(No Model.)

5 Sheets—Sheet 1.

H. W. WINTER.

HEEL NAILING MACHINE.

No. 591,366. Patented Oct. 5, 1897.

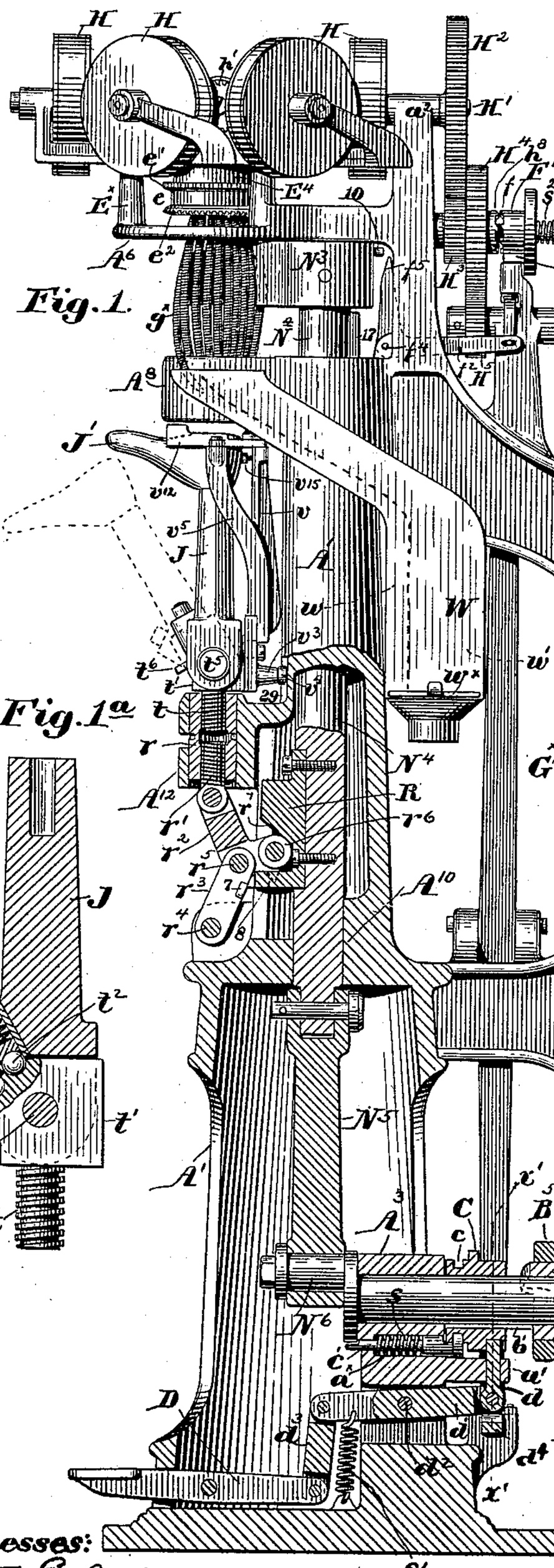

Fig. 1.

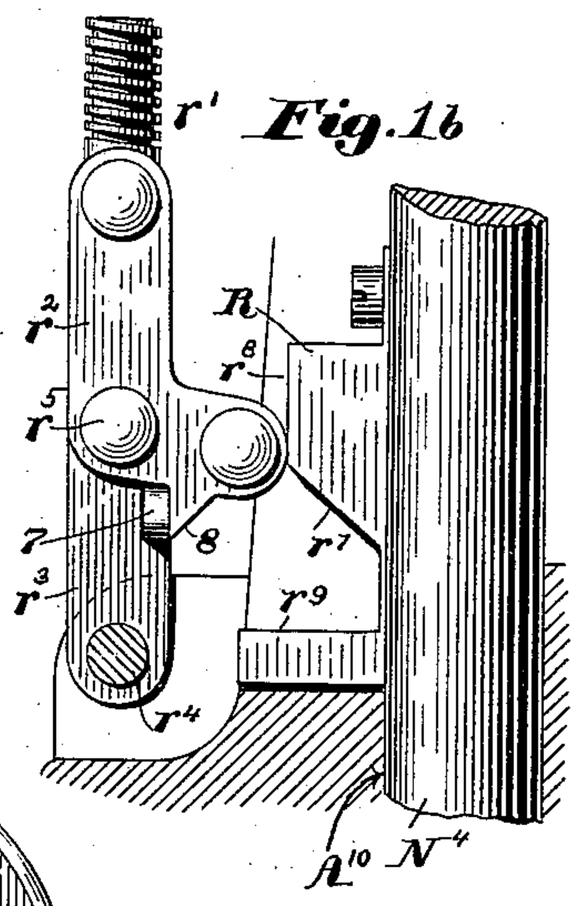

Fig. 1b

Fig. 1a

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Inventor:
Henry W. Winter;
by Crosby & Gregory. Attys.

(No Model.) 5 Sheets—Sheet 2.

H. W. WINTER.

HEEL NAILING MACHINE.

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Fig. 7.

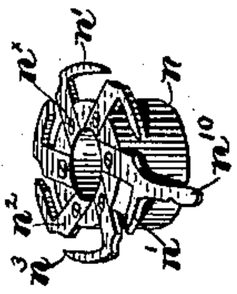

Fig. 6.

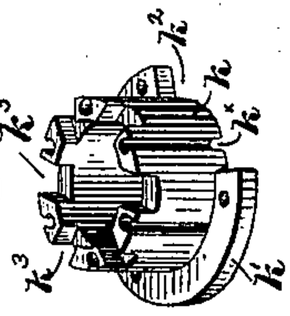

Fig. 5.

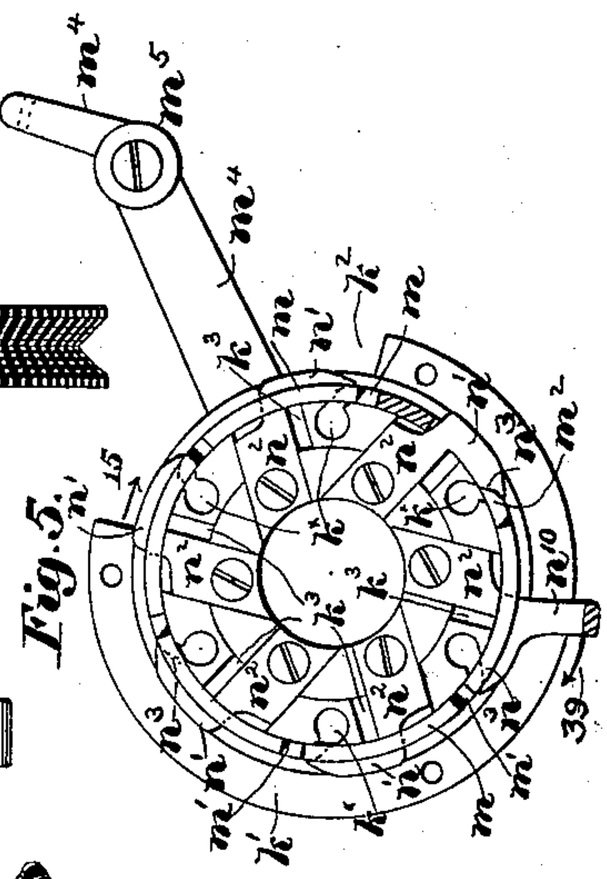

Fig. 2

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(No Model.)

5 Sheets—Sheet 3.

H. W. WINTER.

HEEL NAILING MACHINE.

No. 591,366. Patented Oct. 5, 1897.

