No. 622,476 Patented Apr. 4, 1899.

# H. HUBBELL.

## MACHINE FOR ASSEMBLING SCREWS AND PARTS.

(Application filed Sept. 10, 1898.)

(No Model.) 4 Sheets—Sheet 1.

Fig. 1.

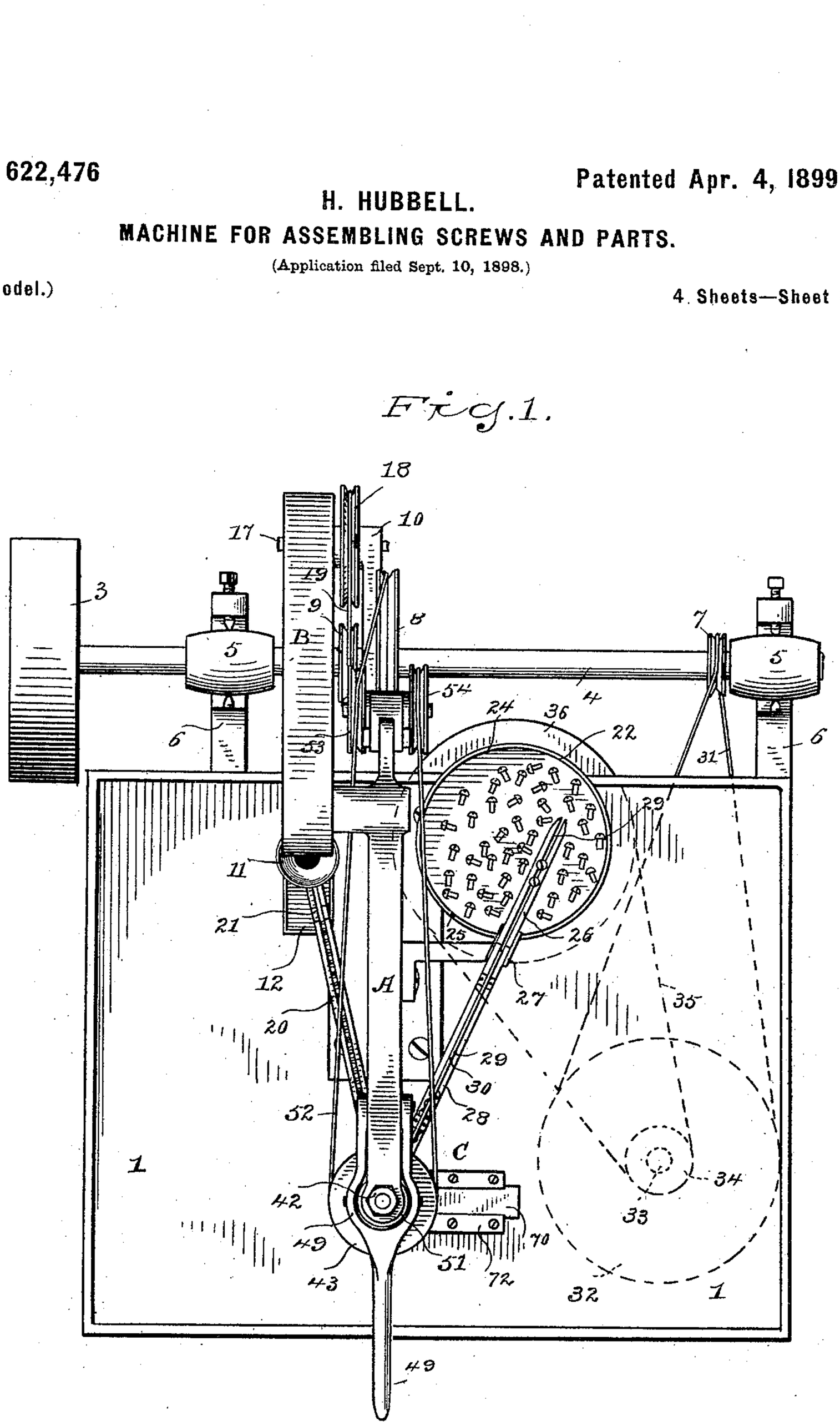
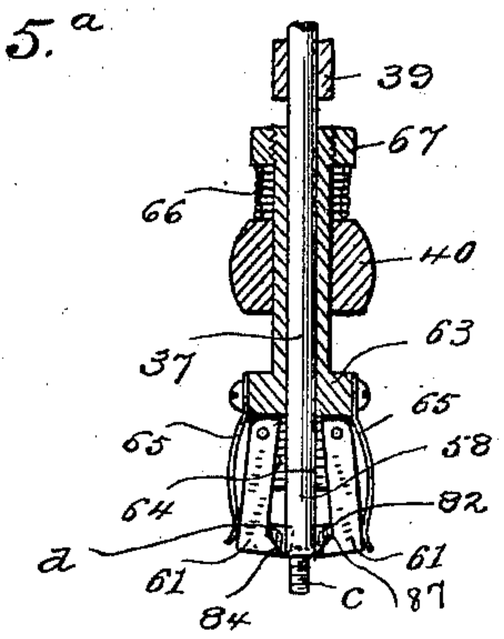



Fig. 5.a




WITNESSES

H. A. Lamb.

B. N. Holey.

INVENTOR

Harvey Hubbell

By A. Wilbrooster

Atty.

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# H. HUBBELL.

## MACHINE FOR ASSEMBLING SCREWS AND PARTS.

(Application filed Sept. 10, 1898.)

(No Model.) 4 Sheets—Sheet 2.

Fig. 2.

