A. S. KING.

NAILING MACHINE.

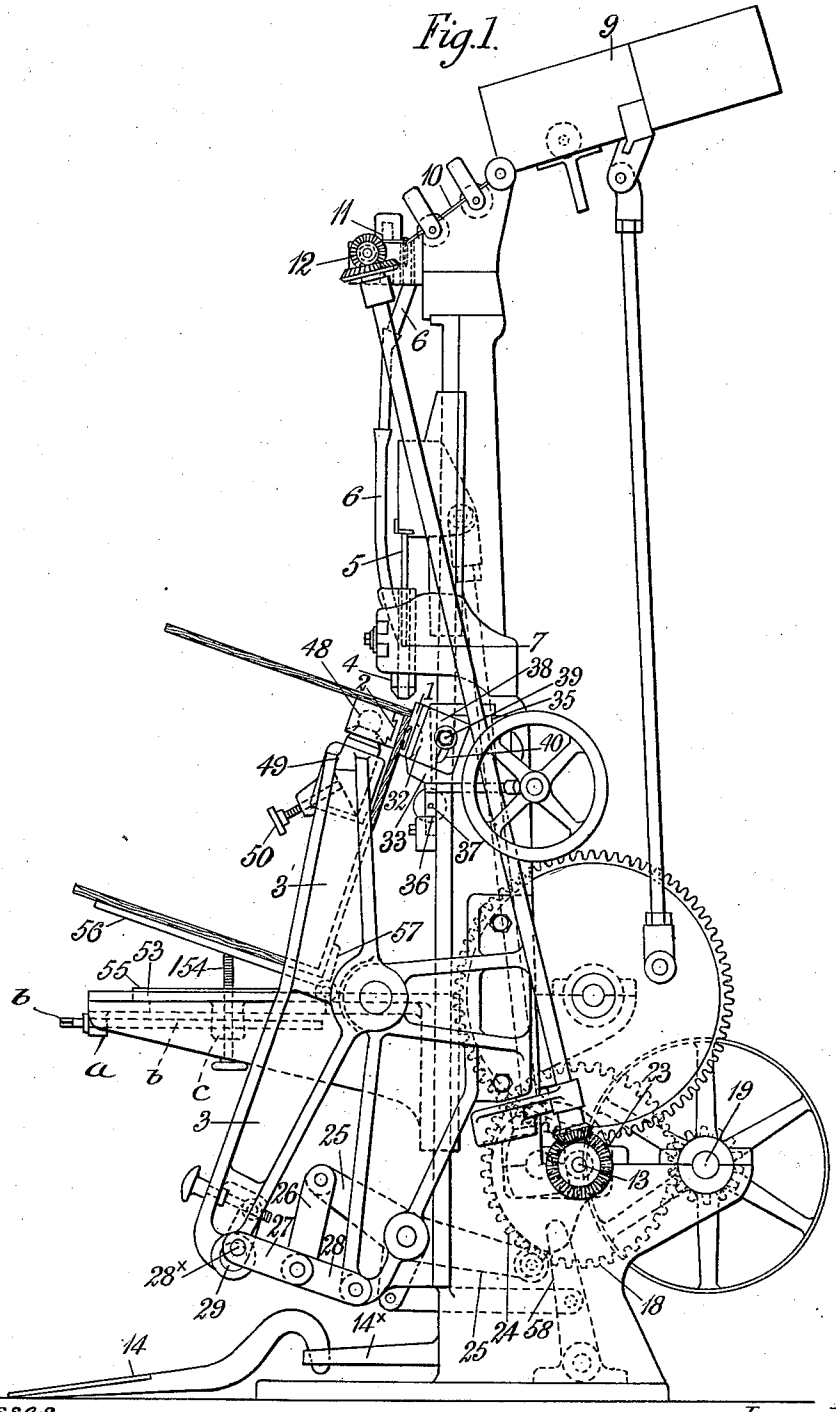
APPLICATION FILED JUNE 9, 1911.

1,026,679.

Patented May 21, 1912.

6 SHEETS—SHEET 1.

Fig. 1.



