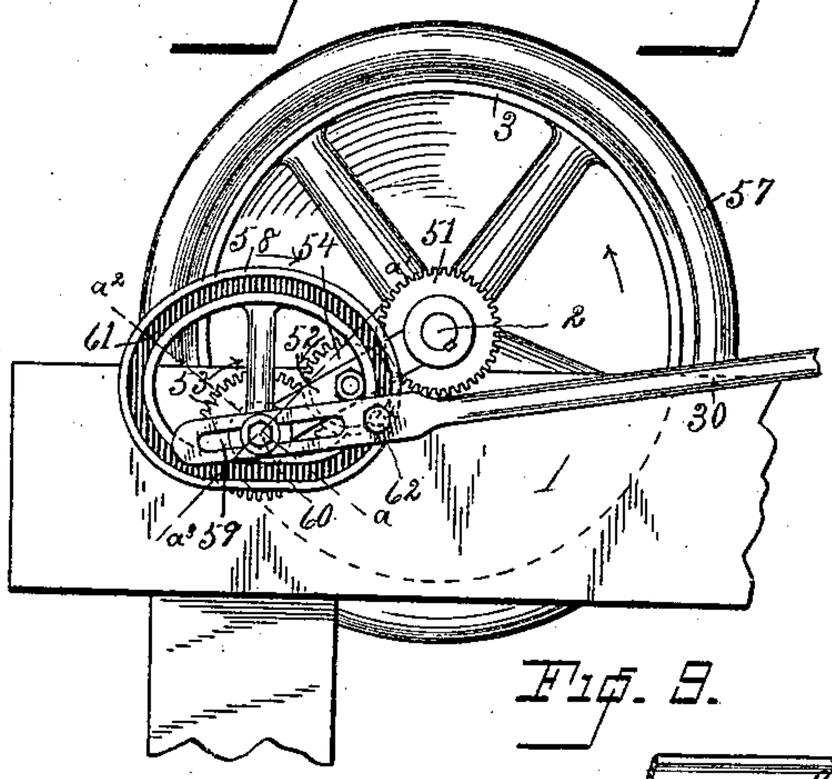



Fig. 7.

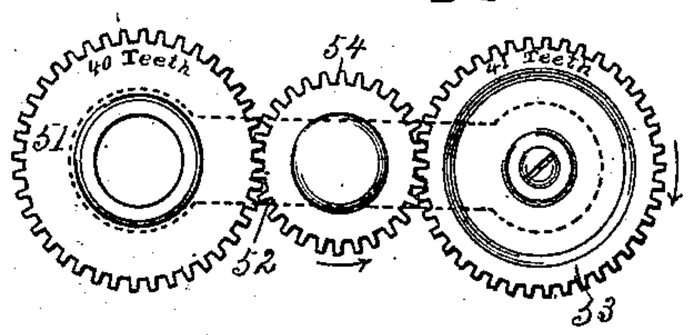



Fig. 8.

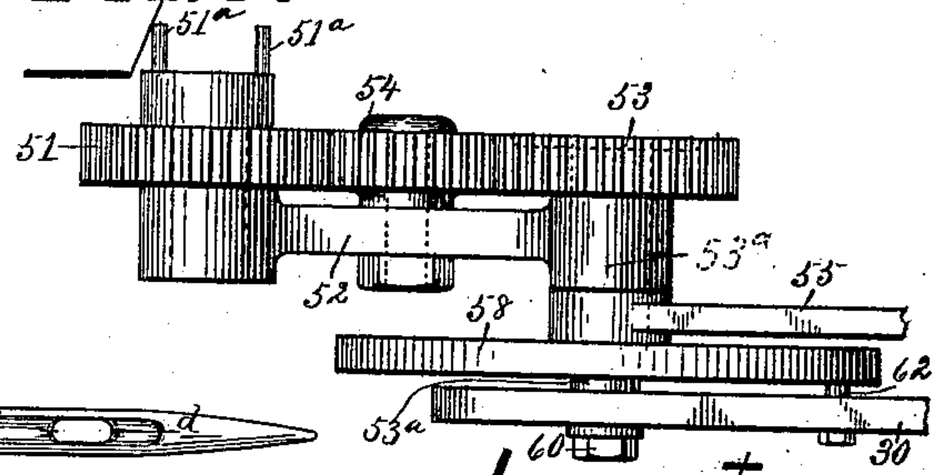



Fig. 9.




