

No. 647,992.

Patented Apr. 24, 1900.

A. H. SCHANCK & L. R. HICKMAN.

BOX MAKING MACHINE.

(Application filed July 17, 1899.)

4 Sheets—Sheet 1.

(No Model.)

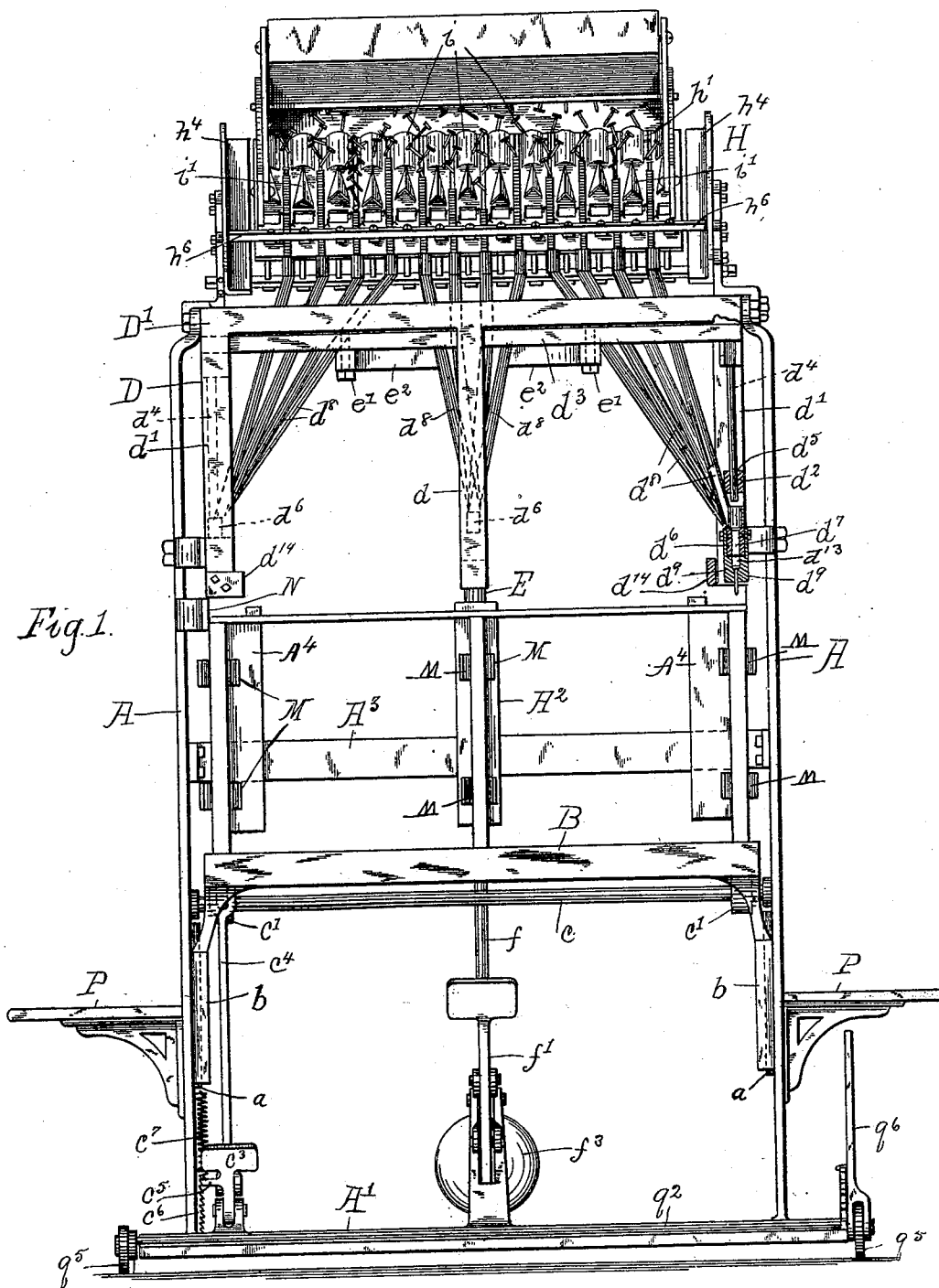


Fig. 1.