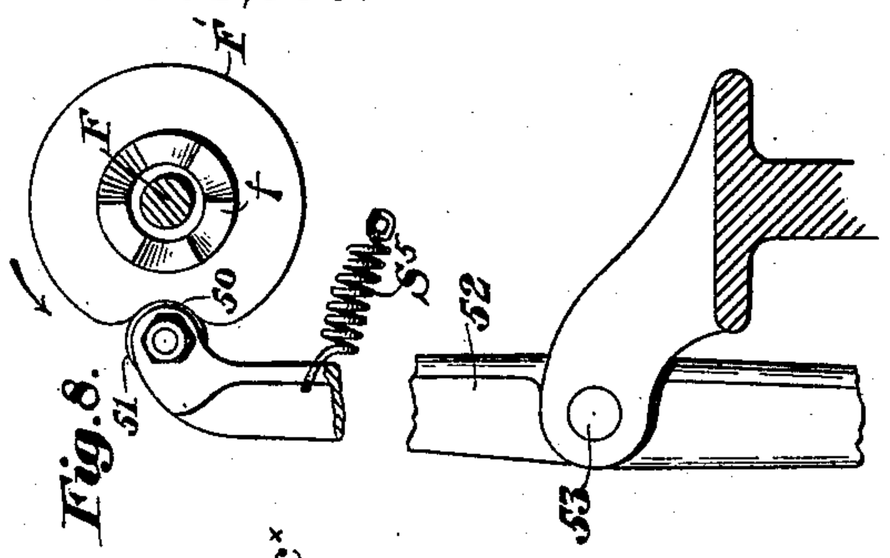
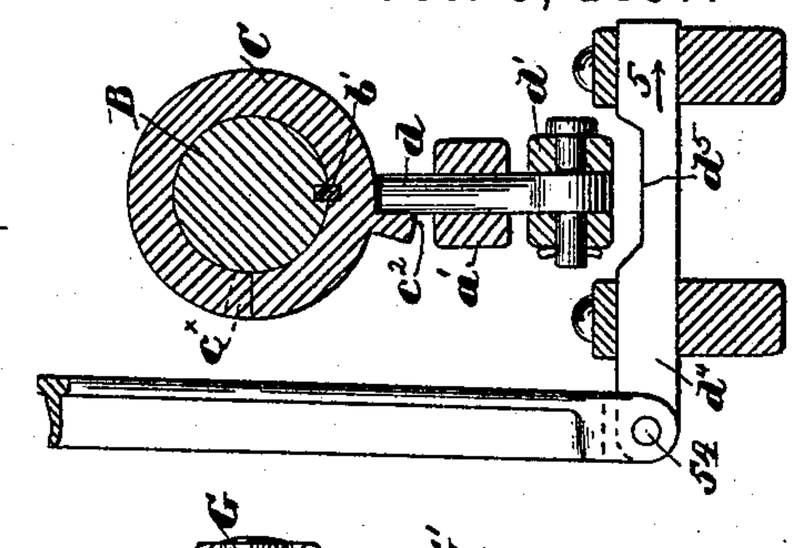


Fig. 8.



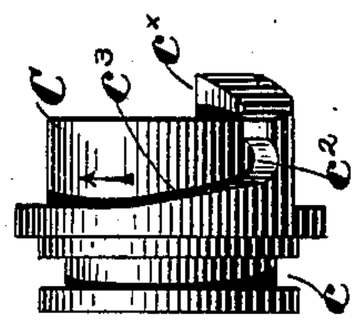


Fig. 9.

Fig. 3.

Fig. 11.

Fig. 10.

Fig. 12.

Fig. 12a.

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(No Model.) 5 Sheets—Sheet 4.

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HEEL NAILING MACHINE.

No. 591,366. Patented Oct. 5, 1897.

Fig. 4.

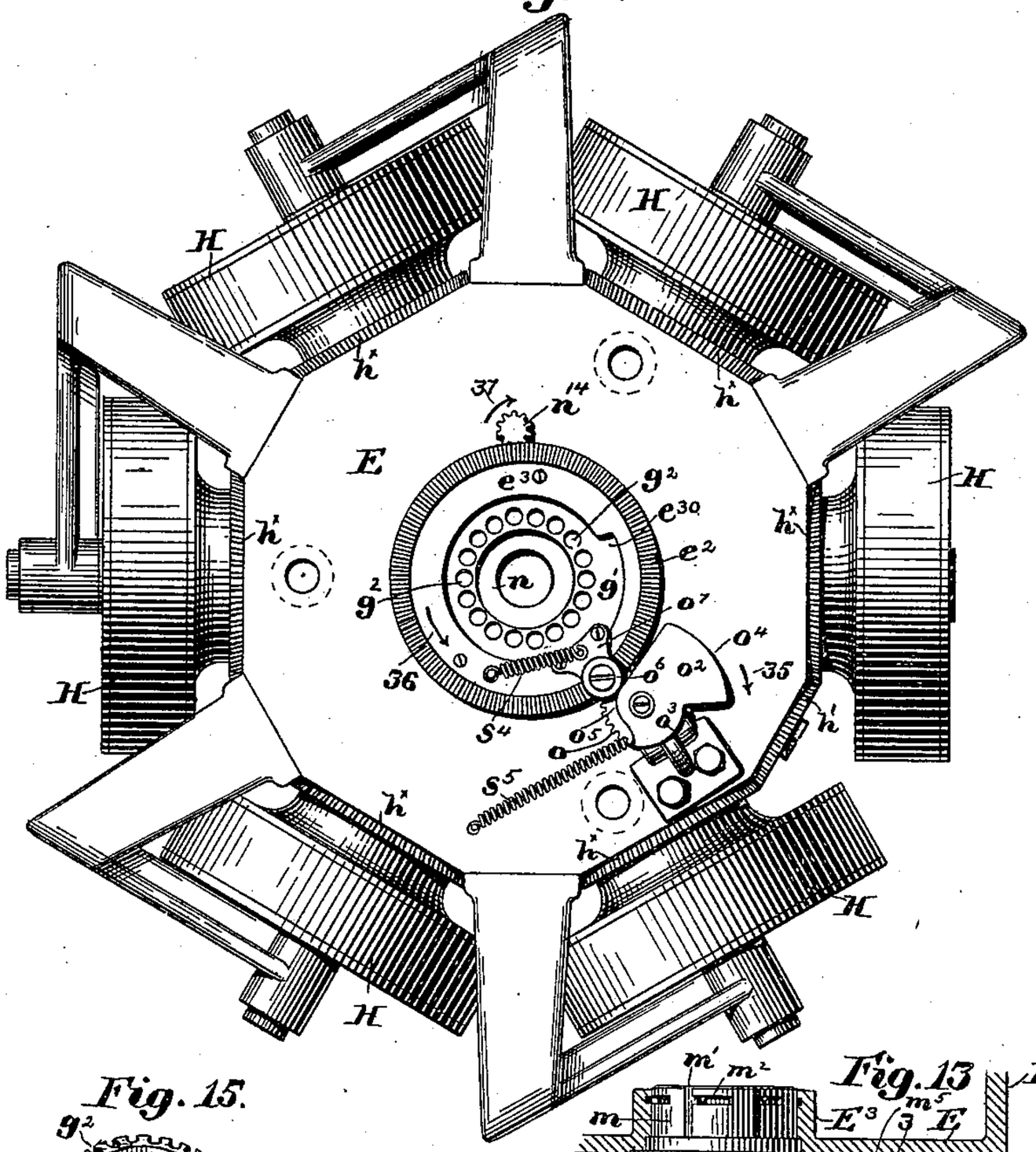

Fig. 15.