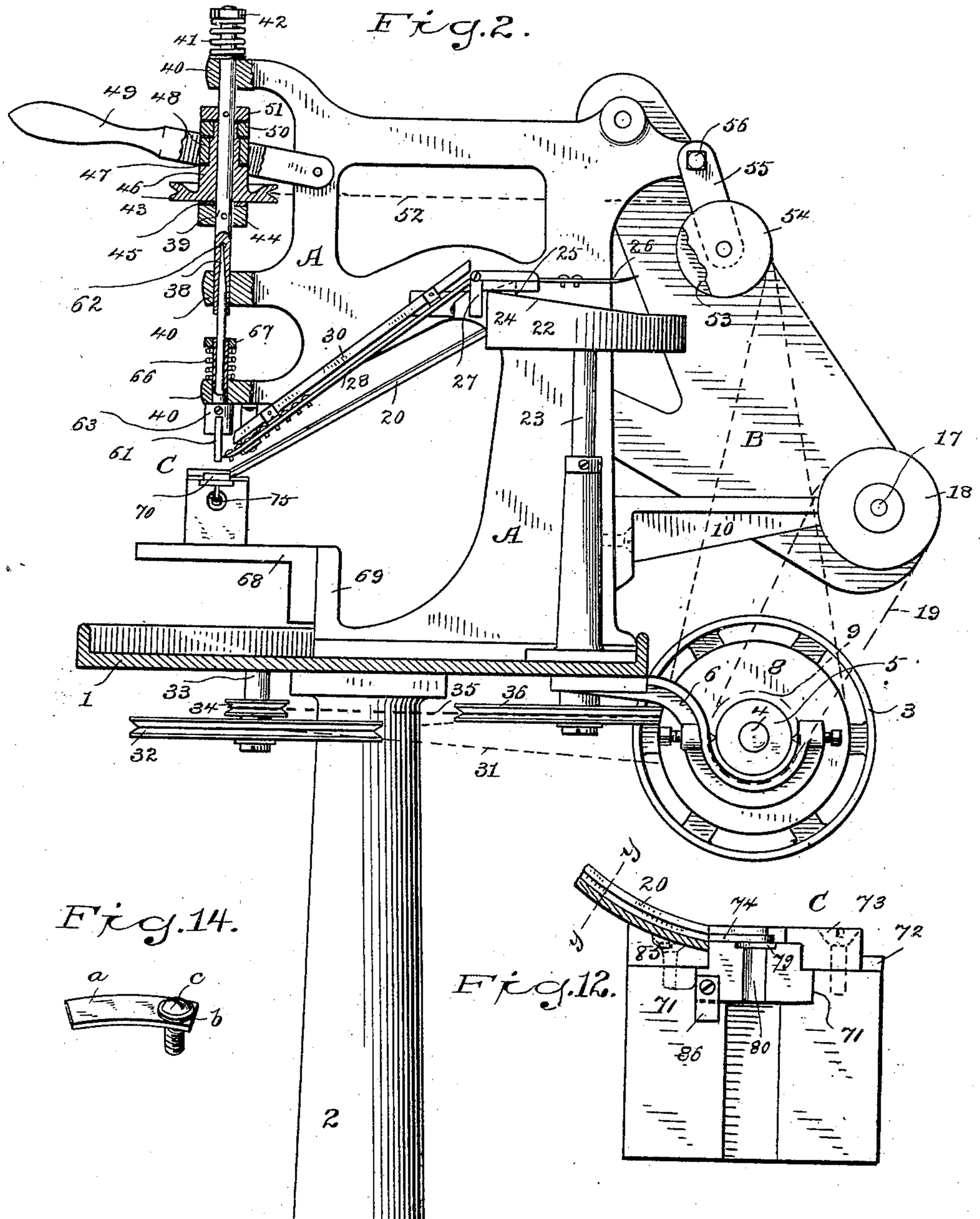


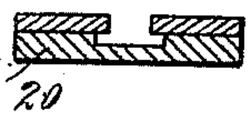

Fig. 14.




Fig. 12.




Fig. 13.




WITNESSES

H. A. Lamb

S. V. Haley

INVENTOR

Harvey Hubbell

By A. M. Wooster

Atty.

No. 622,476. Patented Apr. 4, 1899.

# H. HUBBELL.

## MACHINE FOR ASSEMBLING SCREWS AND PARTS.

(Application filed Sept. 10, 1898.)

(No Model.) 4 Sheets—Sheet 3.

Fig. 3.

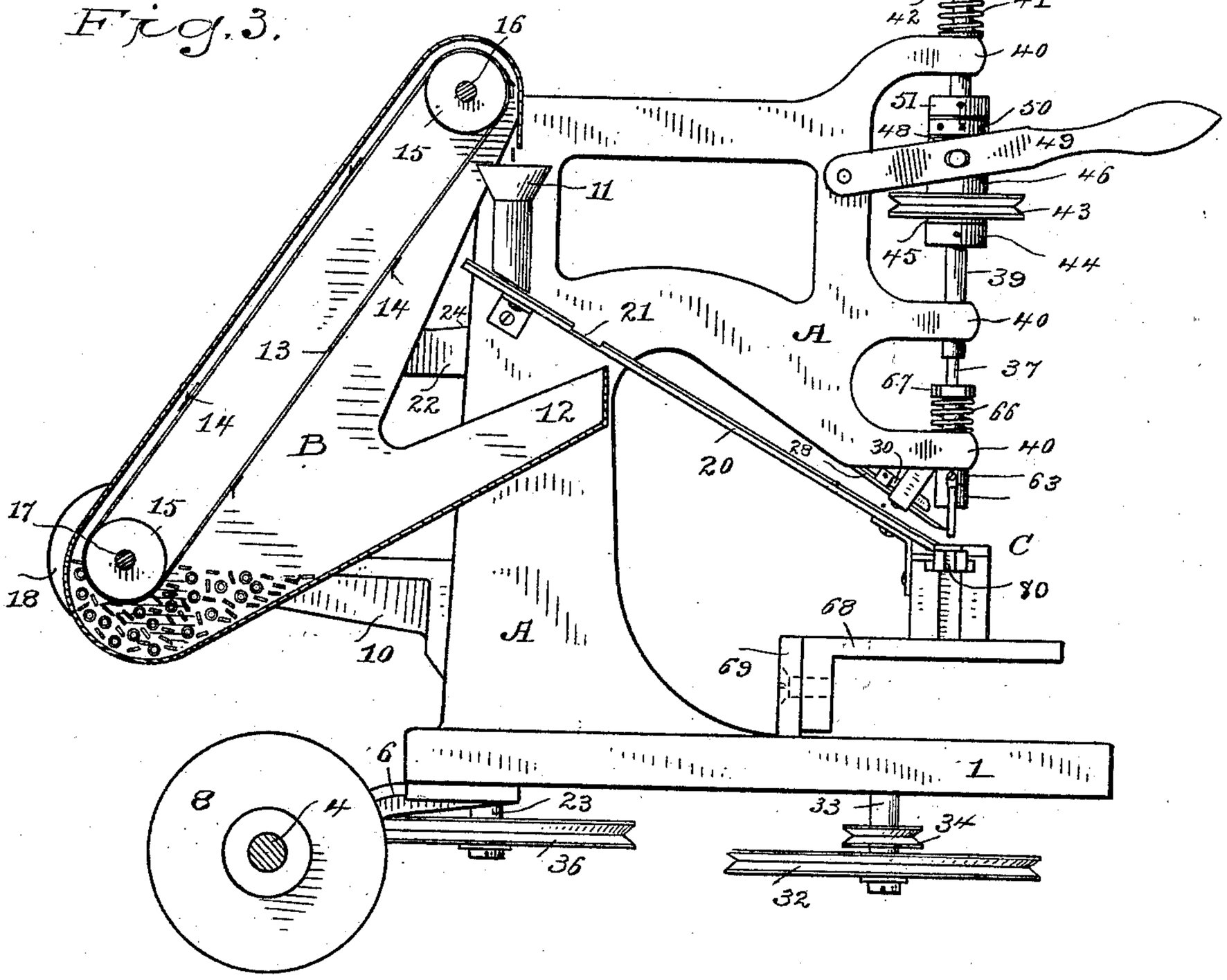



Fig. 4.

