(No Model.) 5 Sheets—Sheet 1.

O. ASHTON.

MACHINE FOR NAILING SOLES TO UPPERS.

No. 602,184. Patented Apr. 12, 1898.

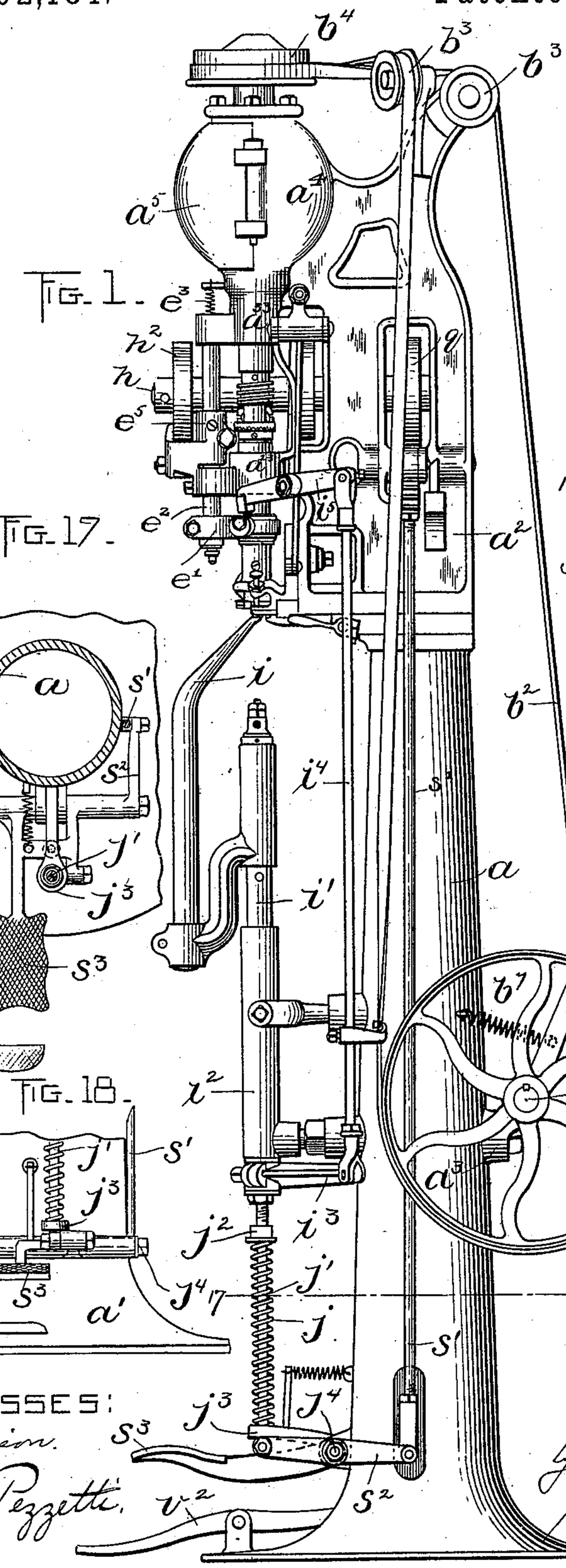


FIG. 1.

FIG. 17.

FIG. 18.

FIG. 7.

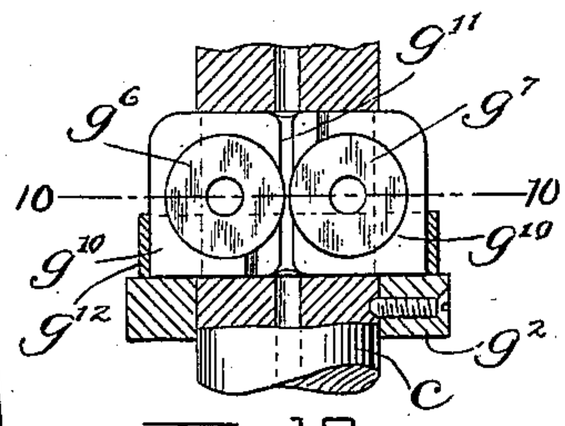
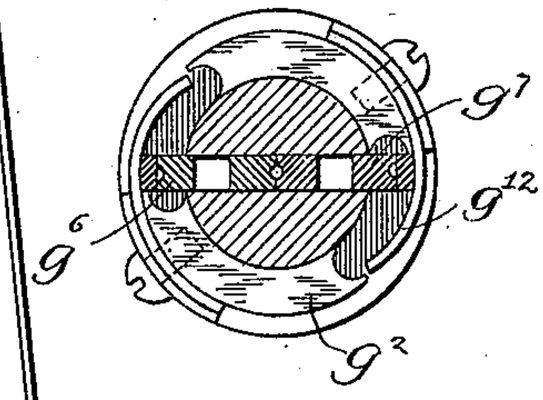


