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8 Sheets—Sheet 1.

P. M. BEERS.

NEEDLE SWAGING MACHINE.

No. 353,529. Patented Nov. 30, 1886.

Fig. 1.

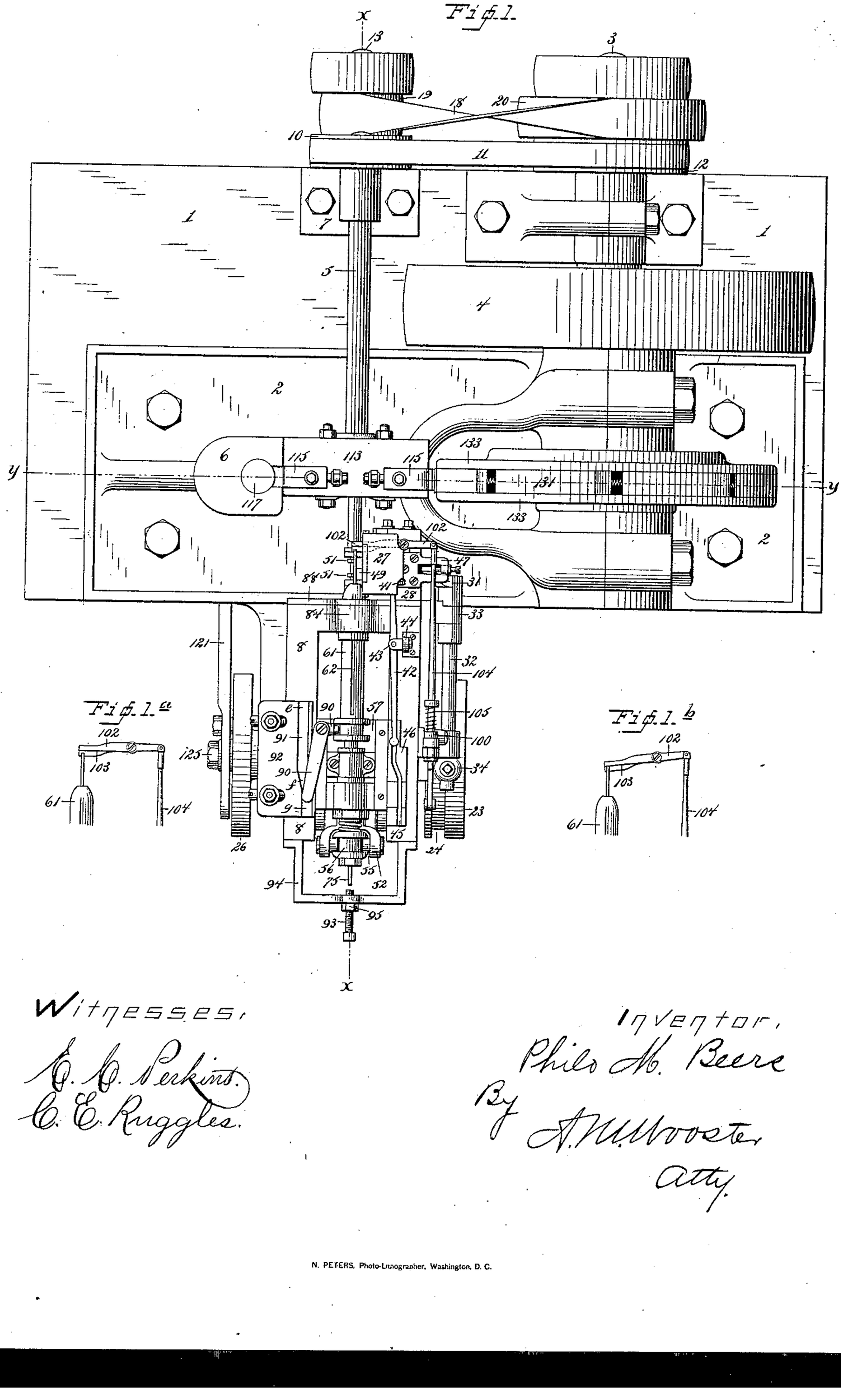

Fig. 1a.

Fig. 1b.

x

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8 Sheets—Sheet 2.

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NEEDLE SWAGING MACHINE.

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Fig. 3.

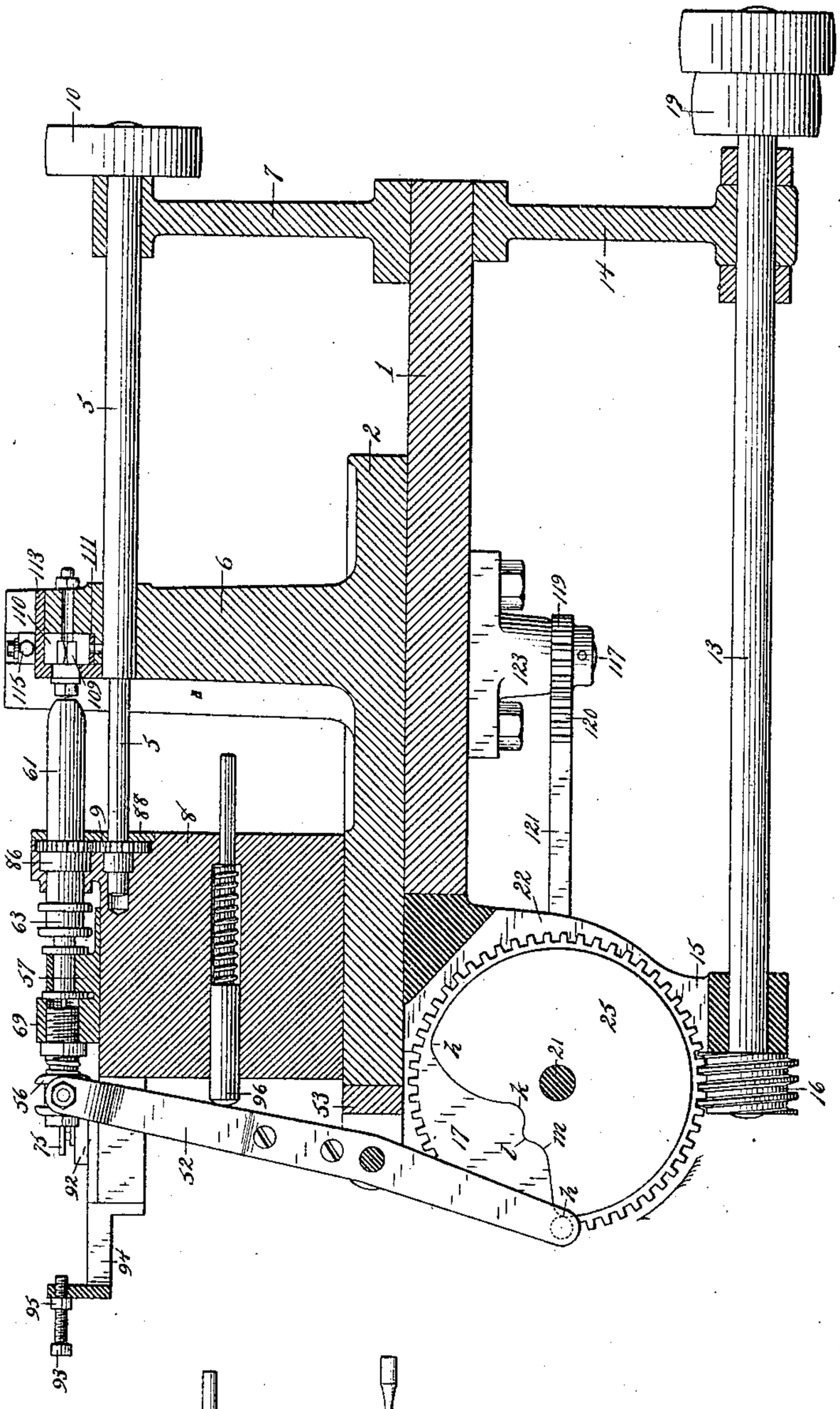

Fig. 12.

Fig. 13.

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P. M. BEERS.

NEEDLE SWAGING MACHINE.

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Fig. 4.