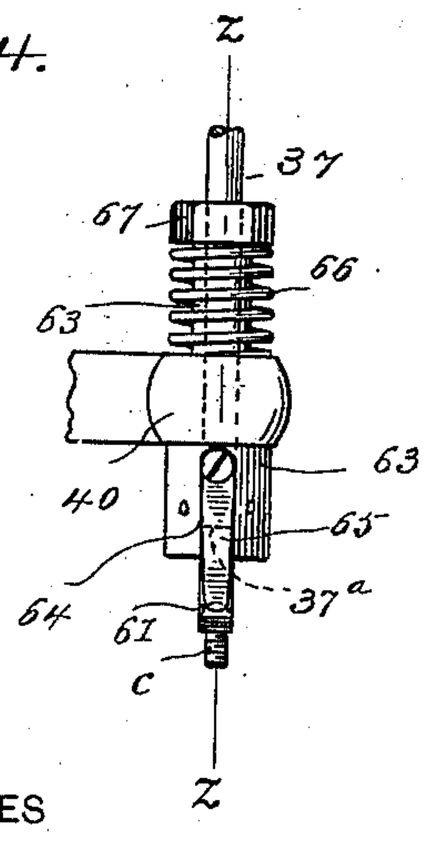



Fig. 6.

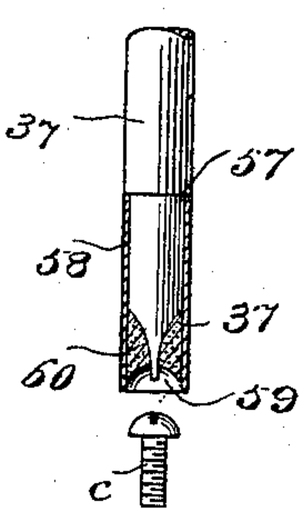
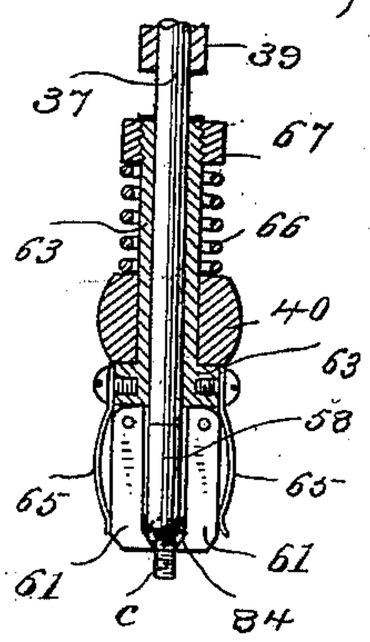



Fig. 5.




WITNESSES

H. A. Sands

S. V. Kelly

INVENTOR

Harvey Hubbell

By A. M. Wooster

Atty.

No. 622,476. Patented Apr. 4, 1899.

# H. HUBBELL.

## MACHINE FOR ASSEMBLING SCREWS AND PARTS.

(Application filed Sept. 10, 1898.)

(No Model.) 4 Sheets—Sheet 4.

Fig. 7.

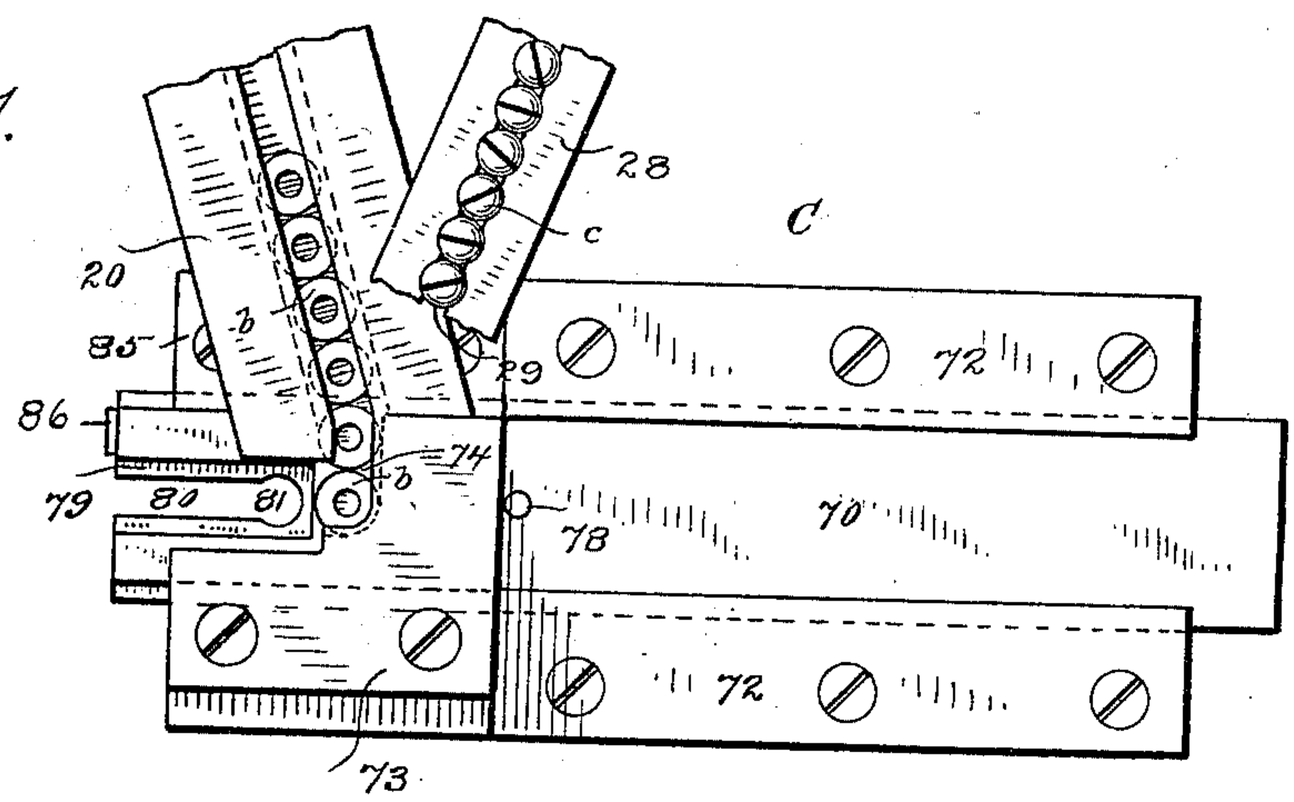



Fig. 8.

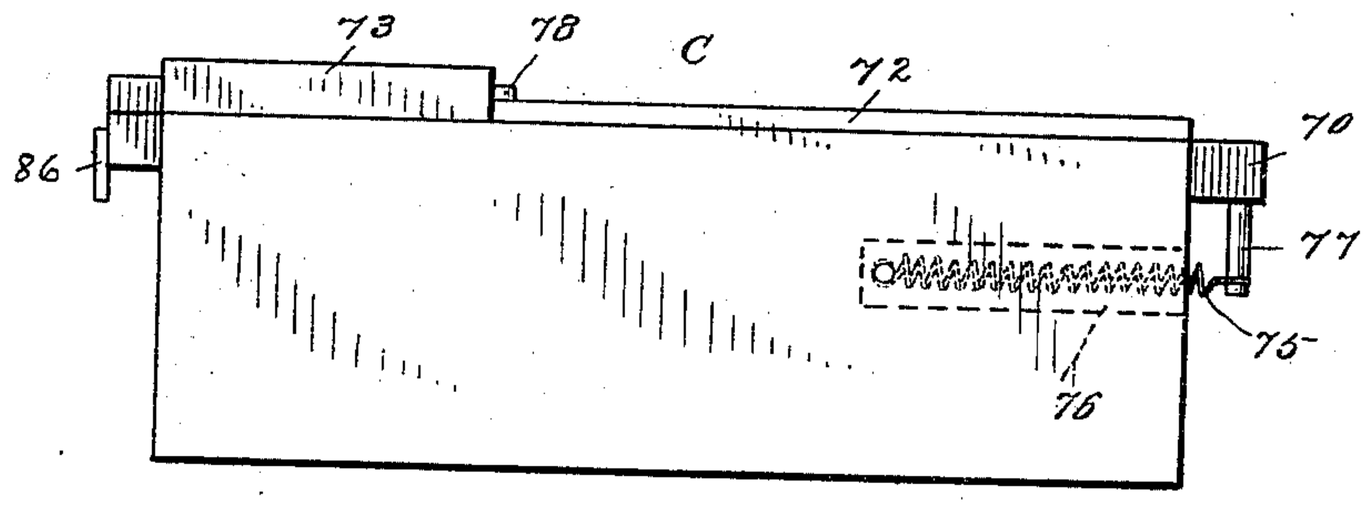



Fig. 9.