Witnesses

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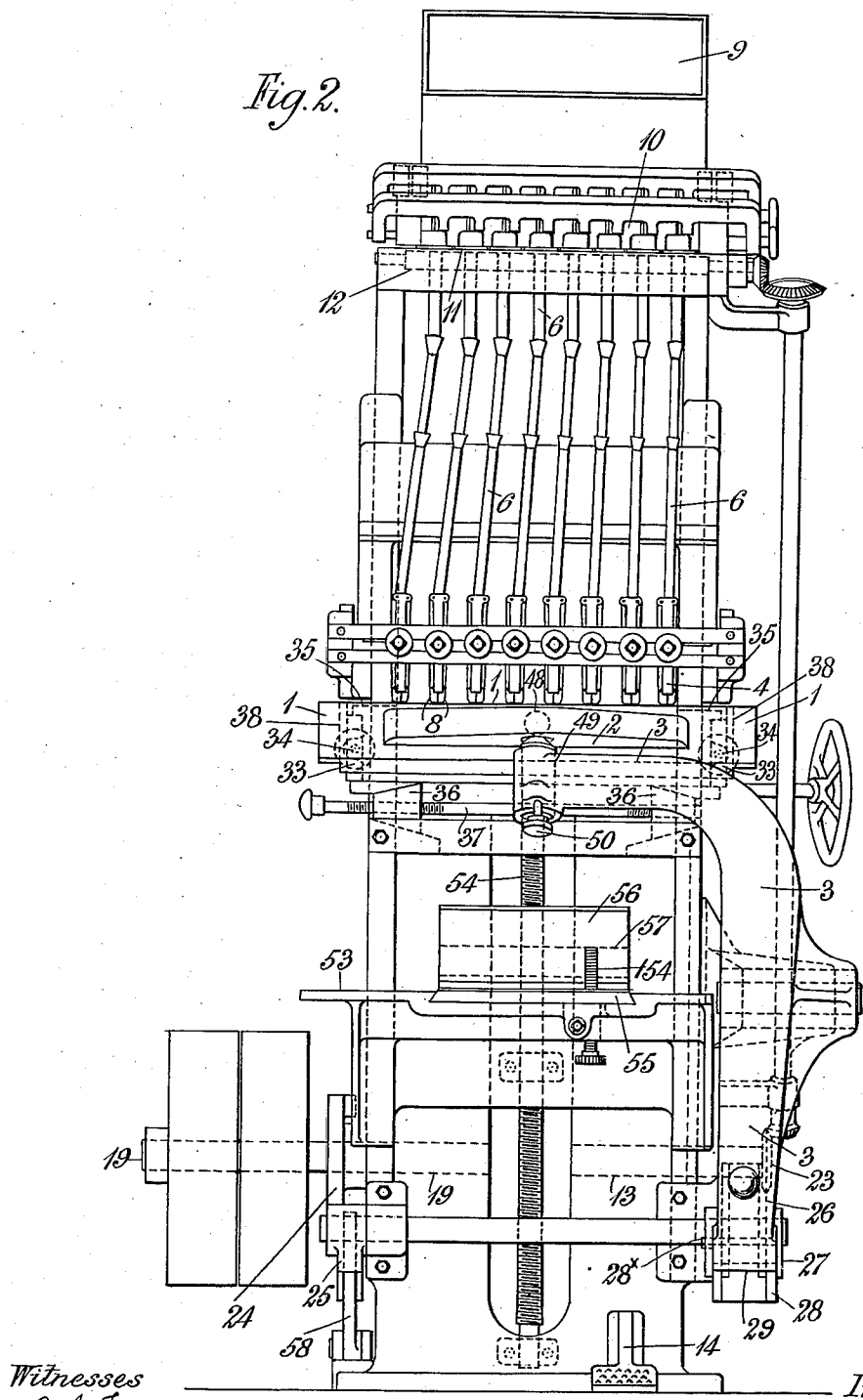
6 SHEETS—SHEET 2.

Fig. 2.



Witnesses

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6 SHEETS—SHEET 3.

Fig. 5.

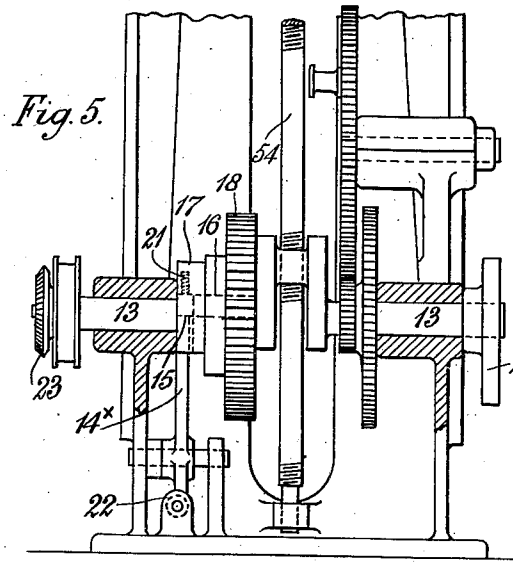


Fig. 4.