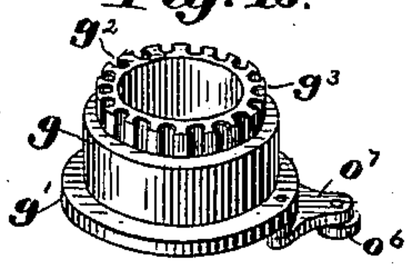

Fig. 16.

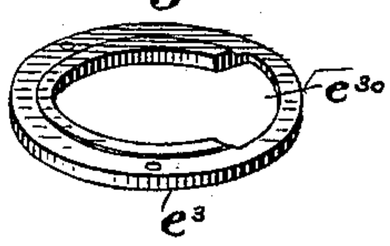

Fig. 13.

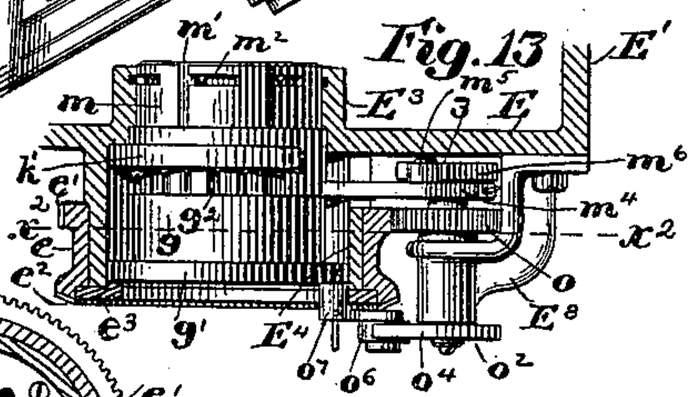

Fig. 14.

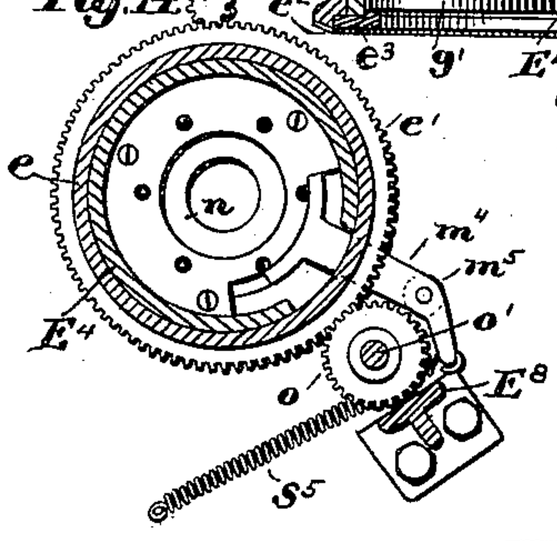

Fig. 17.

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(No Model.) 5 Sheets—Sheet 5.

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HEEL NAILING MACHINE.

No. 591,366. Patented Oct. 5, 1897.

Fig. 18.

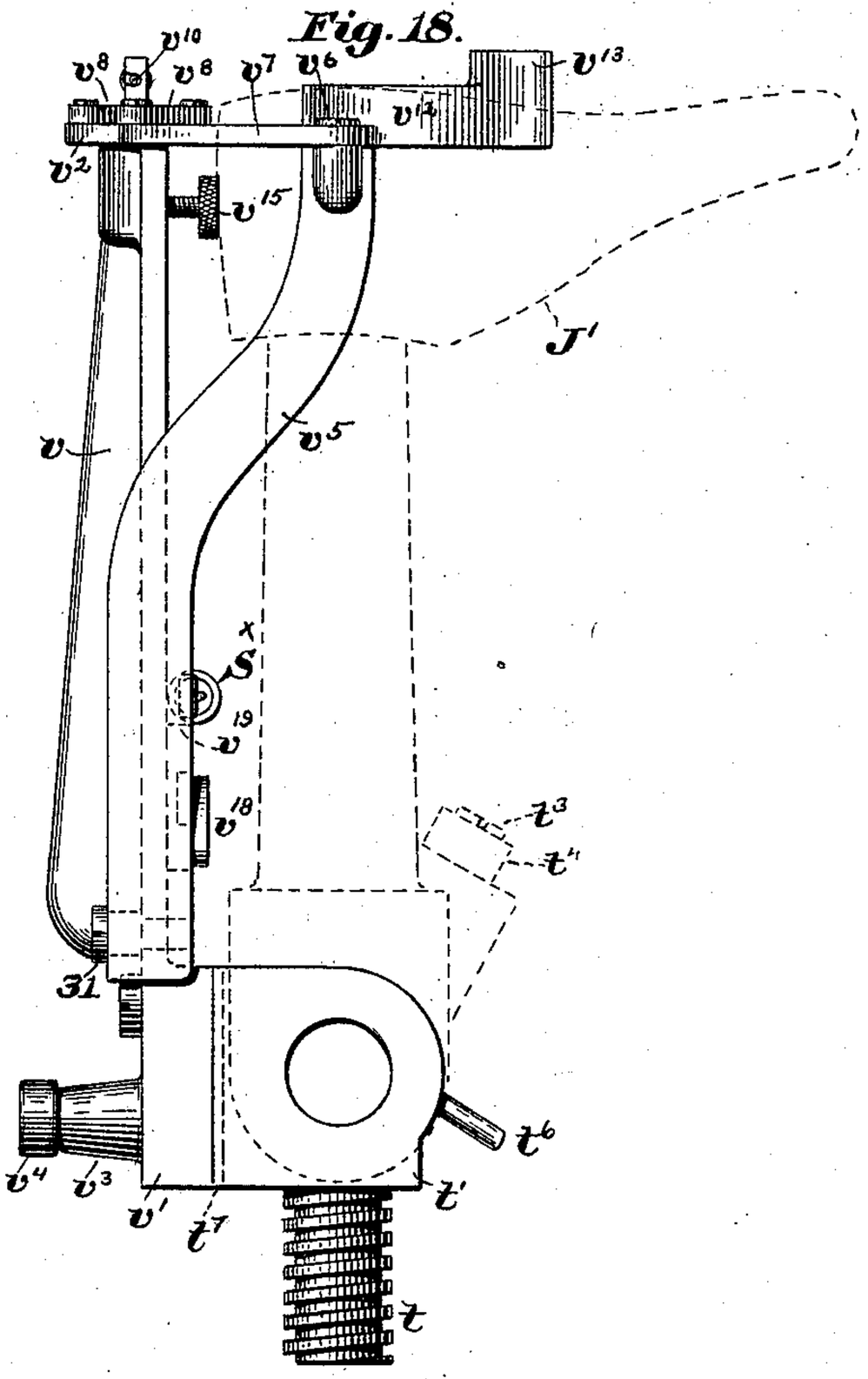


Fig. 19.