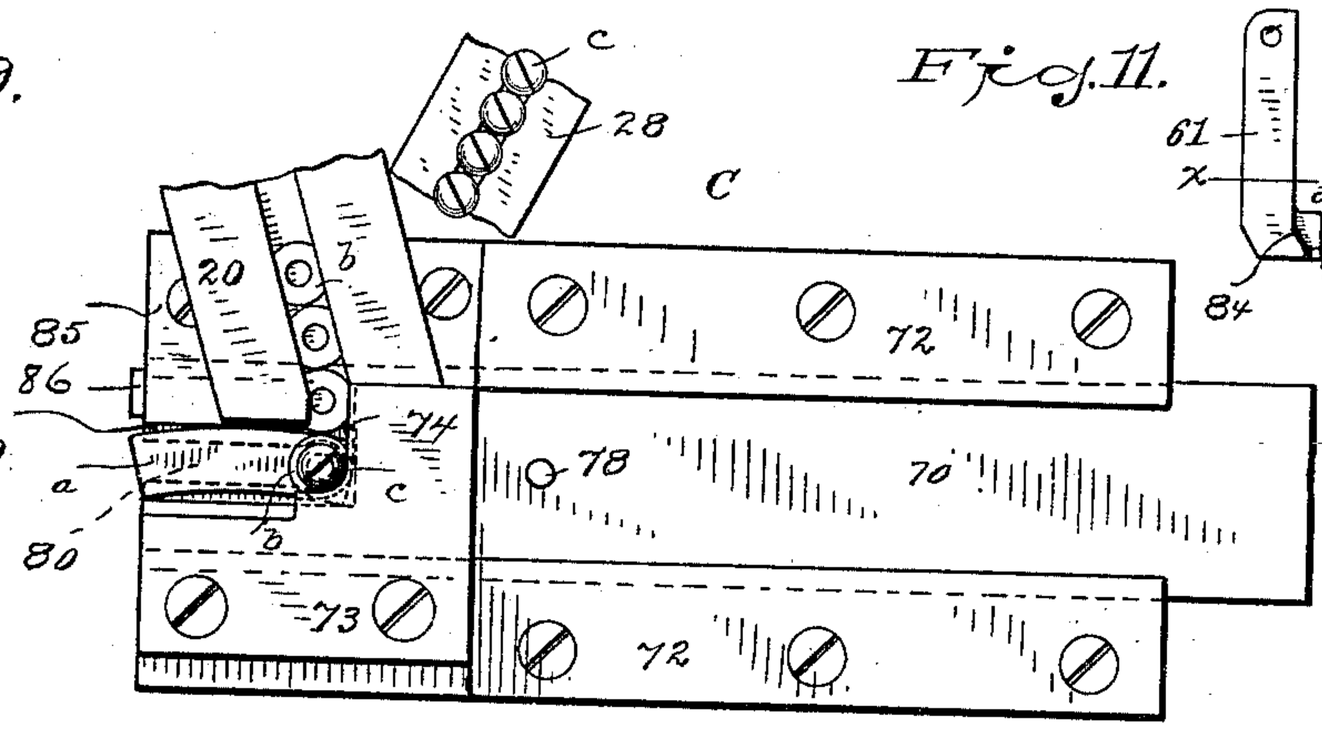



Fig. 11.

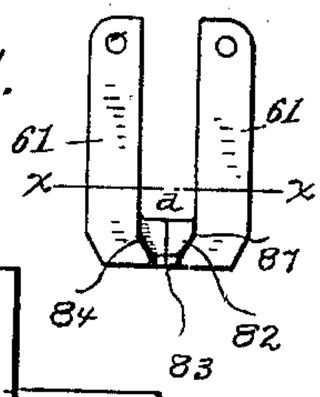
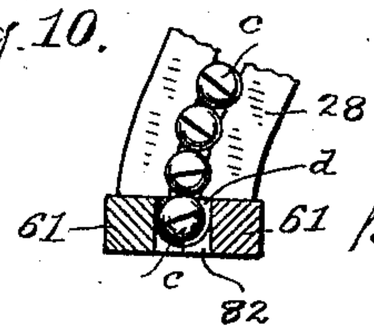



Fig. 10.




WITNESSES

H. A. Lamb

S. A. Foley

INVENTOR

Harvey Hubbell

By A. M. Wooster

Atty.

# UNITED STATES PATENT OFFICE.

HARVEY HUBBELL, OF BRIDGEPORT, CONNECTICUT.

## MACHINE FOR ASSEMBLING SCREWS AND PARTS.

SPECIFICATION forming part of Letters Patent No. 622,476, dated April 4, 1899.

Application filed September 10, 1898. Serial No. 690,700. (No model.)

*To all whom it may concern:*

Be it known that I, HARVEY HUBBELL, a citizen of the United States, residing at Bridgeport, county of Fairfield, State of Connecticut, have invented a new and useful Machine for Assembling Screws and Parts, of which the following is a specification.

My invention has for its object to provide a machine for putting screws in articles with or without other parts, as washers.

In the accompanying drawings, forming part of this specification, I have illustrated a use of my novel machine in which a screw is passed through a washer and turned into a threaded hole in a plate. It should be understood, however, that the special shape and size of the parts assembled are not of the essence of my invention, but that the machine is adapted for use in assembling parts of various shapes and sizes, it being necessary to provide suitable feeding mechanism and ways to accommodate the special parts that are to be assembled.

Figure 1 is a plan view of the machine complete; Fig. 2, an elevation as seen from the right in Fig. 1, the bed and parts of the driver-operating mechanism being in section; Fig. 3, an elevation as seen from the left in Fig. 1, the standard being omitted and the magazine for washers being in section; Fig. 4, an enlarged detail view of the holding-jaws and the carrier, the jaws having just received a screw from the screw-feeding way and the driver being at the raised position; Fig. 5, a section on the line $z\ z$ in Fig. 4, but showing the driver as having moved down and engaged the head of a screw; Fig. 5$^a$, (see Sheet 1,) a similar view showing the position of the parts after the holding-jaws have been opened by the end of the driver; Fig. 6, a detail elevation of the driver detached; Fig. 7, an enlarged plan view of the assembling-table, also showing the washer-feeding and screw-feeding ways, the end of the screw-feeding way being broken away; Fig. 8, a side elevation of the assembling-table without the ways; Fig. 9, a view similar to Fig. 7, showing assembled parts in position at the instant the operation of assembling is completed; Fig. 10, a view of the lower end of the screw-feeding way, the holding-jaws being in horizontal section on the line $x\ x$ in Fig. 11; Fig. 11, an elevation of the holding-jaws detached, showing the socket which receives the screws from the screw-feeding way; Fig. 12, an end elevation of the assembling-table as seen in Figs. 7 and 9, the washer-feeding way being in longitudinal section; Fig. 13, a cross-section of the washer-feeding way on the line $y\ y$ in Fig. 12, and Fig. 14 is a perspective illustrating parts as assembled by my novel machine.

