

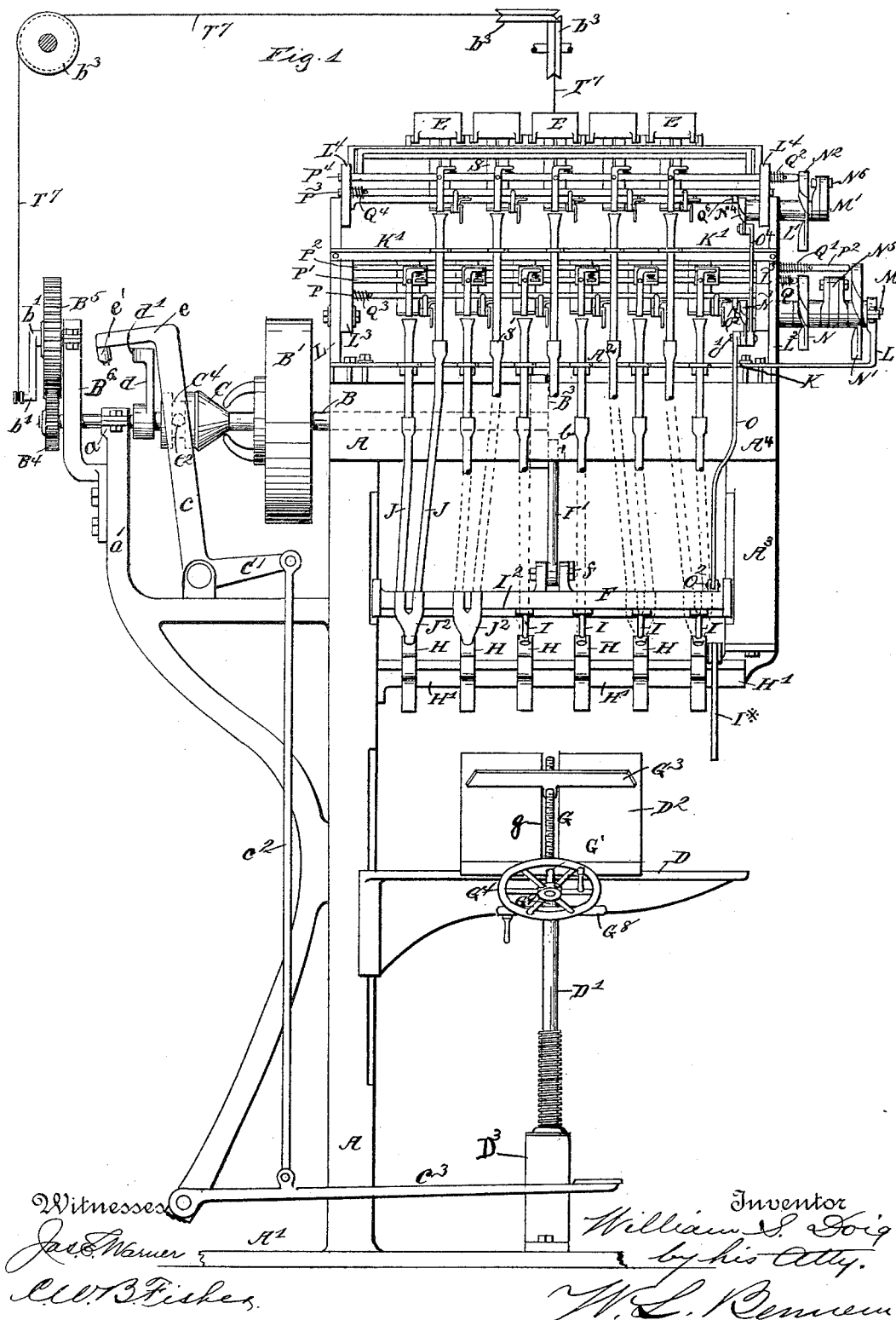
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5 Sheets—Sheet 1.

W. S. DOIG.
BOX NAILING MACHINE.

No. 461,013.