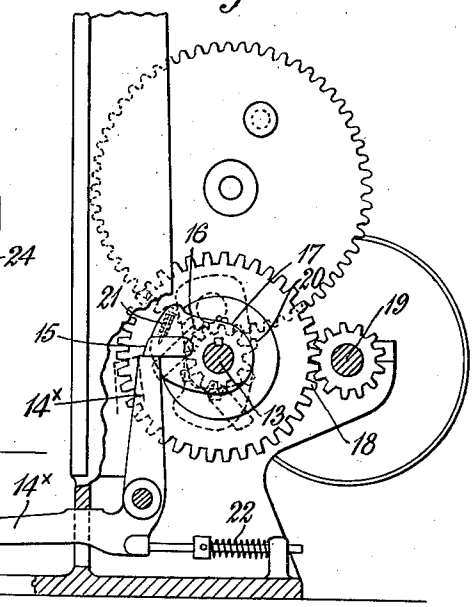
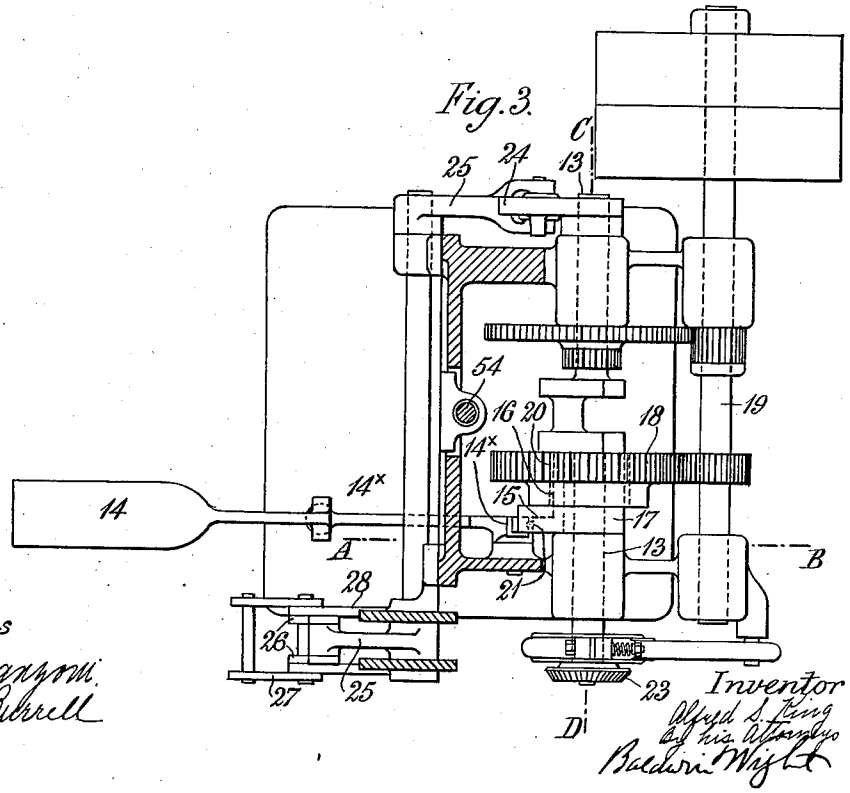


Fig. 3.



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6 SHEETS—SHEET 4.

Fig. 18.

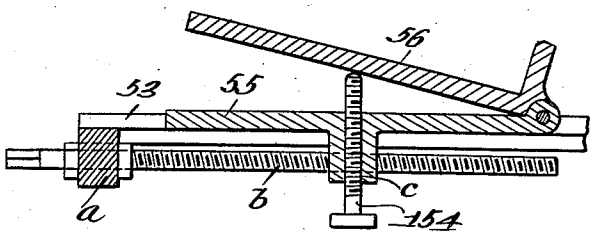


Fig. 6.

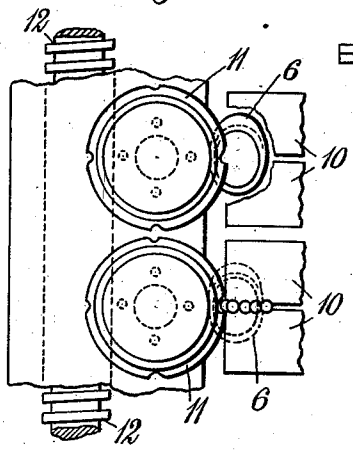


Fig. 10.

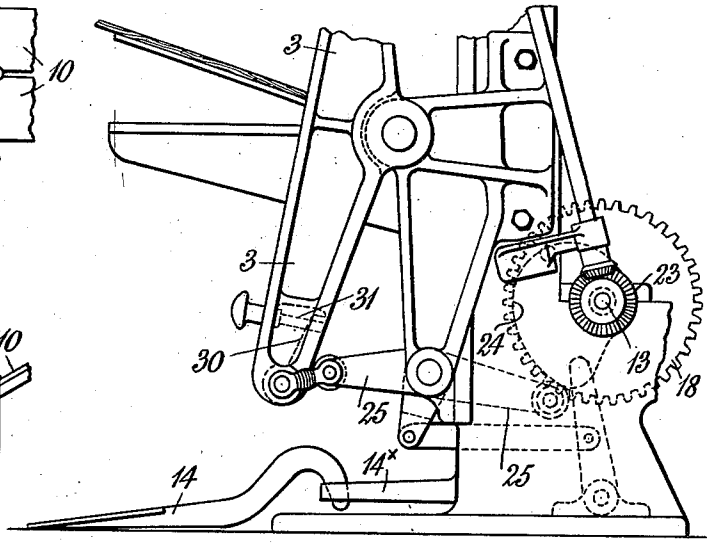


Fig. 7.

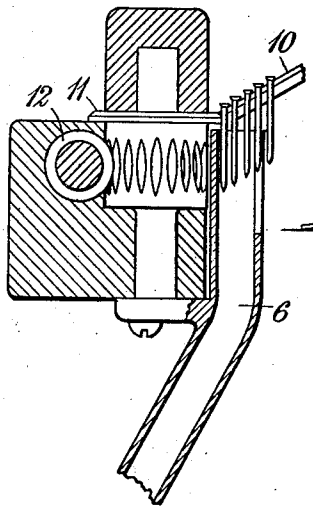


Fig. 16

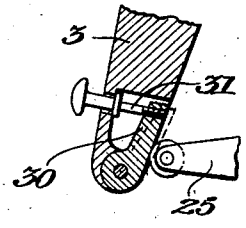
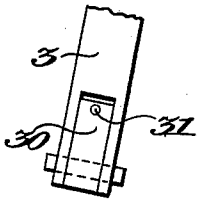


Fig. 17



Witnesses

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6 SHEETS—SHEET 5.

Fig. 8.