FIG. 10.



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O. ASHTON.

MACHINE FOR NAILING SOLES TO UPPERS.

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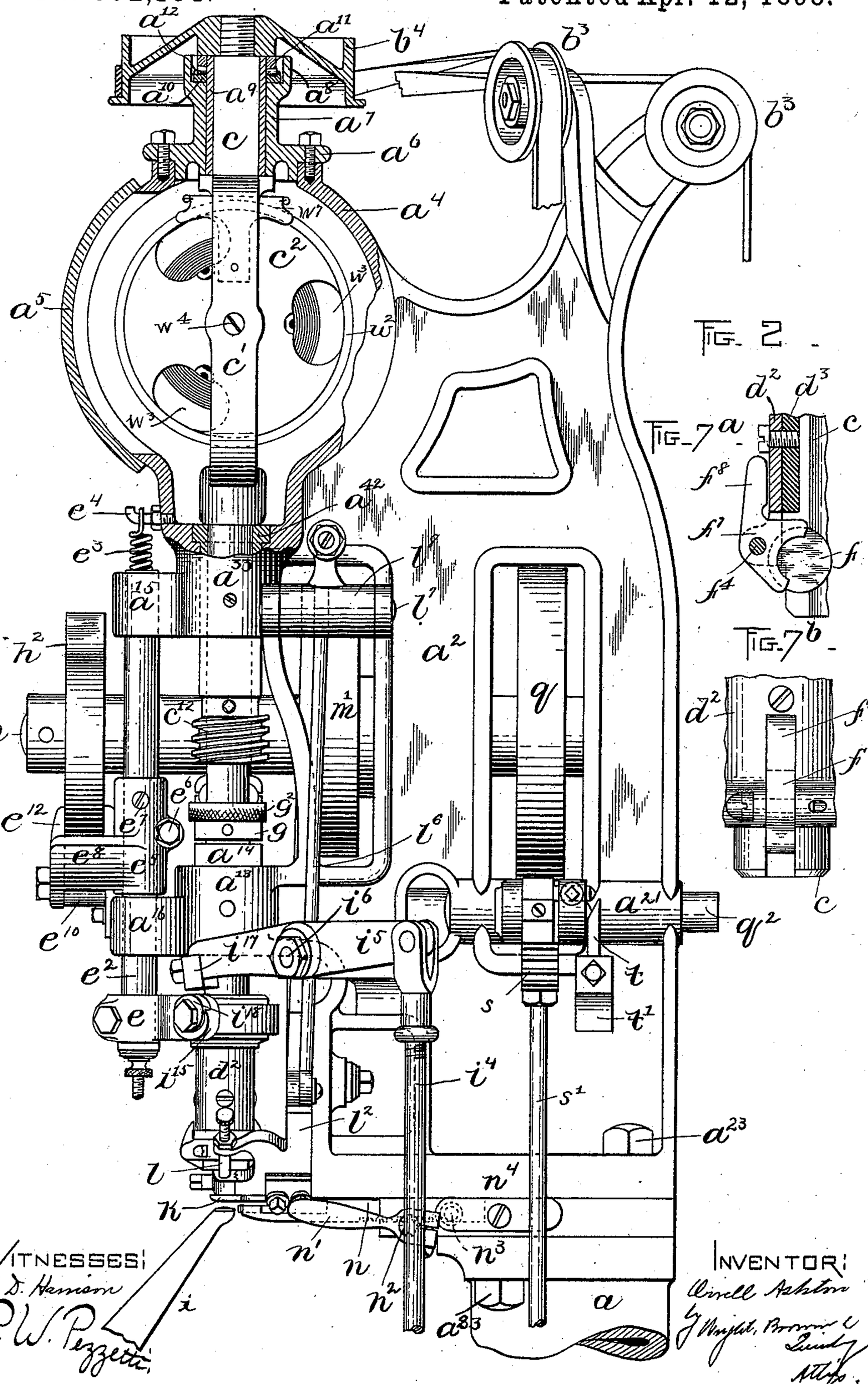