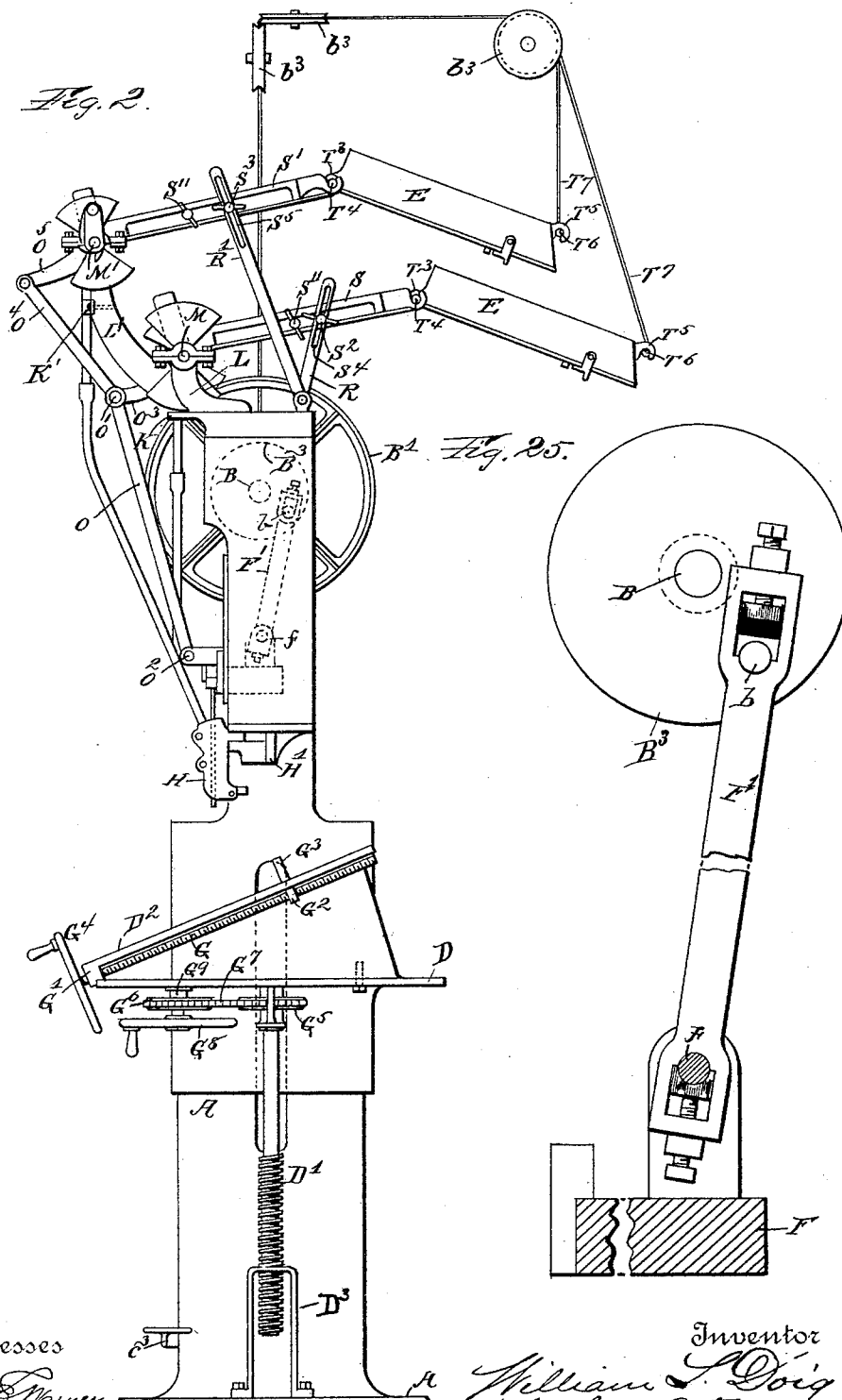
Patented Oct. 13, 1891.



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BOX NAILING MACHINE.

No. 461,013.

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Witnesses
Jas. Warner
C. W. Fisher.

