

No. 817,509.

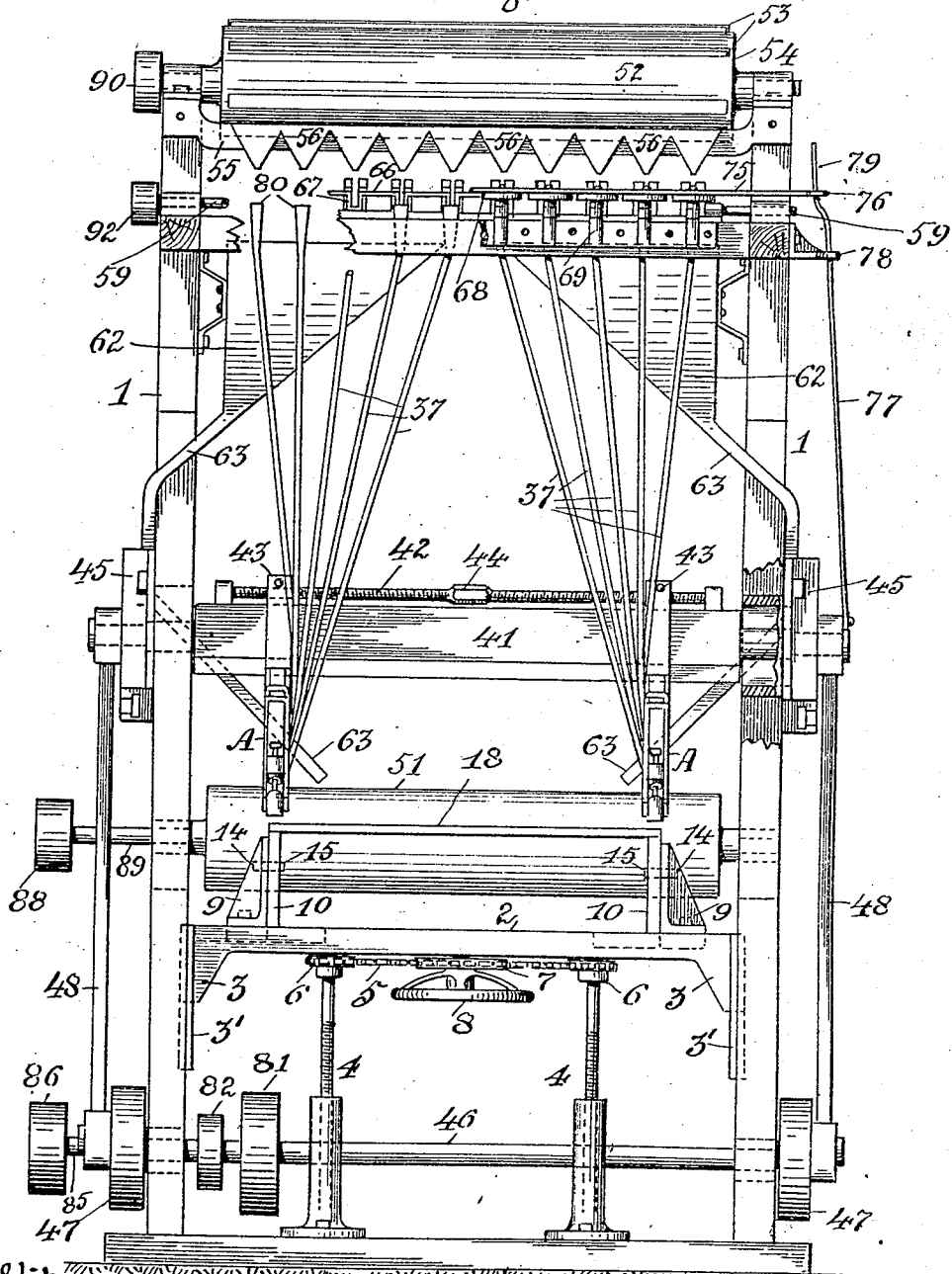
BEST AVAILABLE COPY

PATENTED APR. 10, 1906.