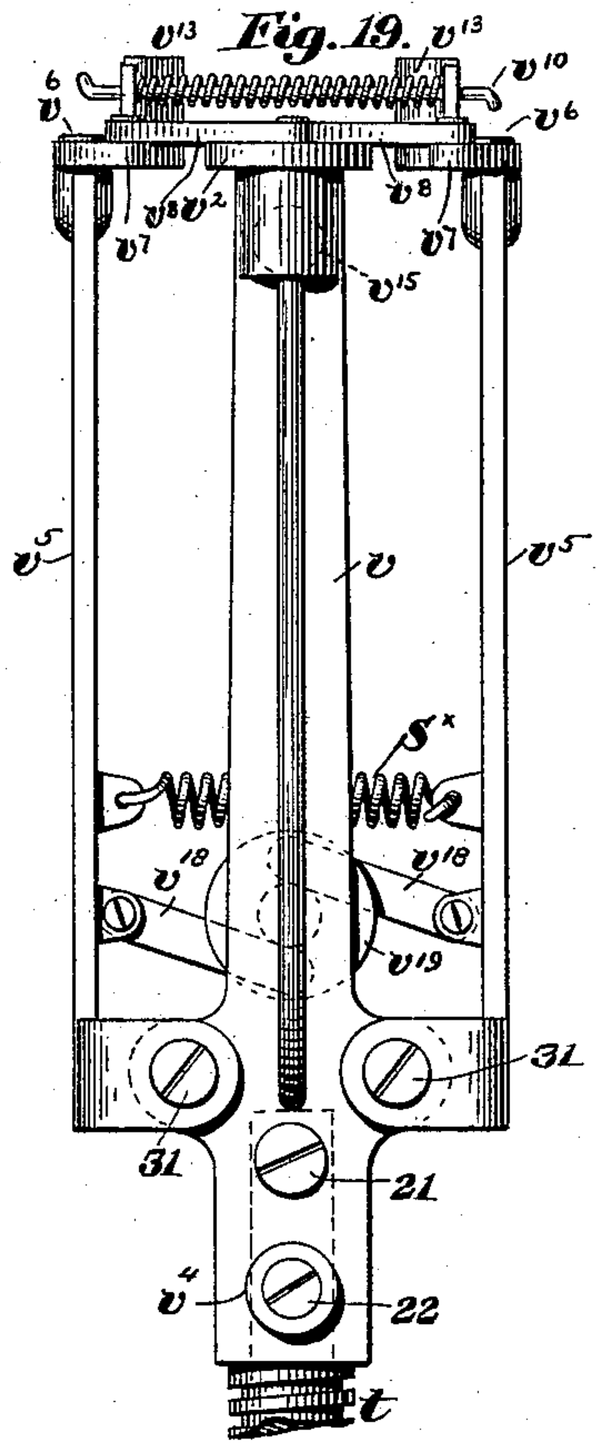
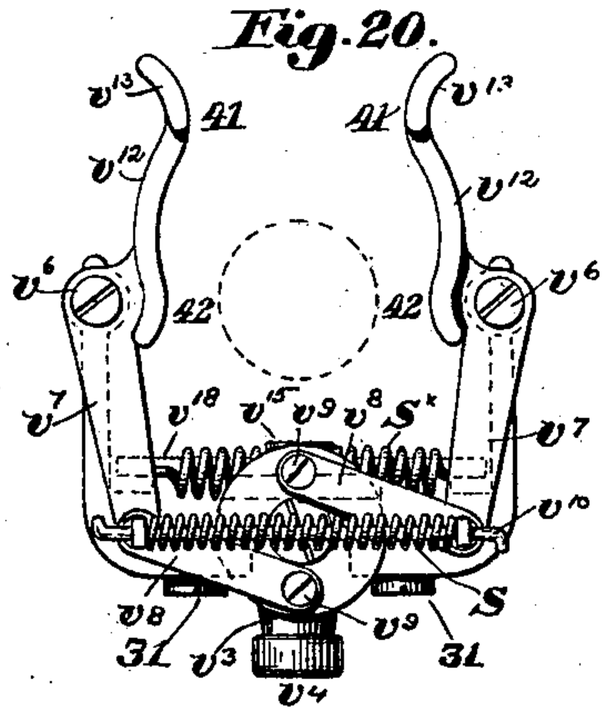


Fig. 20.



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UNITED STATES PATENT OFFICE.

HENRY W. WINTER, OF BOSTON, MASSACHUSETTS.

HEEL-NAILING MACHINE.

SPECIFICATION forming part of Letters Patent No. 591,366, dated October 5, 1897.

Application filed November 27, 1896. Serial No. 613,589. (No model.)

To all whom it may concern:

Be it known that I, HENRY W. WINTER, of Boston, in the county of Suffolk and State of Massachusetts, have invented an Improvement in Heel-Nailing Machines, of which the following description, in connection with the accompanying drawings, is a specification, like letters and figures on the drawings representing like parts.

This invention has for its object the production of an apparatus wherein a series of nails are fed or conveyed directly from suitable distributing mechanism to a nailing-block from which they are driven into the heel of a boot or shoe mounted upon a suitable support to attach the heel. The nailing-block forms also one member of a heel-compressing mechanism by which the heel is compressed just prior to the insertion of the nails therein. I have arranged the apparatus in such manner that while one set of nails is being driven into a heel a new set will move into position ready to enter the nailing-block upon withdrawal of the drivers, so that at every complete cycle of operation of the apparatus the work-support will be moved to bring the heel into position, a set of nails will be driven into the heel, attaching it to the shoe, and a fresh set of nails will be presented in readiness to be driven into the next heel.

Figure 1, in side elevation and partially in section, represents a heel-nailing apparatus embodying my invention. Fig. 1^a is an enlarged sectional detail of the lower part of the jack-spindle and lock. Fig. 1^b is an enlarged detail, in side elevation, of the mechanism for effecting the movement of the work-support to compress the heel. Fig. 2 is a top or plan view of the apparatus shown in Fig. 1 on a larger scale. Fig. 3 is a vertical sectional view of the upper part of the apparatus, taken on the line $x\,x$, Fig. 2. Fig. 4 is an under side view of the nail-distributing mechanism. Fig. 5 is an enlarged view of the nail-transferrer, to be described. Figs. 6 and 7 are perspective views of details of the transferrer. Fig. 8 is a detail, partly in section and in elevation and broken out to save space, on the line x', Fig. 1, looking to the right, of the starting and stopping mechanism for the apparatus. Fig. 9 is a side elevation of the main controlling clutch-cam shown in section in Fig. 8. Fig. 10 is a top or plan view of the nail-guide block. Fig. 11 is an enlarged vertical sectional view of the throat of one of the nail-delivery tubes or passages. Fig. 12 is an enlarged vertical sectional view of one of the nail-detents located in the nail-block, and Fig. 12^a is a lower end view of the detent shown in Fig. 12. Fig. 13 is a partial side elevation of the nail-transferring mechanism, the members shown in Figs. 6 and 7 being partly omitted. Fig. 14 is a transverse sectional view of the transferring mechanism, taken on the line $x^2\,x^2$, Figs. 3 and 13, looking up. Figs. 15 and 16 are perspective details of the transferring mechanism shown in Figs. 3 and 13. Fig. 17 is a plan view of the nail-carrier-controlling cam. Figs. 18, 19, and 20 are enlarged views, in side and end elevation and plan, respectively, of the positioning device for the shoe to insure its proper presentation to the nailing mechanism.

The main frame of the apparatus comprises a suitable base A, an upright hollow column A′, and brace A^2 of suitable shape to provide bearings for the operating parts of the mechanism, the main frame being provided with bearings A^3 A^4 for the main driving-shaft B, on which is loosely mounted the sleeve-like hub B′ of a driving-pulley B^2, adapted to be continuously rotated from any suitable source of power, said sleeve extending through the bearing A^4 and having at its inner end a clutch-lug $b^\times$ to coöperate at times with a lug $c^\times$ (see dotted lines, Fig. 8, and full lines, Fig. 9) on the movable member C of the main clutch member feathered on the main shaft by a suitable spline, as b', Fig. 8.

The clutch member C is annularly grooved at c to engage the notched end of a spring-controlled plunger c', Fig. 1, longitudinally movable in a recess $a^\times$ in the bearing A^3 and normally pressed to the right, Fig. 1, by a suitable spring s, tending to bring the two clutch members into engagement.