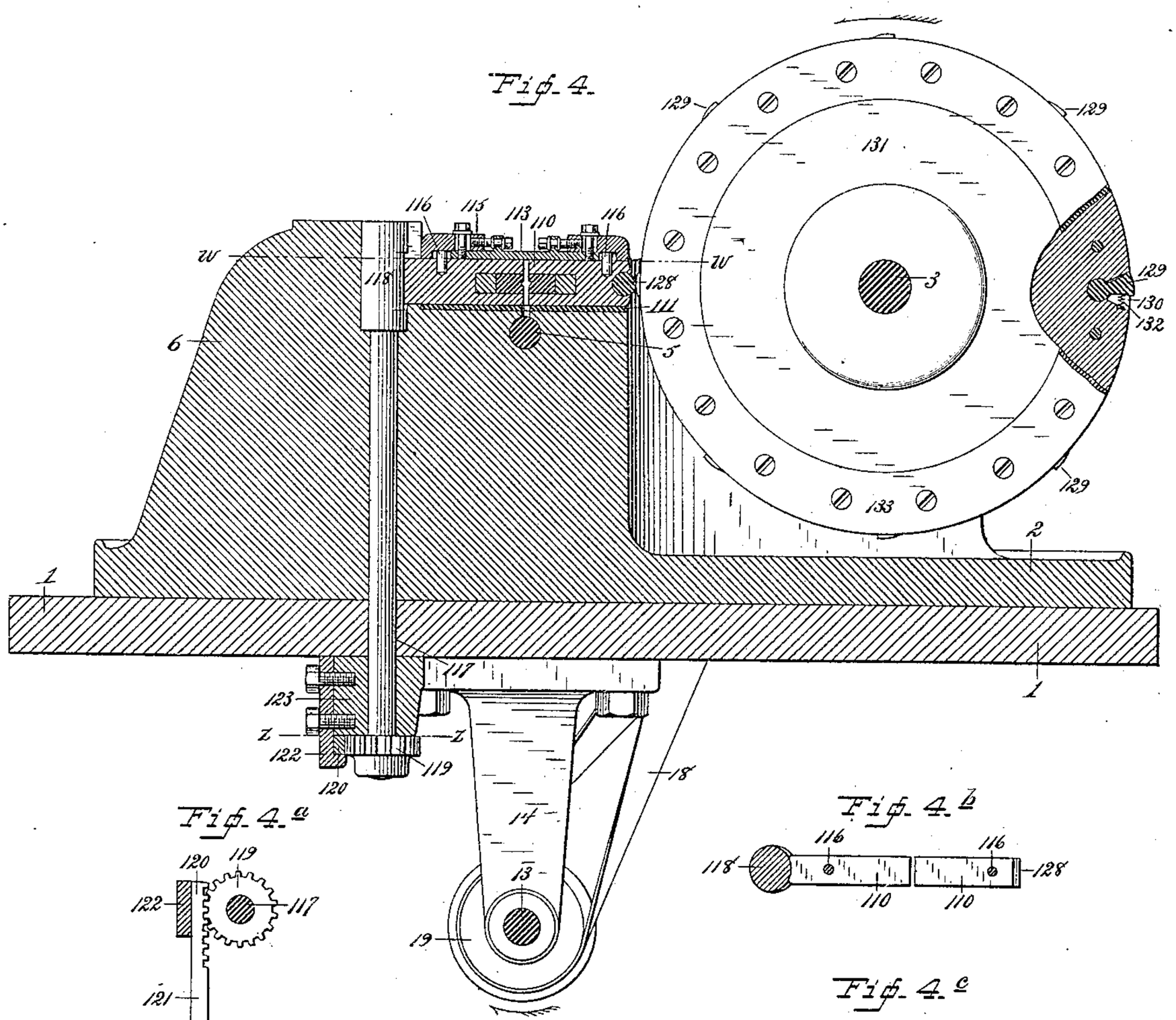


Fig. 4. a

Fig. 4. b

Fig. 4. c

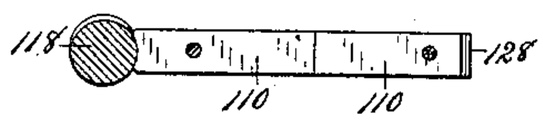
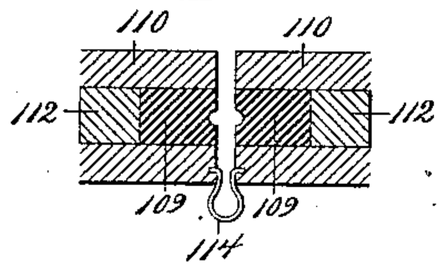


Fig. 4. d



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8 Sheets—Sheet 5.

P. M. BEERS.

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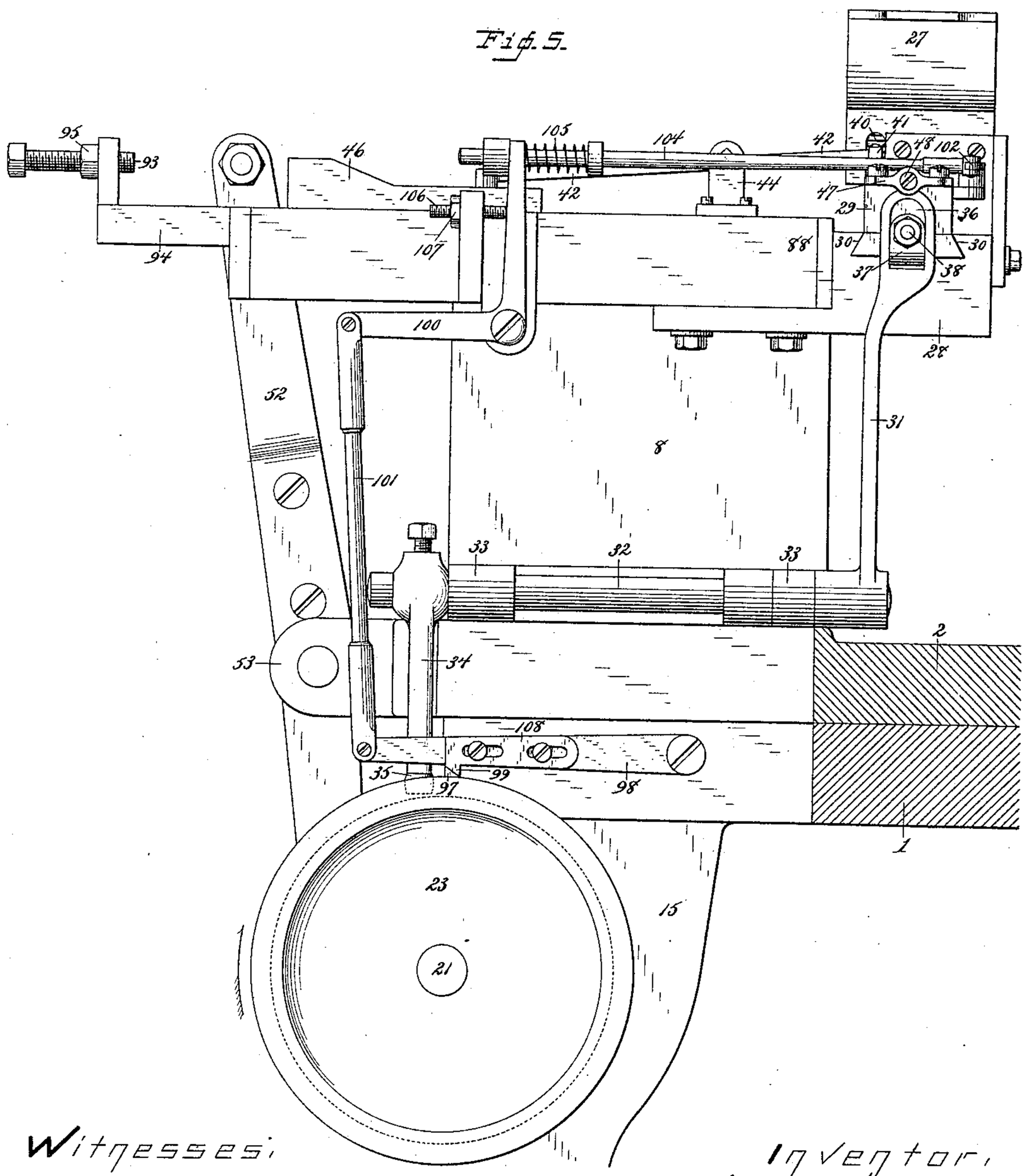
Fig. 5.



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P. M. BEERS.

NEEDLE SWAGING MACHINE.