1 denotes the bed, which is supported by a standard 2. Power is applied to drive the machine by means of a belt (not shown) passing over a belt-pulley 3 on a shaft 4, journaled in bearings 5, carried by brackets 6, which extend outward from the bed.

7, 8, and 9 denote belt-pulleys carried by shaft 4.

A denotes a bracket extending upward from the bed, which carries a large portion of the operative parts of the machine.

The three important instrumentalities of the machine are washer-feeding mechanism, screw-feeding mechanism, and screw-driving mechanism by which the screws are passed through the washers (if used) and turned into the plates or other articles.

$a$ denotes an article—in the present instance a plate—having one or more threaded holes to receive the screws $c$, $b$ denoting the washers which are assembled with the screws. The washers are placed in a magazine B, the upper end of which is supported by bracket A and the lower end by a bracket 10, which is itself secured to bracket A. The special shape of the washer-magazine is not of the essence of my invention, although in practice I ordinarily construct it substantially as shown in the drawings, the magazine itself being placed at an angle, the top and the outer face being closed and the inner side left open, so that washers picked up by the carrying-belt 13, as will presently be explained, will drop into a funnel 11. A trough 12, preferably made part of the magazine itself, is placed in such a position as to catch all of the washers that may fall from the washer-feeding way and allow them to drop back by gravity into a position where they will be again picked up by the carrying-belt. This carrying-belt runs over pulleys 15, one of which is placed at the upper end of the magazine and the other at the lower end, and is provided with

pockets 14, by which washers are picked up from the mass in the magazine. Pulleys 15 are carried by shafts 16 and 17, journaled in the magazine, the shaft 17, upon which the lower pulley is journaled, extending outward from one side of the magazine and carrying a belt-pulley 18. A belt 19, passing over belt-pulley 18 and over belt-pulley 9 on shaft 4, imparts movement to the carrying-belt, so that the pockets will pick up washers from the mass in the magazine and carry them upward and over the upper pulley 15. As the pockets pass over and off from the upper pulley 15 the washers therein will drop out and fall into the funnel 11. Under this funnel and in position to receive washers therefrom is an inclined washer-feeding way 20, the upper end of which is attached to bracket A and the lower end to an assembling-table C. The upper end of the inclined way 20, directly beneath the funnel 11, is cut away or enlarged, so as to admit of the washers passing readily into the partly-covered way, down which they slide to the delivery end. The special shape or construction of the washer-feeding way is not of the essence of my invention, it being simply required that the way be undercut or that the washer-groove be partly covered in such a way that while the washers will slide freely down the way it will be impossible for them to pass out except at the lower end thereof. In order to dispose of the surplus washers—that is, washers picked up by the carrying-belt and dropped into the funnel, but which are not required for use—I cut away both sides of the washer-feeding way a short distance below the funnel, as at 21, so that after the lower portion of the way is filled with washers the surplus washers which drop into the funnel will pass down the way as far as the cut-away portion and will then pass out one side or the other and drop into trough 12 and then pass down into the magazine again. The special form of screw-feeding mechanism likewise is not of the essence of my invention. It is simply required that the screws be fed to the screw-driving mechanism as fast as they can possibly be required for use. In practice I ordinarily use screw-feeding mechanism substantially like the blank-feeding mechanism described and claimed in Letters Patent No. 602,288, granted to me April 12, 1898. The screws are placed in a holder 22, rigidly secured to the upper end of a shaft 23. The outer wall of the screw-holder is circular, and a portion of the top of said wall consists of a spiral incline 24, which terminates in a shoulder 25. The screws, which are thrown loosely into the holder, are picked up by a slotted finger 26, which is pivoted to a bracket 27, itself secured to bracket A. 28 denotes the screw-feeding way, which is the inclined slotted way of my said former patent, the upper end of which is secured to bracket 27 in such a position that when the slotted finger is raised, as will presently be described, the slot in the way is continuous with the slot in the finger, the slot in both the way and the finger being indicated by 29. The slot is made just wide enough to receive the shanks of the screws freely, but not the heads, so that the heads will slide freely along the upper side of the finger and the way. 30 denotes a guard over the inclined way which prevents the screws from jumping out under any circumstances. When the under side of the finger is engaged by the low portion of the spiral incline, the free end of the slotted finger will rest on the bottom of the holder and will pick up screws, the shanks of the screws passing into the slot and the heads resting upon the upper side of the finger. As the rotation of the holder continues the incline will tilt the slotted finger until its free end is higher than the pivoted end, so that the screws which have been picked up by the finger will pass down into the slotted way. It will be apparent that only the screws which have been picked up correctly will pass into the slotted way, as any screws with the heads down and the shanks up will drop out when the finger is raised and screws lying on top of the finger will roll off and drop back into the holder. In practice the screws are picked up by the finger faster than they are required for use. It is obvious, however, that they can only pass into the upper end of the slotted way as fast as they pass out from the lower end thereof. In practice there is no clogging whatever. As soon as the slotted way is filled the screws picked up by the finger will either slide out during the upward or downward movements of the finger and drop back into the holder or a portion of them may remain in the finger until there is room in the slotted way to receive them. Rotary motion is imparted to shaft 23 and the screw-holder as follows: A belt 31 extends from belt-pulley 7 on shaft 4 and passes over a belt-pulley 32, journaled on a stud 33, which extends downward from the bed. 34 denotes another belt-pulley journaled on stud 33, from which a belt 35 extends to a belt-pulley 36 at the lower end of shaft 23.

The screw-driving mechanism consists, essentially, of a rotating driver and holding-jaws which receive the screws from the screw-feeding way and hold them until the heads thereof are engaged by the driver and the ends engage the plate or other article into which they are to be driven.

37 denotes a driver the upper end of whose shank is tapered, as at 38, so as to engage a correspondingly-tapered opening in a spindle 39 with a drive fit. This opening terminates in a transverse opening 62, through which a tapering half-round tool may be passed to start the driver should it be required to remove it.

40 denotes extensions of bracket A, in which the spindle and driver are journaled. The spindle and driver are held at the raised—*i. e.*, the inoperative—position by means of a spring 41, the ends of which bear, respectively, against the upper side of the upper extension 40

and against a nut 42 at the upper end of the spindle.