Inventor
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by his Atty.
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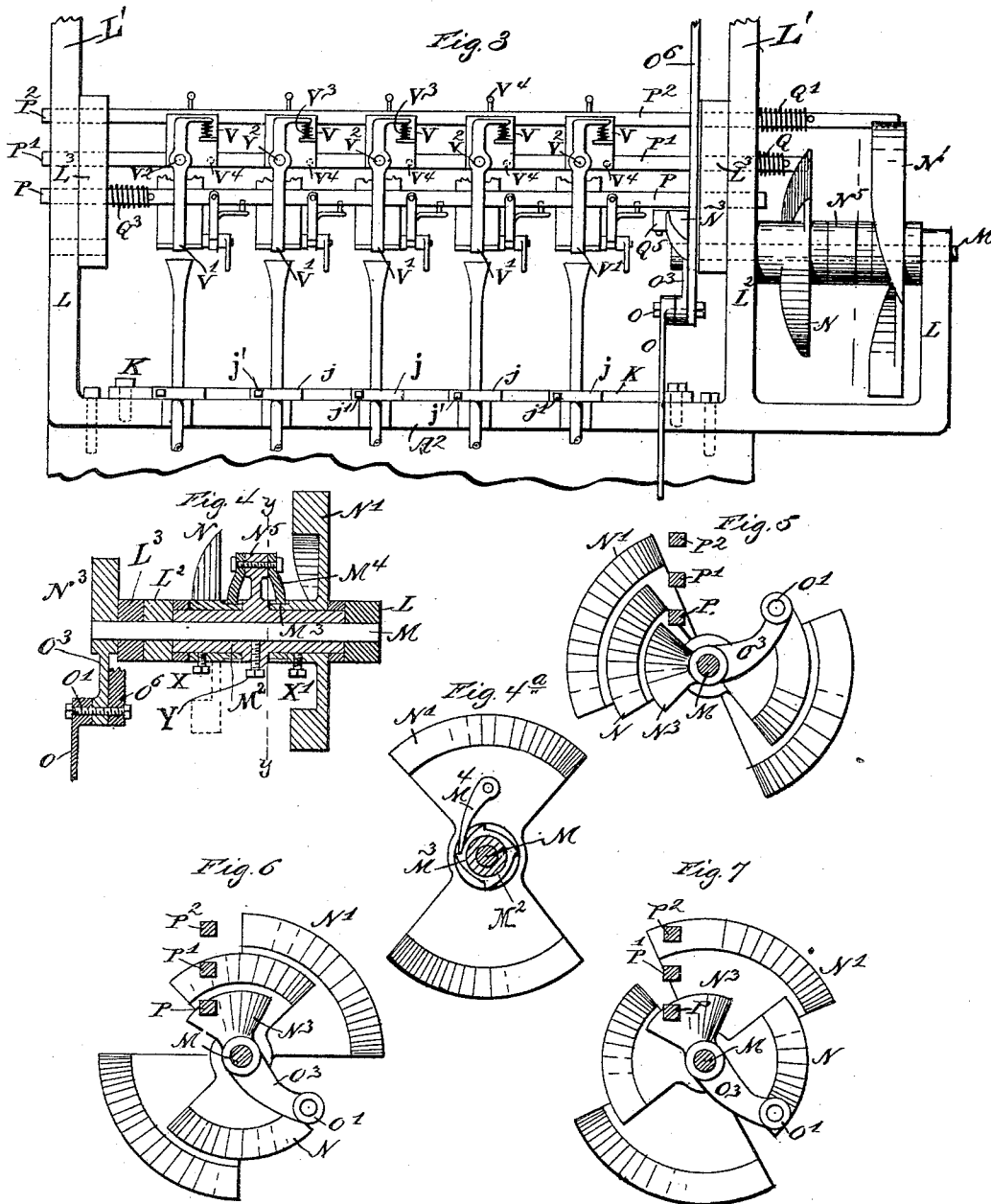
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W. S. DOIG.
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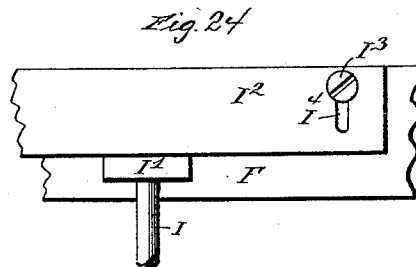
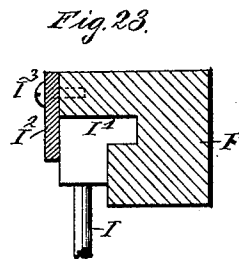
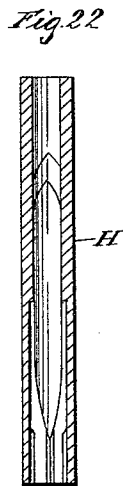
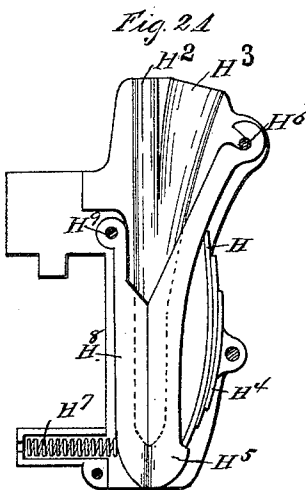
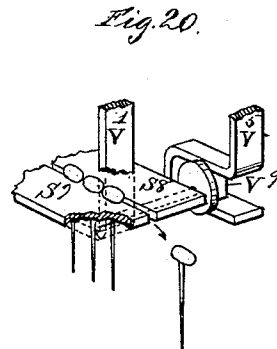
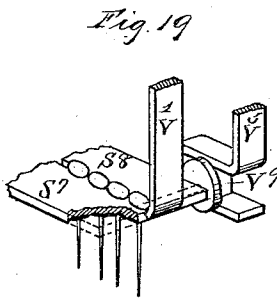
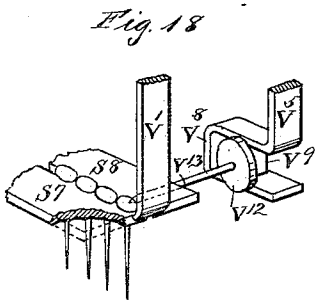
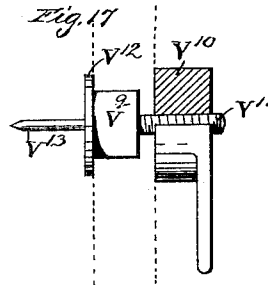
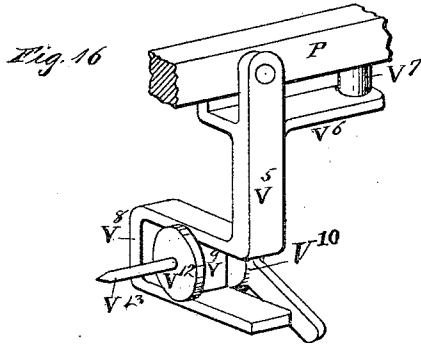
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UNITED STATES PATENT OFFICE.