The bearing A^3 is laterally extended to form an ear a', forming a bearing for a slide-dog d, pivoted at its lower end to a lever d', fulcrumed in the frame at d^2 and connected by a link d^3 to a controlling-treadle D, the outer end of the treadle and also the dog being normally lifted by means of a spring s'.

The dog is adapted to engage a preferably-notched stop c^2 on the periphery of the clutch member C, as best shown in Fig. 9, to act as a stop and prevent rotation of the said member and the driving-shaft B. When, however, the dog is withdrawn by depression of the treadle D, the spring s moves the clutch member C to bring its lug $c^\times$ into engagement with the coöperating lug $b^\times$ on the hub of the driving-pulley B^2 to cause rotation of the shaft, and the shaft will rotate until the cam-surface c^3 of the clutch member engages the dog d and moves the said clutch member laterally into unclutched position as the stop c^2 brings up against the dog. It is necessary to provide means to automatically and positively move the dog into operative position after the machine has been started, so that if the operator should continue to bear upon the treadle D no injury will result to the apparatus, and for this purpose I have mounted a locking-slide d^4 on the main frame below the dog and adjacent the end of its supporting-lever d', as best shown in Fig. 8, the said slide having a depression d^5 therein which is brought beneath the dog just before the completion of a complete cycle of operation of the apparatus, so that the operator may thereafter release the clutch member for the next cycle.

By mechanism which will be hereinafter described the slide d^4 is moved in the direction of the arrow 5, Fig. 8, immediately after the clutch member has been released by the dog to bring the main portion of the slide beneath and to prevent depression of the dog.

Upon the head of the main frame I have mounted a nail-distributing apparatus, comprising a base-plate E, having an upturned flange E', on the exterior of which are mounted a series of rotatable hoppers H, the bell-mouths h of which communicate with openings E^2 in the flange, each hopper being provided with a bevel-gear $h^\times$ in mesh with an intermediate gear h', (see Fig. 2,) the hoppers being arranged symmetrically about the center of the base-plate E and with one of the gears h' between and in mesh with the gears $h^\times$ of adjacent hoppers.

The cylindrical hoppers H herein shown are of suitable construction, and I have herein shown them as provided with interior lifting-wedges h^2 (see Fig. 3) to raise the nails from the mass of nails in the lower part of the hopper as it rotates and to drop them onto the upper ends of suitable raceways h^3, which extend from within the hoppers through their mouths and the openings E^2 to the transferring mechanism, as clearly shown in Figs. 2 and 3.

The nails, which in this instance of my invention are headed, will as they are thrown onto the raceways hang with their bodies suspended between the walls of the raceway, the nail-heads resting and sliding along the inclined tops of the said walls and descending by gravity to the inner ends of the raceways. Each raceway passes through the slotted bottom of a guard h^4, attached to the wall $E^\times$ at the bottom of the opening E^2, and a swinging gate h^5 is pivoted above the guard h^4 and notched at its lower end, as at h^6, Fig. 3, to straddle the raceway, said gate being adapted to swing freely in the guard h^4. As the nails pass down the raceway the gate engages their heads successively and retards and tips up the head of each nail sufficiently to cause it when released to overlap the head of the nail next below it in the raceway to thereby bring the nails into proper position to be engaged by the transferring mechanism, to be described. Should any nails be improperly positioned in the raceway, the gate will engage and brush them off into the guard h^4, whence they will be returned to the interior of the hopper.

One of the hoppers, as shown at the right-hand side of Fig. 2, is provided with a shaft H', mounted in a suitable bearing a^2 on a standard A^5 at the top of the main frame, said shaft having fast thereon a gear H^2 in mesh with a smaller gear H^3, rigidly secured to a large gear H^4, loose on a shaft F, mounted in bearings a^3 a^4 of the main frame, the bearing a^3 forming a part of a ring-like laterally-extended arm A^6, on which, by suitable posts, as $E^\times$, the distributing mechanism is mounted. Rotation of the gear H^2 imparts uniform rotation of the series of hoppers H by means of the gears $h^\times$ and h'. A gear H^5, fast on a short shaft G, is in mesh with the gear H^4, the shaft being rotatably mounted in a suitable bearing a^5 and having secured to it a suitable sheave or pulley G', driven, as herein shown, by a belt or band $G^\times$, fast around a sheave B^5, fast on the hub B' of the main driving-pulley B^2. It will thus be seen that the hoppers are rotated continuously and entirely independently of the operation of the remainder of the apparatus.

The transferrer mechanism is operated by the shaft F, said shaft having longitudinally mounted thereon a clutch member F' and rotatable therewith by means of a suitable spline $f^\times$, the clutch member being normally moved to the left, Fig. 3, by a spring s^2, surrounding the shaft and intermediate a flange or collar f^2 thereon and the clutch member.

A series of lugs or teeth f on the inner side of the clutch member F' are adapted to at times coöperate with corresponding teeth h^8 on the gear H^4, whereby at such time the transferrer-actuating shaft F will be rotated.

A locking-dog f', moved into operative position by a spring s^3, Fig. 3, is pivotally connected to a bell-crank lever f^2 f^3, pivoted at f^4 on the main frame and having a cam-face f^5 to be engaged, as will be described, by a pin 10 to withdraw the dog f' from and to permit the movement of the clutch member F' into operative position. The said clutch member has a cam-face F^3 (see dotted lines, Fig. 3) to engage the dog f' after the latter has returned to normal position to thereby

disengage the clutch member F′ from the gear h^4 as a stop-lug f^6 (see Fig. 1) brings up against the locking-dog f' to thus bring the transferring mechanism to a stop.

The base-plate E is provided with an upturned central hub E^3 and at its under side a larger depending hub E^4, partially shown in Fig. 13 and in horizontal section, Fig. 14.

The hub E^4 is reduced in diameter to leave an annular shoulder 2, against which bears the upper end of a gear-ring e, provided with a spur-gear e' and a bevel-gear e^2, as best shown in Figs. 3 and 13, the gear-ring being maintained in place on the hub by a retaining-ring e^3, (shown separately in Fig. 16,) securely attached by suitable screws to the lower end of the hub E^4.

The retaining-ring e^3 supports upon it an oscillating nail-distributer, shown as a cylindrical block g, having a laterally-extended base g' to fit snugly within the hub E^4, the said block g having a series of vertical nail-receiving pockets g^2 therein, to the lower ends of which pockets are secured in suitable manner the mouths of a series of flexible nail-tubes $g^\times$.

The upper end of the body g of the nail-distributer is cut away, as at g^3, Fig. 15, exposing the upper ends of the pockets g^2.

Referring to Fig. 6, I have shown one member of the transferrer mechanism as a cylinder k, having an annular flange k', cut away at k^2 for a purpose to be described and secured by suitable screws passed through the flange to the bottom of the hub E^3, as shown in Fig. 3, the cylinder k having a series of peripheral vertical nail-pockets $k^\times$, and between each two pockets the cylinder is notched or recessed, as at k^3, for a purpose to be described.

The flange k' serves to support a nail-carrier, shown as a ring m, concentric to the cylinder k, and having a series of vertical slots m' therein and horizontal slots m^2, intersecting the vertical slots, the latter corresponding in numbers to the pockets $k^\times$ in the receiver k, as shown best in Fig. 5.

The carrier m is adapted to be oscillated between the receiver k and the interior of the hub E^3, the lower ends of the nail chutes or guideways h^3 extending through said hub to the outer circumference of the carrier, as best shown in Fig. 2, there being one raceway or chute for each vertical slot m' of the carrier.