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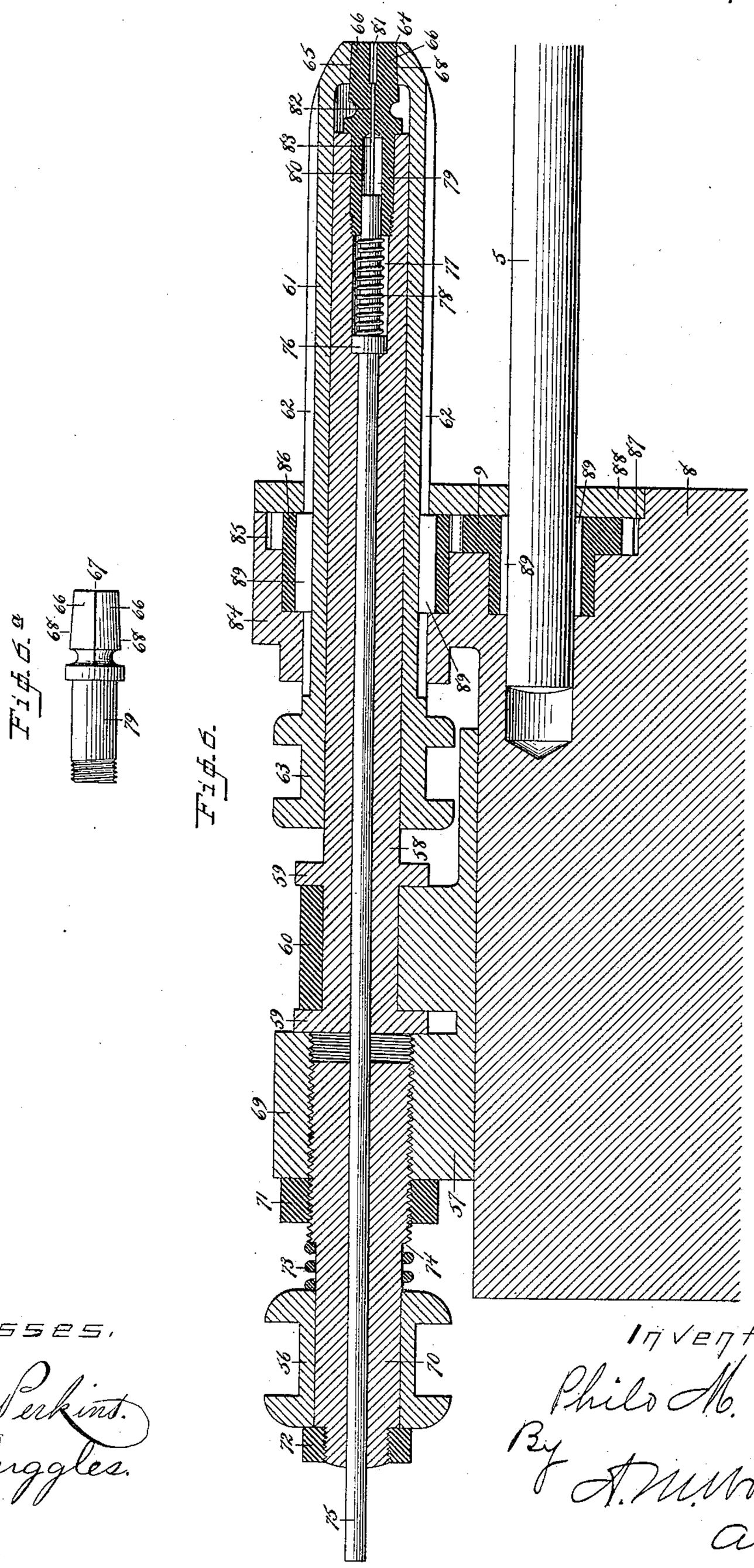

Fig. 2.

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NEEDLE SWAGING MACHINE.

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Fig. 7.

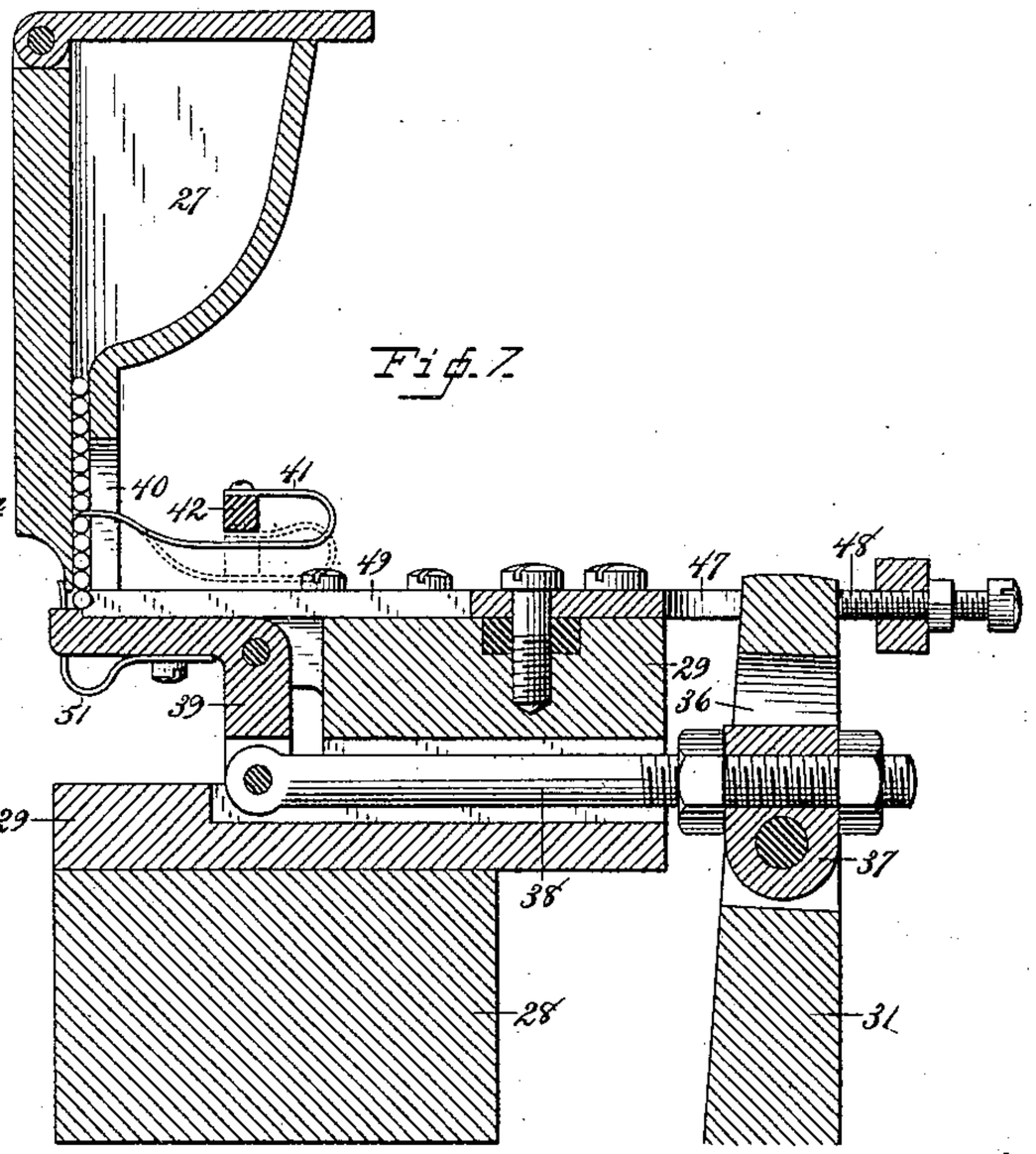


Fig. 7a

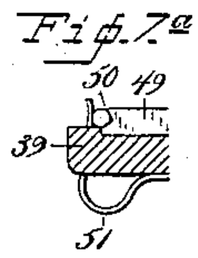
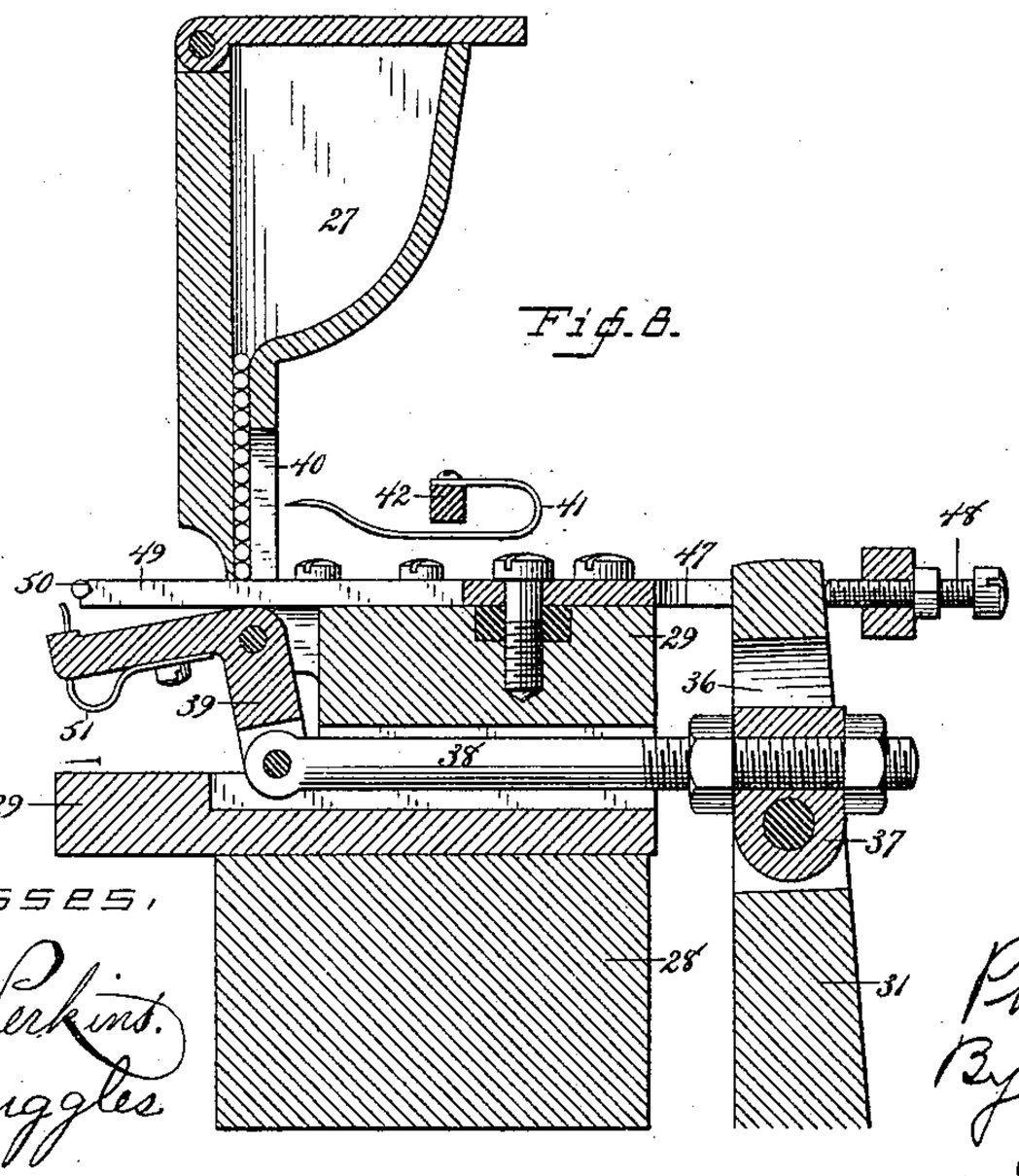


Fig. 8.



