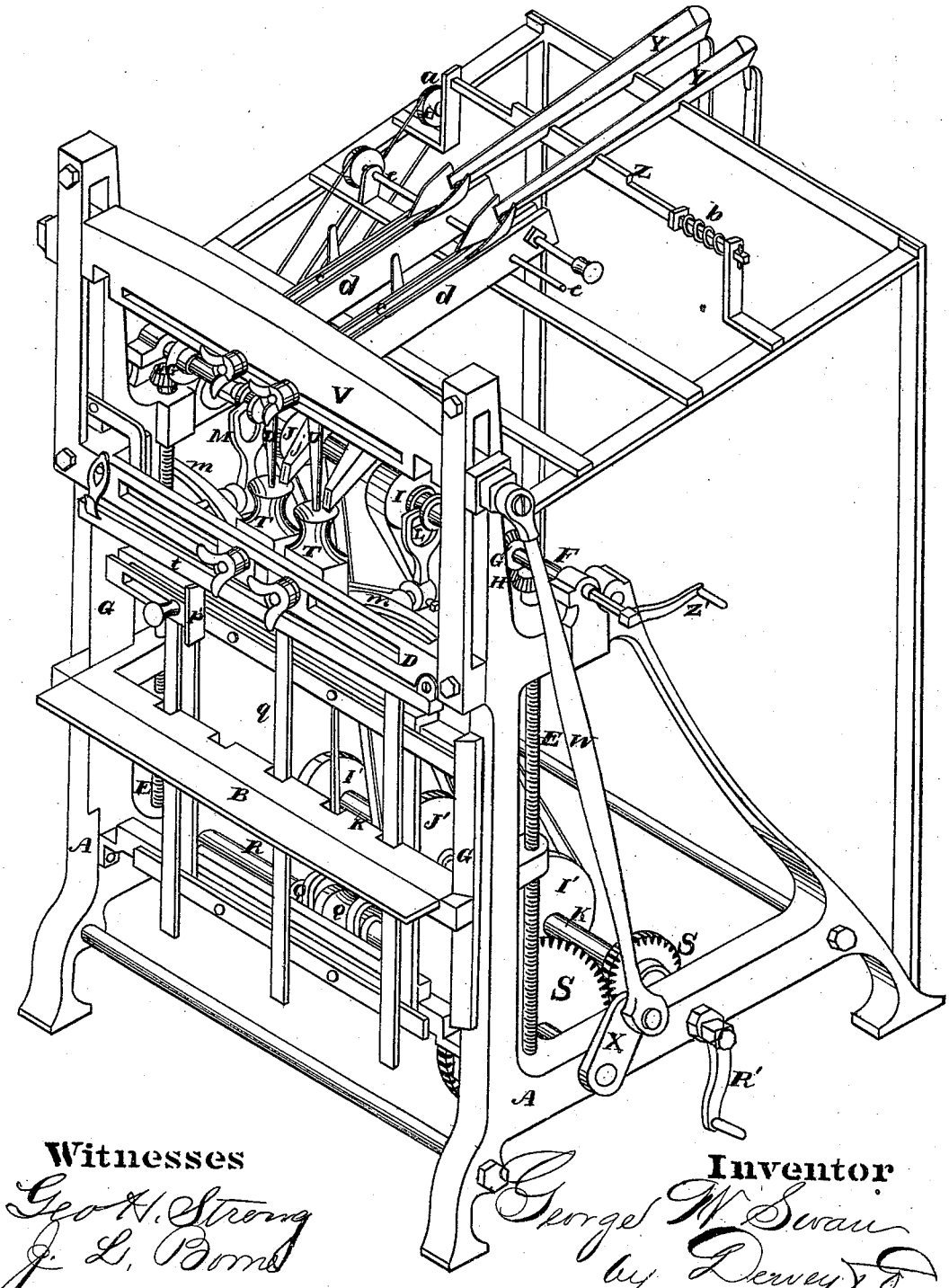
4 Sheets—Sheet 1.

# G. W. SWAN.

## BOX-NAILING MACHINE.

No. 180,503. Patented Aug. 1, 1876.

*Fig. 1.*




**Witnesses**

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4 Sheets—Sheet 2.