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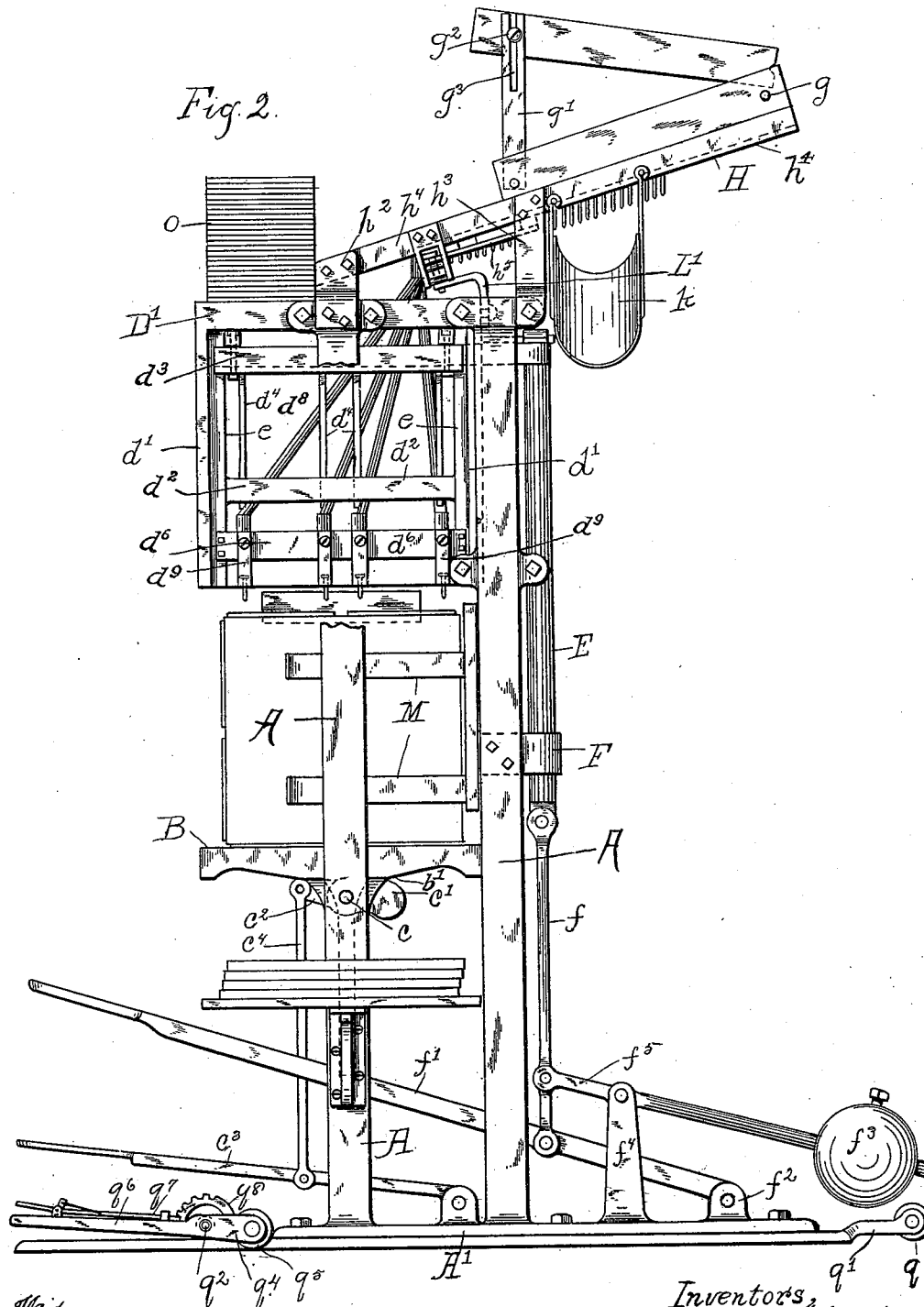
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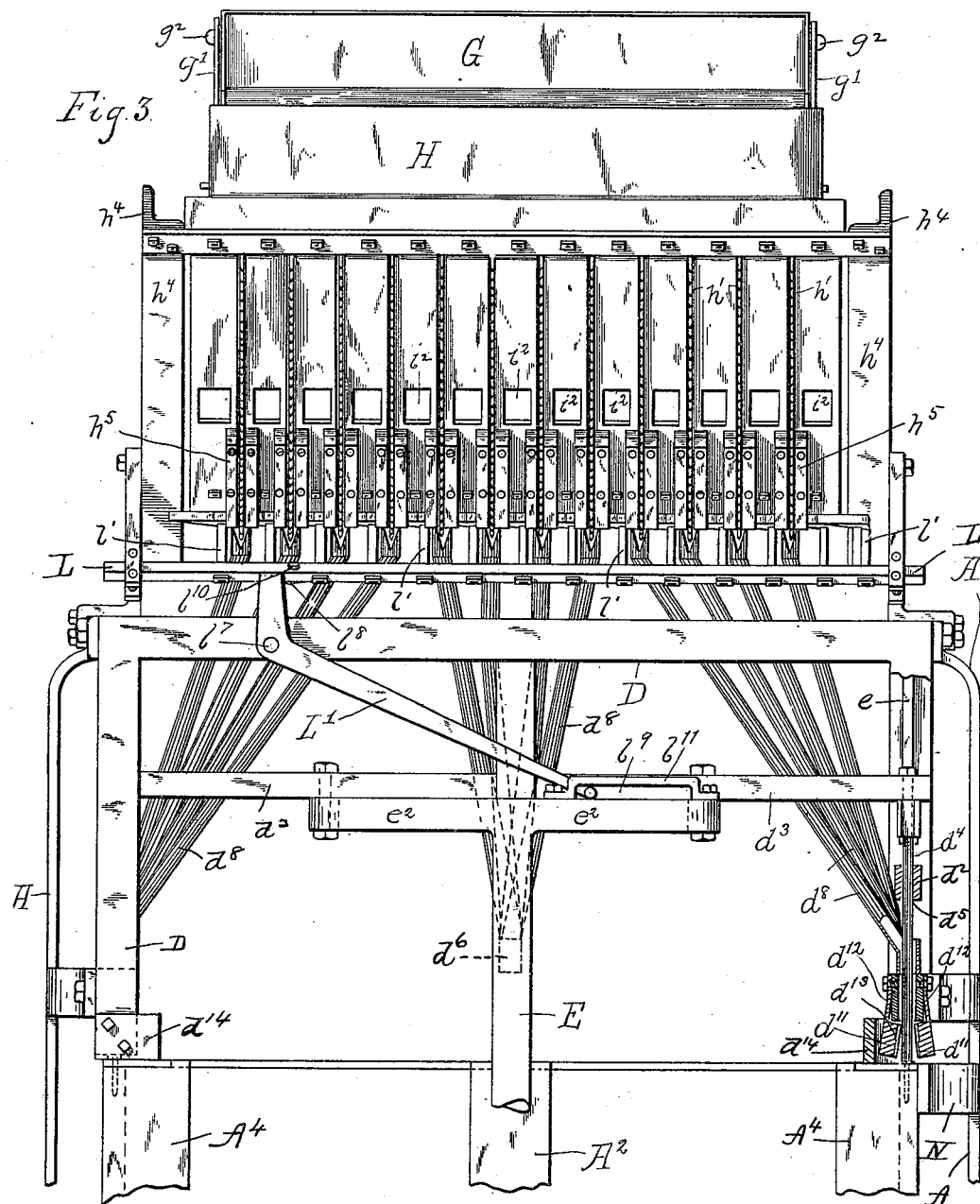
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4 Sheets—Sheet 3.