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(No Model.) 8 Sheets—Sheet 8.

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NEEDLE SWAGING MACHINE.

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Fig. 9.

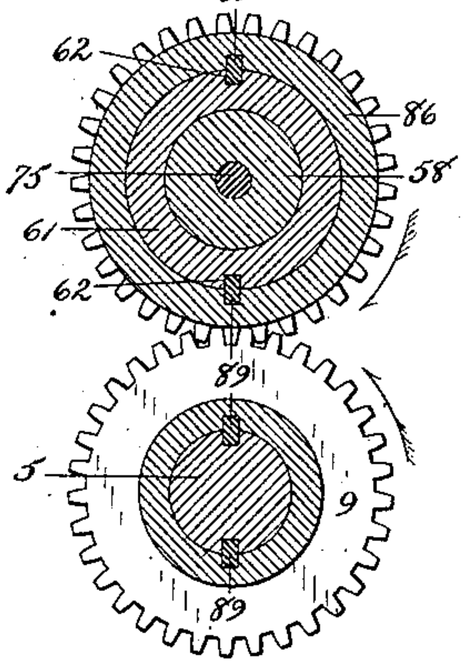


Fig. 10.

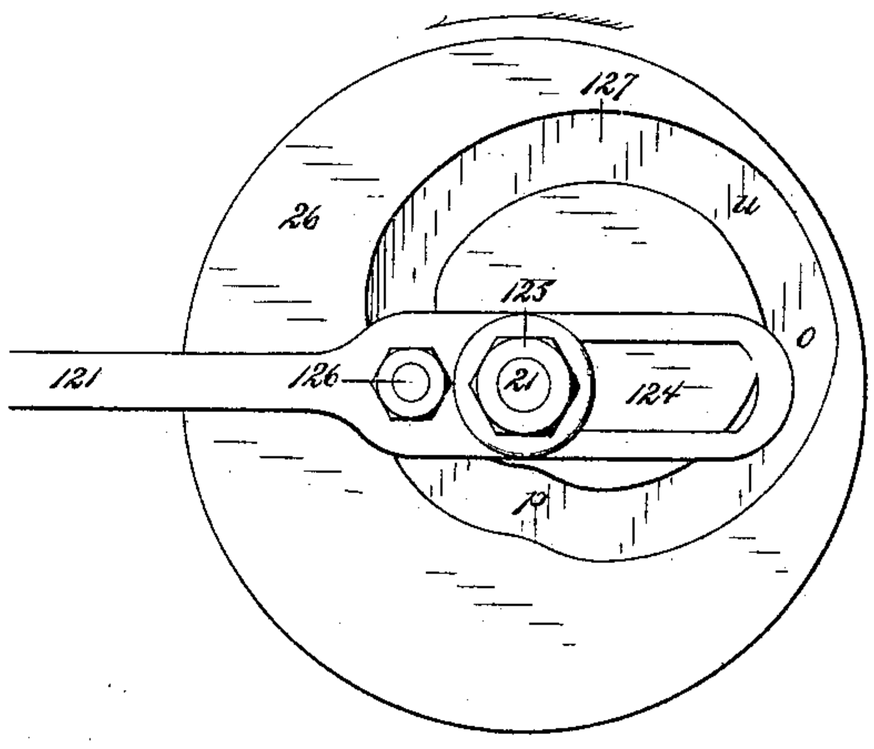
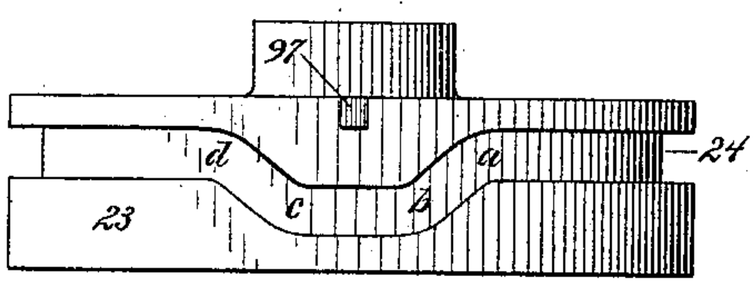


Fig. 11.



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UNITED STATES PATENT OFFICE.

PHILO M. BEERS, OF BRIDGEPORT, CONNECTICUT.

NEEDLE-SWAGING MACHINE.

SPECIFICATION forming part of Letters Patent No. 353,529, dated November 30, 1886.

Application filed May 17, 1886. Serial No. 202,392. (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 Needle-Swaging Machines; 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 has for its object to simplify and improve the construction of this class of machines, to produce, in brief, a machine which will improve the quality of work and increase the production, and, furthermore, to so construct and perfect the machine that it will automatically swage what are known as "cut-back needles"—that is, needles in which the diameter is slightly reduced a short distance above the eye. Needles of this class are used in large quantities in the manufacture of corsets and upon that general class of work, but the reduced diameter has always been produced by milling out the shanks, as no machine has heretofore been devised for swaging cut-back needles. With these ends in view I have devised the novel construction, of which the following description in connection with the accompanying drawings is a specification, similar numbers being used in all the figures to denote the same parts of the machine.

Figure 1 is a plan view of the machine complete, the chuck having taken a needle blank and the finger being about to press it home therein; Fig. 1ª, a detail view illustrating more clearly the position of the chuck, needle-blank, and finger, as in Fig. 1; Fig 1ᵇ, a similar view illustrating the action of the finger in pressing the needle-blank home in the chuck; Fig. 2, a plan view of the entire machine, showing the position of the parts when the chuck has advanced and carried the needle-blank into the dies; Fig. 3, a central longitudinal section through the operative parts of the machine, taken on the line *x x* in Figs. 1 and 2, the chuck being shown in elevation and the needle-blank removed, the parts being in a position corresponding with that in Fig. 2; Fig. 4, a transverse section through the dies and die-carriers on the line *y y* in Figs. 1 and 2, the rotating tappet-cylinder being shown in elevation; Fig. 4ª, a detail sectional view on the line *z z* in Fig. 4, illustrating mechanism for rotating the cam-shaft; Fig. 4ᵇ, a plan view of the die-carriers, the cam for throwing the left die to its operative position being shown in section on the line *w w* in Fig. 4, the carriers being at their open position; Fig. 4ᶜ, a similar section, the cam having made a quarter-revolution, and thrown the left die to its operative position; Fig. 4ᵈ, an enlarged detail view of the dies and die-carriers, illustrating the spring for retracting the dies; Fig. 5, a side elevation, on an enlarged scale, of the feeding mechanism, the position of the parts corresponding with Fig. 1; Fig. 6, an enlarged longitudinal section of the chuck on the line *x x*, the position of the parts corresponding with Figs. 2 and 3; Fig. 6ª, a detail view showing the jaws of the chuck in elevation; Fig. 7, an enlarged transverse section of the hopper and the mechanism which carries the needle-blanks to the chuck; Fig. 7ª, a detail view illustrating the relative position of the carrying mechanism at its extreme forward position; Fig. 8, a section corresponding with Fig. 7, illustrating the third position of the carrying mechanism, the return movement being about to begin; Fig. 9, a detail view illustrating the gears which rotate the chuck; Fig. 10, a side elevation of the cam which actuates mechanism for closing the left die; Fig. 11, a plan view of the cam shown in elevation in Fig. 5, which operates the mechanism for carrying the needle-blanks to the chuck; and Figs. 12 and 13 are respectively elevations of an ordinary needle-blank as swaged by this machine and of a needle upon which a second operation has been performed, whereby it has been swaged to the form required in cut-back needles, the proportions being exaggerated for convenience in illustration.

1 is the bed of the machine; 2, a table bolted or otherwise secured thereto, and 3 is the main shaft journaled in bearings upon the table. Motion is imparted to the machine by a belt passing over a large pulley, 4, upon the main shaft.