Fig. 10.

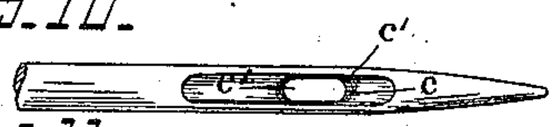
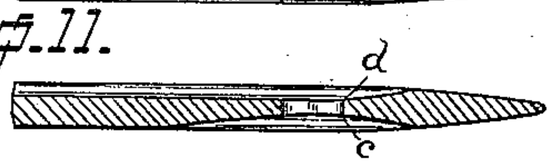



Fig. 11.

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## MACHINE FOR POLISHING THE EYES OF NEEDLES.

No. 407,324. Patented July 23, 1889.

Fig. 12.

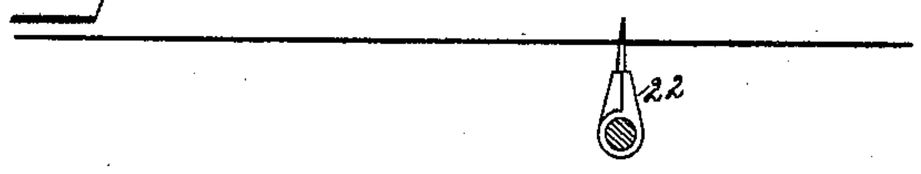



Fig. 13.

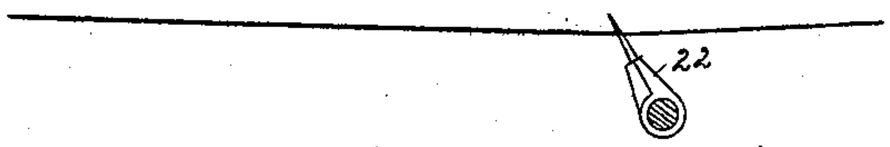



Fig. 14.

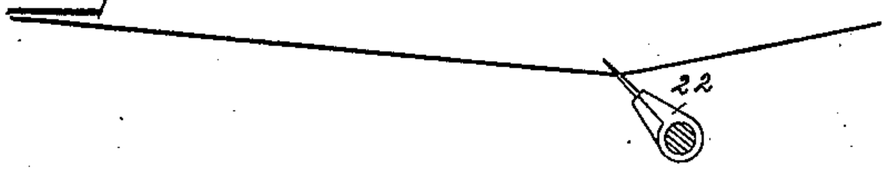



Fig. 15.


Fig. 16.

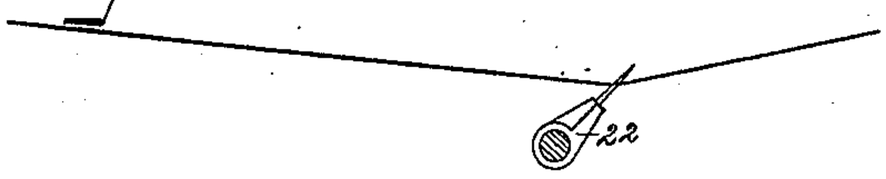



Fig. 17.

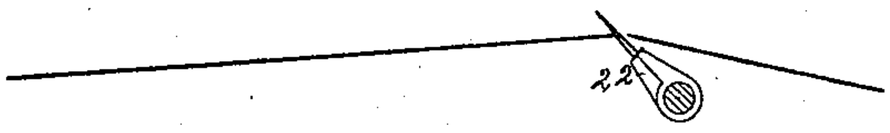
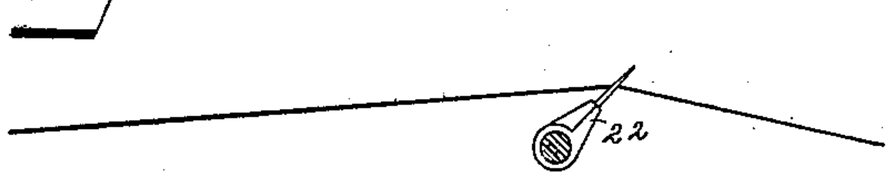



Fig. 18.

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# UNITED STATES PATENT OFFICE.

PHILO M. BEERS, OF BRIDGEPORT, CONNECTICUT.

## MACHINE FOR POLISHING THE EYES OF NEEDLES.

SPECIFICATION forming part of Letters Patent No. 407,324, dated July 23, 1889.