FIG. 2.

FIG. 7a.

FIG. 7b.

(No Model.)

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O. ASHTON.

MACHINE FOR NAILING SOLES TO UPPERS.

No. 602,184. Patented Apr. 12, 1898.

FIG. 3.

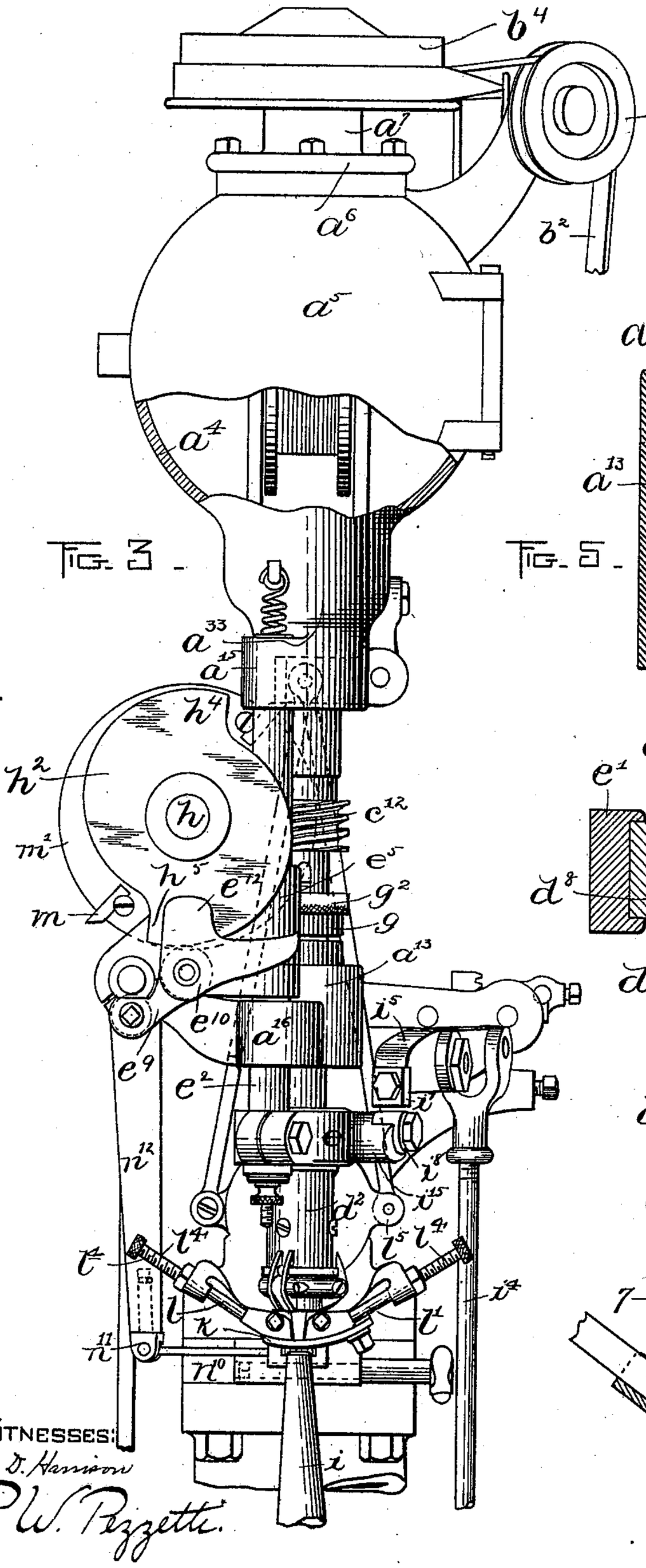
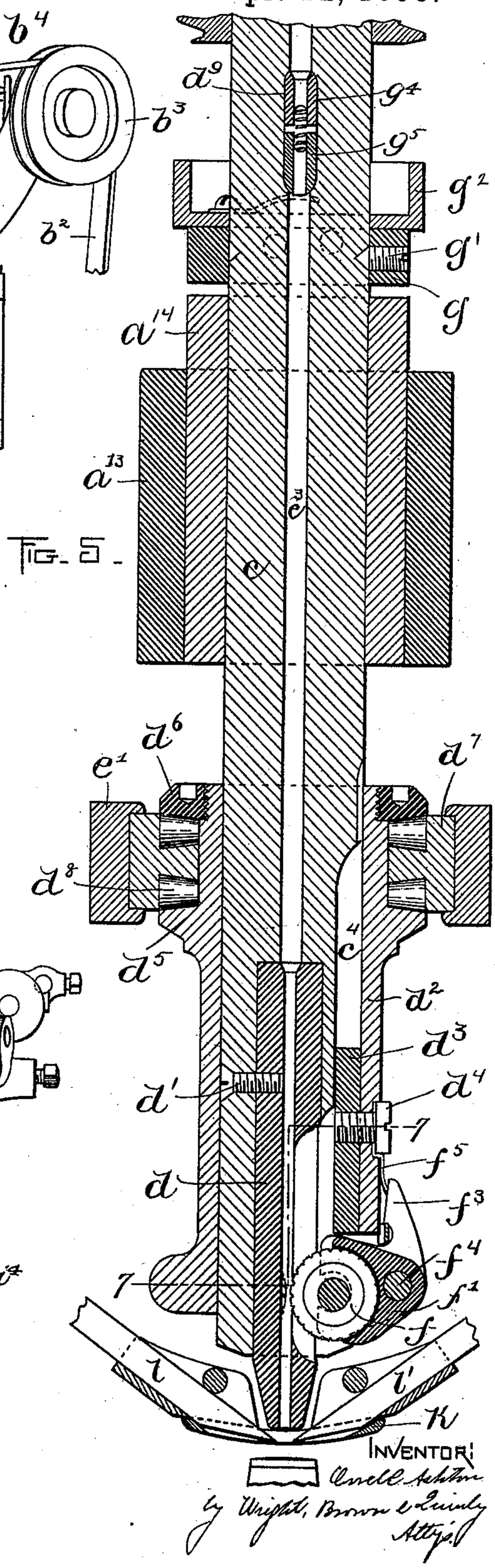