5 is a shaft journaled in a standard, 6, upon the table, in a bracket, 7, secured to the bed, and in a bracket, 8, secured to the table. This shaft carries at its inner end a gear, 9, through which rotary motion is imparted to the chuck,

as will be more fully explained. At the outer end of this shaft is a pulley, 10, which receives motion from a belt, 11, passing over belt 12 upon the main shaft.

13 is a shaft journaled in brackets 14 and 15, which are secured to the bed. Shaft 13 carries at one end a worm, 16, through which motion is imparted to gear 17, as will be more fully explained. Motion is imparted to shaft 13 by a belt, 18, running over pulleys 19 upon shaft 13 and 20 upon shaft 3, belt 18 being crossed to cause shaft 13 to rotate in the opposite direction from the main shaft. 21 is a shaft at right angles to the main shaft, which is journaled in the opposite sides of bracket 15, said bracket being provided with a central opening, 22, to receive gear 17 and certain of the cams upon shaft 21, as will presently be explained.

All of the operative parts of the machine, except the mechanism for rotating the chuck and the rotating tappet-cylinder, are driven by cams upon shaft 21.

At the right of shaft 21, as seen in Figs. 1, 2, and 5, is a cam, 23, having a peripheral groove, 24, by which the needle-feeding mechanism is actuated. At the center of said shaft is a gear, 17, by which the shaft is driven, and on opposite sides of this gear are edge-cams 25, by which the mechanism for imparting the forward-and-backward movement of the chuck is actuated. Gear 17 and cams 25 lie within the central opening in bracket 15. At the opposite end of shaft 21—that is, at the left, in Figs. 1, 2, and 5—is a face-cam, 26, by which the mechanism for moving the left die into operative position is actuated. The operation of these several cams will presently be fully described.

27 is the hopper in which the blanks to be operated upon are placed. The hopper is supported in any suitable manner on a bracket, 28, which in turn is bolted or otherwise secured to bracket 8.

29 is a cross-slide adapted to reciprocate in ways 30 in bracket 28. Motion is imparted to this cross-slide by means of an arm, 31, projecting upward from a rock-shaft, 32, which is journaled in lugs 33 upon the side of bracket 8.

34 is an arm projecting from the other end of the rock-shaft, and having at its lower end a roller, 35, which engages groove 24 in cam 23, as is clearly indicated in Fig. 5, the cam itself being shown detached in Fig. 11. At the upper end of arm 31 is a slot, 36, in which is pivoted a block, 37.

38 is a rod adjustably secured to the block above its pivotal point, and pivoted at its other end to a bell-crank lever, 39, which is pivoted in a recess in the cross-slide.

As shown in the drawings, the cross-slide consists of several pieces, which are bolted or otherwise secured together. I shall not, however, enter into any description of these details of construction, as they are not of the essence of my invention, and may obviously be varied widely without departing from the principle thereof.

40 is a slot in the side of the hopper, and 41 is a spring secured to a lever, 42, which acts to press the needle blanks down in the hopper, so that a blank is always ready to be received by the cross-slide. Lever 42 is pivoted in a yoke, 43, the yoke itself being pivoted in a bracket, 44, which is secured to bracket 8. At the opposite end of this arm is a roller, (not shown,) which engages an angular cam-slot, 45, in a block 46. The shape of this block in side elevation is clearly shown in Fig. 5, the slot being undercut, (not shown,) so that the roller is at all times held therein. The pivotal point of lever 42 is stationary; but block 46 makes a forward-and-backward movement during the manipulation of each needle blank.

It will be apparent from the shape of the slot in plan, as clearly shown in Fig. 1, and from the incline of said block, as indicated in Figs. 1 and 5, that four movements will be imparted to the spring at each reciprocation. The action of the spring in forcing out the needle-blanks is as follows: Starting at the position shown in Fig. 8, it moves forward between two needles, as shown in Fig. 7, then downward to the position shown in dotted lines in Fig. 7, then backward in a line parallel with the dotted lines in Fig. 7, then upward again to the position shown in Fig. 8.

It is not deemed necessary to explain more fully the action of the presser spring, as it forms no portion of my present invention, and is, moreover, fully illustrated and described in my former Letters Patent No. 339,361, dated April 6, 1886.

47 is a yoke, which projects backward from the end of the cross-slide, and is provided with a set-screw, 48, the inner end of which acts as a stop for arm 31.

The operation of this portion of my invention is as follows: When roller 35 is at the portion of groove 24 which is indicated by *a*, the feeding mechanism will be at the position indicated in Fig. 7. The movement of cam 23 is from left to right, and as the roller travels down the incline the cross-slide, bell-crank lever 39, &c., will move forward to the position indicated in Fig. 7ª, at which instant the roller 35 will be at the position indicated at *b*. The parts remain in this position while the roller passes along the short straight portion of the groove. While the parts are in this position the needle-blank is seized by the chuck, as will be more fully explained. When roller 35 reaches the portion of the groove indicated at *c* the return movement of the cross-slide will commence—that is to say, arm 31 will be moved backward. Turning now to Fig. 7, it will be apparent that as arm 31 moves toward the left, it being connected to the lower arm of the bell-crank lever by rod 38, its action must be to hold the upper arm of said lever close up under the carrying-plates 49.

50 is a groove at the end of the carrying-

plates, in which the needle-blank rests; and 51, springs projecting over the end of the bell-crank lever, which act to retain the needle-blank in the groove until it is seized by the chuck, as will be more fully explained. At the instant that the carrying-plates, bell-crank lever, and springs are at the position indicated in Fig. 7ª the chuck advances and seizes the needle-blank. At this instant the return movement of the cross-slide commences, and continues as roller 35 travels along the incline and until it reaches the position indicated at *d*. The instant that the return movement commences the action of lever 31, and rod 38 is to drop the bell-crank lever to the position shown in Fig. 8, the limit of the downward movement of the upper arm being determined by the adjustment of set-screw 48.

As already explained, rod 38 is secured to block 37 above its pivotal point in the slot in arm 31. As the portion of the arm which bears against set-screw 48 is farther from the rock-shaft than the pivotal point of block 37, it follows that the upper end of said arm moves a greater distance—that is to say, it vibrates in a longer arc. As the connection between the cross-slide and arm 31 during the backward movement of the latter is at the upper end of said arm, it follows that as said arm moves backward the bell-crank lever will gradually be raised to its former position—that is to say, the position shown in Fig. 7, which it reaches just prior to the end of the backward movement of the cross-slide.

It will of course be understood that the carrying-plates do not pass out from under the hopper at the left until the bell-crank lever has resumed its proper position to catch and hold the needle as it drops in front of the carrying-plates when pressed down by spring 41.

Turning now to Figs. 2 and 3, 25 indicates edge cams on opposite sides of the large gear 17, which are also secured to shafts 21. I have shown two of these cams, although in practice one may be used, if preferred.

52 is a lever pivoted in a bracket, 53, which is secured to the table. This lever is bifurcated at both ends, as is clearly shown in Figs. 1 and 2, and is provided at its lower ends with rollers 54, which bear upon the edges of cams 25. The upper ends of the lever are provided with rollers 55, which engage a loose flanged collar, 56, upon the chuck.

57 is a sliding carrier, which is adapted to reciprocate in suitable ways (not shown) upon bracket 8.

Turning now to Figs. 6 and 9, the construction of the chuck will be found fully illustrated.

58 is the inner shell, which is provided with flanges 59, by which it is held against endwise motion in a bearing in the sliding carrier.

60 is the cap of the bearing, 61 the outer shell, which is provided with longitudinal grooves 62 and with a flanged collar, 63. At the outer end of the outer shell is an aperture, 64, which opens into the central aperture in the shell. The diameter of this opening gradually increases from the outer edge inward, forming an inwardly-tapering shoulder, 65.

66 indicates the jaws, which are made in a single piece, as is clearly shown in Fig. 6ª, the necessary spring being secured by slots 67, which extend inward from the outer end. The outer ends of the jaws are made to taper, forming shoulders 68, which correspond with shoulder 65 at the end of the outer shell. The piece forming the outer jaws, which for convenience I will term 79, is screw-threaded at its inner end and caused to engage a corresponding screw thread at the outer end of the inner shell. As stated above, the inner shell is secured against endwise movement in the sliding carrier, so that the carrier and shells must slide together.

69 is a bracket in the carrier, which is internally screw-threaded, and 70 is a stud screw-threaded to engage the bracket, which projects backward therefrom. In use the stud is screwed into the bracket until the desired adjustment is gained, the parts being then secured in their position by a check-nut, 71. At the outer end of stud 70 is a nut, 72, which holds flanged sleeve 56 upon the stud.

73 is a coil-spring upon the stud, one end of which bears against sleeve 56, the other against a shoulder, 74, upon the stud. This spring is made sufficiently strong to carry the sliding carrier and the parts upon it forward, but at the same time permits the parts to yield in the event of an obstruction of the movement or the breakage of any part of the machine, its action being to prevent injury to the chuck and die mechanism, which might occur if the movements were positive.