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## BOX-NAILING MACHINE.

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Fig. 3.

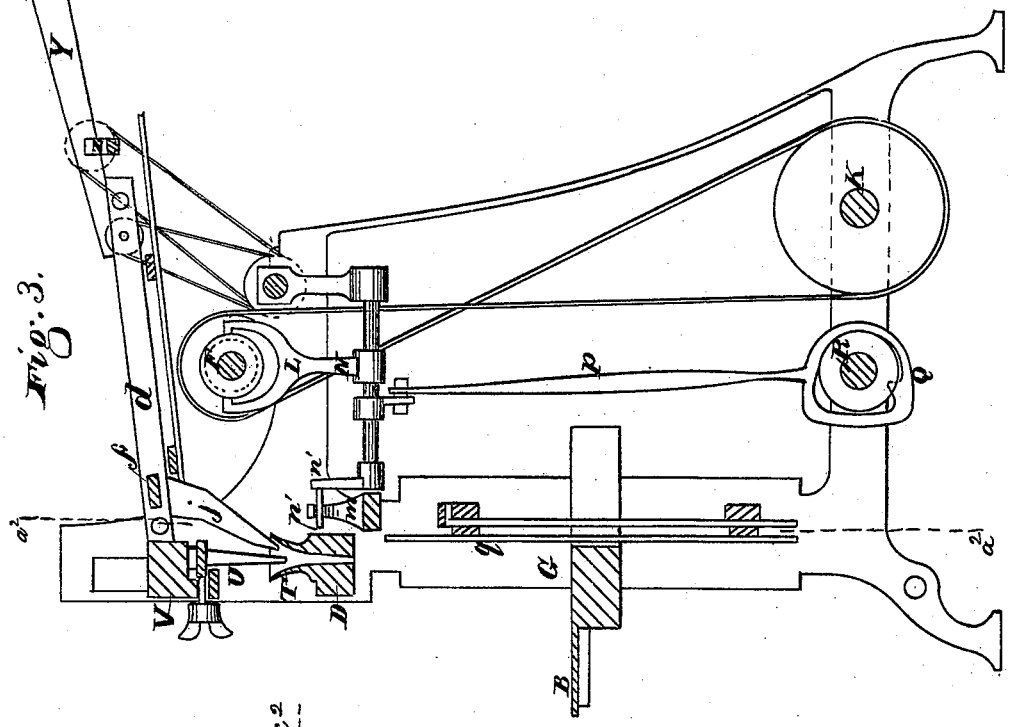
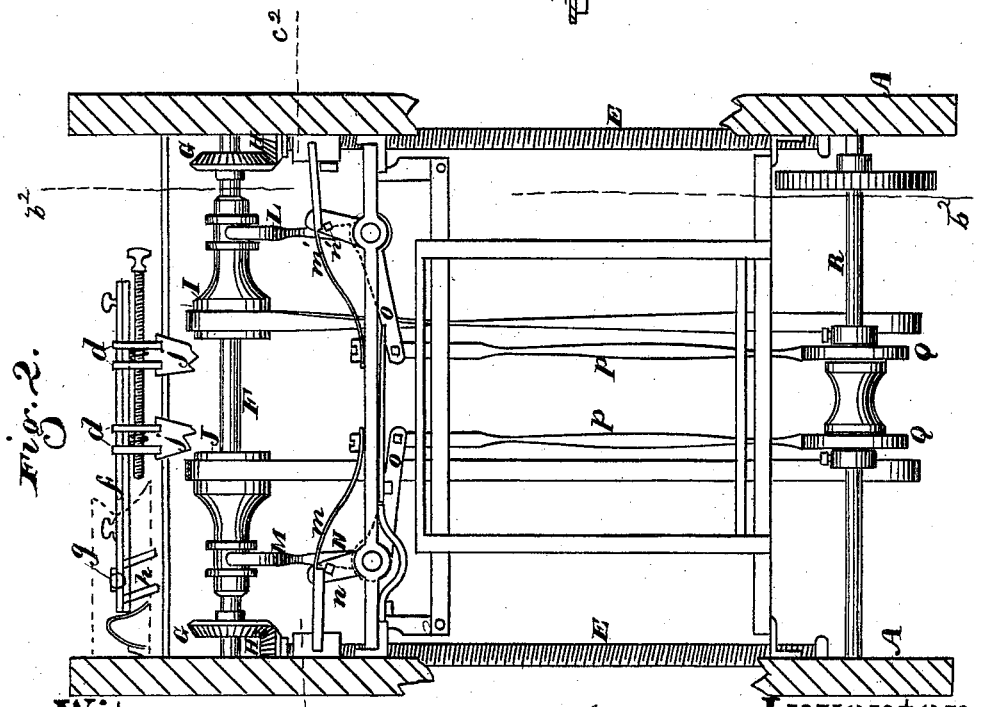