WILLIAM S. DOIG, OF BROOKLYN, NEW YORK.

BOX-NAILING MACHINE.

SPECIFICATION forming part of Letters Patent No. 461,013, dated October 13, 1891.

Application filed June 20, 1890. Serial No. 356,171. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM S. DOIG, a citizen of the United States, residing at Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Box-Nailing Machines, of which the following is a specification.

My invention relates to box-nailing machines of the class illustrated in Letters Patent Nos. 342,230 and 342,268, of May 18, 1886, granted to Thomas L. Smith and myself.

My invention contemplates certain improvements on the machines shown in these patents, which are to be hereinafter fully set forth. The subject-matter deemed novel is set forth in the claims.

In the accompanying drawings, Figure 1 is a front elevation of my improved machine. Fig. 2 is a side elevation. Fig. 3 is an enlarged front view of the mechanism for supplying nails to the nail-delivery tubes. Figs. 4, 4^a, 5, 6, and 7 are detail views of certain parts of the nail-delivery mechanism, Fig. 4^a being a section on the line *yy* of Fig. 4. Fig. 8 is a detail view of one of the nail-supply pans. Fig. 9 is a longitudinal central section of the same. Fig. 10 is a front view thereof. Fig. 11 is a detail view, with parts broken away, of the nail-carrying plates or conveyers and the frame-work in which they are mounted. Fig. 12 is a detail view in section thereof. Fig. 13 is a detail view, on an enlarged scale, showing the bottom of the front part of one of the nail-conveyers. Figs. 14 and 15 show further details of this part of the apparatus. Figs. 16, 17, 18, 19, and 20 are detail views of certain parts of the mechanism for supplying nails individually to the nail-conveying tubes. Fig. 21 is a view of the interior of a nail-box. Fig. 22 is a vertical central section through one of these boxes. Figs. 23 and 24 are detail views of one of the hammers and the cross-piece on which it is mounted, and Fig. 25 is a detail view of the connections between the driving-shaft and the vertically-reciprocating cross-head.

The frame of the machine is suitably shaped to support the mechanism thereof, as shown, consisting of an upright A, a side or end piece A³, a cross connecting-piece A⁴, and a top piece A⁵. The upright A is mounted on a bed-plate A', and carries a bracket a', in which is a

bearing a for the main driving-shaft B. A pulley B' is loosely mounted on the driving-shaft, and is connected to rotate therewith by a clutch C. The clutch is connected with a treadle c³ by an arm c, carrying a pin or roller c², engaging a groove c⁴ in the clutch, an arm c', secured to or forming part of the arm c, and a link c², which is pivoted to the arm c' and to the treadle. The arms c and c' are pivotally supported on the bracket a'.

An arm d on the shaft B is adapted to engage with a roller e' on an arm d' of the arm c. The purpose of this arrangement is to permit the clutch to be automatically disengaged from the driving-shaft.

The shaft B extends through a bracket B⁹ and carries on its outer end a pinion B⁴, which gears with a toothed wheel B⁵, provided with a crank-arm b'. To this arm is secured a cord or wire T', passing over pulleys b³ and connected to the nail-carrying pans. As the crank b' is revolved, the pans are raised and lowered for a purpose hereinafter described.