FIG. 5.



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O. ASHTON.

MACHINE FOR NAILING SOLES TO UPPERS.

No. 602,184. Patented Apr. 12, 1898.

FIG. 4.

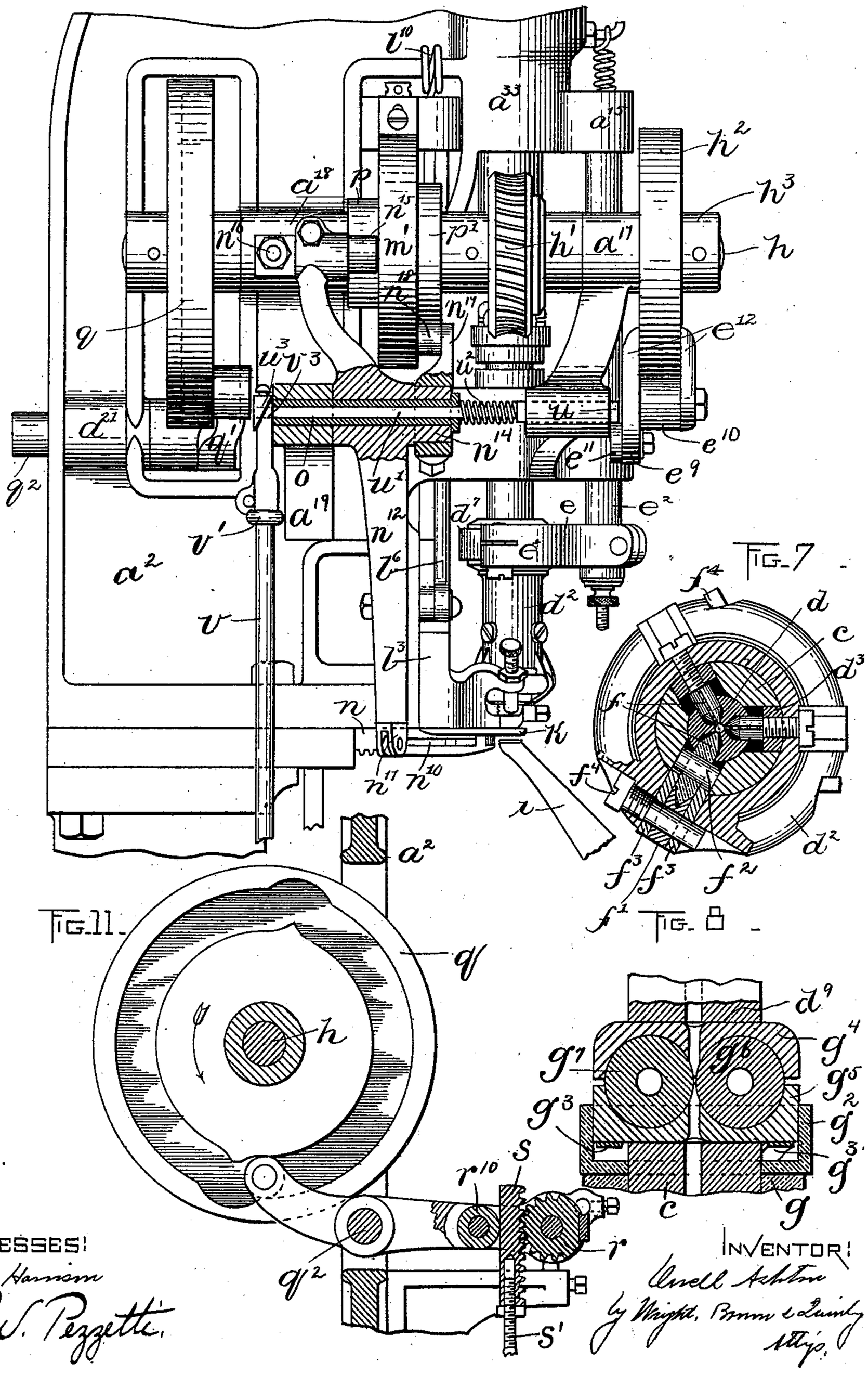

FIG. 7.

FIG. 11.

FIG. 8.

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(No Model.)

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MACHINE FOR NAILING SOLES TO UPPERS.

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FIG. 15.