75 is a spindle, which extends through stud 70 and nearly to the outer end of the inner shell. Near the outer end of the spindle is a shoulder, 76, which lies in a recess, 77, in the outer end of the inner shell. Within this recess is a coil spring, 78, surrounding the spindle, one end of which bears against shoulder 76, the other against the inner end of piece 79. At the inner end of this piece is a recess, 80, which receives the end of the spindle proper, and at the outer end of this piece—that is, between the jaws—is a recess, 81, which is adapted to receive the needle-blank. Recesses 80 and 81 are connected by a small passage, 82, which is just large enough to receive and guide an expelling-rod, 83, which projects forward from the end of the spindle. In the retracted position this rod lies at the base of recess 81, and when thrown forward, as will be more fully explained, it forces the needle out from between the jaws.

Upon the top of bracket 8 is an extension, 84, which may be cast integral therewith, as shown, or cast separately and attached thereto. Within this extension is a recess, 85, in which lies a gear, 86. The chuck passes through this extension and through gear 86. Just below the extension, in the body of the bracket,

is a recess, 87, which receives gear 9 upon shaft 5. Gears 86 and 9 are both held in position by a plate, 88, which is secured to the face of the bracket. Gear 9 is secured to shaft 5 by means of keys 89, which engage corresponding grooves in the shaft and gear. The groove in the shaft is elongated (not shown) to permit adjustment for different sizes of needles. Gear 86 is secured to the outer shell in substantially the same manner. The keys engage grooves in the gear, and also the longitudinal grooves 62 in the outer shell. It will be observed that the several keys are held in position by plate 88.

In the case of the upper gear, the keys slide freely in grooves 62 as the chuck reciprocates. At the same time continuous rotary movement is imparted to the outer shell by the engagement of gear 86 with gear 9.

I will now describe the manner in which the outer shell is retarded while the inner shell is moving forward, whereby the jaws are caused to grasp a needle-blank through the engagement of shoulders 65 and 68.

90 is a bell-crank lever pivoted upon the sliding carrier 57. One arm of this lever engages flanged collar 63 upon the outer shell. The other arm of this lever engages a cam-groove, 91, in a block, 92, which is adjustably secured upon the top of bracket 8. Both arms of this lever are preferably provided with rollers in the usual manner.

e indicates a straight portion at the forward end of said groove, *f* an inclined portion, and *g* a straight portion at the outer end of said groove.

Turning now to Fig. 3, one of the cams 25 is shown in elevation. The position of the parts in this figure corresponds with Fig. 2, the chuck having been thrown to its farthest forward position, but the dies not having commenced to act upon the needle-blank. The action of the dies will presently be fully explained. Cam 25, as seen in Fig. 3, rotates from left to right. The two extremes of the cylindrical portion of cam 25 are indicated by *h*. The chuck remains in the position shown until the cam has made something more than half a revolution. During this time roller 54 rests upon the cylindrical portion of the cam. As soon, however, as the opposite extreme of the cylindrical portion is reached in the revolution of the cam, roller 54 travels down the incline. This causes the lever to move backward until the portion of the cam is reached which I have indicated by *k*. While roller 54 is traveling from points *h* to *k* the chuck will be retracted so far that the end of spindle 75 will come in contact with a set-screw, 93, in a bracket, 94, which is attached to bracket 8. This of course acts to force the spindle forward relatively to the chuck, and the swaged needle-blank is forced out by expelling-rod 83, the pressure of the jaws upon the blank having meanwhile been relieved through the action of bell-crank lever 90, as will be more fully explained. Set-screw 93 is retained at the desired adjustment by a check-nut, 95. While roller 54 is traveling from point *k* to *l* the chuck moves forward and takes a new needle-blank. While the roller is moving from point *l* to point *m* the position of the chuck is stationary. During this time the needle is pressed home in the jaws of the chuck by the action of a finger, as will presently be explained. While roller 54 is traveling from point *l* to point *m* the parts are in the position shown in Fig. 1. While roller 54 is traveling from point *m* to point *h*, at which position it is shown in Fig. 3, the chuck is advancing toward the dies with a new needle-blank.

96 is a spring-actuated rod lying in a recess in bracket 8, the outer end of which bears against lever 52 and acts to hold the lower end thereof upon the edge of cam 25.

Turning now to Figs. 5 and 11, an angular block or dog, 97, will be noticed upon the periphery of cam 23. This cam rotates from left to right, and the right side of the block or dog is provided with an incline, as clearly shown in Fig. 5.

98 is a lever pivoted to the bed and provided with a block or dog, 99, corresponding with block 97 upon the cam. This block or dog is made upon a separate piece, 108, which is secured by set-screws passing through slots, as shown, so that it may be adjusted to different sizes and styles of needles. 100 is a bell-crank lever pivoted upon bracket 8. One arm of this lever is connected to the free end of lever 98 by a link, 101.

102 is a finger, which is pivoted upon the cross-slide 29, and is provided with a shoulder, 103, the purpose of which will presently be explained.

104 is a rod, one end of which is pivoted to the outer end of the finger, the other end being adapted to slide freely through the upper arm of bell-crank lever 100.

105 is a coil spring upon this rod, one end of which bears against a collar on the rod, the other end bearing against the bell-crank lever. Another collar upon rod 104, outside of the arm of the bell-crank lever, prevents said rod and the bell-crank lever from becoming disconnected.

106 is a set-screw, which may be held at any desired position by a check-nut, 107. This set-screw governs the position of lever 98 when not in use, and, consequently, the position of block or dog 99 relatively to the periphery of cam 23. It is usually so adjusted as to hold block or dog 99 just in contact with the periphery of cam 23. Spring 105 acts to hold the several parts in their proper positions when not in use, and also to receive the pressure of the upper arm of the bell-crank lever when its forward movement takes place. This is to provide that the movement of the finger shall be yielding instead of positive, so that should an obstruction occur—as, for example, a defective blank in the chuck—no breakage of parts could take place, but the forward move-

ment of the lever would be taken up by the spring. The spring is of course made strong enough to carry forward rod 104 and to actuate the finger under ordinary circumstances.

The operation of the chuck mechanism is as follows: While cross-slide 29, bell-crank lever 39, and springs 51 are in the position shown in Fig. 7ª, the needle-chuck moves forward to the position shown in Fig. 1, as already explained, and takes the needle from the cross-slide. The bell-crank lever presently drops to the position shown in Fig. 8, and the cross-slide and parts carried thereby move backward out of the way and resume the position shown in Fig. 7 when a needle is forced from the chuck and is received by the cross-slide, as has already been fully explained. While the cross-slide, bell-crank lever, and springs are in the position shown in Fig. 7ª bell-crank lever 100 is actuated by the block or dog 97 on cam 23 through the intermediate connections, the effect of which is to force rod 104 forward, and consequently to force the inner end of finger 102 inward. The position of the parts as this movement is about to take place is shown in Figs. 1 and 1ª. It will of course be understood that at the instant this movement of the finger takes place the outer shell has not yet closed the jaws tightly upon the needle-blank. The needle at this instant lies within the jaws, but has not yet been released by springs 51 and the carrying-plates.

It will be observed that the finger is partially cut away, leaving a shoulder, 103, which presses against the end of the needle-blank, a portion of the finger passing under the needle-blank. This action of the finger is clearly illustrated in Fig. 1ᵇ. The object accomplished by this movement of the finger is to press the needle-blank home firmly in the jaws. As already stated, however, this movement is not positive, spring 105 being provided to receive the pressure of the upper arm of bell-crank lever 100 when its forward movement takes place, should there be any obstruction or should the needle-blank for any reason not have been properly grasped by the chuck. The instant that the finger has performed its office of pressing the needle into the chuck it is withdrawn out of the way by the backward movement of the cross slide. At this instant the forward movement of the chuck commences, as has already been explained. As soon as this forward movement of the chuck commences, the long arm of bell-crank lever 90 is forced outward by the incline in groove 91 in block 92. The inner end of this lever, being in engagement with flanged collar 63 on the outer shell, retards the forward movement of the outer shell and closes it upon the jaws, causing the latter to grip the needle-blank firmly. The forward movement of the chuck continues until the parts are in the position shown in Figs. 2, 3, and 4, the dies being just about to act upon the needle-blank.

The construction of the dies and the die-actuating mechanism is clearly illustrated in Figs. 3, 4, 4ª, 4ᵇ, 4ᶜ, 4ᵈ, and 10.

109 indicates the dies, and 110 the die-carriers, which reciprocate in standard 6.

111 is a steel plate upon which the die-carriers rest.

112 indicates wedges by which they are adjusted in the carriers, and 113 the covering-plate, which is secured to the top of the standard, and by which the parts are held in position.

114 (see Fig. 4ᵈ) is a spring, the action of which is to throw the dies to their open position—that is, away from the needle-blank. The movement of the die-carriers away from each other is controlled by stops 115, which are adjustably secured to the covering-plate.

116 indicates pins in the die-carriers, which come in contact with the stops when the dies, or, rather, the die-carriers, are thrown open by the spring.