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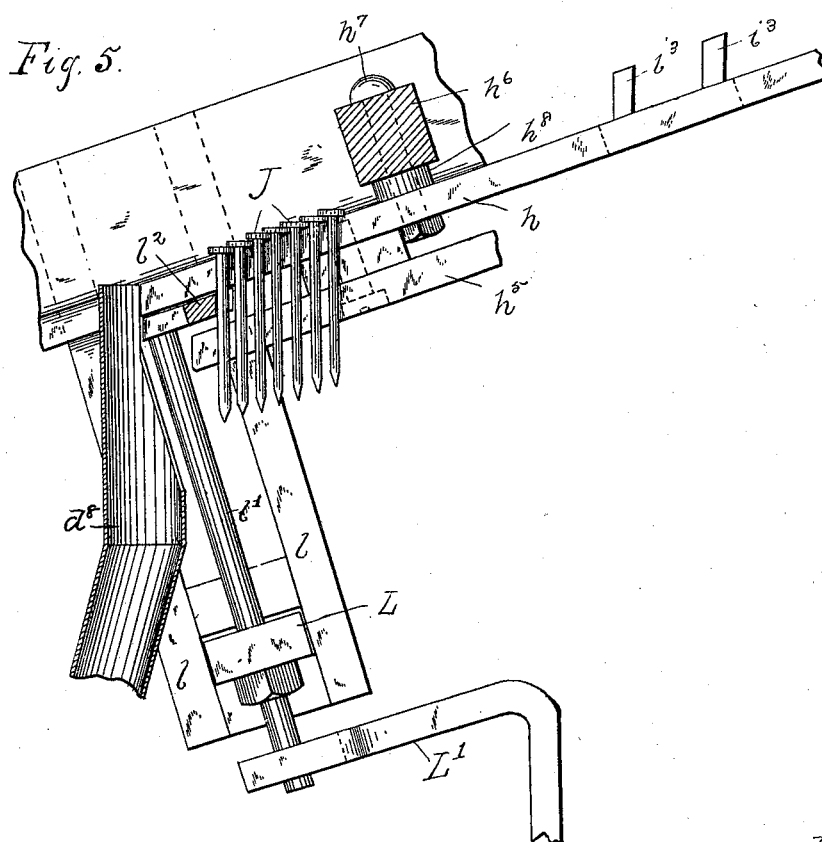
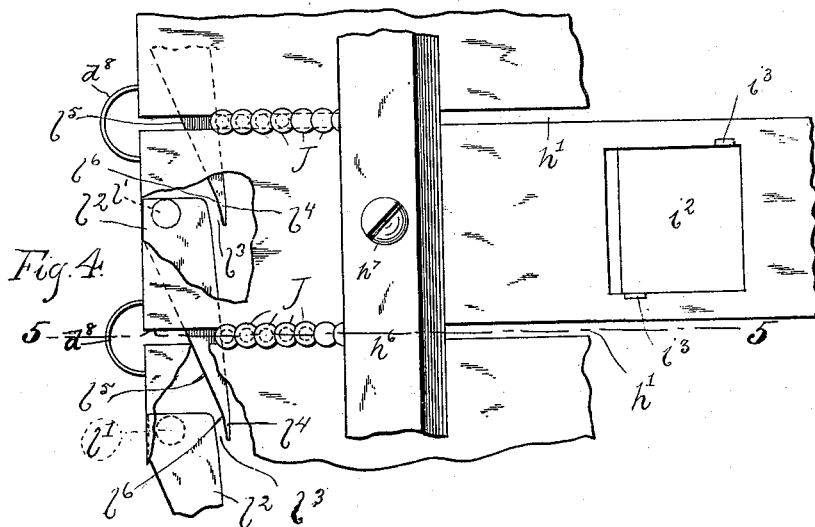
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4 Sheets—Sheet 4.