Fig. 2.



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4 Sheets—Sheet 3.

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## BOX-NAILING MACHINE.

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Fig. 4.

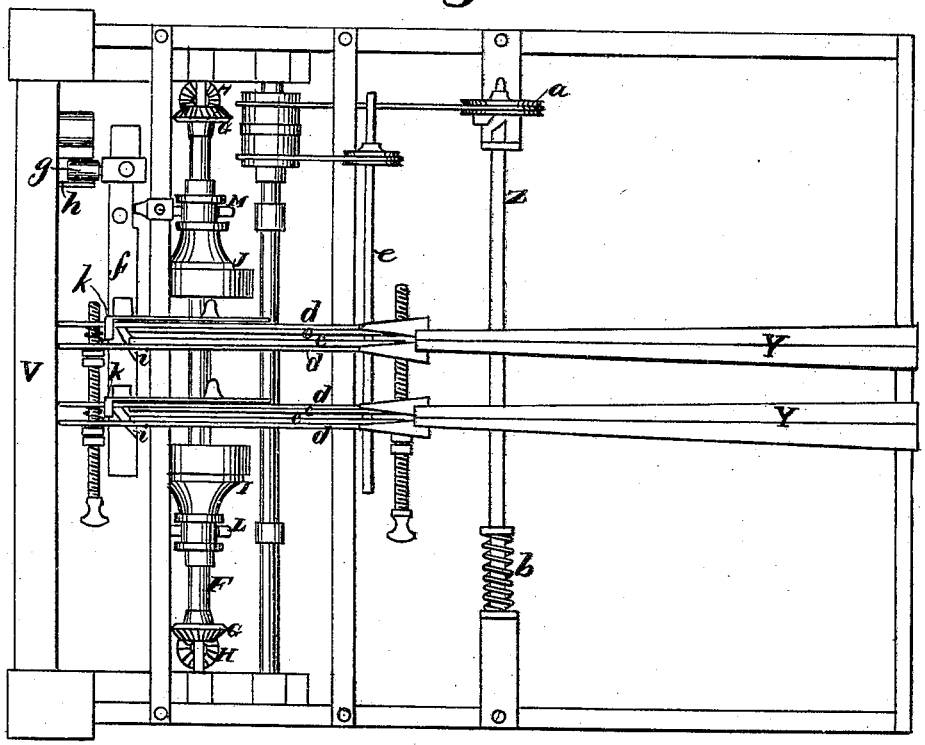
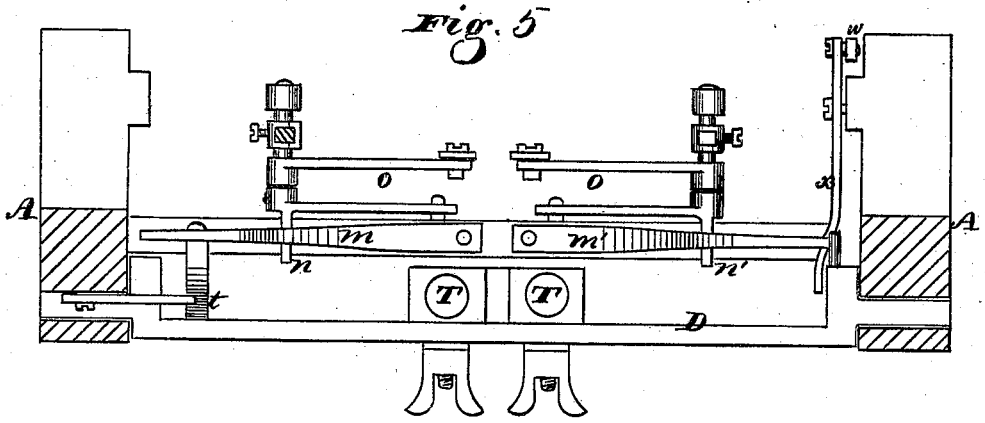



Fig. 5.