E. C. NORTHRUP.
BOX NAILING MACHINE.
APPLICATION FILED AUG. 8, 1904.

3 SHEETS—SHEET 1.

Fig. 1.



Witnesses.

W. H. Monteverde
Walter E. Daniel.

Inventor.
Elmer C. Northrup
by H. F. Booth
his Attorney.

No. 817,509.

BEST AVAILABLE COPY

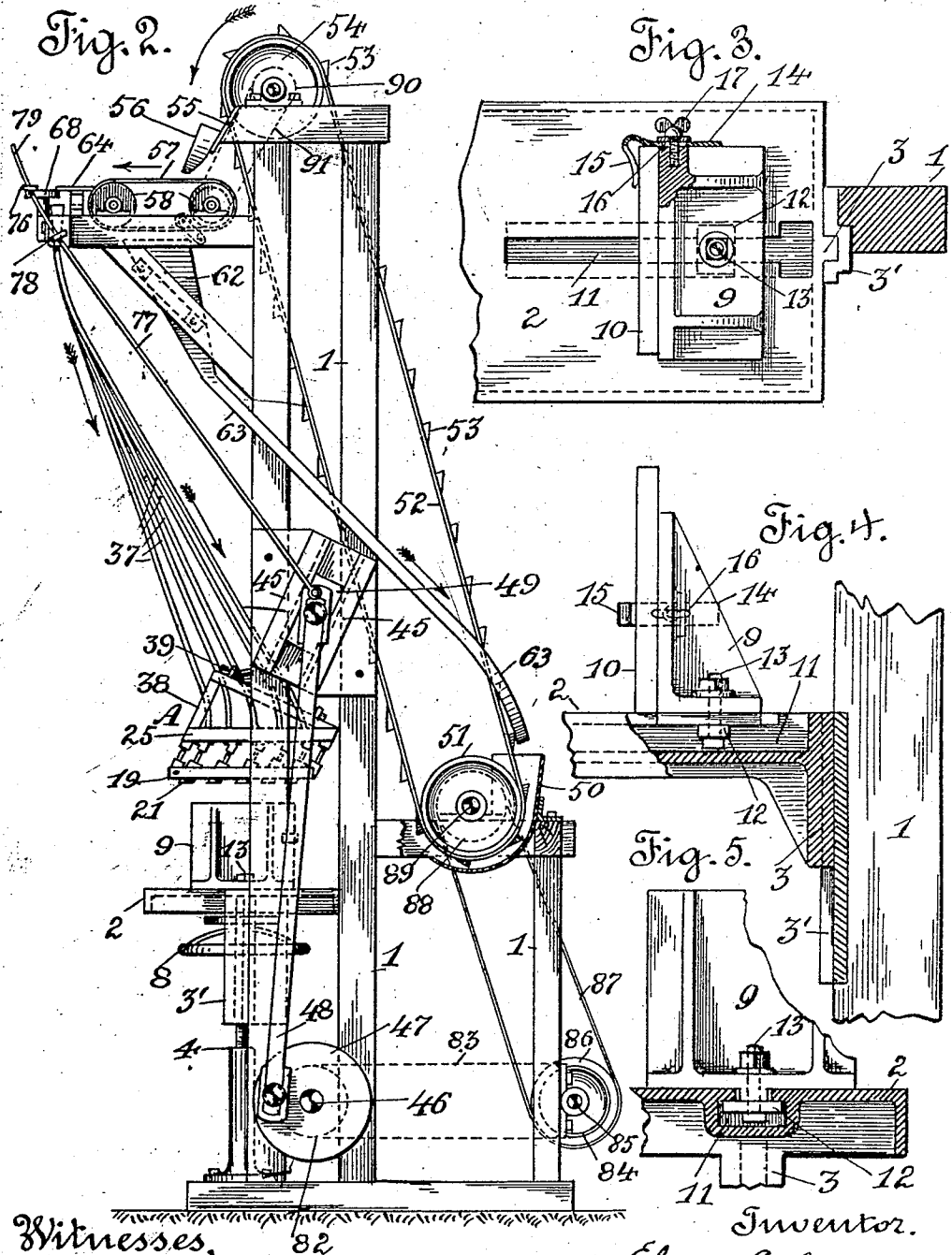
PATENTED APR. 10, 1906.