Application filed July 2, 1888. Serial No. 278,730. (No model.)

*To all whom it may concern:*

Be it known that I, PHILO M. BEERS, a citizen of the United States, residing at Bridgeport, in the county of Fairfield and State of Connecticut, have invented certain new and useful Improvements in Machines for Polishing the Eyes of Needles; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to the class of machines illustrated and described in my former Letters Patent, Nos. 175,539, dated March 26, 1876, and 278,854, dated June 5, 1883, and has for its object to greatly improve their operation by insuring that the entire polishing action shall take place at just those portions of the needle-eye which receive the friction of the thread in use, a special polishing action being provided to smooth the corner of the eye against which the thread is drawn by the action of the hook or shuttle as it takes the loop, thereby reducing the danger of breaking the thread to the minimum and practically avoiding that trouble at the needle even when fine or weak threads are used.

With these ends in view I have devised the simple and novel construction of which the following description, in connection with the accompanying drawings, is a specification, numbers being used to denote the several parts.

Figure 1 is a plan view of the entire machine, portions of the tables being broken away to show the parts beneath; Fig. 2, a side elevation; Fig. 3, a central longitudinal section, the longitudinal shaft being in elevation; Fig. 4, a section on the line *x x* in Fig. 1, looking toward the front of the machine; Fig. 4ª, a detail view of the ends of a pair of the levers which lift the tables; Fig. 5, a section on the line *y y*, looking toward the front of the machine; Fig. 6, a detail side elevation showing a position of the clamp reciprocating and shifting mechanism at another portion of the revolution of the main shaft; Fig. 7, a detail view, on an enlarged scale, of the clamp-shifting gears detached; Fig. 8, a plan view, on an enlarged scale, of the clamp reciprocating and oscillating mechanism detached; Figs. 9 and 10, elevations, on a greatly-enlarged scale, of the point end of a sewing-machine needle; Fig. 11, a section of a needle on the same scale; and Figs. 12 to 18, inclusive, are diagrams illustrating the various positions relatively to each other which are assumed by a needle held by the clamp and a polishing-thread during the operation of polishing an eye.

Similar numbers denote the same parts in all the figures.

1 denotes the frame-work of the machine; 2, the main shaft, to which power is applied by a belt (not shown) running over a pulley 3, and which is provided with a worm 4, engaged by pinion 5 on longitudinal shaft 6.

7 denotes the front table, and 8 the rear table. These tables are both lowered and raised simultaneously by means of levers 9, the outer ends of which are pivoted in any suitable manner underneath the tables. Midway their length these levers are provided with slots 10, which receive blocks 11. (See dotted lines, Figs. 4 and 5.)

12 denotes pins passing through the blocks, the ends of which are journaled in brackets 13 upon cross-bars 13ª. One of these levers is provided at its inner end with a roller 14, (see dotted lines, Figs. 4 and 5,) the end of the other lever being branched to embrace the roller and the end of the lever that carries it, the pins upon which the rollers are journaled engaging slots 15 in the ends of the branches.

16 denotes cams on longitudinal shaft 6, which are adapted to engage rollers 14 during each rotation of said shaft, as will be more fully explained. As viewed in Figs. 4 and 5, the longitudinal shaft rotates from right to left, the action of cams 16 being to press down the inner ends of the levers, thereby raising the outer ends and carrying the tables upward, the table being shown as rising in both of said figures. In addition to the upward and downward movement of the rear table, caused by the rear cam 16 and the rear pair of levers 9, this table has also a lateral movement, caused by the engagement of a cam 17 on longitudinal shaft 6 with an arm 18, projecting downward from the table. It will be noticed (see Fig. 5) that the rear table is provided on its under side with eyes 19, which are engaged by the horizontal arms of angle-pieces 20, the verti-

cal arms engaging similar eyes $1^a$ on the frame-work. The levers 9, which raise and lower this table, are pivotally connected to the angle-pieces instead of to the table proper. Arm 18 is preferably provided with a roller in its face to bear against the cam, and a spring 21 is provided to return the table to its normal position as soon as the cam has passed the arm. It will be seen that the angle-pieces themselves serve as stops to limit the return movement of the table after the cam has passed the roller.