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## BOX-NAILING MACHINE.

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*Fig. 6.*

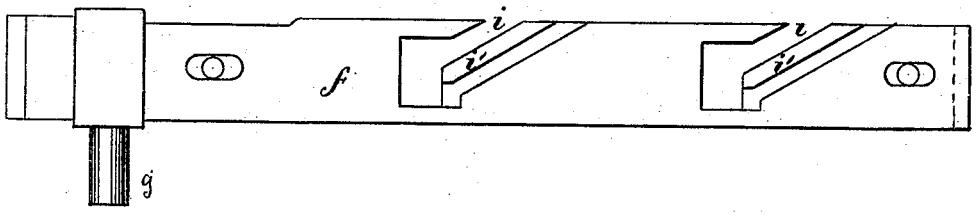



*Fig. 7.*

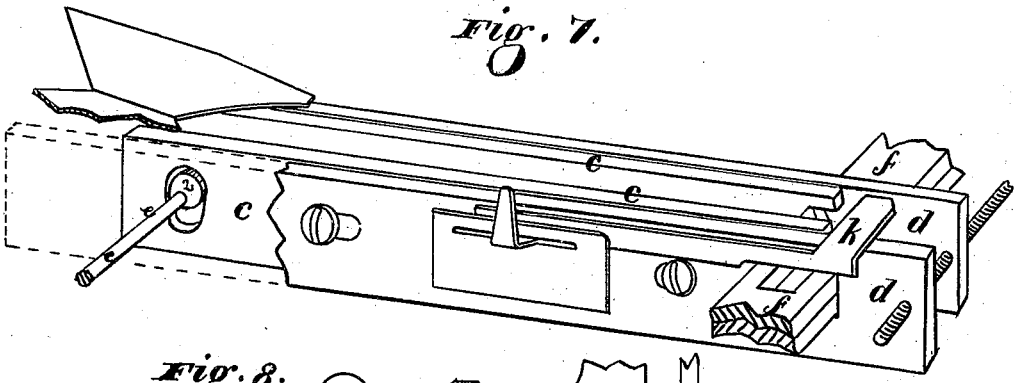
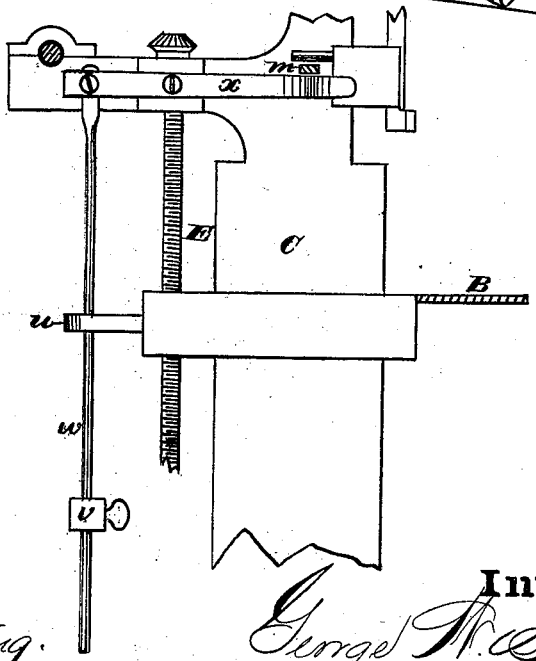



*Fig. 8.*

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# UNITED STATES PATENT OFFICE.

GEORGE W. SWAN, OF SAN FRANCISCO, CALIFORNIA.

## IMPROVEMENT IN BOX-NAILING MACHINES.

Specification forming part of Letters Patent No. **180,503**, dated August 1, 1876; application filed May 9, 1876.