117 is a vertical shaft in standard 6, which is provided at its upper end with a cam, 118, against which the left die-carrier rests. The shape of this cam in cross-section is clearly shown in Figs. 4ᵇ and 4ᶜ, the former showing the left die at its opened position and the latter at its closed position. At the lower end of this shaft is a pinion, 119, which is engaged by rack 120 at the end of rod 121. The rack is secured in position by a plate, 122, which is screwed to a bracket, 123, on the under side of the bed. The other end of rod 121 is provided with a slot, 124, which engages the end of shaft 21, being held in position thereon by a nut, 125, and a washer. Longitudinal reciprocating motion is imparted to rod 121 and the rack by means of a roller (not shown) upon a stud, 126, upon the rod which engages a groove, 127, in the face of cam 26. In Fig. 10 cam 26 is shown in side elevation, the parts being shown in the position they occupy when the dies are at their farthest opened position, the corresponding position of the dies and cam 118 being indicated in Figs. 4 and 4ᵇ. Cam 26, as seen in Fig. 10, rotates from right to left.

As the roller (not shown) travels forward in the groove the left die is gradually moved inward toward the right die until the roller occupies the position in the cam-groove indicated by *n*, the corresponding position of the dies, or rather the die-carriers, being indicated in Fig. 4ᶜ. The dies remain in their closed position until the roller reaches the point in groove 127 indicated by *o*. While the parts are in this position the final swaging action of the dies upon the needle-blank takes place. It will of course be understood from the description already given that while this is taking place the chuck with the needle-blank in it is being rotated by means of gears 9 and 86. As the rotation of cam 26 continues and the roller travels down the incline from point *o* to point *p* the dies gradually open, or rather the left die is thrown to its retracted position. The extreme of the backward movement of the

left die is reached when the lever reaches the point in groove 127 indicated by *p*. From this position until it reaches the position in which it is shown the left die remains stationary.

Turning now to Fig. 4, 128 is a piece of hardened-steel rod inserted in the outer edge of the right-die carrier, to receive the blows of tappets 129, which are set in recesses 130 in rotating tappet-cylinder 131. These tappets project out slightly beyond the edge of the cylinder, have a right oscillatory movement, and are held to their operative position by springs 132. This is in order that the blows of the tappets upon the right-die carrier shall not be absolutely positive, it being found necessary in practice to make the tappets yield slightly as the blow is given. The swaging action is performed entirely by the right die, the left die being caused to move gradually forward and then to remain stationary, serving as an anvil to receive the blows, the needle-blank meanwhile being rotated between the dies, as has already been fully explained. The tappet-cylinder is carried by the main shaft, the tappets being held in position by rings 133, which are recessed into the edges of the cylinder and firmly secured in place.

My present machine is perfectly adapted to the swaging of all ordinary classes of sewing-machine needles, and is also adapted to swage what are termed "cut-back needles." (See Fig. 13.) In swaging this class of needles it is of course necessary that the needle-chuck be thrown to its farthest forward position before the dies begin to close upon it, and that the chuck shall remain stationary so far as longitudinal motion is concerned until the swaging of the needle-blank is completed and until the dies have been sufficiently opened to allow it to be drawn out from between them. In former machines the swaging action of the dies upon the needle-blank begins the moment the needle-blank enters between the dies, and the needle is gradually forced forward during the swaging operation. My present machine, however, is equally well adapted to the swaging of ordinary needles, the only changes required being in the shape of the dies, which in the present instance are rounded to give the cut-back form shown in Fig. 13 and in the shape of cams 25.

It will of course be understood that to swage cut-back needles two operations are required. The blank must first be swaged to the shape shown in Fig. 12, then, if it is desired to produce cut-back needles, the machine is properly adjusted therefor, and the second swaging operation imparts to them substantially the shape shown in Fig. 13.

The operation of the entire machine is as follows: The needle-blanks to be operated upon, either to be reduced to the form shown in Fig. 12 or to be made into cut-back needles, as shown in Fig. 13, are placed in the hopper. The needle-blanks are pressed down singly by spring 41 and are received by carrying-plates 49 upon cross-slide 29, being held in position by bell-crank lever 39 and springs 51. Having received a needle-blank from the hopper, the cross-slide moves forward and remains stationary while the chuck advances and takes the needle-blank. While the parts are in this position finger 102 presses against the outer end of the needle-blank to press it home firmly in the chuck. Bell-crank lever 39 and the springs 51 then drop away from the needle-blank and the cross-slide moves backward out of the way. Forward movement of the chuck then commences, the outer shell being retarded, which causes the jaws which are attached to the inner shell to be compressed by the outer shell and to clamp the needle-blank firmly. The forward movement of the chuck continues until the needle-blank has been carried to the proper position for it to be acted upon by the dies. Having reached this position the chuck in swaging cut-back needles remains stationary as regards longitudinal movement, but is in constant rotation. The left die advances gradually, and while this is taking place a constant series of blows is imparted to the needle-blank by the right die, which is actuated by spring-tappets in the rotating tappet-cylinder. As soon as the swaging operation is completed the right die is gradually released by the cam which holds it, and is forced back out of the way by a spring between the die-carriers. The chuck then moves backward, withdrawing the needle from between the dies. As the chuck reaches its extreme retracted position the swaged needle-blank is expelled by rod 83. The chuck then advances and receives another needle-blank from the cross-slide, the operations being repeated as before.

I do not of course desire to limit myself to the exact details of construction shown and described, as it is obvious that they may be considerably varied without departing from the spirit of my invention.

I claim—

1. The combination, with the needle-hopper and a cross-slide which receives the needles therefrom singly, of a reciprocating chuck which takes the needles from the cross-slide, and a pivoted finger upon said cross-slide which acts to press the needles home in the chuck.

2. The combination, with the hopper and spring 41, which presses the needles out singly, and the cross-slide which receives the needles and carries them forward, of a reciprocating chuck which receives each needle from the cross-slide, and a pivoted finger upon the cross-slide which acts to press the needle home in the chuck.

3. The combination, with the hopper and the chuck, of feeding mechanism consisting essentially, of a cross-slide having grooved carrying-plates 49, a bell-crank lever, 39, and springs 51 upon said lever, which hold the needle in said groove as the cross-slide moves forward.

4. The hopper, chuck, and cross-slide, in combination with rock-shaft 32, having slotted arm 31, block 37, pivoted in said slot, and bell-crank lever 39, pivoted to the cross-slide and connected by rod 38 to said block.

5. The hopper, chuck, and cross-slide, in combination with rock-shaft 32, having arm 31, block 37, pivoted to said arm, bell-crank lever 39, pivoted to the cross-slide and connected by link 38 to the block, and a set-screw, 48, in yoke 47, whereby when arm 31 swings inward the cross-slide is carried forward thereby, and when said arm swings backward the bell-crank lever is first dropped downward and then swung gradually up into position as the cross-slide moves backward.

6. The cross-slide having carrying-plates 49, and yoke 47, with set-screw 48, and bell-crank lever 39, having springs 51, in combination with rock-shaft 32, having slotted arm 31, block 37, pivoted in said slot, and a rod connecting said block with the bell-crank lever, as and for the purpose set forth.

7. The hopper, cross slide, and chuck, in combination with rock-shaft 32, having an arm, 34, adapted to engage the groove in cam 23, and an arm, 31, whereby the forward and backward movements are imparted to the cross-slide.

8. The hopper, cross-slide, chuck, and cam 23, in combination with rock-shaft 32, having an arm, 34, adapted to engage the groove of said cam, and an upwardly-projecting arm, 31, having a swinging block, 37, pivoted thereto, and a rod, 38, connecting said swinging block with the bell-crank lever upon the cross-slide, as and for the purpose set forth.

9. The hopper and chuck, in combination with a cross-slide having grooved needle-plates, and a bell-crank lever carrying springs which hold the needle in said groove, and operating mechanism, substantially as described, whereby said cross-slide is moved forward, the bell-crank lever drops out of the way and then gradually returns to its former position as the cross-slide moves backward.

10. The cross-slide having bell-crank lever 39 and yoke 47, with set-screw 48, in combination with a swinging arm, 31, having swinging block 37 pivoted thereto, and rod 38, one end of which is connected to the lower arm of the bell-crank lever, the other to the block above its pivotal point.

11. The chuck, hopper, and cross-slide, in combination with a finger, 102, pivoted to the cross-slide, and mechanism—for example, arm 31 and rod 104—for actuating said cross-slide and finger.

12. The chuck, cross slide, and cam 23, having a dog, 97, in combination with finger 102, pivoted to the cross-slide, rod 104, pivoted to said finger and provided with shoulders, and a spring, 105, bell-crank lever 100, adapted to bear against said spring, and parts 101 and 98, the latter having a dog, 99, whereby at each revolution of said cam the finger is actuated to press the needle home in the chuck.

13. The hopper, presser-spring, chuck, and cross-slide, in combination with finger 102, pivoted to the cross-slide, cam 23, having a peripheral groove, and a dog, 97, and intermediate mechanism, substantially as described, whereby said finger and cross-slide are actuated.

14. Cam 23, having dog 97, and lever 98, pivoted to the bed, and having an adjustable dog, 99, in combination with pivoted finger 102, parts 100, 101, and 104, and spring 105, whereby at each revolution of said cam a yielding movement is imparted to said finger, as and for the purpose set forth.