22 denotes the needle-clamp, the construction of which forms no portion of my present invention. It is sufficient to say that the clamp consists, essentially, of two plates extending across the machine, between which a row of needles is firmly held, a suitable lock $22^a$ being provided to hold the plates in the closed position, so that the needles cannot shift while the machine is in use and can move only with the clamp. The outer ends of the clamp-plates are secured to arms 23, which extend from rock-shaft 24, journaled in sliding carriage 25, said carriage consisting, essentially, of side pieces 26, connected by cross-bars 27. Each of the side pieces is provided with a roller 28, which travels upon a track 29 upon the frame-work.

30 denotes a connecting-rod, one end of which is adjustably secured to an arm 31 upon the outer end of one of the rock-shafts 24, as is clearly shown in Figs. 1 and 2, the opposite end of said rod being connected to clamp reciprocating and oscillating mechanism, which I will presently describe.

In order to make clear the operation of the machine, I will describe briefly certain portions of the mechanism which are common to this and to my former machines. (See my former patent, No. 278,854, referred to.)

32 denotes the rack by which the needles and the polishing-threads are carried. The needles are threaded with the long grooves toward the front of the machine—that is, toward the right, as seen in Figs. 1, 2, and 3. The rows of needles extend across the machine and are separated by plates 33, the ends of which rest in notches in the rack, one end of two plates and the notches to receive the plates being shown in Fig. 1. The threads pass over a bar on the front table, and each thread is firmly clamped by a spring-actuated plunger 35. Each plunger may be lifted independently of the others by a lever 36 in the event of the thread breaking. After the operation upon each row of needles is finished bar 34 is raised by means of bevel-gears 37, the cross-shaft, hand-wheel, &c., to release all the threads simultaneously. In use the threads pass over bars 38 on the rear table, said bars being provided with notches to receive the threads, which are held taut by a tension device acting between bars 38, which I will presently describe.

Each row of needles after being finished is drawn forward beyond the limit of reciprocation of the carriage, and the thread that has been used in polishing is wound upon cross-shaft 39, said shaft being held against backward movement by a spring-pawl 40, a new length of the thread being provided for each row of needles. Having pushed the finished row of needles backward out of the way, another row is removed from the rack, the separating-plate 33 being used to move them all along together, and this row placed in the clamp and locked there as before. Bar 34 is then lowered, by means of the beveled gears, &c., until the plungers hold the threads firmly, and the tension device is lowered upon the rear ends of the threads between bars 38 on the rear table. The machine is then ready to start. The polishing of the eyes is accomplished by the use of emery and oil, which are placed upon the threads with a brush or in any suitable manner. The tension device consists of a series of spring-actuated plungers 41, carried by cross-bars 42, the opposite ends of which are connected to arms 43, which extend from rock-shaft 44.

45 denotes an arm extending downward from the rock-shaft, 46 a weight, and 47 a strap extending from the weight over a pulley 48 and connected to arm 45, whereby the full pressure of the weight is transmitted to the plungers bearing upon the thread, as clearly shown in Fig. 3. It should be noted that as rock-shaft 44 is journaled upon the rear table the various movements of the table in use have no effect upon the tension device.

49 is a hand-lever by which rock-shaft 44 is rotated to lift plungers 41 away from the thread, and 50 is a spring-pawl engaging the base of one of the arms 43 to lock the plungers in the raised position.

Turning now to Figs. 1, 2, 7, and 8, I will describe the clamp reciprocating and oscillating mechanism.

51 is a stationary gear, which is rigidly secured to the frame-work in any suitable manner, as by pins $51^a$, which are clamped by the parts of the journal-box, and is provided with a central opening, through which the main shaft passes.

52 is a crank-arm secured to the shaft outside of gear 51, 53 a gear rigidly secured to a shaft $53^a$, which is journaled in the outer end of the arm, and 54 an intermediate gear, which meshes with the stationary gear 51 and with gear 53. Shaft $53^a$ extends outward beyond arm 52. (See Fig. 8.)

55 is a connecting-rod journaled on said shaft just outside of the arm, the opposite end of this rod being rigidly connected to carriage 25. 56 is a similar connecting-rod on the opposite side of the machine, one end being rigidly secured to the carriage and the other pivoted to a hand-wheel 57 at the opposite end of the main shaft, the pivotal point of connecting-rod 56 to the hand-wheel being exactly in line with the shaft $53^a$, on which connecting-rod 55 is journaled. The action of these connecting-rods is to impart a recip-

rocatory movement to the carriage, and at the same time to impart an oscillatory movement thereto and to the needle-clamp carried thereby, the carriage tilting on the shaft of rollers 28, upon which it is supported. Hand-wheel 57 acts as a fly-wheel, and is also used to place the carriage in any desired position after the machine has stopped, at each revolution of the main shaft the operation upon the carriage, so far as this portion of the mechanism alone is concerned, being simply that of two cranks working in unison.