43 denotes a belt-pulley loose on spindle 39, which rests upon a collar 44, fast upon the spindle, a washer 45 being interposed between the belt-pulley and the collar, so that ordinarily the pulley will rotate freely; but when the pulley is pressed down upon the washer the rotation of the pulley will be communicated to the spindle and the driver. Belt-pulley 43 is provided with a hub 46, having a shoulder 47, on which a ring 48 rests loosely. 49 denotes a bifurcated lever which is pivoted to bracket A and incloses the ring, the lever being pivoted to the ring in such a manner as to permit the lever to be oscillated freely to raise and lower the belt-pulley, spindle, and parts carried thereby. Ring 48 is shown as retained in place upon the hub by means of a nut 50, which engages the threaded upper end of the hub, and the hub and the pulley are retained in position on the spindle by means of a collar 51, rigidly secured thereto. Motion is communicated to belt-pulley 43 and to the spindle and driver by means of a belt 52, which passes upward from belt-pulley 8 on shaft 4 over an idler-pulley 53, thence around pulley 43, thence over another idler-pulley 54, and thence downward to pulley 8 again. Idler-pulleys 53 and 54 are carried by an arm 55, which is adjustably secured to bracket A by means of a bolt 56 or in any suitable manner. The special construction of driver which is preferably used will be readily understood from Fig. 6. The lower end of the shank is reduced, leaving a shoulder 57, and the driver proper is formed by grinding off the opposite sides, as is clearly shown in Fig. 6. A sleeve 58 is passed on over the reduced portion, the upper end of the sleeve bearing against shoulder 57, and the lower end extending below the tip of the driver, forming a socket 59 to receive the head of the screw. The sleeve is secured to the driver proper, and socket 59 is formed to the exact shape of the screw-head by pouring soft solder into socket 59 about the driver, as at 60. It will be noted that the tip of the driver extends down below the base of the socket, so as to engage the slot in the screw-head, the head itself just fitting in socket 59. This special construction I have found very satisfactory in use, as it never misses a screw until the tip of the driver has been perceptibly worn away, which will not be until after long-continued use. When the tip of the driver does become worn away, it may be easily repaired by melting the soft solder, removing the sleeve, and grinding away the opposite sides of the driver as much as may be required. The sleeve is then replaced and secured in position and the socket formed for the screw-head by the use of soft solder, as before. If necessary, the lower end of the sleeve may be ground away slightly to compensate for the slight reduction in the length of the driver.

61 denotes the holding-jaws, which are pivoted in a slot 64 in a carrier 63, the jaws being retained at the closed or holding position by springs 65. The driver passes freely through the carrier, its movements being wholly independent of the movements of the carrier. The normal or raised position of the lower end of the driver is indicated by the dotted line $37^a$ in Fig. 4, and the position of the driver at the time a screw has been turned into an article is clearly shown in Fig. $5^a$. The carrier is free to move vertically in the lower extension 40 of bracket A, and the carrier is normally inactive and at rest excepting when it is forced downward into operative relation to the work by the driver, said carrier and jaws being held at the normal or raised position by means of a spring 66, one end of which bears against the upper side of the said lower extension, the other end bearing against a nut 67 at the upper end of the carrier.

The assembling-table C is shown in the present instance as resting upon a bracket 68, which is itself adjustably secured to an extension 69 of bracket A.

70 denotes a carrying-slide which is adapted to move freely in ways 71 in the table, the slide being retained in the ways by plates 72.

73 denotes a top plate which is provided with a socket 74, into which the washers pass from the washer-feeding way.

The carrying-slide is shown at its normal position in Figs. 7 and 8, in which position it is retained by a spring 75, one end of which is secured in a socket 76 in the assembling-table, (see dotted lines, Fig. 8,) the other end being attached to a pin 77, extending downward from the carrying-slide. The outward movement of the carrying-slide is limited by the engagement of a stop 78 on the slide with the top plate, and the inward movement, which is against the power of spring 75, is limited by the engagement of a stop 86 on the slide with the assembling-table. At one end of the carrying-slide I provide a socket 79, which receives the articles into which screws are to be turned. In the present instance I have shown the operative end of the slide as provided with a slot at the center of the socket, said slot terminating in an enlargement 81. The shape of the socket and the use of the slot and enlargement are, however, mere details of construction which are adapted to any special work upon which the machine may be placed, it being, of course, necessary to provide a slot to receive the end of the screw and permit the removal of the article whenever the end of the screw passes beyond the plate or other article into which it is driven.

The special shape of the holding-jaws will be clearly understood from Fig. 11, in connection with Figs. 5, $5^a$, and 10. The essential feature of the holding-jaws is that at the operative ends of said jaws I form a socket *d*, closed at the front and open at the back, (see Fig. 11,) which receives the screws singly

from the screw-feeding way, as is clearly shown in Fig. 10. The walls which close the front of socket *d* are indicated by 82. The upper portion of the socket is made amply large to receive the heads of the screws freely, and at its lower end is a neck 83, which just receives the shanks of the screws freely. Between the neck and the upper portion of the socket which receives the heads of the screws are inclines 84 on both jaws, the action of which is to cause the jaws to be thrown to the open position, as in Fig. 5ª, by the driver as the latter is forced downward against the shoulders 87, formed by the upper ends of the inclines 84, after the carrier has reached the limit of its downward movement—*i. e.*, when spring 66 has reached the limit of compression, as in Fig. 5ª. In use the carrier is moved downward against the power of spring 66 by the engagement of the lower end of the driver with the shoulders 87 at the upper end of the inclines 84, springs 65 being strong enough to retain the jaws at the closed position until spring 66 has reached the limit of its compression, as in Fig. 5ª, after which, the screw having now engaged the article into which it is to be driven, continued downward movement of the driver causes the latter to travel down the inclines 84 and throw the jaws to the open position against the power of springs 65, thereby releasing the screw, as is clearly shown. While the driver is at the lowered position, the driver itself will of course serve as a stop to prevent screws in the screw-feeding way from dropping out. The instant the driver begins to rise, however, and the assembled screw and article are removed from the carrying-slide the jaws will be returned to their closed position by springs 65, and as soon as the carrier has reached its normal or raised position another screw will pass into socket *d* from the screw-feeding way. In practice a screw is always ready in the jaws to be caught by the driver at each downward movement.

The lower end of washer-feeding way 20 rests upon and is secured to a block 85, which is itself secured to the table. This washer-feeding way registers with socket 74 in the top plate, so that the washers will feed by gravity down into the socket one by one. The relative position of the lower end of the screw-feeding way will be clearly understood from Fig. 3. Holding-jaws 61 rest against the end of this way, and the screws feed by gravity from the way into socket *d* one by one, the open side of the socket being of course toward the way and the screws being retained in the socket by the walls 82 at the lower ends of the jaws at the front.