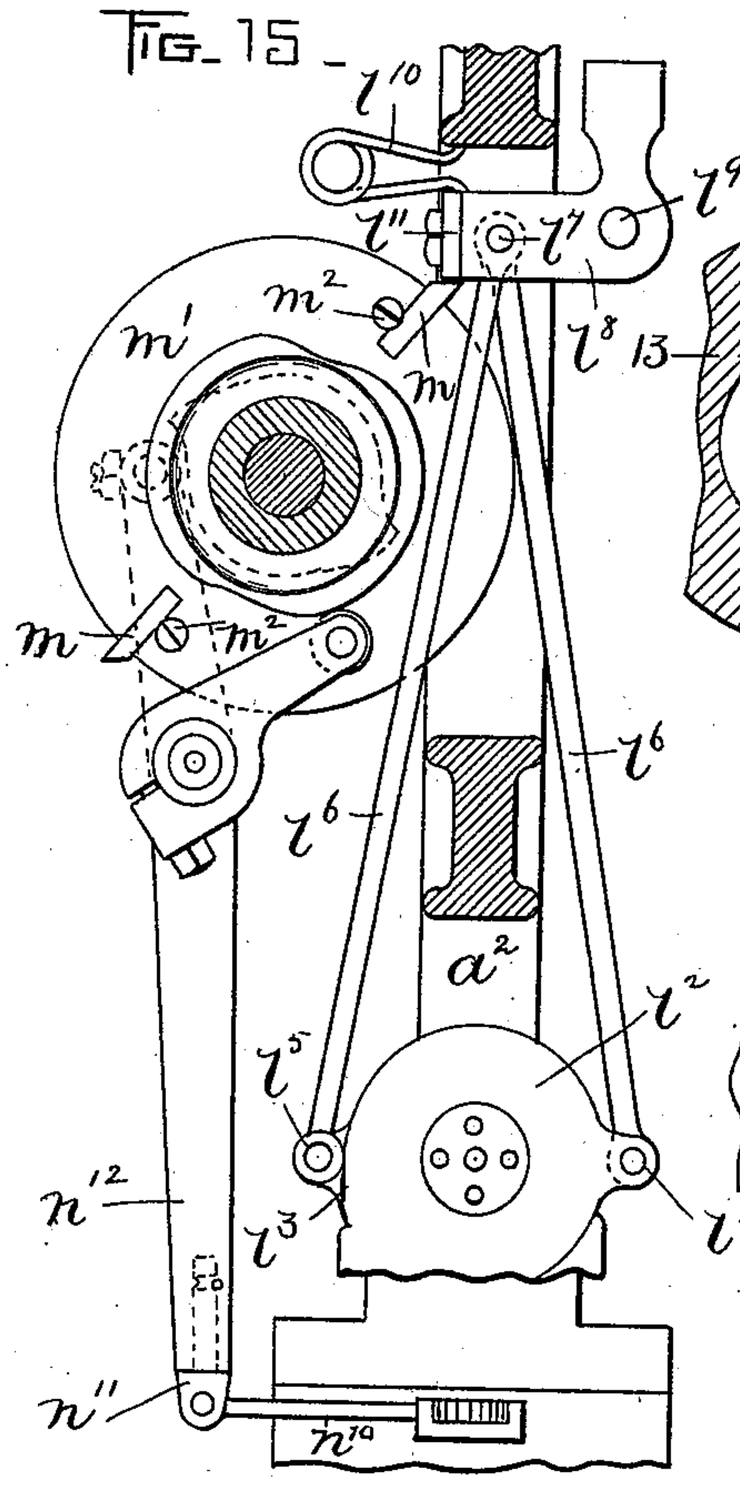


FIG. 12.