E. C. NORTHRUP.

BOX NAILING MACHINE.

APPLICATION FILED AUG. 8, 1904.

3 SHEETS—SHEET 2.



Witnesses.
H. J. F. J. J. J.
Halter & Co. (Vane).

Inventor.
Elmer C. Northrup
by *H. J. J. J.* Booth
his Attorney.

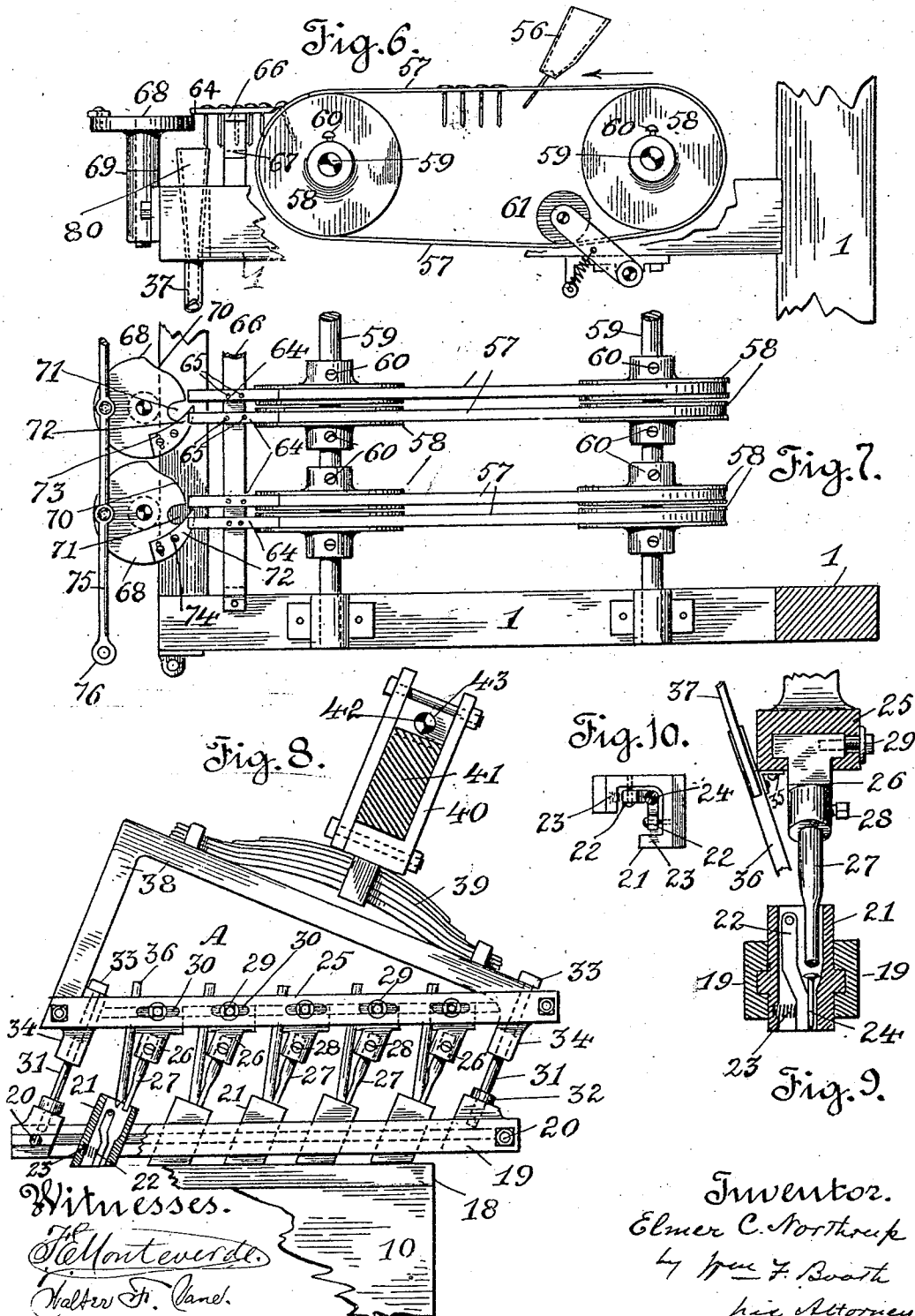
BEST AVAILABLE COPY

No. 817,509.