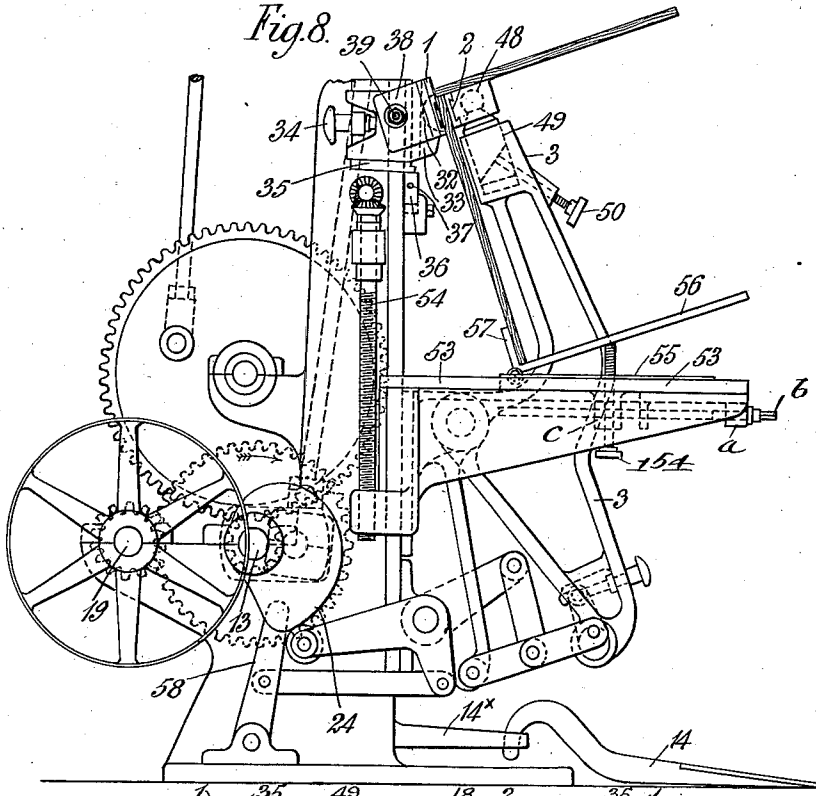
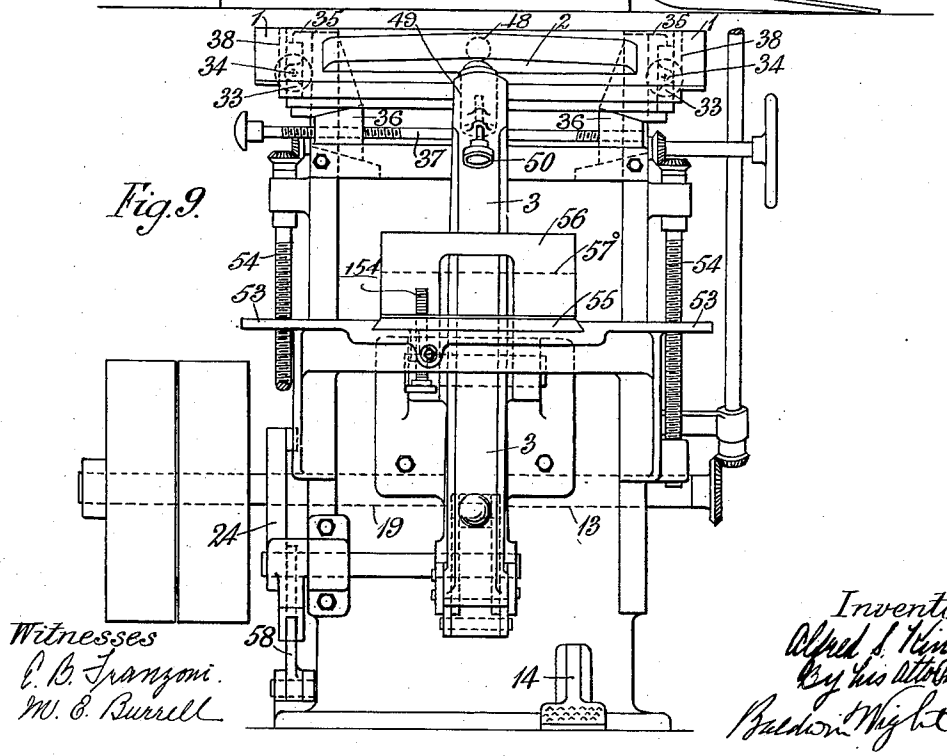


Fig. 9.



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6 SHEETS—SHEET 6.

Fig. 11.

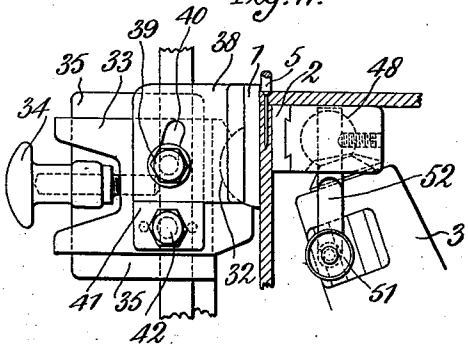


Fig. 13.