Just outside of connecting-rod 55 is a cam 58, which is rigidly secured to shaft $53^a$. Connecting-rod 30 is provided at its rear end with a slot 59, through which the outer end of shaft $53^a$ passes, a nut 60 holding the parts in position, but allowing the connecting-rod to slide freely upon said shaft. Cam 58 is provided with a groove 61, which is engaged by a roller or pin 62 upon connecting-rod 30.

An important peculiarity of my present construction is, that gear 53 is provided with one more tooth than gear 51. In the present instance gear 51 is provided with forty teeth and gear 53 with forty-one teeth, so that gear 53 loses a tooth relatively to gear 51 at each revolution of the main shaft, so that when the latter shall have made forty revolutions gear 53 will have made a single axial revolution, and will consequently have imparted a complete revolution to cam 58, which is rigidly attached to shaft $53^a$.

The various positions which the needle-clamp is caused to assume during a revolution of cam 58 and during forty revolutions of the main shaft are clearly illustrated in Figs. 13, 14, and 16. It will of course be apparent, gear 51 being fixed and arm 52 rotating with the main shaft, that if gear 53 upon shaft $53^a$, which carries cam 58, had the same number of teeth as gear 51, the cam in being carried around by arm 52 would receive no axial rotation whatever; consequently no movement other than the reciprocating movement and the tilting movement at each reciprocation would be imparted to the carriage.

Turning now to Figs. 2, 4, 5, and 6, and to diagram, Figs. 12 to 18, inclusive, I will explain the operation of the mechanism which changes the angle of inclination of the needle-clamp relatively to the threads, and also the mechanisms which raise and lower the tables, and which impart a lateral movement to the rear table. At the instant the operation upon a row of needles commences the needle-clamp and each needle and thread are in approximately the position relatively to each other shown in Fig. 12. At this instant pin 62 upon the rear end of connecting-rod 30 occupies the relative position in cam-groove 16 denoted by $a$. The rotation of the main shaft is from right to left, and the axial rotation of cam 58 from left to right, as is indicated by arrows. As the axial rotation of the cam from left to right progresses, it will be seen that as pin 62 follows the groove it will be drawn nearer to the main shaft, which is of course the center of rotation of the arm 52, which carries the cam, the effect of which is to swing the needle-clamp from the position shown in Fig. 12 to the position shown in Fig. 14. It should be understood, however, that these positions are relative only, as the reciprocation of the carriage and the oscillation of the needle-clamp are continuous, without regard to the angle of inclination of the needle-clamp relatively to the plane of reciprocation. When the needle-clamp has reached the position indicated in Fig. 14, pin 62 will be at the position in the cam-groove denoted approximately by $a'$, in which position it will remain, while the rotation of the cam carries pin 62 from the point in the groove denoted by $a'$ to the point denoted by $a^2$. This portion of the groove is an arc of a circle, of which shaft $53^a$ is the center. As already stated, the needles are threaded with the long grooves toward the front of the machine, so that while the clamp and the needles carried thereby are inclined toward the rear of the machine—that is, toward the left, as seen in Figs. 2 and 3 and the diagram, Figs. 13, 14, and 17—the polishing action will be upon the side of the needle having the short groove. Turning now to Figs. 4 and 5, at the instant pin 62 is at the point in the cam-groove denoted by $a$ rollers 14 at the inner ends of levers 9 will be in engagement with that portion of the periphery of cams 16 upon the longitudinal shaft denoted approximately by $b$. As the longitudinal shaft, as seen in Figs. 4 and 5, rotates from right to left, it will be apparent that while that portion of the periphery of the cams extending from $b$ to $b'$, approximately, is in contact with rollers 14 the inner ends of levers 9 will be pressed down, and consequently the tables will be lifted. This lifting of the tables changes the position of the threads relatively to the eyes of the needles from the position shown in Fig. 12 to that shown in Figs. 14 and 16. It will be noticed from the shape of cams 16 that the rise of the table must be rapid, and that as the periphery of these cams from about the points denoted by $b'$ to the points denoted by $b^2$ is an arc of a circle of which the longitudinal shaft is the center, the tables will be held at the raised position while this portion of the cams is in engagement with rollers 14. The longitudinal shaft is so speeded relatively to the main shaft as to make one revolution to eighty revolutions of the main shaft, cam 58 making a revolution to forty revolutions of the main shaft. In other words, cams 16 make an entire revolution, raising and lowering the tables once during the polishing of both ends of the needle-eyes, and cam 58 makes a revolution, shifting the needle-clamp from its extreme inclination toward the left to its extreme inclination toward the right during the polishing of each end of the needle-eyes. Turning again to Fig. 5, it will be noticed that at about