A table D, on which the box is to be placed while being nailed, is connected with the frame and adapted to slide vertically thereon. It is provided with a downwardly-extending rod D', screw-threaded at its lower end and entering a bracket D³. At its upper end the rod D' is connected with a sprocket-wheel G⁵, which is connected with a sprocket-wheel G⁶ on the bottom of the table by means of a chain G⁷. A hand-wheel G⁸ is secured to the shaft G⁹ of the sprocket-wheel G⁶, and by turning this wheel the screw may be rotated so as to adjust the table D vertically. An inclined supplemental table D² is supported on the table D and rigidly secured thereto. A screw-shaft G, extending through a bracket G' on the under side of the inclined table, is provided with a hand-wheel G⁴, by which it may be turned. The screw-shaft extends through the downwardly-extending screw-threaded end G² of a slide G³. By operating the hand-wheel the slide G³ may be adjusted from one end of the table to the other, which is provided with a slot g to admit of this adjustment.

On the inner end of the shaft B is a crank-wheel B³, the crank-pin b of which is connected with a pitman F', pivotally connected at its lower end to the vertically-reciprocating

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ing cross-head F. As shown in Fig. 25, yielding blocks of rubber are interposed in the connections of the pitman F' to relieve the strain and shock when the cross-head is reciprocated. The cross-head F carries a series of hammers I. Each of these hammers is provided with a flanged head-piece I', as shown in Fig. 23, adapted to enter a groove in the front of the cross-head F. A plate I² is secured to the front of the cross-head and holds the heads of the hammers in position; but in order that any or all of the hammers may be removed the plate is formed with vertical slots I⁴, through which extend the set-screws I³. By loosening the screws the plate may be raised so that its lower end rises above the heads of the hammers, and they may be readily removed. When the plate is lowered and the screws tightened, the hammers are firmly held in the cross-head and may be reciprocated vertically therewith.

Nail-boxes H, one for each hammer, are secured to a cross-beam H', attached to the main frame, and these boxes are arranged to receive the nails and to permit the hammers to reciprocate through them. As shown in Figs. 21 and 22, each nail-box is formed with two channels H² and H³, through which the nails and hammer may pass. Jaws H⁵ and H⁸ are pivoted at H⁶ and H⁹, respectively, and springs H⁴ and H⁷ tend to force the lower ends of the jaws together, but permit of their being separated and moved about their pivots when the nail is driven by the hammer. The jaw H⁸ has a slight movement independent of its pivotal connection by means of an open bearing, as shown at H⁵, so that the jaw may yield should the nails clog in the box. An arm I* is secured to the cross-beam H' and extends downwardly therefrom to form an abutment or guide for holding the box in position on the table.

The nails are conveyed to the nail-boxes by means of tubes J, which are preferably flexible. These tubes receive the nails from nail-delivery mechanism, and they are connected to and supported by the frame in cross-pieces K K'. The cross-pieces K K' are provided with recesses through which the tubes pass, and the front ends of these recesses are closed by caps j, secured by means of set-screws j'. When the screws are tight, the tubes are firmly held in position; but by loosening the screws and allowing the caps to drop the tubes may be individually removed from their supports.

A top piece A² of the frame is extended beyond the side or end piece A³ and is provided at each end with a bracket L and with a third bracket L² over the end piece A³. A series of brackets or plates L' L³ L⁴ are secured to the brackets L and L² and form bearings for mechanism presently to be described.

In the right-hand end of the machine in the brackets L and L² is mounted a shaft M. This shaft carries cams N, N', and N³. The cams N and N' are secured to a sleeve M² by

means of set-screws X and X'. The hubs of the cams N' and N³ are formed with ratchets M³, with which engages a pawl M⁴, carried by a lever N⁵. The sleeve M² may be secured to the shaft M by a set-screw Y. Normally the cams N and N' move with the shaft; but in order that the cams may be adjusted relatively to the shaft the set-screw Y may be loosened, and by operating the lever N⁵, which carries the pawl M⁴, the cams may be moved about the shaft M so as to vary their relation to the mechanism which they operate or throw them out of operative connection therewith.

The cam N³ is secured to the shaft M inside the bracket L². On this cam is an arm O³, connected by a pivot-pin O' to a pitman O, connected to the vertically-reciprocating cross-head F, by a pivotal connection O². As the cross-head is reciprocated, a vibrating motion is imparted to the cam N³ and its shaft M and, consequently, a like motion is imparted to the cams N and N'. A cam-shaft M' is mounted in the brackets L' L⁴ and carries cams N² N⁴, the cam N⁴ being on the end of the shaft M' inside the bracket L⁴. Mechanism N⁶ for adjusting the cam N², relatively to its shaft M', substantially like that described in connection with the shaft M, may be provided.