The operation is as follows: The manipulation of the articles—in the present instance plates—into which the screws are to be turned is by hand. The operator with one hand picks up the plates singly, places them in socket 79, and presses the carrying-slide forward against the power of spring 75 until it is stopped by the engagement of stop 86 with the table. The relative position of sockets 74 and 79 will be clearly understood from Fig. 9 in connection with Fig. 12. It will be seen that the plate *a* in socket 79 will pass under the washer in socket 74 when the carrying-slide is moved forward. With the other hand the operator by means of lever 49 presses down belt-pulley 43, which imparts rotary movement to the spindle and driver. As already stated, the operation of the screw-feeding mechanism is to keep the screw-feeding way always filled with screws, so that the instant the holding-jaws return to their normal or raised position after each screw has been turned into place another screw will pass by gravity from the screw-feeding way into the socket in the holding-jaws. The continued downward movement of the spindle and driver produced by means of lever 49 causes the driver to catch the head of the screw that is lying in the socket of the jaws and to cause the end of the screw to engage the threaded hole in the article into which it is to be turned. An instant later the end of the driver engages the inclines in the jaws and throws them to the open position, which releases the screw. As soon as the screw is turned into the article, which takes place in a fraction of a second, as the driver is caused to rotate very rapidly, the operator by means of lever 49 returns the driver and carrier to their normal position, the holding-jaws returning to their closed position the instant the driver commences to rise and the carrier with the holding-jaws also returning to their normal or raised position. The instant the carrier has reached its normal position—socket *d* in the jaws facing the end of the screw-feeding way—the lowest screw in the way will pass by gravity into the socket ready to be caught by the driver at the next downward movement. While the operator is returning the spindle, driver, carrier, and jaws to their normal position with one hand, with the other hand he removes the assembled parts—*i. e.*, the plate, washer, and screw—from the carrying-slide, the latter being returned to its normal position by spring 75 the instant pressure is removed. It will of course be apparent that the removal of the assembled parts from the carrying-slide is perfectly easy, owing to the fact that slot 80 is amply large to permit the passage of the screw, and, furthermore, that the entrance of the screw into and through the article takes place with absolute certainty, owing to the fact that enlargement 81 prevents the possibility of the end of the screw coming in contact with the slide. As the article into which the screw is to be turned is pressed into the end of the socket and the carrying-slide is pressed inward until its movement is terminated by a stop, there is no difficulty whatever in causing the ends of the screws to engage the threaded openings in the plates.

In practice the operation of assembling parts may be repeated many times while the

description of it is being read, owing to the fact that the feeding of the washers and the screws is practically instantaneous and that the driver is rotated at a high velocity. It follows, therefore, that the actual limit to the speed of the machine is the ability of the operator to pick up the plates, press them forward in the carrying-slide, and remove them therefrom, these operations having to be performed with one hand while the other hand manipulates the driver and carrier by means of lever 49.

Having thus described my invention, I claim—

1. In a machine of the character described, the combination of the following instrumentalities, viz: a screw-feeding way, screw-holding devices to receive screws from said way mounted on a stationary support and movable thereon, screw-driving mechanism adapted to move the said screw-holding devices into operative relation to the work, release the screws therefrom and drive them into the work, and means for supporting the work in operative relation to said mechanism.

2. In a machine of the character described, the combination of the following instrumentalities, viz: a screw-feeding way, screw-holding devices to receive screws from said way mounted on a stationary support and vertically movable thereon, screw-driving mechanism adapted to move the said screw-holding devices into operative relation to the work, release the screws therefrom and drive them into the work, and means for supporting the work in operative relation to said mechanism.

3. In a machine of the character described, the combination of the following instrumentalities, viz: a screw-feeding way, screw-holding devices to receive screws from said way mounted on a stationary support, and vertically movable thereon, means for normally holding said screw-holding devices elevated, screw-driving mechanism adapted to move said screw-holding devices downward into operative relation to the work, release the screws therefrom and drive them into the work, and means for supporting the work in operative relation to said mechanism.

4. In a machine of the character described, the combination of the following instrumentalities, viz: a screw-feeding way, screw-holding devices to receive screws from said way, said devices being mounted on a fixed portion of the machine-frame so as to have a vertical movement thereon, a spring to normally elevate said screw-holding devices, screw-driving mechanism adapted to depress said screw-holding devices into operative relation to the work, release the screws therefrom, and drive them into the work, and means for supporting the work in operative relation to said mechanisms.

5. In a machine of the character described, the combination of the following instrumentalities, a screw-feeding way, mechanism for automatically supplying screws to said way, screw-holding mechanism comprising a vertically-movable spring-elevated head or carrier mounted on a fixed support on the machine-frame, screw-gripping jaws pivoted on said carrier and adapted to receive screws from said way, a driver movable within said carrier and adapted to depress the carrier into operative relation to the work, open the gripping-jaws to release the screws and drive them into the work, and means for supporting the work in operative relation to the said mechanisms.

6. In a machine of the character described, the combination of the following instrumentalities, a screw-feeding way, mechanism for automatically supplying screws to said way, screw-holding mechanism comprising a vertically-movable spring-elevated head or carrier mounted in a fixed support on the machine-frame, screw-gripping spring-jaws pivoted on said carrier and adapted to receive screws from said way, a driver movable within said carrier and adapted to depress the carrier into operative relation to the work, open the gripping-jaws to release the screws and drive them into the work, and means for supporting the work in operative relation to the said mechanisms.

7. In a machine of the character described, the combination with suitable screw feeding and driving mechanisms, of a stationary work-support, a sliding work-holder carried thereby and provided with a slot at its forward end, said work-holder being movable into an operative position beneath said screw feeding and driving mechanisms, and automatic means for returning said sliding work-holder to an inoperative position after the screws have been supplied to the work.

8. In a machine of the character described, the combination with suitable screw feeding and driving mechanisms, of a stationary work-support, a sliding work-holder mounted on said stationary support and provided with a slot at its forward end, said sliding work-holder being movable into operative relation to said screw feeding and driving mechanisms, a spring to return said sliding work-holder to an inoperative position after the screws have been supplied to the work, and means for supporting a washer over the slotted end of said sliding work-holder when said work-holder is in operative relation to the screw feeding and driving devices.

9. In a machine of the character described, the combination with suitable screw feeding and driving mechanisms, of a stationary work-support, a sliding work-holder mounted on said support and provided with a slot at its forward end, said sliding work-holder being movable into operative relation to said screw feeding and driving mechanisms, a spring to return said sliding work-holder to an inoperative position after the screws have been supplied to the work, means for supporting a washer over the slotted forward end of said sliding work-holder when said work-holder is

in operative position relative to said screw feeding and driving mechanisms, and a washer-feeding way to deliver washers to said washer-support.

10. The combination with a screw-feeding way and means for holding an article, of jaws having a socket open at the back to receive screws from the way and having inclines 84, a vertically-movable carrier to which the jaws are pivoted and a driver movable within the carrier which engages the head of a screw in the socket and drives it into an article and also engages the incline whereby the jaws are opened and the screw released.

11. The combination with a screw-feeding way and means for holding an article, of jaws having a socket closed at the front and open at the back to receive screws from the way, shoulders 87 and inclines 84 below the shoulders, a vertically-movable carrier to which the jaws are pivoted and a driver movable within the carrier which engages the head of a screw in the socket and drives it into an article and also engages shoulders 87 to move the carrier downward and then engages the inclines to open the jaws and release the screw when the limit of downward movement of the carrier is reached.

12. The combination with a screw-feeding way and means for holding an article, of jaws having a socket to receive screws from the way, said socket comprising shoulders 87, below said shoulders inclines, and below the inclines a neck which receives the shanks of the screws, a vertically-movable carrier to which the jaws are pivoted, said carrier being normally inactive and at rest, and a driver movable within the carrier which forces said carrier into operative relation to the work, drives the screw into an article and simultaneously opens the jaws and releases the screw.