A let-off mechanism is movably mounted on the stationary receiver k of the transferring mechanism and consists, as best shown in Fig. 7, of a hub n, having a series of curved fingers n' extended in a horizontal plane from the outer ends of arms n^2, attached to the top of the hub by suitable screws, as $n^\times$, the arms, as shown in Fig. 5, entering loosely the slots k^3 of the stationary member, so that the let-off may have a slight oscillating movement relatively to said member, the curved fingers n' entering the slots m^2 of the carrier.

The movement of the transferring mechanism is effected by suitable devices to be described, such movement effecting the transfer of a nail from each of the raceways to a slot m' in the carrier and from said carrier into the pockets $k^\times$ of the stationary receiver of the transferring mechanism, and, as is yet to be described, the nails are delivered from said stationary receiver to the pockets g^2 of the nail-distributer, the latter having given to it a step-by-step movement to receive a plurality of sets of nails before it is fully loaded, its pockets being a multiple of the number of pockets in the receiver.

Supposing the parts to be in the position shown in Figs. 2 and 5, the first movement of the let-off is in the direction of the arrow 15 to partially close the slots m' and at the same time retain the remaining nails in the raceways, after which the carrier m and the let-off are moved oppositely to the arrow 15 to bring the slots m' opposite the mouths of the pockets $k^\times$, and as the carrier is moved a little farther than the let-off the inclined face n^3 on the inner side of each finger n' of the let-off will act against the nail in the adjacent slot m' and snap it quickly into the pocket $k^\times$ at such time, the head of the nail hitting against the outwardly-beveled overhanging edge of a cap 20, (see Fig. 3,) which is mounted on the hub n of the let-off.

The actuating-shaft F for the transferrer mechanism has fast thereon a bevel-gear f^7 in mesh with and to rotate the bevel-gear e^2, formed on the ring e, such rotation by or through the spur-gear e' rotating a smaller gear o, fast on a shaft o' in a suitable bracket E^8, depending from the base-plate E, said shaft having at its lower end a cam o^2, (shown in plan in Fig. 4,) the periphery of said cam having two throw portions o^3 and o^4 and a rest portion o^5 to be engaged by a suitable roller or other stud o^6, rotatably mounted on a foot o^7, suitably secured to the base-flange g' of the nail-distributer, as clearly shown in Fig. 15. A spring s^4, fast at one end to the ring e^3, is attached at its other end to the foot o^7 to move the roll against the cam o^2 and also to return the nail-distributer to normal position after complete rotation of the cam.

Referring to Fig. 16, it will be seen that the ring e^3 is cut away at e^{30} to permit the oscillation of the nail-distributer, the ends of said cut-away portion acting as stops to limit such movement.

The cam o^2 is rotated in the direction of the arrow 35, Fig. 4, and as the roll passes from the dwell portion o^5 to the rise o^3 the nail-distributer will be partially rotated in the direction of the arrow 36, and it will be moved a still further distance in the same direction when the roll is engaged by the rise o^4 of still greater radius, the latter giving the nail-distributer its greatest movement. As the roll leaves the rise o^4 the spring s^4 quickly returns the distributer to normal position, as shown in Fig. 4, so that herein there are three successive positions assumed by the nail-distrib-

uter for each complete rotation of the controlling-cam o^2.

The nail-carrier m is provided with a laterally-extended arm m^4, Figs. 13 and 14, on which is mounted a roll m^5 to be engaged by the arms 3 of a cam m^6, (shown in plan, Fig. 17,) fast on the shaft o', the sides of the arms acting to gradually move the nail-carrier in one direction and to dwell while the roll is engaged by the end of the arm, and when the roll leaves the end of the arm a spring s^5, fixed at one end and attached at its other end to the lever m^4, quickly returns the nail-carrier to the position shown in Figs. 2 and 5. The nail-carrier is herein shown as having six nail-receiving slots m', and the coöperating stationary receiver k has a like number of pockets $k^\times$, into which the nails are moved, as has been described, while the nail-distributer (shown separately in Fig. 15) has eighteen nail-receiving pockets, and therefore it is necessary in order to completely load the distributer-tubes $g^\times$ to transfer three sets of nails from the carrier thereto. This is effected by the cam o^3, which is rotated to move the nail-distributer into its second position before the first set of nails is moved from the carrier m into the pockets $k^\times$, such nails passing from the pockets into six of the pockets g^2 of the distributer below them and thence to their tubes $g^\times$.

The continued movement of the cam o^2 carries the distributer to its third position at the time the second load of nails is ready to be transferred thereto from the pockets $k^\times$, and the distributer will have returned to its first position (shown in Fig. 4) in time to receive the third load of nails from the carrier, six of the pockets g^2 of the distributer, as herein shown, receiving nails at each end of said movements thereof.

Inasmuch as the nail-carrier m must be oscillated three times for each complete rotation of the cam o^2, the cam m^6 is provided with three of the arms 3, each arm acting to move it in one direction, the spring s^5 returning it thereafter.

Referring to Figs. 2, 5, and 7, the let-off mechanism has one of its arms m^2 extended beyond its finger n', as at n^{10}, said arm and the let-off mechanism being retained in normal position by a suitable spring s^{10}, (see Fig. 2,) the arm being located in the path of a tappet-cam n^{12}, fast on a shaft n^{13}, rotatable in the plate E, said shaft below the plate having secured to it a pinion n^{14} (see Figs. 4 and 14) in mesh with the gear e' and rotated thereby in the direction of the arrow 37. At each rotation of the shaft n^{13} the tappet-cam n^{12} will engage the arm n^{10}, moving it and the let-off as a whole in the direction of the arrow 39, Fig. 5, to cause the fingers n^2 to cover up the openings m' in the carrier, and at the same time closing the lower ends of the raceways h^3. As the carrier is then moved oppositely to the arrow 39, the portions of the carrier between the slots m' are brought opposite to the ends of and closing the raceways about the time that the tappet-cam releases the let-off. The spring s^{10} immediately returns the latter to its normal position, bringing the fingers n^2 into proper relation with the nail-pockets $k^\times$ of the receiver, so that as the nails are brought opposite the openings of said pockets by the continued movement of the carrier the inclined faces n^3 of the fingers will act upon and remove the nails from the carrier into the pockets of the receiver.

The nails as they are loaded into the distributer will pass therefrom down the flexible tubes $g^\times$ to the throat-pieces g^8, one of which is shown enlarged and in section in Fig. 11, and through the nail-block guide $N^\times$ into the nail-block N below it, each throat-piece having a branch portion g^9 secured to the lower end of its delivery-tube $g^\times$ and opening into the driver-passage g^{10} of the throat, the lower ends of the throats extending into suitable holes in the nail-block guide, arranged in a line substantially corresponding to the shape of the heel to be nailed. The nail-block N has therein a series of holes, one of which, as n^{10}, is shown in Fig. 3 registering with the holes in the guide-block, and the upper portion of each hole n^{10} is enlarged to receive therein a detent (shown as a short tube n^{12}) longitudinally slotted at n^{13} to leave a series of spring or yielding fingers n^{14}, two of which, as best shown in Fig. 12^a, are bent in toward the center to contract the lower end of the tube.

When the nails pass from the nail-guide block into the nail-block N, the fingers n^{14} will act to slant or tip the nail toward the center of the heel and the yielding portion n^{14} will grasp the body of the nail and prevent it from dropping out of the nail-block.

The straight or unbent portion of the detent-tube rests on the shoulder n^{15} of the hole in the nail-block, the smaller portion of the hole n^{10} and the interior of the detent-tube forming a continuation one of the other to afford no obstruction to the passage of the nail.

The nail-block and nail-guide block are mounted in a suitable holder A^8, forming a part of the frame, the nail-block being held in place in usual manner.