the instant that cams 16 begin to raise the tables cam 17 upon the longitudinal shaft will engage arm 18, projecting downward from the rear table, and will move said table toward the left against the power of spring 21. This movement takes place simultaneously with the raising of the tables, and continues during that portion of the operation by which the point end of the short-groove side of the needle-eye is polished—that is, until approximately the time at which pin 62 is in engagement with the portion of the cam-groove denoted by $a^2$. As soon as cam 17 has passed beyond arm 18 spring 21 will instantly return the table to its normal position.

Turning now to Fig. 10, I will denote the point end of the short-groove side of the needle-eye by $c$. If the table were merely raised and the needle-clamp oscillated toward the left, the scouring or polishing action would of course be directly toward the point. It is of course understood that in the case of all sewing-machine needles the friction upon this portion of the eye is not directly toward the point, but is off toward one side or the other, depending upon the direction in which the loop of thread is drawn by the shuttle or hook in forming a stitch. In the present instance I will illustrate the application of this portion of my invention in polishing the eyes of Wheeler & Wilson sewing-machine needles, in which the line of draft of the thread is approximately at the point indicated by the line $c'$. It will of course be understood that this polishing action of the threads covered with oil and emery scours out the eyes thoroughly, removing all burrs of metal. The manner in which this lateral polishing action at the point end of the short-groove side of the needle is effected will be clearly understood from diagram Fig. 15, which shows a single polishing-thread diverted from the right line in the horizontal plane by the lateral movement of the table. The position of the thread in the vertical plane during this lateral action is indicated in Fig. 13, which shows an intermediate stage of the rising of the tables, and in Fig. 14, which shows the position of a thread when the tables are at the extreme of their upward movement.

Returning now to Figs. 2 and 6, in connection with the diagram figures, ten revolutions approximately of the main shaft will so change the position of cam 58 that the point of engagement of pin 62 with the groove will be shifted from point $a$ to point $a'$. This will shift the position of the needle-clamp from the position shown in Fig. 12 to that shown in Fig. 14, and during the same time, through the raising of the table by the engagement of cams 16 with rollers 14, the position of the polishing-threads relatively to the needle-eyes will also have changed from the position shown in Fig. 12 to that shown in Fig. 14. During the next ten revolutions of the main shaft the position of the cam-groove relatively to pin 62 will have changed from point $a'$ to point $a^2$. During these ten revolutions the needle-clamp will be at approximately the position shown in Fig. 14, but will of course oscillate, as already explained. During the next or third ten revolutions of the main shaft, it being understood, of course, that this division of each revolution of cam 58 is approximate only, the position of pin 62 relatively to the cam-groove will have changed from point $a^2$ to point $a^3$. The effect of this movement, as pin 62 follows the groove, will be to throw said pin outward farther from the main shaft—that is, from the center of rotation of arm 52, by which the cam is carried, which swings the needle-clamp from the position shown approximately in Fig. 14 to that shown in Fig. 16, in which position it remains for approximately ten revolutions of the main shaft—that is, while the position of pin 62 relatively to the groove is changing from point $a^3$ toward point $a$. During this time the polishing action will have been entirely upon the point end of the long-groove side of the needle, which I have denoted by $d$ in Fig. 9. As there has been no lateral movement of the rear table during this time, the polishing action upon this side of the needle-eye will have been directly toward the point. By the time pin 62 has reached the point in the cam-groove denoted by $a$ the fortieth revolution of the main shaft will have been completed and the needle-clamp, needle, and thread will again be at approximately the position shown in Fig. 12. It will of course be understood that the action of cam 17 will have lasted for about half only of the revolution of cam 58—that is, while the polishing action was upon the short-groove side of the point end of the needle. During the whole of this revolution of cam 58 the tables will have been rising or retained at the raised position—that is to say, the portion of the periphery of cams 16 in engagement with rollers 14 will have changed from point $b$ to point $b'$, during which time the tables will have been rising, and then to point $b^2$, during which time the tables will have been held at the raised position. At about the completion of the fortieth revolution of the main shaft and the single revolution of cam 58 the portion of the periphery of cams 16 denoted by $b^2$ will have passed rollers 14, and said rollers will travel down the inclines, thereby lowering the tables. This will change the position of the threads relatively to the eyes of the needles from that shown in Fig. 16 to that shown in Fig. 17. During the second revolution of cam 58 the action is the same as during the first revolution, the only difference being that during the first revolution the tables are raised, placing the polishing-threads in the position relatively to the needle-eyes shown in Figs. 14 and 16, and during the second revolution the tables are at the lowered position, placing the polishing-threads in the position relatively to the needle-eyes shown in Figs. 17 and 18.