Horizontal rods P P' P² extend through the brackets L L² L³ and are free to slide therein. The rods P' and P² are adapted to engage with the cams N' and N, respectively. Springs Q Q' normally hold the rods in engagement with the cams. The rod P is provided with a roller Q⁵, which engages the cam N³. The rod P is normally held to cause the engagement of the roller Q⁵ with the cam N³ by a spring Q³. Rods P³ and P⁴ are adapted to slide horizontally in the brackets L⁴. The rod P⁴ is normally held by a spring Q² in engagement with the cam N². The rod P³ carries a roller Q⁶, which engages with the cam N⁴, and is normally in engagement with this cam by a spring Q⁴.

As the cross-head F reciprocates vertically, an oscillating or vibrating movement is given to the cam-shaft M and the cams thereon, and through the rod O⁴ a similar movement is given to the cam-shaft M' and its cams.

Before describing the mechanism which the rods P, P', P², P³, and P⁴ operate, I will describe the mechanism which holds the nails and carries them to the tubes J.

Two nail-conveyers S and S' are provided in this machine, the one above the other. The conveyer S is supported at its front end in suitable bearings on the frame and also by vertical rods R, hinged to the top of the main frame and having slots S⁴ at their upper ends. Through these slots extend pivot-screws S³, attached to the conveyer, which may be adjusted vertically in the slots to vary the inclination of the conveyer S. Rods R' in like manner are provided with slots S⁵ and with adjustable bearing-screws S². The construction of one of these conveyers is shown in de-

tail in Figs. 11 to 15 inclusive. Within the outside frame S is an inside frame S⁶, and to these frames are secured metallic plates S⁷, S⁸, S⁹, and S¹⁰. The plates S⁷ are secured to the frame S and the plates S⁸ to the frame S⁶. Adjusting-screws S¹¹, extending through the frame S and bearing against the frame S⁶, admit of the adjustment of these frames relatively to each other, so as to vary the space or channel S¹² between the plates S⁷ and S⁸.

As a further means of adjusting the plates, I may provide cleats or bars S¹³, secured to the plates S¹⁰, and adjustably secured to the frames S⁶ by screws S¹⁴. By this means the plates may be adjusted without moving the frame S⁶ relatively to the frame S. The delivery ends of the channel S¹² may be opened and closed by fingers T, pivoted to the front of the frame S, as shown in Fig. 12. When the end of the finger enters the channel S¹², as shown in Fig. 12, it is closed and the passage of nails is obstructed; but when turned aside, as shown in Fig. 11, the nails may pass freely through the channels.

On the under side of the plates S⁷, S⁸, S⁹, and S¹⁰ are secured guide-flanges T¹ and T², which serve to keep the nails in order as they are delivered from the channels. These flanges diverge or flare at their inner ends. At their rear ends the frames S are provided with brackets having open bearings T³, in which the bearing-studs T⁴ of the pans E rest.

It will thus be seen that the nail-conveyers form the supports for the front ends of the pans, and that when the conveyers are adjusted vertically the pans are correspondingly adjusted. It will also be seen that as the bearings are open the pans may readily be removed, and that they have a slight vertical play independent of the conveyers. A series of nail-pans E are provided at their front ends with bearing-studs T⁴, adapted to rest in the open bearings T³ of the nail-conveyers. At their rear ends the pans are formed with hooks T⁵, which extend over a rod T⁶, connected with the cord or wire T⁷, which is in turn connected with the crank U, as before mentioned. When this crank is revolved, the pans are raised and lowered at their rear ends about their pivotal connection with the conveyers S and S', so that the nails are shaken up and delivered to the conveyers. Each of these pans is preferably constructed as follows: The rear end of a pan is provided with an inwardly-inclined back piece and at the front with a horizontally-sliding plate u⁵, slotted at u⁶, and through these slots extend adjusting-screws u³. A plate u⁷ is secured to the plate u⁵ and extends horizontally beneath the pan. At its inner end the plate u⁷ is connected with a cross-piece u⁴. Another plate u, parallel with the plate u⁷, is connected with the pan in a fixed relation thereto, and is supported at its rear end by a cross-piece u². Above the plates u and u⁷ are beveled plates u⁷. These act as guides for the nails, the shanks of which extend through the slot be-

tween the beveled plates u⁷ and the plates u and u⁷.

When the pans E are lifted, the nails in the slots just mentioned pass to the slots or channels S¹² in the conveyers S and S', and pass down these conveyers into position to be delivered to the tubes J. Each conveyer S and S' is provided with a series of pans which deliver the nails thereto, and a set of tubes J for each conveyer is provided for carrying the nails to the hammer-boxes; but, as shown in Fig. 1, the arrangement is such that nails from the upper conveyer are carried to the same nail-box as nails from the lower conveyer, the lower ends of the tubes being connected to a Y-shaped coupling-piece J². By this arrangement nails of different sizes or kinds may be delivered to the same nail-boxes.