The nail-drivers n^{16} are mounted in a driver block or plate N^2, secured to a cross-head N^3, rigidly secured to a vertically-reciprocating plunger N^4, having bearings in the column A', and provided with a suitable spline 17 to prevent rotation of the plunger.

The pin 10, to control the elbow-lever f^3 for the clutch member F, is shown as mounted on the cross-head N^3.

The lower end of the plunger N^4, below its bearing A^{10}, (see Fig. 1,) has pivoted thereto a pitman N^5, connected at its lower end to a wrist or crank pin N^6, carried by the main driving-shaft B, whereby rotation of the latter will reciprocate the plunger, each descent of the plunger moving the drivers n^{16} down

through the driver-openings g^{10} of the throats g^8 and into the nail-block to drive the nails held therein into the heel and shoe. When the drivers are depressed, they will close the outlet of the branches g^9 of the nail-delivery throats, so that the nails next to be driven cannot pass into the nail-guide block until the drivers are withdrawn on the upstroke of the plunger. A slide-block r is mounted to be vertically moved in a guide A^{12}, secured to or forming part of the column A, said slide-block having screwed thereinto from its lower end an eyebolt r', pivoted to one member or link r^2 of a toggle, the other link r^3 being fulcrumed at r^4 on the main frame and joined at r^5 to the member r^2. The latter member has a roll r^6 thereon at the inside of the joint to be engaged by a cam-block R, fast on the plunger N^4, as best shown in Figs. 1 and 1^b, said cam-block having a downwardly-inclined face r^7 to act upon the roll and gradually straighten the toggle as the plunger descends, thereby gradually raising the slide-block r, which carries the work-support.

The links r^2 and r^3 are provided, as best shown in Fig. 1^b, with coöperating stops 8 and 7 to engage with each other when the toggle is straightened, the vertical face r^8 of the cam-block R maintaining the toggle straightened while the plunger completes its downward movement, the timing of the cam being such that the toggle will be fully straightened before the drivers begin to drive the nails into the heel.

The foot r^9 below the cam-face r^7 acts upon the roll r^6 and breaks the toggle as the plunger ascends. A screw t is threaded into the upper end of the slide-block r, said screw having a head t' circular for a portion of its periphery and provided with a plurality of depressions $t^\times$, one or other of which receives a locking-ball t^2, pressed toward the screw-head by a spring s^7, Fig. 1^a, held by a suitable retaining-screw t^3, in a tubular holder t^4, secured to or forming part of the jack-spindle J; which is bifurcated at its lower end to receive the head t' of the screw on which it is pivoted at t^5. It will be obvious that the spring will force the locking-ball t^2 into one or other of the depressions $t^\times$, according as to whether the jack-spindle is in full or dotted line position, Fig. 1, and will hold the latter in position until positively moved therefrom.

The spindle J is adapted to carry the work-supporting last J', as shown in Fig. 1, and upon which the shoe is placed, the movement of the slide-block r, hereinbefore described, moving the shoe and heel-support, to be described, toward the under side of the nail-block N and present the heel just before the nails are driven thereinto. A limiting-stop t^6 on the screw-head t' prevents undue outward movement of the jack-spindle when it is drawn into dotted-line position, Fig. 1, to have a shoe moved therefrom or placed upon it.

In Figs. 1, 18, 19, and 20 I have shown a convenient and novel positioning device to insure the correct presentation of the shoe to the nailing mechanism, the apparatus herein shown being particularly adapted in nailing spring-heel shoes, although my invention is not restricted to such work. The screw-head t' is vertically grooved at its rear side, as at t^7, (see dotted lines, Fig. 18,) to receive therein the foot v' of an upright v, on the upper end of which is pivoted a disk v^2. The foot v' is rigidly secured to the screw-head by suitable screws 21 and 22, Fig. 19, the screw 22, passing through a boss v^3 on the foot v, being provided with a roll v^4 to run in a vertical groove 29 in the column A' and prevent undue rotation of the work-support and heel-holder on the slide-block. Upturned and outwardly-bent arms v^5 are secured to the upright v near its lower end, as by screws 31, said arms having pivotally mounted thereon at their upper ends at v^6 levers v^7, pivotally connected by links v^8 to crank-pins v^9 on the disk v^2, the inner ends of the levers v^7 being normally separated by a spring S, surrounding a guide-rod v^{10}, loosely extended through ears on the connecting-pivots between the links and arms. The levers v^7 are prolonged beyond their fulcrums to form gripping-fingers or clamps v^{12}, having convexed portions 41 42 at their outer and inner ends, respectively, Fig. 20, to engage the shoe on the last or work-support J' at at least four points. The portion of the clamp nearest the back of the shoe will engage only the upper thereof, while I may upturn the outer ends of the clamps, as at v^{13}, to engage the sole of the shoe at or near the shank. It will be seen that the movement of one clamp member on its fulcrum v^6 must be duplicated by its fellow member, owing to the equalizing connection therebetween made by the links and disk v^2, thus preventing any crooked or improper positioning of the shoe. An adjustable back-stop v^{15} is mounted in the upper end of the standard v to bear against the back of the shoe, the back-stop being herein shown as a headed screw, but any other suitable adjustable device may be used.

In order to adapt the positioning device to any sized shoe, the arms v^5 are mounted to rock on their attaching-screws 31, and they are normally drawn together by a spring $S^\times$ and equalized as to their separation by links v^{18}, pivotally connected to a rotatable disk v^{19}, mounted on the lower part of the upright v. It will be seen that whether the arms v^5 are swung in toward each other or apart the operation of the clamping members v^{12} will be the same and that the latter will coöperate with the shoe in any adjusted position of the supporting-arms thus provided for all sizes and shape of shoes.

In nailing spring-heel shoes it is desirable to insert a shorter nail at or near each corner of the breast, and in the apparatus herein shown I provide one of the hoppers H with the short nails, so that three short nails will

be loaded into the nail-receiver g for each complete operation of the apparatus, and inasmuch as it is only necessary to use two of the short nails I have shown in Fig. 1 one of the nail-delivery tubes as disconnected from its throat and opening into one of the compartments, as w, of a chute or receptacle W, having at its lower end a removable gate x, the other compartment a' being provided to receive the larger nails if it is desired to use a less number of nails than there are pockets in the nail-receiver.

By referring to Figs. 1 and 3 it will be seen that when the plunger N^4 descends to drive a series of nails from the nail-block N the dog f' will be withdrawn from and release the clutch member F', thereby causing the transferring mechanism to operate and transfer the full number of nails from the raceways h^3 to the pockets of the nail-distributer g, and such of the nails as pass thence to the nail-delivery tubes before the elevation of the plunger will be held in the branches g^9 of the throat-pieces by said drivers ready to pass into the nail-block as the drivers are again brought to rest in raised position. The detents in the nail-block prevent the nails from dropping out of it while the operator is placing a new shoe in position to have the heel nailed thereon.

Referring to Fig. 8, the clutch member F' has in its circular periphery a depression 50, and a roll 51 on the upper end of a lever 52 is held in engagement with the periphery of said clutch member by a spring S^5, Fig. 8, the said lever being fulcrumed on the frame at 53 and joined at 54 to the locking-slide d^4. During almost the entire rotation of the clutch member F' the roll 51 will be on the high part of its periphery and will maintain the slide in locking position to prevent depression of the dog d', but the low part 50 of the clutch member permits the roll to enter it and to withdraw the locking-slide d^4 at the end of each cycle of operation of the apparatus.

By referring to Figs. 1 and 3 it will be seen that the transferring and distributing mechanism is located substantially directly above the nail-block, so that the nails pass by the shortest and most direct route thereto.