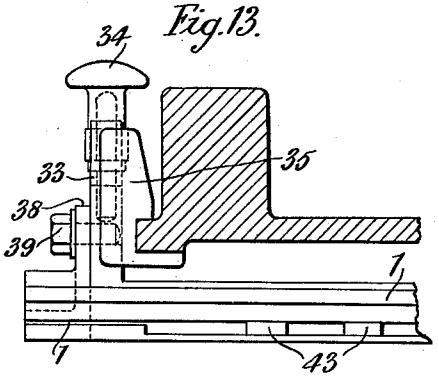


Fig. 12.

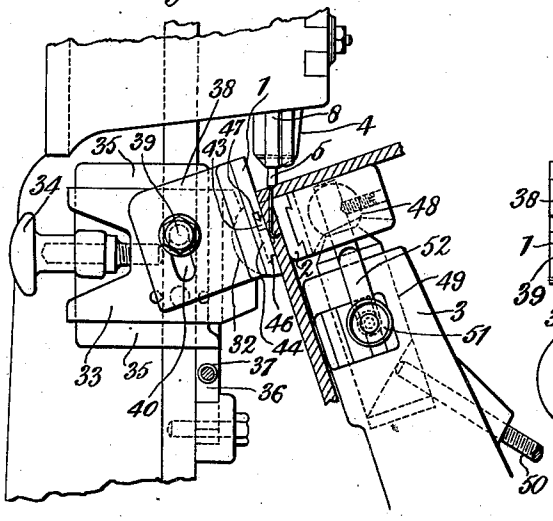


Fig. 14.

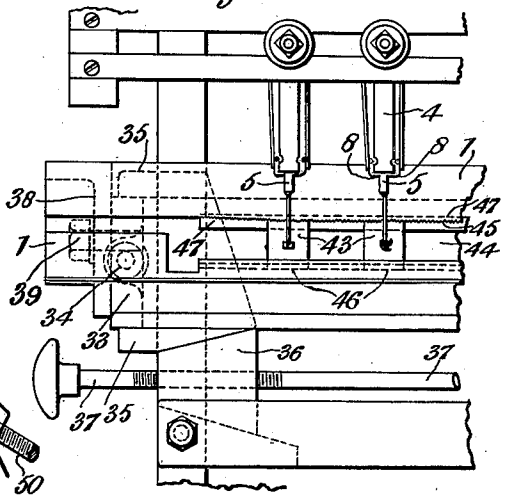
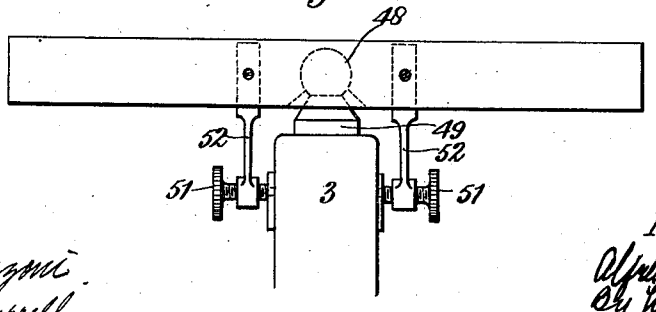


Fig. 15.



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UNITED STATES PATENT OFFICE.

ALFRED STEPHEN KING, OF NORWICH, ENGLAND.

NAILING-MACHINE.

1,026,679. Specification of Letters Patent. Patented May 21, 1912.

Application filed June 9, 1911. Serial No. 632,164.

To all whom it may concern:

Be it known that I, ALFRED STEPHEN KING, a subject of the King of Great Britain, residing at "Hollinsclough," Eaton Road, Norwich, England, have invented new and useful Improvements in Nailing-Machines, of which the following is a specification.

Heretofore nailing machines have been constructed in such a manner that nails have been delivered one by one into nail chucks or holders below plungers which are then caused to descend and to drive the nails which are then held in the nail chucks into the two parts of the work which are to be nailed together. Nailing machines of this kind have also been constructed in such a manner that the nail delivery mechanism and the plungers have been brought into action each time that a shaft has been allowed to make one complete revolution.

According to my invention I construct machines acting in the above manner in such a way that one part of the work (the one part of the work into which the points of the nails are to be embedded after they have been driven through the other part) is held between clamp plates or jaws which prevent the points of the nails from passing out from the work. I also cause one of these clamp jaws to be moved toward the other or fixed clamp jaw each time that the above mentioned shaft is allowed to make one revolution so that the piece of work which is to be held between them may be firmly clamped and held before the nail driving plungers descend and so that afterward when the nails have been driven the movable jaw is moved away from the fixed jaw to liberate the work. The clamp jaws can be held in planes at an angle inclined to the plane in which the plungers move so that the points of the nails when driven downward may come against the inner surface of the fixed or back jaw and be bent and deflected by it so as to again pass back into the work. I also form projecting guide surfaces on the inner face of this clamp jaw or on the inner face of both jaws to deflect the points of the nails in any directions desired. The upper surface of the movable or front jaw may also if desired be inclined so that the points of the nails may be made to come against and be deflected by it before they enter the piece of work that is held in the clamp. The nails used may be either single prong headed nails or they may be double prong nails commonly called staples.

My improvements are shown in the drawings annexed.