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UNITED STATES PATENT OFFICE.

ALBERT H. SCHANCK AND LEE R. HICKMAN, OF RIVERSIDE, CALIFORNIA.

BOX-MAKING MACHINE.

SPECIFICATION forming part of Letters Patent No. 647,992, dated April 24, 1900.

Application filed July 17, 1899. Serial No. 724,083. (No model.)

To all whom it may concern:

Be it known that we, ALBERT H. SCHANCK and LEE R. HICKMAN, of Riverside, in the county of Riverside and State of California, have invented certain new and useful Improvements in Box-Making Machines, of which the following is a specification.

This invention relates to improvements in box-making machines, and refers more particularly to a machine adapted for nailing together wooden boxes of the kind used for packing fruit and the like.

Among the objects of the invention are to provide a machine which will automatically assort and arrange in position the required number of nails to fasten any given side of the box and to thereafter drive all of the nails into place by a single movement of the operator, to provide simple manually-operated means whereby the operator can by a single movement clamp the parts of the box together preparatory to driving the nails therein and without adjustment of or special mechanism to compensate for change in the size of the box as it receives its several sides successively, to provide a simple reliable nail-feeding mechanism which will properly arrange and deliver the nails to their individual positions with ease and certainty, to provide a machine so constructed and arranged that a single operator may rapidly perform all the operations of assembling and nailing together the parts of a package or box, including the driving of the nails, and in general to provide a machine of simple and economical construction, of durable character, and capable of rapid and certain operation.

The invention consists in the matters hereinafter described and more particularly pointed out in the appended claims, and the same will be readily understood from the following description, reference being had to the accompanying drawings, in which—

Figure 1 is a front elevation of a machine embodying our invention, certain parts being shown in section and a partly-formed box being shown in position within the machine. Fig. 2 is a side elevation of the same, certain parts being shown in slightly-changed position. Fig. 3 is a rear elevation of the upper part of the machine shown in Figs. 1 and 2, drawn on a somewhat larger scale. Fig. 4 is

a fragmentary detail in plan view with parts broken away, showing particularly the construction of the nail-separating devices of the nail-feed. Fig. 5 is a sectional view taken on line 5 5 of Fig. 4.

Referring to said drawings, A A designate the main side frame members, a pair at each side, connected with and arranged to rise from a suitable base-frame A', the said side frames being arranged parallel with each other and at a distance apart slightly in excess of the length of the box or package for which the machine is designed. B designates a horizontally-arranged table or support, arranged to extend between the side frame members and provided at each end with downwardly-extending arms b, grooved to engage vertical ways a upon the interior of the front members of said side frames A, said table being designed to support the box during the clamping and nailing operations.

In the operation of the machine the table B is raised slightly, so as to force the parts of the box which are to be fastened together into bearing with overhanging presser-bars hereinafter to be described, and in order to thus lift the table a rock-shaft c is arranged to extend transversely beneath the table B, having bearing at its ends in suitable bearings formed in the side frames A and carrying at each end a rigidly-attached cam c', adapted to act upon cam-surfaces b', formed upon the under side of the table, so as to lift the latter when the rock-shaft is oscillated. In order to oscillate the rock-shaft, the latter is provided with a rigid arm c², with the outer end of which is connected a rod or link c⁴, which extends downwardly to and is connected with a foot-lever or treadle c³, suitably mounted upon the base-frame of the machine.

In order that the table may be held in its raised position, the side of the foot-lever c³ is provided with a dog c⁵, adapted to engage a ratchet-bar c⁶, mounted upon the inside of the adjacent side frame A, the pivotal support of the foot-lever being made sufficiently loose in the joint to permit the lever to swing laterally into and out of engagement with said ratchet-bar and a coiled spring c⁷ being preferably provided to lift the foot-lever normally to its uppermost position.