My invention is not restricted to the precise construction and arrangement of parts herein shown, as the same may be variously modified or rearranged without departing from the spirit and scope of my invention.

While I have shown one convenient form of hopper and a certain number of hoppers, my invention is not restricted either to the particular form of hopper shown nor to the number, the latter depending only on the number of nails which it is desired to drive into the heel and also on the ratio between the number of pockets in the nail-distributer and in the nail-carrier.

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

1. In a heel-nailing apparatus, a work-support, a nail-block, nail-distributing mechanism, means to convey the nails directly therefrom to the nail-block, to be driven, a reciprocating plunger, a gang of nail-drivers mounted thereupon and actuated thereby, and means operated by said plunger to cause relative movement of the work-support and nail-block to compress the heel on its shoe prior to the insertion of the nails, substantially as described.

2. In a heel-nailing apparatus, nail-distributing mechanism, a nail-block fixed relatively thereto, a nail-guide block above it, having a series of removable and adjustable branching throats, nail-passages leading from the distributing mechanism to one of the branches of each throat, and a gang of drivers reciprocable in the other branches of the throats, to drive the nails from the nail-block into the heel, the openings of the nail-passages being closed by the drivers as the latter descend, substantially as described.

3. In an apparatus of the class described, nail-transferring mechanism, comprising a movable nail-distributer having nail-pockets, and a series of nail-tubes connected therewith, a superposed stationary receiver having open peripheral pockets, and a concentric nail-carrier, to receive nails singly from each of a plurality of raceways, combined with means to move said carrier to transfer the nails to the receiver to pass therefrom by gravity to the distributer, and means to move the latter successively to present a new series of pockets to receive a fresh supply of nails from the receiver, substantially as described.

4. In an apparatus of the class described, nail-transferring mechanism, comprising a stationary receiver, and a movable nail-carrier, having each a like number of nail-receiving portions, and a nail-distributer having a series of pockets, a multiple of the number of nail-receiving portions of the receiver, combined with means to move said carrier to transfer a set of nails to the receiver, means to move the distributer step by step after each movement of the carrier, to present a new series of pockets to receive the nails from the receiver, and a series of nail-passages connected to said distributer, substantially as described.

5. In an apparatus of the class described, a series of raceways along which nails pass by gravity, a common transferring mechanism, comprising a fixed nail-receiver having a series of open pockets, an oscillating carrier to take nails singly from each of said raceways and present them to the pockets, a let-off to govern the movement of the nails in the raceways, and means carried by said let-off, to eject the nails from the carrier, substantially as described.

6. In an apparatus of the class described, a

series of raceways along which nails pass by gravity, a common transferring mechanism, comprising a fixed nail-receiver having a series of open pockets, an oscillating carrier to take nails singly from each of said raceways and present them to the pockets, a let-off to govern the movement of the nails in the raceways, means to eject the nails from the carrier, and a distributer to distribute the nails ejected into the receiver, substantially as described.

7. In an apparatus of the class described, a series of nail-raceways, a carrier to take nails singly therefrom and deposit them in a receiver, the receiver, a distributer having a series of flexible nail-tubes attached thereto, means to move the distributer to take nails from the receiver and direct them to the tubes, and a nail-block having nail-driving passages, the lower ends of said nail-tubes communicating with the passages, substantially as described.

8. In a heel-nailing apparatus, a nail-block having a series of nail-passages provided each with a shoulder, a tube inserted in each hole and resting on the shoulder, said tube being longitudinally slotted at its lower end to leave yielding detent-fingers to grasp the nail and retain it in the nail-block till positively removed therefrom, substantially as described.

9. In a heel-nailing apparatus, a nail-block having a series of nail-passages provided each with a shoulder, a tube inserted in each hole and resting on the shoulder, said tube being longitudinally slotted at its lower end to leave yielding detent-fingers, two of said detent-fingers being bent inward to contract the lower end of the tube, said bent fingers acting to tip or slant the nail toward the center of the heel into which it is to be driven, substantially as described.

10. In an apparatus of the class described, a rotatable hopper, its support having an opening communicating with the hopper, a raceway having its upper end extended through said opening into the hopper, a guard embracing said raceway at the bottom of the opening, and a pivotally-mounted gate to straddle said raceway within the guard, to return improperly-presented nails to the hopper, substantially as described.

11. In an apparatus of the class described, a rotatable hopper having an open mouth in one side thereof, a raceway extended through the mouth of and into the hopper, to receive the nails, the heads of the latter being supported with their bodies depending between the walls of the raceway, and means to retard the nails successively and tip them to cause the head of each to overlap the head of the nail next below it, substantially as described.

12. In an apparatus of the class described, a series of hoppers to receive the nails in bulk, means to continuously rotate said hoppers, nail-transferring mechanism, to receive the nails from the hoppers, and to transfer them to a nail-block, the nail-block, nail-passages leading directly thereto from the transferring mechanism, and means to operate said mechanism intermittingly, substantially as described.

13. In an apparatus of the class described, a series of hoppers to receive the nails in bulk, means to continuously rotate said hoppers, nail-transferring mechanism, to receive the nails from the hoppers, and to transfer them to a nail-block, the nail-block, nail-passages leading directly thereto from the transferring mechanism, a gang of drivers, a reciprocating plunger to actuate them, connections, including a clutch, between the transferring mechanism and the means to rotate the hoppers, and a clutch-controller governed by movement of the plunger, whereby the transferring mechanism is intermittingly operated, substantially as described.

14. In an apparatus of the class described, a work-support, a slide-block on which it is mounted, and a toggle to raise and lower said block, combined with a stationary nail-block, a gang of drivers, a reciprocating plunger to actuate them, and a cam on said plunger, to straighten the toggle and raise the work-support before the drivers drive the nails into the heel, substantially as described.

15. In an apparatus of the class described, a work-support, a slide-block on which it is mounted, and a toggle to raise and lower said block, combined with a stationary nail-block, a gang of drivers, a reciprocating plunger to actuate them, a cam on said plunger, having an inclined and a vertical face, to act successively upon and to straighten the toggle, and thereafter to maintain it in such condition while the nails are being driven, substantially as described.

16. In an apparatus of the class described, a nail-block, a work-support, means to move one relatively to the other, to compress the heel of a shoe, a gang of drivers, a reciprocating plunger on which they are mounted, and a controlling device on said plunger, to govern the means for causing relative movement of the nail-block and work-support, substantially as described.

17. In an apparatus of the class described, a work-support adapted to swing in a vertical plane, a head upon which it is pivotally mounted, said head having a partially-circular periphery provided with a plurality of depressions therein, and a spring-controlled locking member carried by the work-support and comprising a spring and a locking-ball adapted to enter one or other of said depressions in the circular periphery, to maintain the work-support in such position unless positively withdrawn therefrom by bodily movement of the work-support, substantially as described.

18. In an apparatus of the class described, a work-support, and a coöperating positioning device for the work, said device comprising upturned, separable arms, an equalizing connection between them, separable clamping

members pivotally mounted on said arms, to rock in substantially horizontal planes to grasp the sides of the shoe, and spring-actuated equalizing connections between the clamps, substantially as described.

19. In an apparatus of the class described, a work-support, and a coöperating positioning device for the work, said device comprising pivotally-mounted laterally-swinging clamping members each having two convexed portions on their inner faces, to engage the upper of the shoe, said clamps being upturned at their outer ends to engage the sole at or near the shank, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

HENRY W. WINTER.

Witnesses:
JOHN C. EDWARDS,
AUGUSTA E. DEAN.