Figure 1 is a side elevation and Fig. 2 a front view of a machine in which the movable jaw of the clamp is operated by a lever at one side of the machine. Fig. 3 is a horizontal section of the lower parts of the machine. Fig. 4 is a vertical section taken through the line A—B, Fig. 3, and Fig. 5 a vertical section taken through the line C—D, Fig. 3. Figs. 6 and 7 show separately a plan view and section, on a larger scale, of the parts by which nails are delivered one by one point downward into each nail guide tube. Figs. 8 and 9 show a side elevation and front view of the lower half of a modified form of the machine in which the lever arm by which the movable front jaw of the clamp is carried is placed centrally instead of being at one side of the machine as in Figs. 1 and 2. Fig. 10 shows in side elevation a modified way of giving a rocking motion to the lever arm. Figs. 11 and 12 are side elevations of the back and front clamp jaws and the parts by which they are carried illustrating how they can be set either parallel with the nail hammer or be inclined thereto. Fig. 13 is a plan partly in section and Fig. 14 is a front elevation of the parts shown in Fig. 12 with the front jaw removed. Fig. 15 is a front elevation of the front jaw and upper part of the lever arm by which it is carried when the carrying lever is placed centrally of the machine. Figs. 16 and 17 are detail views showing one way of adapting the clamp for different thicknesses of material. Fig. 18 is a detail view in section, showing the devices for adjusting the slide on the supporting table and the hinged member carried by said slide.

In Figs. 1 to 5, 1 (see Figs. 1 and 2) is the back jaw of the clamp held fast to the framing of the machine, 2 is the movable front jaw of the clamp carried by the upper end of a lever 3 by rocking which it can be moved toward or away from the fixed jaw. 4 are the nail chucks or holders in which the nails are held point downward before they are forced out from the chucks or holders and driven into the work by the descent of hammers or plungers 5. These chucks or holders may be of any ordinary construction. In the drawing they are shown as being of the construction ordi-

narily used for holding single pronged, headed nails. In the construction shown in the drawing such nails are delivered point downward one by one in the ordinary way down tubes 6 into the lower part of vertical tubes 7 (see Fig. 1) below the plungers when the plungers are raised, the plungers fitting within the tubes 7 and being raised and lowered as usual. The nail dropped into each tube 7 drops from the bottom of this tube into a coned passage between two jaws 8 which normally are pressed together by springs in the usual way. The nail cannot drop through this coned passage but when the plunger descends it forces the nail downward and thereby causes the jaws to move away from one another and allow of the nail being driven down into the work.

In the machine shown in the drawings the means used for delivering the nails one by one to the guide tubes 6 are of the most usual construction. The nails are delivered from the hopper 9 in the ordinary well known way and as illustrated in Figs. 6 and 7 and travel downward in a single file suspended by their heads with their stems hanging down through a space between two inclined parallel plates 10. The lowermost nail comes against a disk 11 and is thereby stopped. The disk is turned one quarter of a revolution each time that the foot lever is depressed and has a series of notches in its circumference say four or two; whenever one of these notches comes around opposite to the lowermost nail, this nail passes down into the notch and is carried around in it and as the disk revolves is allowed to drop into the guide tube 6. The disk as usual rests on the top of, and is driven by, a worm wheel which is driven by the worm 12. As usual the worm wheel has points projecting up from it which pass into holes in the disk and the disk is held down by a weight so that in case of any obstruction the disk is lifted and the worm wheel can be turned without turning the disk. As heretofore an intermittently revolving motion is given to the worm 12 and the nail plungers or hammers have a vertical to and fro movement given to them from the crank shaft 13 which whenever a treadle 14 is depressed is caused to make one revolution.

Any suitable means may be adopted for causing the crank shaft 13 to make this one revolution whenever the treadle is depressed. In the machine shown in the drawings it is effected in the way shown in Figs. 3, 4 and 5. The treadle when depressed rocks a bell crank 14^x and turns the vertical arm of this crank away from an arm 15 which extends from a half round locking key 16 which when out of action lies within a recess in the circumference of a sleeve 17 which is keyed to the crank shaft. A toothed wheel 18 driven continuously from a driving shaft 19 turns around the exterior of the sleeve and has notches or recesses 20 in its inner circumference. A spring 21 acts against the arm 15 and when the treadle is depressed and the vertical arm of the crank lever 14^x moved away from the arm 15 this arm is free to be turned by the spring and one edge of the locking key thereby caused to project out from the sleeve into one or other of the recesses 20 and so locks the sleeve to the continuously revolving wheel 18 and the crank shaft is thereby caused to revolve. Before it has completed one revolution the treadle will have been released and the crank lever 14^x will have been brought back to its normal position by the action of a spring 22. When the crank shaft has completed one revolution the arm 15 which extends from the locking key 16 comes against the top of the vertical arm of the crank lever 14^x and is thereby turned into such a position that it lies within the recess in the circumference of the sleeve and no longer locks the sleeve to the continuously driven wheel and the crank shaft remains at rest until the treadle is again depressed. From the central crank of the crank shaft an up and down motion is given to the nail hammers as shown in Fig. 1 and as shown in this figure and in Fig. 2 intermittent motion is transmitted from a bevel wheel 23 which is fast on the end of the crank shaft, to the worm 12 which operates the nail delivery mechanism. To the crank shaft, I, according to my invention, secure a cam 24 from which I transmit a backward movement to the movable clamp jaw 2 each time that the crank shaft makes one revolution.