Describing now the nailing mechanism, D

designates as a whole a skeleton frame mounted upon the upper part of the side frame members in position to overhang the box-recess, comprising an upper horizontally-disposed rectangular frame D' , from which depend side and intermediate arms, as d' d , respectively, connected in pairs by cross-supports d^2 , extending from front to rear, as indicated most clearly in Figs. 1 and 2.

d^3 designates a rectangular horizontally-disposed skeleton frame mounted to reciprocate vertically within the frame D , guided conveniently by being provided at its front and rear with vertical grooves which engage ways e upon the frame members d' .

d^4 designates a plurality of hammer-rods seated in the frame d^3 and arranged to depend therefrom and extend at their lower ends through guide-apertures d^5 , formed through the cross-bars d^2 , as indicated most clearly in the sectional portion of Fig. 1, the number and location of the hammer-rods being of course arranged to correspond with the number of nails and position of the latter by which the particular box is to be fastened. Immediately beneath each row of hammers and in vertical alinement with the latter are arranged supporting-bars d^6 , suitably connected with the main side frame members and provided at points vertically beneath each hammer-rod with nail-passages d^7 , with the upper end of each of which is arranged to communicate a guide tube or chute d^8 , which extends upwardly to and communicates with a nail-hopper provided with nail-distributing devices to be hereinafter described. The lower end of each of said nail-tubes which communicate with nail-apertures of the supporting-bars has the form of an open-ended thimble, into the side of which the tube opens, the thimbles being arranged in vertical alinement with the several hammer-rods, so as to permit the passage of the latter therethrough, while serving to direct the nails downwardly to the nail-passages of the bar. Mounted upon the supporting-bars d^6 , at opposite sides of the same and in vertical alinement with each of the nailing-apertures therein, is a pair of nail-gripping devices consisting, as shown herein, of jaws d^9 , provided in their meeting faces with semicircular grooves or channels d^{11} , arranged to come into vertical alinement with the center of the nail-passages of the supporting-bar when the jaws are closed together, the size of the nail-holding portion of said grooves being such as to permit the body of the nail to pass therethrough, but small enough to prevent the head from passing through the jaws until forced positively therebetween by the hammer-rod. Said jaws are held yieldably in contact with each other in position to receive the nails by means of plate-springs d^{12} , which in the present construction constitute also the means of supporting the jaws from the cross-bars. In order that the nails may be readily driven through the gripping-jaws by the hammer-rods, the entrance

end of the nail-holding portion of each of the semicircular channels is beveled or countersunk, as indicated clearly at d^{13} in the sectional part of Fig. 3.

In order to depress the hammer-frame, with its several hammer-rods, means are provided as follows: E designates a rod or bar mounted to reciprocate vertically in a suitable guide or bearing F upon a frame member A^2 , arranged in vertical position at the center of the rear side of the main frame and supported in this position by means of a cross-frame member A^3 , extending between the main side frames A . At its upper end the bar E is provided with two divergent arms e^2 , rigidly connected therewith and arranged to extend at right angles therefrom beneath the hammer-supporting frame d^3 , to which latter the arms are connected by means of suitable bolts e' . With the lower end of the rod E is connected a link or bar f , which extends downwardly to and is connected at its lower end with a second foot-lever or pedal f' at a point intermediate of the length of the latter, one end of said foot-lever being suitably pivoted to a pivot-lug f^2 , mounted upon the base-frame, while the treadle end thereof projects out in front of the machine in position for the foot of the operator. In order to return the foot-lever and connected hammer-frame to its normal uppermost position, a gravity-weight f^3 is provided, mounted upon a lever f^4 , pivoted between its ends upon a standard f^4 , rising from the base-frame, that end of the lever remote from the weight being pivotally connected with the link f , as indicated most clearly in Fig. 2.

To next describe the nail-distributing mechanism, by means of which a single nail is fed into the upper end of each one of the nail-chutes upon each reciprocation of the hammer-rods, H designates as a whole a hopper secured upon the upper frame D , with its bottom h arranged in a forwardly and downwardly inclined position, as indicated most clearly in Fig. 2. Conveniently said hopper is secured in this position by means of uprights h^2 h^3 , secured to said frame D and the side frame members h^4 of the hopper, the front lower edge of the hopper being arranged in line with the inlet ends of the nail-chutes d^8 . The bottom of the hopper H is provided with a series of longitudinally-extending slots h' equal in number to the number of nail-chutes and each arranged to deliver into one of the latter, which slots are of suitable width to permit the bodies of the nails to enter therein, but too narrow to allow the nail-heads to pass therethrough, so that nails fed into the upper end of the hopper and sliding downwardly over the bottom of the same will drop into the slots and be suspended by their heads therein, as indicated at J in Figs. 4 and 5. In order to facilitate the distribution of the nails and their entrance into the slots as described, a transversely-extending series of semicylindric projections or bosses i are provided in the upper part of the hopper-bottom, said bosses

being of such width that each substantially occupies the full width between a pair of slots h' , so that nails falling thereon will roll downwardly on one side or the other into one of the slots. In order to still further facilitate the entrance of the nails into the slots, tapered V-shaped projections i' are provided at points slightly below the bosses i , and in order to permit those nails which do not drop into the slots to be discharged through the bottom of the hopper, so as not to interfere with the feeding of the distributed nails, a series of openings i'' , one between each pair of slots, is provided immediately beneath the V-shaped projections last described. At either side of these openings upstanding fingers i''' are provided, which serve to arrest the nails and direct them through the openings. From the openings through the bottom of the hopper the nails drop into a guide-chute k , suspended beneath the hopper-bottom, and are thereby conducted to any suitable receptacle to be from time to time again returned to the hopper.