13. The combination with a screw-feeding way and means for holding an article, of jaws having a socket to receive screws from the way, said socket comprising inclines 84 which terminate in a neck to receive the shank of the screw, a vertically-movable carrier, said carrier being normally inactive and at rest, and a driver vertically movable within the carrier which forces said carrier into operative relation to the work drives the screw and by means of the inclines opens the jaws and releases the screw.

14. The combination with a screw-feeding way and means for holding an article, of jaws having a socket to receive screws from the way, said socket comprising shoulders 87 and inclines 84 which terminate in a neck to receive the shanks of the screws, a vertically-movable carrier and a driver vertically movable within the carrier which drives the screw and engages the shoulders to move the carrier downward and engages the inclines to open the jaws and release the screw after the carrier has reached the limit of its downward movement.

15. The combination with a screw-feeding way and means for holding an article, of jaws having a socket to receive screws from the way, a vertically-movable carrier to which the jaws are pivoted, said carrier being normally inactive and at rest, a driver vertically movable within the carrier which forces said carrier into operative relation to the work, springs for holding the carrier and the driver at the raised position, and means for moving the driver and the carrier downward against the power of the springs.

16. The combination with a screw-feeding way and means for holding an article, of jaws having a socket to receive screws from the way, a vertically-movable carrier to which the jaws are pivoted, said carrier being normally inactive and at rest, a driver vertically movable within the carrier, which forces said carrier into operative relation to the work, a spindle by which the driver is carried, springs acting to hold the carrier and the driver at the raised position, a belt-pulley which normally rotates on the spindle, and means whereby the belt-pulley is caused to drive the spindle and move the spindle, driver and carrier downward against the power of the springs.

17. The combination with a vertically-movable carrier, which is normally inactive and at rest, a driver vertically movable within the carrier which forces said carrier into operative relation to the work, a spindle by which the driver is carried and springs by which the spindle and driver are held at the raised position, of a belt-pulley loose on the spindle, a ring loose on the hub of the belt-pulley and a lever, pivoted to the ring, whereby the belt-pulley may be caused to rotate the spindle and the driver, and the spindle, driver and carrier may be moved downward against the power of the springs.

18. The combination with a screw-feeding way and jaws having a socket to receive screws from the way, said socket comprising shoulders 87 and inclines 84 which terminate in a neck to receive the shanks of the screws, of a carrier to which the jaws are pivoted, a driver vertically movable within the carrier, springs 41 and 66 by which the driver and carrier are held at the raised position and means for moving the driver and carrier downward against the power of the springs, the driver engaging the shoulders and moving the carrier downward until the limit of compression of spring 66 is reached and then engaging the inclines, thereby opening the jaws and releasing the screw.

19. In a machine of the character described, the combination with a screw-feeding way, of jaws provided with a socket to receive the screws from the way, a carrier mounted in a fixed support so as to have a limited vertical movement therein to which said jaws are pivoted, and a driver having an independent vertical movement within the carrier which engages a screw held by said pivoted jaws.

20. A driver 37 having at its lower end a

fixed but removable sleeve 58 which extends below the tip of the driver whereby a socket is formed to receive the head of a screw.

21. The driver 37 having at its lower end a sleeve 58 which extends below the tip of the driver and is secured thereto by a filling of solder whereby a socket is formed corresponding to a screw-head.

22. The driver 37 having at its lower end a shoulder 57, a sleeve extending below the tip of the driver and abutting against the shoulder and a filling of soft solder between the driver and the sleeve which covers all except the tip of the driver and retains the sleeve in position.

23. In a machine of the character described, the combination with a washer-feeding way, of a washer-magazine closed on its top and outer face but open at its inner side, a carrying-belt located within said magazine and provided with pockets which pick up the washers, and a funnel over the washer-feeding way to which the washers are delivered by said carrying-belt and by which they are guided to the said feeding-way.

24. In a machine of the character described, the combination with a magazine for washers having an open front and inclined bottom, of a carrying-belt within said magazine provided with pockets which pick up the washers, of a washer-feeding way extending within said magazine, a funnel over said way which receives the washers from said carrying-belt and directs them to the washer-feeding way, said feeding-way having a cut-away portion at a point below the delivery end of the funnel and over the inclined bottom of said magazine.

25. In a machine of the character described, the combination with a screw-feeding way, of washer-feeding devices, jaws having a socket into which the screws pass, a carrier for said jaws mounted on a fixed portion of the frame, and having a limited vertical movement thereon, means for normally elevating said carrier, a vertically-movable driver to engage a screw, release it from the said socket, pass it through a washer and enter it in the work, and a work-carrying slide having a holding-socket to receive an article and hold it in operative relation to the aforesaid mechanisms.

26. The combination with a screw-feeding way, jaws having a socket *d* into which the screws pass, plate 73 having a socket 74 into which the washers pass, a carrying-slide having a socket 79 to receive an article with a threaded opening and a vertically-movable driver which engages a screw in socket *d*, passes it through a washer in socket 74 and drives it into a threaded opening in an article in socket 79.

27. The combination with the assembling-table, the carrying-slide having a socket 79 and plates 73 having a socket 74, of a washer-feeding way leading into socket 74, a screw-feeding way, jaws having a socket to receive screws from said way and a driver which passes the screws through a washer in socket 74 and into a threaded opening in an article in socket 79.

28. The combination with the assembling-table, the carrying-slide having a socket 79, a spring for retaining the slide in its normal position and a plate having a socket 74, of a washer-feeding way leading into said socket, a screw-feeding way, jaws having a socket to receive screws from said way, a vertically-movable carrier to which the jaws are pivoted and a vertically-movable driver for the screws.

29. The combination with a screw-feeding way and means for holding an article, of jaws having a vertical movement in the fixed part of the frame which receive screws from the way, springs for holding the jaws at the closed position and a driver which drives the screws and also opens the jaws against the power of the springs to release the screws.

30. In a machine of the character described, the combination with a screw-feeding way and a washer-feeding way, of jaws mounted on a stationary part of the frame so as to have a limited vertical movement thereon and a driver adapted to engage each screw in the jaws, release it, pass it through a washer, and drive it into the work.

31. In a machine of the character described, the combination with a screw-feeding way, of a washer-feeding way, a stationary plate 73 provided with a washer-receiving socket 74 communicating with said washer-feeding way, a work-carrying slide having a socket 79 which registers with the washer-receiving socket 74 when the slide is moved to operative position, jaws which receive screws from the screw-feeding way, and a driver which engages the screws, releases them from the jaws, passes them through a washer in socket 74 and drives them into the work.

32. In a machine of the character described, the combination with a screw-feeding way, of a washer-feeding way, a stationary plate having a socket to receive and hold said washers, and a work-carrying slide moving beneath the said stationary plate and provided with a socket to register with the washer-holding socket in said stationary plate, and devices which receive the screws from said screw-feeding way, pass them through the washers and enter them in the work.

33. The combination with the carrying-slide, of a screw-feeding way, jaws which receive screws therefrom, a washer-feeding way, a plate having a socket to receive washers therefrom and the driver, substantially as shown, for the purpose specified.

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

HARVEY HUBBELL.

Witnesses:
A. M. WOOSTER,
A. M. WITHERELL.