In the machine shown in Figs. 1 and 2 the cam rocks a lever 25 which by a link 26 acts upon toggle links 27, 28. The outer end of one link 28 turns on a fixed pivot while the outer end of the link 27 is connected to a pin 28^x projecting eccentrically from a short axis 29 carried by the lower end of the lever 3 which carries the front clamp jaw. The axis has an arm projecting from it by which a partial turn can be given to it to set the pin 28^x nearer to or farther from the fixed pivot at the outer end of the link 28 and so set the movable jaw of the clamp nearer to or farther from the fixed jaw when the toggle links 27, 28 are brought into line. In this way the clamp can be adapted to clamp the part which is to be held in it whatever may be the thickness of this part. In the modification shown in Fig. 10 in which the lever 25 is made to act directly against the lower end of the lever 3 the same end is attained by jointing to the lower end of the lever 3 an arm 30 for a roller or track on the end of the lever 25 to bear against and by setting the arm to any angle desired by a screw 31. These devices are illustrated in Figs. 16 and 17. To allow

of the back clamp jaw 1 being set either parallel with or inclined to the vertical plane in which the nail plungers work, and to allow of its being moved backward or forward or raised or lowered, this jaw has a horizontal semi-cylindrical projection 32 at the back along its entire length. This projection rests in a correspondingly curved socket along the front face of a bar which at its ends has slide plates 33 extending backward from it which by screws 34 (one at each end) can be moved backward or forward along horizontal guides on blocks 35 carried by the framing of the machine and which can be raised or lowered by wedges 36 moved endwise by a screw 37 as shown in Fig. 14. The back jaw 1 has also plates 38 extending backward from its ends. These plates fit against the slide plates 33 and can be clamped to them by locking bolts 39 which pass through slots 40 cut through the plates 38 concentrically with the cylindrical projection 32. This cylindrical projection forms a pivot around which the jaw can be turned and inclined to any angle desired and the jaw can then be locked by the locking bolts.

In Fig. 12 the jaw 1 is shown locked in an inclined position for inclined nailing and in Fig. 11 in a vertical position for central plane nailing. When set for central plane nailing a dowel plate 41 may be fixed by a bolt 42 to the slide 33 for the under side of the plate 38 to rest against. When used for central nailing the back jaw may be formed with a plain flat front face. When the back jaw is to be inclined in order to turn or clench the nails it is, as shown in Figs. 12 and 14, adapted to have nail turning die plates 43 secured at any desired distance apart to its front face, (one below each nail plunger). A recess 44 is formed along the front face. This recess at the top is formed with rack teeth 45 as shown in Fig. 14 and may if desired have a grooved channel formed along it at the bottom as shown. Each die plate 43 is at the top formed with teeth to engage with the rack teeth 45 and at the bottom may be formed with a downward projection 46 to enter the grooved channel. The die plates can be inserted into place from the front and when in place may be locked by a key bar 47 as shown in Fig. 12 or in other suitable ways. The upper part of this key bar passes along a recess at the back of the rack teeth 45 while its lower part passes into a recess in the top of each die plate. Each die plate according to the work to be done has either a rounded projection standing out from its face as shown in Fig. 12 which deflects the points of the nails and causes them to bend into a hook form in a plane at right angles to the face of the die plate as shown in that figure and on the left hand side of Fig. 14. Or the projection may be shaped in such way as to bend them into a hook form in a plane inclined to the face of the die plate as shown on the right hand side of Fig. 14. Or instead of projections standing out from the face of the die plates shallow grooves might be formed in the face of the die plates to effect the same object. Or the nail deflecting surfaces might be angular or they might be compounded of one or more of these features according to the nature of the work to be done. In some cases also similar nail deflecting surfaces may in addition be provided on the front clamp jaw so that the points of the nails having been deflected by nail deflecting surfaces on the back jaw and thereby caused to strike the front jaw may be a second time deflected by guide surfaces on this front jaw. Or if the upper surface of the front clamp were for some classes of work inclined and the nails when driven down through the work caused to first strike against this inclined surface this surface might be provided with nail deflecting guide surfaces to cause the points to afterward pass into the part of the work placed against the back jaw.

The front jaw 2 can be adjusted to bring its face parallel with the face of the back jaw. It is carried by a ball and socket joint at the upper end of the lever 3. The ball and socket joint can be raised or lowered, the ball 48 having a stem 49 descending from it which can be raised or lowered in a socket at the upper end of the lever and be kept at any elevation desired by means of a set screw 50 as shown in Fig. 12. The front jaw when inclined to the desired angle to correspond with the angle of the fixed jaw can normally be maintained at this angle and horizontally by screws 51 screwed through spring arms 52 projecting downward from it as shown in Fig. 15. The spring arms while thus normally holding the front jaw approximately in the position desired still allow of its alining itself to irregularly sawed work and giving a more uniform pressure than would be possible with a front jaw that was rigidly locked in parallel position.