PATENTED APR. 10, 1906.

E. C. NORTHRUP.
BOX NAILING MACHINE.
APPLICATION FILED AUG. 8, 1904.

3 SHEETS—SHEET 3.



UNITED STATES PATENT OFFICE.

ELMER C. NORTHRUP, OF SAN JOSE, CALIFORNIA.

BOX-NAILING MACHINE.

No. 817,509.

Specification of Letters Patent.

Patented April 10, 1906.

Application filed August 8, 1904. Serial No. 219,879.

To all whom it may concern:

Be it known that I, ELMER C. NORTHRUP, a citizen of the United States, residing at San Jose, Santa Clara county, State of California, have invented certain new and useful Improvements in Box-Nailing Machines; and I do hereby declare the following to be a full, clear, and exact description of the same.

My invention relates to the class of machines for nailing boxes.

The object of my invention is to provide a simple, economical, and effective machine of this class, to which end my invention consists in the novel constructions, combinations, and arrangements of parts, which I shall now fully describe by reference to the accompanying drawings, in which—

Figure 1 is a front elevation of my machine, the elevator being broken away to avoid confusion and certain parts being broken and in section to better illustrate them. Fig. 2 is a side elevation of the machine. Fig. 3 is a top detail view, enlarged, showing the adjustable form-bracket on the table and the means for holding the end shook. Fig. 4 is an end elevation of the same, partly in section. Fig. 5 is a back view of the same. Fig. 6 is a side elevation, enlarged, of the nail-adjuster and cut-off mechanism. Fig. 7 is a top view of the same. Fig. 8 is a side view, enlarged, of the hammer A. Fig. 9 is a sectional view of the nail driver and chuck. Fig. 10 is an end view of the nail-chuck.

1 is the frame of the machine.

2 is the box-table, adapted to be vertically adjusted by suitable means to provide for different heights of boxes. The table, as shown in Figs. 1, 3, and 4, has end slides 3, playing in guides 3' in the side timbers of the frame, and said table is supported and vertically adjusted by means of the screw-jacks 4, operated by an endless chain 5, passing between sprockets 6 on the jacks and actuated by a central sprocket 7, operated by a hand-wheel 8, as shown clearly in Figs. 1 and 2.

Upon the box-table 2 are the box-form brackets 9 for the end shooks 10 of the box to be formed. These brackets are adjustable to and from each other to provide for different lengths of boxes. This adjustment and the means for effecting it are shown in detail in Figs. 3, 4, and 5. In the table near each end is made a groove 11, in which slides a head 12, carried by a bolt 13, passing down through the foot of the bracket. By loosening

this bolt the bracket may be moved on the table, and by tightening up the bolt again the bracket will be firmly clamped at the point to which it is adjusted.

In order to hold the end shook 10 to the face of the form-bracket 9 and to insure its position accurately, there is secured to one edge of the bracket, Figs. 3 and 4, a stop-plate 14, having a spring-head 15, adapted to receive the edge of the shook, as seen clearly in Fig. 3, and to hold said shook and define its position. To regulate this stop for different thicknesses of shooks, the plate 14 is made adjustable by means of an elongated slot 16 in it, Figs. 3 and 4, through which slot the securing-screw 17 passes, as seen in Fig. 3.

In Figs. 1 and 8, 18 represents one of the side shooks to be nailed to the end shooks 10.