The nails distributed into the slots h' and depending by their heads therein slide downwardly toward the lower end, at which point they are arrested by a nail-separating mechanism hereinafter to be described. In order to prevent the nails from getting out of line with each other and thereby preventing the uniform action of the nail-separating mechanism, guide-slats h^5 are provided to extend parallel with and adjacent to each side of each of the slots h' and at a suitable distance below the hopper-bottoms, as indicated clearly in Fig. 5, said slats being arranged to extend from a point near the hopper-openings downwardly to the point where the separating devices receive the nails. In order to unite and support the strips constituting the bottom of the hopper, the latter is provided with a transversely-extending supporting-bar h^6 , secured to each of said strips by means of screws h^7 , said bar being supported a sufficient distance above the slots to avoid interfering with the passage of the nails by means of suitable space-blocks h^8 .

To now describe the nail-separating mechanism, L designates a transversely-arranged bar mounted to reciprocate endwise in suitable guides l , depending from the side frames members h^4 of the hopper in position to support said bar directly beneath the discharge edge of the hopper-bottom. Seated in said reciprocatory bar is a series of standards l' , one for each of the slots of the hopper, which standards extend upwardly to a point adjacent to the bottom of the hopper and are there each provided with a separating head or jaw l^2 , rigidly mounted thereon. Said separating-heads consist of approximately right-angled triangular-shaped plates, each arranged with its longer right-angled side extending transversely underneath the slot, said latter side being uppermost, so as to serve as a stop against which the lowermost one of the nails

is normally arrested, as indicated most clearly in Fig. 4. Each of the separating-plates is of such length as to extend from its point of connection with its standard, which is located midway between the slots, across and some distance beyond the slot which it controls and far enough to overlap with its pointed end the heel portion of the next separate plate, said point being, however, arranged to extend at a distance from the heel of the adjacent feed-plate slightly greater than the diameter of the nail-body, so as to form a slot l^3 , through which the nail may pass. In the nail-feeding operation the reciprocatory bar, with the separating-heads carried thereby, is normally retracted to its rearmost position, in which position the points of said heads are carried backwardly a distance sufficient to permit the first or lowermost nail to drop down into contact with the heel of the next adjacent separate head, such action obviously occurring simultaneously with each of the heads of the series. Upon the downward movement of the hammer-rods the reciprocatory rod and separating-heads are carried forwardly, whereupon the point l^4 of the feed-head enters between the first two nails, the lowermost passing through the slot l^3 and being obviously forced downwardly through and out of the lower end of the slot h' by the oblique lower edge l^5 of the separate plate, while the succeeding nail is held from forward movement by the upper edge of the plate. In order to facilitate the entrance of the point l^4 between the nails and the feeding of the separated nail forwardly, the point of said plate is curved very slightly, as indicated at l^6 .

In order to reciprocate the bar in the manner described, means are provided as follows: L' designates a bent lever pivoted at its angle, as at l^7 , to a rear transversely-extending member of the frame D, (see Fig. 3,) one arm of said lever extending upwardly and being provided in its end with a suitable slot or aperture l^8 , engaging a stud or pin l^{10} upon the under side of the reciprocatory bar, while the opposite arm extends obliquely downward to and is operatively connected with a slot l^9 , conveniently formed by a suitably-shaped confining-strap l^{11} , secured upon the upper side of one of the arms e^2 of the hammer-rod frame, said confining-strap being so located upon the arm e^2 as to insure the proper movement of the reciprocatory bar when the hammer-frame is depressed and returned.

In order to facilitate the distribution of the nails evenly over the bottom of the hopper H, a second hopper G is mounted above the latter, having its bottom arranged in inclined position and so as to feed into the upper end of the hopper H, said hopper being conveniently supported at one end by means of slotted standards g' , rising from the hopper H, and at its opposite end by suitable supporting-studs g in the sides of the hopper H, with which it is engaged. Adjusting-screws g^2 , engaging the slots g^3 of the standards g' , serve

to provide means for adjusting the angle of inclination of the bottom of the hopper to insure the proper flow of the nails therefrom.

In the operation of nailing a box the end and intermediate partitions are arranged in position parallel with each other and at suitable distance apart in the box-recess and side slats or pieces first applied to the uppermost edges of said end and partition members. In order to hold said end and partition members in position until the first side is applied, U-shaped spring-clips M are mounted upon the back frame-pieces A² A⁴ and arranged with their open ends projecting forwardly therefrom in position to receive the several vertical box members, a pair of said clips being provided for each member, as indicated most clearly in Figs. 1 and 2. Preferably, also, a guide-stop N is provided mounted upon one of the side frame members A in position for engagement with the ends of the side slats of the box when the latter are placed in position for nailing, so as to facilitate their rapid adjustment into place.