53 is the table for supporting that portion of the work the upper portion of which is to be grasped in the clamp before the clamp closes. This table can be raised or lowered to any desired height by screws 54 as shown. The table 53 has on its surface a horizontal slide 55 which can be set backward or forward upon the table. The slide is provided with a downwardly projecting portion *c* through which extends a horizontally arranged screw *b* that passes through a downwardly projecting portion *a* of the table 53. By means of the screw *b* the slide may be made to move back and forth. The back end of the slide 55 has jointed to it an upper table 56 upon which the work rests. This

upper table 56 may be raised and lowered by means of a vertically arranged screw 154 passing through the slide and the part *c* thereof. At the back of this upper table is an upwardly projecting plate 57 which forms a stop for the lower part of the work resting on the table to bear against. By adjusting the position and angle of the upper table the piece of work which is at the top to be clamped by the clamp may when the clamp is open be placed upon the upper table with its lower part bearing against the plate 57 and its upper part against the face of the back clamp jaw and the piece of work be so supported in an inclined position corresponding with the inclination of the back clamp jaw.

58 is a lever by which the clamp is opened when a bowl on the side face of the cam comes around against it.

The action of the machine is as follows: One of the two parts which are to be nailed together is placed by hand into position with its lower edge resting on the upper table and its upper part resting against the front face of the back clamp jaw. The second part of the work which is to be nailed to the first is then placed over the top of the front clamp jaw and its edge held against the back clamp jaw as shown in Figs. 11 and 12. The workman then depresses the treadle whereby the crank shaft 13 is caused to make one revolution which causes the nail plungers to be forced downward and nails driven down into the work as illustrated in these figures. For nailing together the sides of boxes the machine shown in Figs. 1 and 2 is used, but for nailing the bottom of a box to the sides then I use the machine shown in Figs. 8 and 9. If desired a machine might be constructed to do both classes of work by providing in one machine not only the front jaw arm shown in Fig. 2 but also the front jaw arm shown in Fig. 9 and making their upper parts removable by providing suitable sockets in front of the fulcrum whereby the socketed arms could in turn be respectively used on the completion of each class of work appropriate to each arm.

In the drawings I have only shown the machine adapted for nailing together the parts of boxes having flat sides but if the back and front jaws were curved the machine could be used for nailing flat ends on to the ends of cylinders.

What I claim is:—

1. In a box nailing machine the combination of a row of nail chucks or holders, plungers or hammers reciprocated to and fro for driving down the nails from the chucks or holders, a pair of inclined clamp jaws below the chucks or holders, one clamp jaw fixed with the lower part of its inner face positioned in front of the longitudinal central lines of the plungers or hammers and the upper part of the same face in rear of these lines, the other clamp jaw movable toward and away from the said inner face of the fixed jaw so that when the upper part of one board is held between the clamp jaws and another board is held down on to the top of the movable clamp jaw and on to the top edge of the board held between the jaws, nails may be driven down through both of them and the nail points brought down on to the inner face of the fixed clamp jaw and thereby clenched.

2. In a box nailing machine the combination of a row of nail chucks or holders, plungers or hammers reciprocated to and fro for driving down nails from the chucks or holders, a pair of clamp jaws below the chucks, one jaw having means for mounting and for adjusting it in such manner that it can be raised or lowered and moved horizontally backward or forward and inclined at any desired angle to the plane in which the hammers move and a jaw movable toward and away from the first mentioned jaw and provided with means constructed and arranged to permit adjustment of the movable jaw into parallelism with the first mentioned jaw when clamping a board against it.

3. In a box nailing machine the combination of a row of nail chucks or holders, plungers or hammers reciprocated to and fro for driving nails from the chucks or holders, a pair of clamp jaws below the chucks or holders, one jaw fixed and the other movable and provided near its center with a ball and socket joint, means for raising and lowering said movable jaw and devices for moving said movable jaw toward and away from the fixed jaw.

4. The combination of the back clamp jaw, means capable of adjustment so that this jaw can be raised and lowered and moved horizontally forward and backward and also inclined to any desired angle and of a front jaw mounted at its center on a ball and socket joint, a lever arm at the end of which this joint is mounted, means for rocking this lever to move the front jaw toward and away from the fixed jaw and means whereby the front jaw can be set nearer to and farther away from the fixed jaw to adapt it for different thicknesses of work.

5. The combination of the back jaw, the front jaw, the ball and socket joint by which said front jaw is carried, the rocking lever carrying the ball and socket joint, the spring arms projecting downward from the front jaw one on either side of the ball and socket joint and means for causing the lower ends of these spring arms to bear against the lever to tend normally to hold the front jaw in any position into which it may have been set and yet allow of the front jaw when moved toward the fixed jaw adapting

its position to give a uniform pressure against any piece of work placed between the jaws.

6. The combination of a clamp jaw, means for holding the work against the inner face of this jaw, means for driving a nail through the work and toward this face in a direction inclined to it, and a projecting guide surface on the inner face of the jaw against which the point of the nail strikes after coming against the inner face of the jaw, which projecting guide surface bends the nail and directs its point back again into the work.

7. In a box nailing machine, the combination of a row of nail chucks or holders, plungers or hammers reciprocated to and fro for driving down the nails from the chucks or holders, a pair of clamp jaws below the chucks or holders, one clamp jaw being adjustable to be inclined to any desired angle to the plane in which the plungers or hammers move and to be locked in this inclined position, the other clamp jaw movable toward and away from the fixed clamp jaw, a table below the clamp jaws, means for tilting this table to bring it into a plane approximately at right angles to the plane of the inner face of the fixed clamp jaw, a ledge projecting up from the rear edge of the table, means for raising and lowering the table and means for moving it horizontally backward and forward whereby the ledge can be brought into the same plane as the inner face of the fixed clamp jaw.

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Witnesses:
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