*To all whom it may concern:*

Be it known that I, GEORGE W. SWAN, of the city and county of San Francisco, State of California, have invented certain new and useful Improvements in Box-Nailing Machines; and I do hereby declare the following description and accompanying drawings are sufficient to enable any person skilled in the art or science to which it most nearly appertains to make and use my said invention without further invention or experiment.

My invention relates to certain improvements in that class of machines which are employed to nail together the parts of boxes, and the details will be more fully explained by reference to the accompanying drawings, in which—

Figure 1, Sheet 1, is a perspective view of my machine. Fig. 2, Sheet 2, is a vertical section taken through $a^2$, Fig. 3. Fig. 3, Sheet 2, is a vertical section taken through $b^2$, Fig. 2. Fig. 4, Sheet 3, is a top view. Fig. 5, Sheet 3, is a horizontal section taken through $c^2$, Fig. 2. Fig. 6, Sheet 4, is an enlarged view of the transverse slide. Fig. 7 is a view of the feeders. Fig. 8 shows rod *w*, &c.

A is a frame, supporting the various parts of the mechanism. B is the table upon which the parts of the box to be nailed are laid, and this table moves up and down upon guides C upon the frame A, both for the purpose of primary adjustment, to fit or place it in position for any size of work to be done, and also to raise the parts of the box up, automatically, to the stationary cross-bar D, where the nails are driven out from the nail-holders into the box by the vertically-moving punches.

The adjustment of the table is made by means of vertical screws E, which are operated from a horizontal shaft, F, by means of gear-wheels and pinions G H, one at each side of the machine, and the automatic movement of the table for the purpose of nailing each box is also effected by the screws E, the shaft F being turned alternately in one direction and the other by pulleys I and J, which are driven in opposite directions by means of straight and crossed belts from pulleys I′ J′ upon the main driving-shaft K.

Friction-clutches L and M, secured to the shaft F, are alternately thrown into contact with the pulleys I and J, so that, by the alternate revolutions of the shaft F in opposite directions, it will act to raise and lower the table B by the action of the screws E. The clutches L and M are operated by clutch-levers N N, which have their lower ends hinged to horizontal shafts; and lever-arms O O, projecting at right angles, so as in effect to form bell-crank levers, are operated upon at the proper time by connecting-rods P P from the cams Q Q′. These cams are secured to a shaft, R, which receives motion from the main driving-shaft K by means of a spur-wheel and pinions S S′, as shown.

The nail-holders T are supported upon the stationary bar D at suitable intervals, being adjustable by screws, and the driving-punches U, also adjustable, are secured in a line above these holders to a cross-head, V, which slides in vertical guides upon the upper part of the frame A, and is operated by connecting-rods W from cranks X upon the ends of the cam-shaft R.

The nail-holders T have conical holes, wider at the top than at the bottom, so that a nail falling into one of them will be held in the small lower part of the nail-holder until the punch strikes it. The holder is made in two parts, held together by springs, and will thus readily allow the nail to be forced out into the box when the punch strikes it.

The nails are first placed in slightly-inclined V-shaped troughs Y at the upper back part of the frame, as shown, and the front ends of these troughs are supported upon a transverse bar, Z, which is pushed in one direction by a cam-wheel, *a*, and is returned after the cam passes by a spring, *b*, thus giving a little shock, which causes the nails to move slowly down the troughs until they fall upon the inclines *c*, which consist of two parallel plates placed near enough together to allow the nails to swing between them and be held by the head. These plates *c* are placed between two outside plates, *d*, which guide them, and they are moved longitudinally by means of eccentrics upon a shaft, *e*, so as to continually feed the nails forward as they hang suspended in the slots.

Transversely through the plates *d*, and just beyond the lower end of the feeders *c*, a bar,