The delivering apparatus for one kind of nails may be closed while the delivering apparatus for the other kind is in use by mechanism hereinafter described.

I will now describe the mechanism for delivering the nails individually to the nail-conveying tubes.

To either the bar P' or P² is secured by screws V⁴ a series of blocks V, to which are pivoted by pins V² stops V'. Springs V³, interposed between laterally-projecting arms of these stops and brackets on the blocks V, normally hold the stops in a vertical position to normally close the channel-ways S¹². As the cams N and N' are oscillated, the bars P' and P² are reciprocated and move the stops V' alternately away from and in front of the channels. When the channels are unobstructed by the fingers T, nails may be delivered from the channels to the tubes J when the stops V' are withdrawn therefrom. Similar stop mechanism is mounted on the rod P⁴ and operated in a similar way by the cam N². Figs. 18, 19, and 20 are detail views, in perspective, showing clearly the arrangement by which the stops V' obstruct the channels S¹² of the nail-conveyers.

In order that nails may be delivered independently to the conveying-tubes J and without interference I provide what I call "pointers," which separate the nail at the end of a channel from that directly behind it when the stop V' is removed from the front of the channel. By this arrangement when the stop is removed the first nail in the series drops into a tube J, but the other nails in the channel are held back by the pointer. These pointers for the lower set of nail-channels are carried by the bar P.

The details of construction are shown in Figs. 16 to 20, inclusive, where a hanger V⁵ is shown as pivoted to the bar P and provided at its lower end with a rearwardly-projecting bifurcated arm V⁸ and at its upper end with a laterally-projecting arm V⁶, between which and the bar P is interposed a spring V⁷. The hanger V⁵ is so pivoted to the bar P that it has a little play, so as to

rock slightly about its pivot against the force of the spring V⁷. In the bifurcated arm V⁸ is mounted a block V⁹, having a flange V¹², bearing against one side of the arm. The block also carries a screw V¹¹, with which engages a screw-threaded lever V¹⁰, the inner end of which bears against the opposite side of the arm V⁸. In this way the block V⁹ may be held securely in the arm V⁸ and may be adjusted therein. Projecting laterally from the block V⁹ is a pin or pointer V¹³, tapered at its outer end and adapted to pass between the first and second nails in a channel S¹² and separate them.

When the bar P is reciprocated by the cam N³, the pointers or pins V¹³ alternately pass between the nails in the channels S¹², and the machine is so timed that the pointers thus pass between the nails when the stops V' are removed from the front of the channels. In this way nails are delivered independently or separately to the nail-conveying tubes.

Should one of the pointers strike a defective nail, the hanger V⁵ will swing on its pivot against the force of the spring V⁷, and will give sufficiently to allow the bar P to reciprocate as usual and actuate the other pointers in the series, while this one remains inactive until the defective nail or obstruction is removed, when the spring V⁷ returns this mechanism to its normal position to act with the others. In like manner, should any one of the stops V' meet with an obstruction, the springs V³ will allow it to yield and remain inactive while the other stops are operating as usual. Mechanism for separating the nails in the channels similar to that just described is carried on the bar P³, operated by the cam N⁴, and need not be specifically described.

The apparatus described is compact in construction and efficient in operation.

The hammer-boxes may each be supplied with nails from two sources by the tubes J J, and nails from any set or any series of nail-channels in the conveyers may be readily closed or opened, and the cams for operating the stop mechanism, being adjustable on their shafts, may be readily thrown into or out of action without stopping the main driving mechanism.

I claim as my invention—

1. The combination, in a box-nailing machine, of the main frame, a table adjustable vertically thereon, a supplemental inclined table secured to the top of the vertically-adjustable table, a slide adjustable along the inclined surface of the supplemental table, and box-nailing mechanism located above both tables and having hammers reciprocating vertically toward and from them, substantially as set forth.

2. The combination, in a box-nailing machine, of the main frame, a table adjustable vertically thereon, a supplemental inclined table secured to the vertically-adjustable table, a slide adapted to move in a slot in the inclined surface of the supplemental table, a

screw-shaft extending through the screw-threaded end of the slot and through a bracket on the inclined table, a hand-wheel for operating the screw-shaft, and box-nailing mechanism located above both tables and having hammers reciprocating vertically toward and from them.

3. In a box-nailing machine, the combination of a series of hammers having flanged heads, a grooved cross-head in which the hammer-heads are adapted to fit, a plate for holding the hammer-heads in position on the cross-head, and adjusting-screws extending through vertical slots in this plate, whereby the plate may be lifted vertically and permit the removal of any one or all of the hammers, substantially as set forth.

4. In a box-nailing machine, the combination, in a nail-box, of the pivoted jaws, springs for holding them together, and an open bearing for one of the jaws to prevent the clogging of nails in the box, substantially as set forth.