The mechanism which includes the nail-chucks, the nail-drivers, their connecting devices and heads I shall for the sake of clearness term "hammers," designating these as a whole by the letter A, Figs. 1, 2, and 8. As shown in Fig. 1, there are two of these, one over each end shook of the box, though there may be as many as necessary. Their slanting disposition and their inclined movement relatively to a perpendicular to the plane of the part to be nailed, as well as the means for mounting them and effecting their movement, had better succeed the description of their construction. Referring to Figs. 8 and 9, the chuck-carrying head consists of two bars 19, which by means of end bolts 20 clamp between them the series of nail-chucks 21. These latter are adjustable to and from each other by being fitted between the head-bars by a sliding tongue-and-groove connection, as seen in Fig. 9, so that the distances between the driven nails may be regulated to suit the size of box. Each chuck consists of a hollow piece, Fig. 9, open on one side, as seen in Fig. 10. Within the chuck are two pivoted nail-holder arms 22, controlled by springs 23, adapting them to yield to pressure. These holder-arms are disposed, as seen in Fig. 10, at right angles, whereby they grasp the nail 24 between them in the closed inner corner of the chuck.

The driver-carrying head consists of a bar 25, lying above and parallel with the chuck-carrying head 19. As shown in Fig. 9, the head 25 is formed with a downwardly-opening T-groove, in which are fitted and adapted to be slidably adjusted the sockets 26 of the nail-drivers 27. The nail-drivers are adjust-

able lengthwise in their sockets, being set by screws 28, and the sockets themselves are set where adjusted by means of screws 29, playing in elongated slots 30 in the head 25. The drivers 27 enter the open ends of the underlying chucks 21 and are alined with the nails 24 when the latter are held by the arms 22, as is seen in Fig. 9. The adjustment of both chucks and drivers enables this alinement to be preserved under all circumstances of regulation to suit the size of box. Now it is to be especially observed that the chucks and drivers are inclined to a perpendicular to the box-surface to be nailed, this slant being obtained by the inclined disposition of the chucks in their head and by the inclination of the driver-sockets 26, purposely so constructed, so that the nail 24, held in the chuck, is presented and driven in on a slant.

The two heads 19 and 25 are joined by a yieldable suspension connection comprising, as shown in Fig. 8, a bolt 31 at each end, said bolt being screwed at its lower end into a nut 32 on the lower head 19 and passing freely through the upper head 25 and having a head 33 above. Thus while the head 19 is suspended from the head 25 and is lifted by the latter it will be readily seen that when the bottom of the chucks come down to rest upon the box, as is indicated in Fig. 8, the upper head 25 will continue its downward movement, thereby causing the drivers to send the nails home. In order to avoid the direct and too jarring contact of the lower ends of the driver-sockets 26 with the upper ends of the chucks 21, the head 25 has end bumpers 34, which come in contact with the nuts 32 below before the sockets and chucks can come in contact.

The upper head 25 carries, by means of a bracket 35, Fig. 9, the telescopic extension 36 of the nail-delivery tube 37, said extension passing downwardly into the upper end of the chuck, as is shown in the sectional chuck of Fig. 8. The nail is thus delivered to the chuck, and the extension 36 by slipping up and down on the nail-tube 37 accompanies the movement of the head 25. The upper head 25 is provided with a top frame 38, inclined as shown in Fig. 8, and said frame carries a spring 39, to which is secured a yoke 40, which embraces a cross-head 41, from which the whole hammer A is suspended.

The hammers A are adjustable to or from each other to suit different lengths of boxes by reason of the yokes 40 sliding on the cross-head 41, said movement being effected by the right and left hand screw 42, (see Fig. 1,) mounted on the cross-head and engaging nuts 43 in the yoke-tops. The screw has a central wrench-hold 44, by means of which it can be easily operated.

It will be seen that the cross-head 41 is inclined from the vertical, Fig. 8, and said cross-head is given an up-and-down move-

ment in the plane of its inclination. To effect this, its ends are mounted and adapted to slide in inclined guides 45, secured to the main frame 1, as shown in Fig. 2. Suitable means are employed to make the stroke. The means shown comprise, as seen in Figs. 1 and 2, the main driving-shaft 46, the cranks 47 on the shaft ends, the connecting-rods 48 from the cranks, and the blocks 49 on the cross-head ends, to which the rods are connected at their upper ends. The object of this inclined disposition of the hammers is to drive the nails on a slant.