*f*, passes, and this bar has an arm or friction-roller, *g*, projecting at one side, so that when the cross-head V rises and falls the arm *g* will enter an inclined slot, *h*, upon the cross-head, and by the action of the slot the bar *f* will be caused to move a short distance to the right and left at each movement of the cross-head. This bar has a diagonally-inclined slot, *i*, made vertically through it, where it passes each of the feeders, and when the bar is moved in one direction the upper open end of this slot is brought opposite the space between the feeders, thus allowing one nail to move down into the inclined slot. The reverse movement of the bar *f* forces the nail forward down the inclined slot, still supported by its head, until at the lower end the space is enlarged, so that the nail can drop into the spout *j* and pass directly to the nail-holder T. The bar *f* is made in two parts, and a projection, *i'*, from the lower part forms one side of the inclined slot *i*, so that by sliding these parts of the bar upon each other the size of the slot can be adjusted to receive any size of nail. The parallel plates *c* can also be adjusted to or from each other by screws, so that it is only a momentary work to adjust the apparatus for any kind of nails. A slide is fitted upon the side of the plates *d*, having a strap, *k*, which crosses the top of the plate. By moving this slide up the strap *k* will stop the nails in any one or more of the feeders, and this will be necessary when small boxes are to be finished. The distance between the nail-holders T and between the driving-punches U is made adjustable by screws, as before mentioned, for the same reason. The cam-wheel *a*, which operates the shaking-bar *z*, and the eccentric shaft *e*, which moves the feeders *c*, are driven by belts from a pulley at I upon the main shaft, either directly or by means of intermediate pulleys.

In order to hold the clutches L or M in contact with their pulleys I or J, so that they shall actuate the shaft F in either direction as long as may be necessary after the cams Q have thrown them into contact, spring-latches *m* *m'* are so placed that they will catch and hold lever-arms *n* *w'*, which are secured to the same shaft with the clutch-levers N, and these are released at the proper time in the following manner: When the table B is down the parts of the box to be nailed are placed upon it and held in position by guides *p'* and the adjustable vertical back *q*. The foot of the operator is then placed upon a treadle, (not shown,) which throws a clutch into contact with the driving-pulley, (also not shown,) but which takes the place of the crank R' upon the main shaft K. As soon as the shaft begins to turn the cam Q operates to throw the clutch L into contact with the pulley I, and this turns the vertical screws E, so as to elevate the table until the upper part of the box strikes the arm *t*, which is hinged at one end to the cross-bar D, so that the opposite end hangs a little below it. A projection extending backward from the arm *t* stands just beneath the spring-latch *m*, so that, when the arm *t* is raised by the contact of the box, the latch *m* will be raised, and the lever *n* will be released, thus allowing the clutch L to move out of contact with the pulley I, this being effected by a spring. The screws E stop turning and the table remains stationary until the punches have been forced down by the cross-head V, thus driving the nails which are in the nail-holders T, after which the punches and cross-head move upward again by the continued action of the cranks X upon the connecting-rods W. The cam Q' then acts to throw the clutch M into contact with the pulley J, the reversed belt of which causes the shaft to turn in the opposite direction, and thus operate the screws E to depress the table until a projecting arm, *u*, strikes an adjustable nut, *v*, upon the rod *w*. This rod draws down one end of a lever, *x*, and the opposite end releases the lever *n'* by lifting the spring-catch *m'*, when the actuating-spring throws the clutch M out of contact with the pulley J, and the table remains stationary until the parts of another box are placed in position, and the cam Q again acts upon the clutch L, as above described. The back *q*, against which the parts are placed, is adjusted by screws, so that the nails will be driven into the middle, whatever the thickness of the pieces, and the movement up and down of the table is made sufficient for the work to be done, (usually about three inches.)

After the box is finished and it is desired to put the cover on by driving the nails part way down, the bar *t* is adjusted, so as to release the clutch L and stop the table a little lower down. The cover-nails will then be found to project enough to be readily withdrawn when the box is needed for use, and will retain the cover in place until that time. The table is readily adjusted to nail boxes of any size by attaching a crank, *z'*, to the end of the shaft F, and when both clutches are disengaged the crank can be turned, and the vertical screws E will elevate or depress the table to any point within the limit of the machine. It will readily be seen that the greatest differences in size will not affect the automatic action of the machine, as the striking of the box against the arm *t* below the stationary bar D always throws out the clutch, which raises the table, and the adjustment of the nut *u* on the rod *w* limits the descent of the table, the space traveled over while working being, as before described, sufficient for any thickness of lumber or length of nail.