During the first ten revolutions of the main

shaft in the second revolution of cam 58—that is, while the position of the cam-groove relatively to pin 62 is changing from point *a* to point *a'*—the position of the clamp and needles will change from the position shown in Fig. 12 to that shown in Fig. 17. The position in Fig. 17 will be maintained during the next ten revolutions—that is, while the position of the cam-groove relatively to pin 62 is changing from point *a'* to point $a^2$. During the third ten revolutions the position of the needle-clamp will be reversed, throwing it to the position shown in Fig. 18, this shifting movement taking place while the cam-groove is changing relatively to pin 62 from point $a^2$ to point $a^3$. The clamp will remain in the position shown in Fig. 18 until the next ten revolutions are nearly completed—that is, while the cam-groove is changing relatively to pin 62 from point $a^3$ to point *a* and until the completion of the second revolution of cam 58—at which moment the threads, needles, and needle-clamp will be in approximately the position relatively to each other shown in Fig. 12, cam 58 and pin 62 will be at the position relatively to each other denoted by *a*, and cams 16 and rollers 14 will be at the position relatively to each other denoted by *b* in Figs. 4 and 5. This second revolution of cam 58 will complete the polishing of the shank end of the eyes of a row of needles. It will of course be apparent from Fig. 17 that the short-groove side of the shank end is first polished, (see point denoted by $c^2$ in Fig. 10 in connection with Fig. 17,) after which the long-groove side is polished, as indicated at *d'* in Fig. 9 in connection with Fig. 18, the entire polishing of the needle-eye taking place in eighty revolutions of the main shaft and one revolution of the longitudinal shaft, during which time cam 58 will have made two revolutions, owing to the relative difference in the number of teeth of gears 51 and 53.

Having thus described my invention, I claim—

1. In a machine of the class described, the combination, with a reciprocating carriage, an oscillating needle-clamp carried thereby, and connecting-rods 30 and 55, of a main shaft having an arm 52, gears 51, 53, and 54, and cam 58, to which rod 30 is connected.

2. The combination, with the carriage, connecting-rod 55, the clamp journaled on the carriage, and connecting-rod 30, pivoted to the clamp, of tables by which the threads are carried, and mechanism, cams, and levers, as shown, whereby the tables are raised and lowered during the polishing of each row of eyes.

3. The combination, with the carriage, connecting-rod 55, the clamp journaled upon the carriage, and connecting-rod 30, pivoted to the clamp, of tables by which the threads are carried, and mechanism—for example, cams and levers, as shown, and arm 18—whereby the tables are raised and lowered during the polishing of each row of eyes, and a lateral movement is imparted to the table as it rises, as and for the purpose set forth.

4. The carriage, the clamp carried thereby, the main shaft having an arm 52, and connecting-rod 55, whereby the carriage is reciprocated, in combination with a fixed gear 51, within which the shaft rotates, an intermediate gear upon the arm engaging gear 51, a shaft journaled in the arm and carrying a cam having a groove 61, a gear 53, engaging the intermediate gear, and a rod 30, connected to the clamp and having a pin engaging the groove, said gears being so proportioned relatively to each other that gear 53 will lose a tooth at each revolution of the shaft and will complete a revolution when the shaft has made as many revolutions as there are teeth in gear 51.

5. The combination, with the reciprocating carriage, the clamp, and shaft 6, of levers 9, by which the tables are supported, and cams 16, engaging the inner ends of said levers, whereby the tables are raised and lowered during each rotation of shaft 6.