As hereinbefore described, the first step in the operation of nailing the box after having placed the end and partition members in position and adjusting the members of one side thereon is to lift the box bodily into engagement with overhanging parts, so as to clamp the box members together preparatory to nailing the same, it being noted that the lower ends of the frame-pieces A² A⁴ terminate at such a distance above the table as to permit the latter to rise sufficiently to carry the box into engagement with the overhanging parts without striking said ends. To this end horizontally-arranged presser-bars d¹⁴ are mounted upon the lower ends of the depending arms d' in position to engage the upper side of the box at points immediately above the end and partition members thereof.

In order to provide means for holding a supply of side strips in most convenient position for access by the operator, the upper part of the front portion of the frame D is so constructed as to form a horizontal support upon which side pieces o may be piled, and, likewise, in order to provide supports for a supply of end and intermediate box members bracket-shelves P are provided upon each side of the main frame.

In order that the machine as a whole may be conveniently wheeled about and yet may be allowed to rest directly upon its base when in operation, caster-supports are provided. A single caster q is mounted upon a rigid arm q', located midway of the rear edge of the base-frame and projecting slightly upward and outwardly therefrom, so as to hold the caster out of engagement with the floor when the machine rests upon the latter. At the front side of the base a transversely-extending rock-shaft q² is provided mounted in suitable bearings in said base and provided at its ends with rigid arms q³ q⁴, carrying at their ends caster-wheels q⁵. One of

said rock-bar arms is extended to form a hand-lever q⁶, upon which is mounted a spring-pressed latch q⁷, adapted to engage a notched segment q⁸, suitably mounted upon the base adjacent thereto.

The operation of the machine constructed as described is as follows: A suitable supply of nails having been placed in the upper hopper and some of them fed downwardly, so that each of the slots contains one or more nails held back by the feed-plates, the operator places his foot upon the foot-lever f' and depresses it, which retracts the feed-plates and permits the nail held by each plate to drop down against the heel of the plate next in front of it. Upon the return movement the points of the plates separate off the first or advance nail of each slot and deliver them into the several guide-chutes, through which they pass into position in the several gripping-jaws in readiness to be driven. The operator now places an end piece in vertical position in each side pair of U-shaped clips and a partition-piece (which is exactly like the end pieces) in the intermediate pair of clips M and then places the several strips which are to form the side of the box then uppermost upon the upper edges of the end and intermediate pieces, adjusting them to position by means of the stop N, and then depresses the foot-lever c³, so as to raise the table B into engagement with the lower ends of the vertical box members and carry or push the latter through the clips, together with the side pieces resting upon said vertical pieces, upwardly into clamped engagement with the overhanging presser-bars d¹⁴. The operator having thus assembled the pieces upon the table and clamped them together next depresses the foot-lever f', thereby bringing down the hammer-frame and hammer-rods carried thereby and driving the several nails held in the gripping-jaws simultaneously into the side of the box. Upon permitting the hammer-frame to return to its normal uppermost position a new set of nails is fed forward into position to be driven upon the next reciprocation of the hammer-rods. The operator next releases the box by lowering the supporting-table, rotates it forward one step, so as to bring that side which in the finished box will become the bottom thereof uppermost, and again places the required side strips in position upon the then upper edges of the end and partition pieces. Obviously the nailing of this side and the succeeding one are exact repetitions of the first-described operation, and it is to be noted in this connection that the constantly-changing size of the box as it receives its several sides does not in any way affect or interfere with the clamping and nailing operations. Ordinarily the cover or top side of the box is not nailed on by the machine; but it obviously may be, if for any reason this is found desirable. After the machine has been once started the vibration due to its operation serves to feed down the nails from the upper to the lower

hopper and down over the bottom of the latter, during which latter movement the greater part of them are distributed into the slots, as hereinbefore described. Such as drop
5 through the openings at the lower edge of the hopper-bottom are from time to time returned to the upper hoppers.

Obviously the machine might be connected with any suitable source of power, so as to be
10 operated thereby and simply fed and controlled by the operator.

From the foregoing it will be seen that we have produced a machine which is exceedingly simple in all its parts, which may be
15 readily and rapidly operated by a single operator, a machine in which the feed mechanism is positive and certain and not liable to be affected by variations either in the size of the nails or in the exact form of the latter within reasonable limits, and a machine
20 in which the nailing operation is performed directly under the eye of the workman, so that should the supply of nails become exhausted or for any other reason a complete
25 set of nails should fail to feed down upon each reciprocation of the hammers the operator will instantly detect such failure and before successive defective nailing operations. At the same time the several advantages are
30 obtained without the use of complicated mechanism or numerous parts.

While we have herein shown and described what we deem to be a preferred embodiment of our invention, yet it will be obvious the
35 details thereof may be modified to some extent without departing from the invention, and we do not therefore wish to be limited to the details shown except as made the subject of specific claims.