5. In a box-nailing machine, a nail-conveyer consisting of the combination of an outer frame, an inner frame, cleats adjustably secured to the inner frame, plates secured to the cleats and the inner and outer frames, and devices for adjusting the inner frame relatively to the outer frame, substantially as set forth.

6. In a box-nailing machine, a nail-conveyer having a nail-channel, a vibrating stop V', adapted to alternately open and close the channel, and a stop-finger T, connected with the frame of the conveyer and adapted to be moved into or out of said channel, substantially as set forth.

7. The combination of a frame, a series of nail-channels therein, a series of vibrating stops for alternately opening and closing the channels in the series, and a series of pivoted stop-fingers secured to the frame and adapted to open and close said channels individually, substantially as set forth.

8. The combination of a frame, a series of nail-channels therein, and flanges below the channels with their inner ends diverging or flaring, substantially as set forth.

9. The combination of a frame, a nail-channel therein, a nail-supply pan pivotally connected with said frame, supports for the front end of the frame, adjustable supporting-rods for the rear ends of the frames, and flexible supports for the rear ends of the nail-supply pans, the organization being such that the frames having the nail-channels and the nail-supply pans are adjusted vertically and simultaneously by the adjusting-rods, substantially as set forth.

10. In a box-nailing machine, the combination of the nail-supply pans, the hooks on the rear ends thereof, the rod extending through said hooks, the main driving-shaft of the machine, and a flexible connection between the rod and the driving-shaft, substantially as set forth.

11. In a box-nailing machine, the combination of two frames arranged one above the other, nail-channels therein, means for independently raising and lowering said frames, means for opening and closing said channels, nail-supply pans for the nail-channels in the two frames, and means for actuating the nail-supply pans, substantially as set forth.

12. In a box-nailing machine, the combination of two frames arranged one above the other, nail-channels in these frames, means for independently raising and lowering said frames, nail-supply pans for the channels in the two frames, the main driving-shaft, flexible connections between the driving-shaft and the nail-supply pans, mechanism for automatically and independently opening and closing the nail-channels, nail-boxes, hammer mechanism, and conveyers for carrying nails from the nail-channels to the nail-boxes, substantially as set forth.

13. In a nail-supply pan, the combination of a fixed plate, an adjustable front plate, and a plate parallel with the fixed plate secured to the front plate and adjustable therewith, substantially as set forth.

14. In a nail-supply pan, the combination of a fixed plate, an adjustable front plate, a plate parallel with the fixed plate secured to the front plate and adjustable therewith, and the bars $w^2 w^4$, on which the inner ends of the plates rest.

15. In a box-nailing machine, the combination, with a nail-box, of two or more nail-conveying pipes or tubes leading from separate nail-channels to the nail-box to carry nails of different sizes thereto and means for feeding nails to the tubes, substantially as set forth.

16. The combination of a series of nail-channels, stops for opening and closing the front ends of these channels, a rod to which these stops are connected, a cam for operating the rod, and means for adjusting the cam to throw it into and out of operative connection with the rod, substantially as set forth.

17. In a box-nailing machine, the combination of the vertically-reciprocating cross-head and hammers, a series of nail-channels, stops for opening and closing these channels, a rod

to which the stops are connected, a cam for actuating this rod, connections between the cam and the vertically-reciprocating cross-head, and means for adjusting the cam relatively to the rod to throw it into or out of operative connection therewith, substantially as set forth.

18. The combination of two separate sets of nail-channels, two separate sets of stops for opening and closing these channels, rods to which these stops are connected, cams for operating these rods, means for operating the cam to actuate the stops for one set of channels, and connections between this cam and the cam which actuates the stops for the other set of channels, substantially as set forth.

19. The combination of a nail-channel, a pointer or finger for separating the nails in the channel, a hanger to which the pointer is secured, means for adjusting the pointer transversely to its axis in the hanger, and a bar to which the hanger is secured, substantially as set forth.

20. The combination of a nail-channel, a pointer, a hanger or frame in which it is mounted, a bar to which the frame or hanger is pivotally connected, and a spring for holding the hanger in its normal position, substantially as set forth.

21. The combination of a series of nail-channels, a series of pointers adapted to separate the nails in the channels, a reciprocating bar to which the pointers are connected, an arm engaging this bar to actuate it, a series of stops for opening and closing the nail-channels, and a cam for actuating said stops, substantially as set forth.

22. In a box-nailing machine, the combination of a series of nail-channels, a series of tubes to which nails from the channels are delivered, cross-bars having recesses for supporting these tubes, and movable caps for holding the tubes in the recesses, substantially as set forth.

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