6. In combination, the tables, levers 9, having slots 10 and pivotally secured to the tables, blocks engaging said slots and journaled in suitable brackets, and rotating cams engaging the inner ends of the levers, whereby the tables are raised and lowered.

7. In combination, the tables, levers 9, whose outer ends are pivotally secured thereto, one lever of each pair carrying a roller at its inner end, the other being branched to receive the roller, and rotating cams adapted to engage said rollers, whereby the tables are raised and lowered.

8. The combination, with the tables, shaft 6, and cams 16, of levers 9, pivotally connected to the tables and having slots 10, blocks engaging said slots and having pins at opposite ends, and suitable brackets wherein said pins are journaled, substantially as and for the purpose set forth.

9. In a machine of the class described, frame-work table 8, having arm 18 and eyes 19, and supported by angle-pieces engaging said eyes and eyes upon the frame-work, in combination with a rotating cam engaging said arm to impart a lateral movement to the table, and a spring whereby it is returned to its normal position when the cam has passed the arm.

10. In combination, table 8, having an arm 18, angle-pieces by which the table is supported, shaft 6, having a cam 17, engaging said arm, whereby the table is moved laterally, and a spring whereby the table is returned to its normal position after the cam has passed the arm.

11. Table 8, having eyes 19 and arm 18, and vertically-movable angle-pieces engaging said eyes, in combination with levers 9, whose outer ends are pivoted to the angle-pieces, a rotating cam 16, engaging said levers to raise

and lower the table, and a rotating cam 17, engaging arm 18 to impart a lateral movement to the table.

12. Table 8, having thread-bars 38 and a thread-shaft 39, in combination with a rock-shaft having arms 43 and cross-bars, spring-plungers in said cross-bars which engage the threads between bars 38, arm 45, and a strap and weight whereby the spring-plungers are kept in engagement with the thread.

13. Thread-bars 38 and thread-shafts 39, in combination with the rock-shaft, arms 43, cross-bars secured to said arms, spring-actuated plungers carried by said bars and adapted to engage the threads between bars 38, means, as a strap and weight, for retaining the plungers in engagement with the threads, and spring-pawls engaging shaft 39 to prevent backward movement, and the rock-shaft to hold the plungers out of engagement with the threads.

14. In combination, the reciprocating carriage, the needle-clamp journaled thereon, the main shaft, a crank-arm carried thereby, a shaft $53^a$, journaled in said arm, a cam rigidly secured to said shaft, intermediate gearing actuated by the main shaft, whereby shaft $53^a$ and the cam are caused to rotate once during a predetermined number of revolutions of the main shaft, and a connecting-rod pivoted to the needle-clamp and engaging the cam, whereby the plane of the needle-clamp is shifted independently of the movements of the carriage.

15. In combination, the reciprocating carriage, the needle-clamp journaled thereon, the main shaft having a crank-arm, shaft $53^a$, journaled in said arm, a grooved cam secured to said shaft, intermediate gearing actuated by the main shaft, whereby said cam is caused to rotate once during a predetermined number of revolutions of the main shaft, and a connecting-rod pivoted to the needle-clamp and to arm $53^a$, and having a pin engaging the cam-groove, whereby the plane of the needle-clamp is shifted independently of the movements of the carriage.

16. In combination, the carriage supported by single rollers on opposite sides, the needle-clamp journaled thereon, the main shaft having a crank-arm, a shaft $53^a$, journaled in said crank-arm, a grooved cam secured to said shaft, intermediate gearing actuated by the main shaft, whereby rotary motion is imparted to the cam, connecting-rod 55, pivoted to shaft $53^a$ and rigidly secured to the carriage, connecting-rod 30, pivoted to the needle-clamp and having a slotted connection to shaft $53^a$, and a pin engaging the cam-groove, whereby the carriage is reciprocated and tilted forward and backward at each reciprocation and the plane of the needle-clamp is shifted independently of the movements of the carriage.

17. The carriage having a roller 28 at each end, and the needle-clamp carried thereby; in combination with the main shaft having an arm and a hand-wheel, and connecting-rods 55 and 56, one end of said rods being pivoted, respectively, to said arm and said hand-wheel, the other ends being rigidly secured to the carriage, so that each revolution of the shaft will reciprocate the carriage and cause it to tilt forward and backward upon rollers 28.

In testimony whereof I affix my signature in presence of two witnesses.

PHILO M. BEERS.

Witnesses:
A. B. FAIRCHILD,
C. M. NEWMAN.