15. The chuck and cross-slide, in combination with finger 102, pivoted to said cross-slide, and having a shoulder, 103, and spring-actuated rod 104, whereby a yielding movement is imparted to said finger to press the needle home in the chuck as soon as it is received thereby.

16. The combination, with the cross-slide and finger 102, of the cams 25, and a pivoted lever, 52, one end of which is adapted to engage the chuck and the other to bear upon cams 25, whereby the chuck is caused to advance and take the needle and then remain stationary while the needle is pressed home by the finger.

17. The chuck having loose collar 56 and spring 73, in combination with cams 25, and lever 52, adapted to bear on said cams and to engage the collar upon the chuck, whereby the latter is caused to move forward with a yielding movement.

18. The combination, with bracket 8 and sliding carrier 57, of the chuck carried by said carrier, cams 25, and lever 52, whereby reciprocating motion is imparted to said carrier and chuck.

19. Bracket 8, having gear 9 recessed therein, and provided with an extension, 84, having gear 86 recessed therein, in combination with the sliding carrier and the chuck.

20. The combination, with inner shell, 58, having jaws attached thereto, of outer shell, 61, having flanged collar 63, which is engaged by bell-crank lever 90, to retard the movement of the outer shell relatively to the inner shell as the chuck moves forward, as and for the purpose set forth.

21. Inner shell, 58, and piece 79, having jaws 66 attached thereto, said jaws being provided with shoulder 68, in combination with the outer shell having shoulder 65, a flanged collar, 63, and bell-crank lever 90, adapted to engage said flanged collar, whereby the movement of the outer shell is retarded, causing shoulder 65 to clamp the jaws upon the needle.

22. The inner shell having recess 77 at its outer end, and piece 79, having jaws 66 secured in said recess, in combination with spindle 75, having expelling-rod 83 at its outer end, and spring 78, for holding said rod in its retracted position.

23. The inner shell having a recess, 77, at its outer end, a piece, 79, having jaws to receive the needle, a recess, 80, at its inner end,

and a passage, 82, leading from said recess to the opening between the jaws, in combination with the spindle having a shoulder resting in recess 77, a spring bearing against said shoulder and the inner end of piece 79, and an expelling-rod projecting forward from the spindle and into passage 82.

24. Piece 79, having jaws 66, with shoulders 68, and a recess between said jaws, in combination with the inner shell, to which piece 79 is attached, and an outer shell adapted to move longitudinally on the inner shell and provided with shoulders 65, which engage and close the jaws.

25. Piece 79, having spring-jaws 66, made integral therewith, in combination with an inner shell to which said piece is attached, and an outer shell adapted to move longitudinally upon the inner shell, whereby the jaws are opened and closed.

26. Piece 79, having spring-jaws made integral therewith, a recess, 81, between said jaws, and a recess, 80, at its inner end, in combination with the inner shell having a recess, 77, the spindle having a shoulder, 76, and an expelling-rod, 83, and a spring, 78, adapted to bear upon said shoulder and the inner end of piece 79, whereby the expelling-rod is retained at the base of recess 81.

27. The inner shell and the jaws, in combination with the outer shell adapted to move longitudinally thereon and having longitudinal grooves 62, and gear 86, having keys adapted to slide in said groove, whereby rotary motion is imparted to the chuck independently of its longitudinal motion.

28. The inner shell, the jaws attached thereto, and an outer shell adapted to reciprocate thereon, and having longitudinal grooves 62, in combination with gear 86, keyed in said grooves and held against longitudinal movement by plate 88, and a gear, 9, adjustably keyed to shaft 5, whereby rotary motion is imparted to the outer shell.

29. The inner shell adapted to reciprocate longitudinally, and the jaws secured thereto, in combination with the outer shell having longitudinal grooves 62 and the flanged collar 63, bell-crank lever 90, adapted to engage said collar, whereby the longitudinal movement of the outer shell is retarded relatively to the inner shell, and gear 86, keyed in groove 62, whereby rotary motion is imparted to the outer shell irrespective of the longitudinal movement of the chuck.

30. Bracket 8, having extension 84 and provided with recesses 85 and 87, and gears 9 and 86, lying in said recesses, and held there by plate 88, in combination with shaft 5, to which gear 9 is attached, and the outer shell having a longitudinal groove, in which gear 86 is keyed.

31. Sliding carrier 57, the inner shell having flanges 59 and cap 60, by which it is secured to the sliding carrier, in combination with the outer shell having flanged collar 63, bell-crank lever 90, engaging said collar, and gear 86, keyed to the outer shell, by which rotary motion is imparted thereto.

32. The sliding carrier having stud 70, adjustably connected thereto and carrying the inner shell, in combination with a flanged collar, 56, on the stud, and spring 73, one end of which bears against the collar, the other against a shoulder on the stud, and the cam-actuated lever 52, engaging said collar, whereby yielding forward movement is imparted to the chuck.

33. The sliding carrier, inner and outer shells, and stud 70, in combination with bell-crank lever 90, one end of which engages cam-groove 91, the other engaging the outer shell, whereby the latter is retarded as the chuck is moved forward by the engagement of lever 52 with a yielding sleeve, 56, upon the stud.

34. The combination, with the sliding carrier, the inner and outer shells, and stud 70, adjustably secured in the sliding carrier, of sliding flanged collar 56, spring 73 upon said stud, and lever 52, engaging said collar, whereby a yielding forward movement is imparted to the chuck.

35. The sliding carrier, inner and outer shells, stud 70, and the spindle having an expelling-rod, 83, in combination with set-screw 93, adjustably secured in bracket 94, whereby at each backward movement of the chuck the spindle is forced forward relatively thereto and the needle-blank is expelled.

36. The inner shell and the jaws attached thereto, the outer shell, and the spindle having a rod extending to the base of the jaws, in combination with bell-crank lever 90, which controls the movement of the outer shell, lever 52, which controls the movement of the sliding carrier, and set-screw 93, against which the spindle strikes to expel the blank at the proper moment.

37. The sliding carrier, the inner and outer shells, and stud 70, in combination with bell-crank lever 90, engaging the outer shell for the purpose set forth, lever 52, engaging a yielding sleeve upon the stud, cams 25, and spring-actuated rod 96, whereby lever 52 is held in contact with the cam.

38. The combination, with the dies, of the jaws, the inner and outer shells, the sliding carrier, and levers 52 and 90, whereby the jaws are caused to grasp the needle-blank, carry it forward to the dies, and then withdraw it therefrom.

39. The combination, with the sliding carrier, the inner and outer shells, and the jaws, of dies 109 and tappets 129, carried by a rotating cylinder, whereby the operating-die is actuated in use.

40. The sliding carrier, the inner and outer shells, and the jaws, in combination with the dies, the spindle having expelling-rod 83, and levers 90 and 52, whereby the needle is carried to the dies, then withdrawn therefrom, and expelled after being acted upon by the dies.

41. The cross-slide, inner and outer shells,

jaws, and sliding carrier, in combination with the dies, the spindle having expelling-rod 83, and set-screw 93, as and for the purpose set forth.

42. The combination, with the hopper, the cross-slide, and the dies, of the sliding carrier, the inner and outer shells, the jaws, and the spindle having expelling-rod 83.

43. The cross-slide and pivoted finger 102, in combination with the sliding carrier, the inner and outer shells, and the jaws.

44. The needle-chuck, in combination with the dies and die-carriers, spring 114, the rotating tappet-cylinder and cam 118.

45. Bracket 6, having plate 111, and the die-carriers resting on said plate, in combination with the rotating tappet-cylinder and cam 118.

46. Bracket 6, the die-carriers having pins 116, and covering-plate 113, by which the dies are held in place, in combination with spring 114 and adjustable stops 115 upon the carrying-plate, whereby the backward movement of the die-carriers is limited.

47. The dies supported in die-carriers, and spring 114, for throwing said die-carriers apart, in combination with the rotating tappet-cylinder, and a rack, pinion, and cam, for imparting forward-and-backward movement to the die-carrier not acted on by the tappet-cylinder.

48. The die-carriers and dies, in combination with cam 118, the rotating tappet-cylinder, and spring 114.

49. The die-carriers, the rotating tappet-cylinder, and spring 114, in combination with cam 118 upon shaft 117, and a rack and pinion whereby oscillatory motion is imparted to said cam.

50. The die-carriers having pins 116, cam 118, and the rotating tappet-cylinder, in combination with plate 113 and adjustable stops 115, which engage said pins, as and for the purpose set forth.

51. The combination, with the die-carriers and dies, cam 118, and spring 114, of cylinder 131, having recesses for the tappets, springs 132, whereby they are held in operative position but allowed to yield, and rings 133, whereby they are held in place.

52. The spring-tappets recessed in the periphery of cylinder 131, in combination with the die-carriers, one of which is provided with a rod, 128, to receive the blows of the tappets, and spring 114.

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

PHILO M. BEERS.

Witnesses:
A. M. WOOSTER,
CORA E. RUGGLES.