40 We claim as our invention—

1. In a box-nailing machine, the combination with the main frame, of a box-supporting table movably mounted upon said frame,
45 an opposing support arranged to overhang the supporting-table, mechanism for lifting the table to carry the box members thereon into engagement with the overhanging support and a plurality of clips mounted upon the frame, adapted to support the vertical
50 members of the box yieldingly so as to permit them to be lifted by the supporting-table.

2. In a box-nailing machine, the combination with the main frame, of a box-supporting table movably mounted upon said frame,
55 an opposing support arranged to overhang the supporting-table, mechanism for lifting the table to carry the box members thereon into engagement with the overhanging support and a plurality of U-shaped spring-clips
60 mounted upon the frame, adapted to support the vertical members of the box yieldingly, so as to permit them to be lifted by the supporting-table.

3. In a box-nailing machine, the combination with the main frame, of a box-supporting table movably mounted upon said frame,
65 an opposing support arranged to overhang the

supporting-table, mechanism for lifting the table to carry the box members thereon into engagement with the overhanging support
70 and a plurality of pairs of U-shaped spring-clips mounted upon the rear of the main frame in vertical alinement with each other and arranged to project forwardly therefrom in position to receive the vertical members of the
75 box, as and for the purpose set forth.

4. In a box-nailing machine, the combination with the main frame, of a box-supporting table movably mounted upon said frame,
80 an opposing support arranged to overhang the supporting-table, and mechanism for lifting the table to carry the box members thereon into engagement with the overhanging support comprising a rock-shaft extending beneath and parallel with the table, a pair of
85 cams located at a distance apart upon said rock-shaft, adapted to engage and lift the table when the rock-shaft is oscillated, a crank-arm upon said rock-shaft and a pedal mechanism operatively connected with said crank-
90 arm.

5. In a box-nailing machine, the combination with the main frame, of a box-supporting table movably mounted upon said frame,
95 an opposing support arranged to overhang the supporting-table, and mechanism for lifting the table to carry the box members thereon into engagement with the overhanging support, comprising a rock-shaft extending beneath and parallel with the table, a pair of
100 cams located at a distance apart upon said rock-shaft, adapted to engage and lift the table when the rock-shaft is oscillated, a crank-arm upon said rock-shaft, a pedal mechanism operatively connected with said crank-
105 arm and a ratchet mechanism adapted to engage the pedal mechanism to hold the table elevated in any desired position.

6. A nail-distributing device comprising an inclined feed-board provided with a plurality
110 of slots adapted to hold nails suspended by their heads, a series of projections having inclined sides arranged between said slots and adapted to direct the nails into the slot, openings in alinement with and in advance of said
115 projections, through which such nails as fail to enter the slot will be discharged, and a hopper mounted above said feed-board and having its bottom inclined at an adjustable angle oppositely disposed with relation to the
120 angle of inclination of the feed-board and arranged to discharge upon said feed-board, substantially as described.

7. In a box-nailing machine, the combination with the main frame, a vertically-reciprocatory hammer-frame mounted thereon,
125 and mechanism for reciprocating said hammer-frame, of a nail-separating mechanism adapted to feed forward a set of nails upon each reciprocation of the hammer-frame and
130 means for operating said nail-separating mechanism comprising a reciprocatory bar upon which the nail-separating devices are mounted a bent lever pivoted at its angle upon

the main frame and having one of its arms
operatively engaged by means of a slot-and-
pin connection with the reciprocatory bar and
having its opposite arm connected with the
5 hammer-frame by a slot-and-pin connection,
whereby the vertically-reciprocatory move-
ment of the hammer-frame imparts a horizon-
tally-reciprocatory movement to the bar of
the separating mechanism.
10 8. A nail-distributing device comprising an
inclined feed-board provided with a plurality
of slots adapted to hold nails suspended by
their heads, a series of projections having in-
clined sides arranged between said slots and
15 adapted to direct the nails into the slots, open-
ings in alinement with and in advance of said
projections and upstanding fingers or projec-
tions adjacent to said openings and adapted
to arrest such nails as fail to enter the slots
20 and direct them through the openings.
9. The combination with a portable ma-
chine-frame adapted to rest upon a working
floor, of a rock-shaft arranged to extend
transversely of said frame parallel with and
25 adjacent to the supporting-contacts which rest

upon the floor, a pair of crank-arms mounted
upon said rock-shaft provided at their ends
with casters, a notched disk or segment mount-
ed rigidly upon the frame, a ratchet-lever ar-
ranged to cooperate with said notched seg- 30
ment to lock the rock-shaft in determined po-
sition and a third caster mounted at the side
of the machine opposite that at which the
rock-shaft is located in bearings holding it
elevated free from the floor when the machine 35
rests directly upon its base, said latter caster
being adapted to be brought into bearing with
the floor when the opposite side of the ma-
chine is tilted upwardly by elevating it
through the medium of the rock-arm casters. 40

In testimony that we claim the foregoing as
our invention we affix our signatures, in pres-
ence of two subscribing witnesses, this 7th
day of July, A. D. 1899.

ALBERT H. SCHANCK.
LEE R. HICKMAN.

Witnesses:

C. F. MARCY,
A. MARTIN.