The nail-supplying, the distributing, the adjusting or lining-up, the cut-off, and the feeding mechanisms will now be described.

At the back of the frame 1 is supported, Fig. 2, the initial or main hopper 50, in which operates a driving-drum 51, around which passes the elevator 52, carrying the cross-buckets 53. The elevator passes upwardly to a second drum 54 on the top of frame 1. The two drums 51 and 54 are approximately as long as the width of the machine, as is shown in Fig. 1, and the elevator, a portion only of which is shown in said figure, has a width equal to the length of the drums, and its buckets 53 have a length equal to the width of the elevator. Secured to the top of frame 1 immediately below and in front of the elevator as it descends from the upper drum is a cross-piece 55, Fig. 1, which carries a number of distributing-chutes 56, contiguous and communicating above, but each tapering downwardly and having each its own outlet. Directly below each chute is a device for arranging the nails in lines and which I shall term a "nail-adjuster." This adjuster consists of a pair of parallel spaced endless traveling steel ribbons 57. Two of these pairs are shown in Fig. 7. Each adjuster is mounted upon a pair of terminal pulleys 58, which pulleys are mounted upon their shafts 59 in such a manner, as by the set-screws 60, as to adapt them to be adjusted along the shaft to or from each other to properly regulate the space between the members of each ribbon pair to suit the size of nails being used. The space between the ribbons is wide enough to let the body of the nail through, but not its head, so that the nail will hang between the ribbons by its head, as shown in Fig. 6. A spring-controlled tightener-pulley 61, Fig. 6, acts upon the lower course of the ribbons to properly tension them. Under the adjuster-ribbons and occupying an area equal to the operative area of the ribbons are the capacious return-hoppers 62, Figs. 1 and 2, one on each side, the discharge-necks 63 of which lead outwardly downwardly and curve inwardly again, as seen in Fig. 1, and terminate over the main or initial nail-hopper 50, as in Fig. 2. It will now be seen that the nails supplied to the initial hopper 50 will be picked up by and

carried up in the buckets 53 of the elevator 52. Reaching the top drum 54, the inverting buckets traveling as the arrow indicates in Fig. 2 will discharge the nails into the distributing-chutes 56. From these the nails will fall in comparatively haphazard fashion. Some will fall properly in a manner to be suspended by their heads between the pair of ribbons of each adjuster. The remainder will fall from the adjusters into the hoppers 62 and will be returned by the necks 63 to the initial hopper 50, to be put through their travel again.

At the end of each adjuster is a stationary extension thereof, consisting of a pair of parallel-spaced plates 64, Figs. 6 and 7, which overlap the descending ribbons in such close proximity as to receive the line or strips of suspended nails passing between the pair of terminal pulleys, which nails the said plates continue to suspend, as is shown in Fig. 6. These extension-plates are supported upon and secured adjustably by bolts or screws 65, Fig. 7, to a bar 66, which below the space between the strips is depressed or bent downwardly, as shown at 67 in Fig. 1, in order to allow the suspended nails to pass.

At the end of each adjuster extension is a nail cut-off. This consists, as shown in Fig. 7, of a disk 68, mounted rotatably to oscillate in a horizontal plane upon a vertical axis 69, Fig. 6. The disk 68 is cut away, Fig. 7, at a portion 70 of its periphery, which said portion joins an indented portion 71. The point of a tooth 72, secured adjustably to the disk, overlaps this indented portion 71 and is so disposed that as the disk oscillates said point will pass under the adjuster extension 64 and entering between two of the suspended nails will cut the first one out of line and withdraw it from the end of said extension, forcing it into the indentation 71, which is large enough to allow it to drop clear through. As the disk rocks back again its cut-away portion 70 will close the end of the extension 64 against the advancing line of nails. The adjustable connection (shown in Fig. 7) between the tooth 72 and the disk 68 and consisting of a bolt passing through an elongated slot 73 in the tooth and a pivot-screw 74, on which the tooth may turn, enables the tooth-point to be turned farther out or in to suit the size of nails.