In order to insure the proper position of the nails when they fall into the feeders *c c*, the receiving-troughs Y are made, as above described, V-shaped, so that when the nails are put in at random the gradual shaking and moving them forward will cause them all to lie diagonally, whether the head or point be toward the mouth of the trough, and when they fall between the plates *c c* they will all hang in the same position—that is, with their

wedge shaped sides longitudinally in the space between the feeders. They are held in this position until they are carried by the slotted bar *f* into the spouts *j*, which, being steeply inclined and having flat bottoms, will retain the nails still in the same position until they fall into the nail-holders. These, as before described, are funnel-shaped and made in two parts, and they serve only to hold the nails until they are driven by the punches.

In forming the vertical diagonal slots *i* in the transversely-moving bars *f*, it will be found necessary to make the upper acute angle of the slot (which acts as a cut-off for each nail as it is received) in the form of a yielding spring, because bad nails, or those of different sizes, are often found in any lot which may be used, and when one of these gets in front of any one of the points of the slots *i* it will stop the whole bar unless such a provision is made. By making these angles separate and mounting them upon springs, it will be seen that if one of them comes in contact with a bad nail the bar will move on, and the others will all feed properly.

In my machine I have shown a method of relieving the bar *f* if any such obstruction occurs, which consists in making one side of the slot or guide *h* of the cross-head V elastic, so that it will give and allow the bar to stop for obstructions.

I am aware that a patent has been heretofore granted for certain improvements in machines for nailing boxes, in which are claimed dies or nail holders, having a gradually-widening groove or slot, and guiding the nails in a certain position, and also a toothed or fingered roller for taking the nails from a box and delivering them into die holders and conductors. I do not therefore claim these devices, nor broadly a machine for nailing boxes.

I am also aware that nails have heretofore been fed to box-nailing machines by means of a slotted feeder given a reciprocating movement; hence I do not claim this broadly; but

What I claim as new, and desire to secure by Letters Patent, is—

1. The table B, moving upon vertical guides C, and operated, both for primary adjustment and automatically to raise and lower the parts to be nailed, by means of the screws E, which are turned alternately in opposite directions by mechanism, substantially as herein described.

2. The shaft F, with its pulleys I and J, turning in opposite directions, as shown, and the clutches L and M, with their levers N, connecting-rods P, and cams Q Q′, for driving the shaft F, and through it the screws E, alternately in opposite directions, substantially as herein described.

3. The lever-arms *n n′*, secured to the clutch-lever shaft, and the spring catches or pawls *m m′*, when used to retain the clutches L M in contact with the pulleys I and J after they have been thrown in by the arms Q Q′, substantially as herein described.

4. The arm *t*, loosely attached to the cross-bar D, and having an arm extending beneath the latch *m*, so that when the table raises the box or other article until it strikes the arm, the latch *m* will be lifted, and the clutch L will be automatically thrown out of contact with the pulley, substantially as described.

5. The rod *w*, with its adjustable nut *v*, and the lever *x* beneath the latch *m′*, in combination with an arm from the table B, so that the descent of the table will release the clutch M and arrest the descent of the table, substantially as herein described.

6. The plates *d*, shaft *e*, and cam Q, in combination with the interior plate *c*, working in slots 3 on guides 4, as and for the purpose described.

7. The bar *f*, having the diagonally-inclined vertical slots *i* opposite to each feeder, as shown, and provided with an arm, *g*, in combination with the incline *h* upon the cross-head V, for the purpose of moving the slots *i* across the front of the feeders, so that they will each receive one nail at each movement, and deliver it to the discharge-spout, substantially as herein described.

8. The bar *f*, made in two parts, the lower part having a projection, *i′*, which forms one side of the diagonal slot *i*, and is made movable, so as to adjust the size of the slot to the nails to be used, substantially as herein described.

9. The slides and straps *k*, in combination with the feeders, for the purpose of stopping the nails in one or more of them, substantially as herein described.

10. The combination of the V-shaped receiving-troughs Y, the parallel feeders *c*, the transversely-moving slotted bar *f*, and the flat-bottomed inclined spouts *j*, so constructed as to receive the nails in any position and deliver them into the nail-holders T in the proper position to be driven, substantially as herein described.

11. The inclined guiding-slot *h* upon the cross-head V, for operating the bar *f*, having one side made elastic for relieving the strain if the bar should be stopped in its movements, substantially as herein described.

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Witnesses:
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CHAS. G. PAGE.