In order to oscillate the cut-off disks, they are connected by a link 75, Figs. 1 and 7, one terminal of which has an eye 76. A rod 77, secured at its lower end to the end connection of the cross-head 41, Fig. 2, is guided by a bearing 78 on the frame 1, above which bearing the end 79 of the rod is offset, as shown best in Fig. 1, and engages the link-eye 76. As the cross-head 41 moves up and down the rod 77 moves the link 75 back and forth, thereby actuating the cut-off disks 68 and

feeding the nails to time with the strokes of the hammers A and conformably to their needs.

Directly below the indentation 71 of each cut-off disk is the receiving-funnel 80 of the nail-tubes 37, so that when a nail is cut off it drops into the funnel 80, and thence point downwardly is conducted by the tube 37 to its proper chuck through the telescopic extension 36 of said tube.

In Fig. 1, 81 is the main drive-pulley on shaft 46. Upon this shaft is a pulley 82, from which a belt 83, Fig. 2, extends to a pulley 84 on a counter-shaft 85 on the back of the frame 1. On the counter-shaft is a pulley 86, from which a belt 87 extends to a pulley 88, Fig. 1, on the shaft 89 of the lower drum 51, whereby the elevator 52 is driven. Upon the axis of the upper elevator-drum 54, Fig. 1, is a pulley 90, from which a belt 91, Fig. 2, extends to a pulley 92 on the end of the shaft 59, Fig. 1, which carries one set of terminal pulleys 58 of the adjuster-ribbons 57, whereby said ribbons are driven.

The operation of the machine is as follows: The several adjustments are first made to conform to the size of box to be nailed. Then the end shooks 10 are placed and held to the form-brackets 14 and one side shook 18 is laid on the end shooks. The machine having been previously started to be in an operative condition with a nail in each chuck 21, the inclined hammers now descend. When the bottoms of the chucks reach the box, as shown in Fig. 8, they are arrested; but the upper works of the hammers continuing their descent the drivers 27 come down upon the nails 24 in the chucks and drive them home. The driving is a slanting one and the blow, due to the spring 39, is a cushioned one, resulting in little or no jar. The spring 39 also cushions the contact of the end bumpers 34 with the nuts 32, which contact, as heretofore mentioned, prevents the direct contact of the lower ends of the driver-sockets 26 with the upper ends of the chucks 21. As the hammers rise the operator turns the partial box a quarter-round and lays a fresh side shook on the end shooks ready for a second nailing. Meanwhile upon the upstroke of the hammers other nails drop into the chucks, and the descending nail-lines in the tubes 37 are replenished at their upper ends by fresh nails cut off from the adjuster extensions 64. The adjuster 57 is also, meanwhile, receiving nails from the distributors 56 and passing their suspended lines along to the extensions 64.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a box-nailing machine, a hammer comprising a chuck-head, a nail-chuck carried thereby, a driver-head, a driver carried thereby, a yieldable suspension connection

between the two heads, end contacts to limit the approach of the two heads, a reciprocating cross-head, and a spring connecting the cross-head with the driver-head.

2. In a box-nailing machine, a hammer comprising a chuck-carrying head, nail-chucks adjustably fitted to said head, a driver-carrying head, nail-drivers adjustably fitted to said head, a yieldable suspension connection between the two heads, end contacts to limit the approach of the two heads, a reciprocating cross-head, and a spring connecting the cross-head with the driver-carrying head.
3. In a box-nailing machine, a hammer comprising a chuck-carrying head, nail-chucks adjustably fitted to said head, a driver-carrying head, nail-drivers adjustably fitted to said head, slip-bolts connecting the two heads and suspending the chuck-carrying head from the driver-carrying head, end contacts to limit the approach of the two heads, a reciprocating cross-head, and a spring connecting the cross-head with the driver-carrying head.
4. In a box-nailing machine, the combination of a chuck-carrying head, nail-chucks fitted to said head, a driver-carrying head, nail-drivers fitted to said head, slip-bolts connecting said heads and suspending the chuck-head from the driver-head, end contacts to limit the approach of the two heads, a reciprocating cross-head, a spring connecting the cross-head with the driver-carrying head, nail-tubes for supplying the nails to the chucks, and telescopic extensions on the ends of said tubes secured to the driver-carrying head.
5. In a box-nailing machine, a nail-adjuster comprising pairs of separated terminal pulleys, traveling, parallel, spaced ribbons mounted on said pulleys, and adapted to suspend the nails by their heads between them, and means for relatively adjusting said pulleys to vary the width of the space between the ribbons.
6. In a box-nailing machine, a nail-adjuster comprising endless, traveling, parallel-spaced ribbons adapted to suspend the nails by their heads between them, a stationary extension of said adjuster comprising parallel-spaced plates overlapping the traveling ribbons at their descending bights, and means for relatively and correspondingly adjusting the ribbons and the plates to vary the space between each, to suit the size of nails.
7. In a box-nailing machine, the combination of the adjuster comprising the traveling parallel, adjustably-spaced ribbons adapted to suspend the nails by their heads between them and to advance the line of suspended nails, the stationary adjustably-spaced extension-plates to receive the advancing nail-line, and the cut-off consisting of the rotary

disk at the end of the extension-plates having a peripheral portion disposed to check the nail-line, an indentation to free the line and to receive the leading nail and permit it to drop through and a tooth disposed to cut off said leading nail from the line and direct it into the indentation.

8. In a box-nailing machine, the combination of the adjuster comprising the traveling, parallel, adjustably-spaced ribbons adapted to suspend the nails by their heads between them and to advance the line of suspended nails, the stationary adjustably-spaced extension-plates to receive the advancing nail-line, the cut-off consisting of the rotary disk at the end of the extension-plates having a peripheral portion disposed to check the nail-line, an indentation to free the line and to receive the leading nail and permit it to drop through, and a tooth disposed to cut off said leading nail from the line and direct it into the indentation, the funnel beneath the indentation of the cut-off disk adapted to receive the nail and the tube to direct the nail to its destination.

9. In a box-nailing machine, the combination of the adjuster comprising the traveling, parallel, adjustably-spaced ribbons adapted to suspend the nails by their heads between them, and to advance the line of suspended nails, the stationary adjustably-spaced extension-plates to receive the advancing nail-line, the cut-off consisting of the rotary disk at the end of the extension-plates having a peripheral portion disposed to check the nail-line, an indentation to free the line and to receive the leading nail and permit it to drop through, and a tooth disposed to cut off said leading nail from the line and direct it into the indentation, the funnel beneath the indentation of the cut-off disk adapted to receive the nail, the tube to direct the nail to its destination, a chuck to which the nail is destined, and a driver to send it home.

10. In a box-nailing machine, the combination of an initial nail-hopper, a traveling elevator with cross-buckets operating to pick up and elevate the nails from the hopper, separate distributing-chutes receiving the nails from the buckets, nail-adjusters below the chutes comprising traveling parallel adjustably-spaced ribbons adapted to suspend the nails by their heads between them and to advance the suspended nail-line, receiving-hoppers below the ribbons for returning to the initial hopper the nails which fail to be suspended between the ribbons, the stationary adjustably-spaced extension-plates to receive the advancing nail-line, the cut-off consisting of the rotary disk at the end of the extension-plates having a peripheral portion disposed to check the nail-line, an indentation to free the line and to receive the leading nail and permit it to drop through, and a tooth dis-

posed to cut off said leading nail from the
line and direct it into the indentation, the
funnel beneath the indentation of the cut-off
disk adapted to receive the nail, the tube to
5 direct the nail to its destination, a chuck to
which the nail is destined, and a driver to
send it home.

In witness whereof I have hereunto set my
hand.

ELMER C. NORTHRUP.

Witnesses:

WALTER F. VANE,
D. B. RICHARDS.