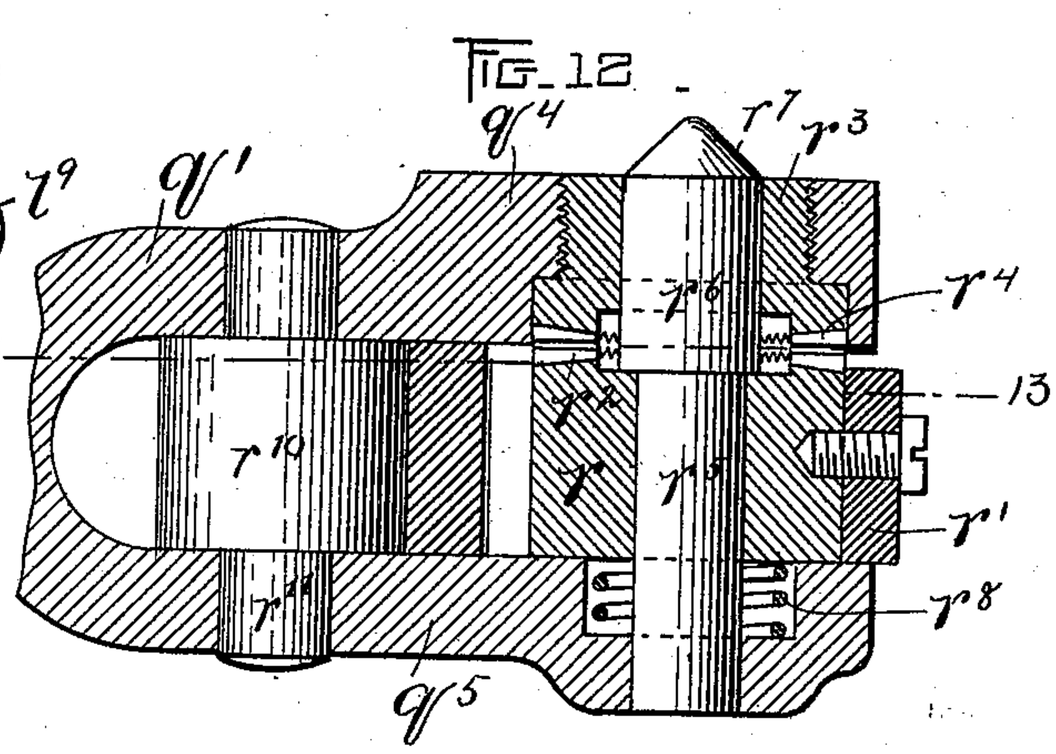


FIG. 13.

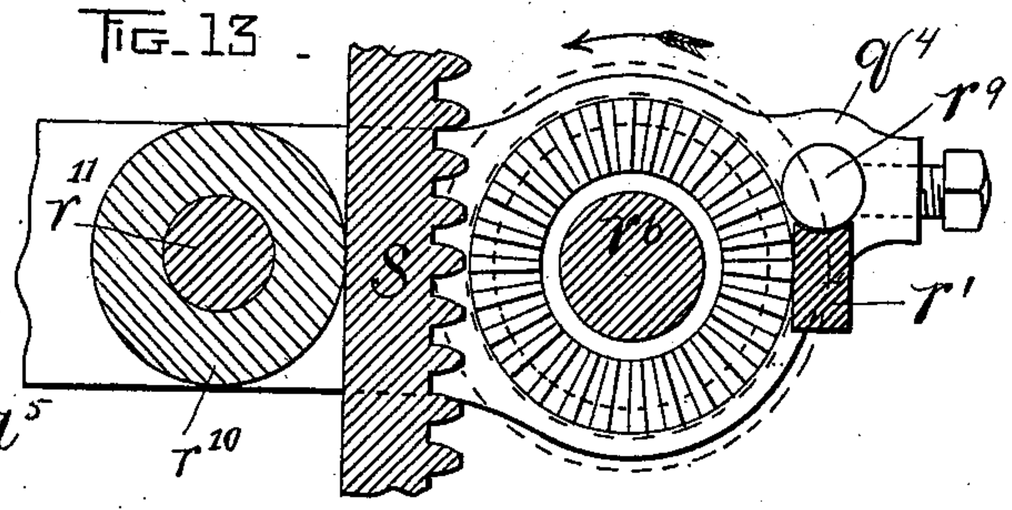


FIG. 14.

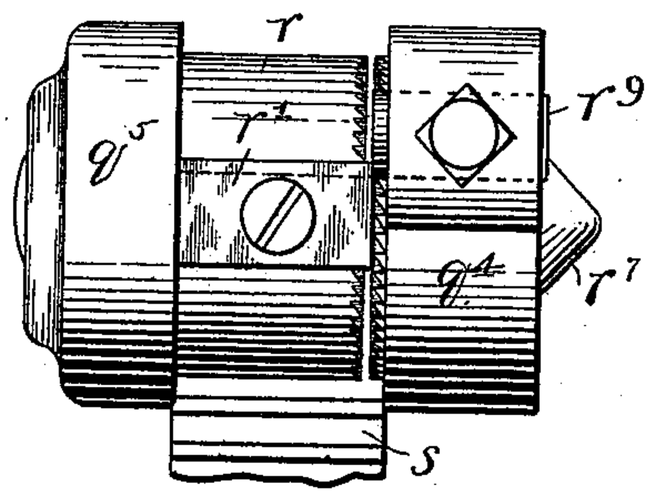


FIG. 16.

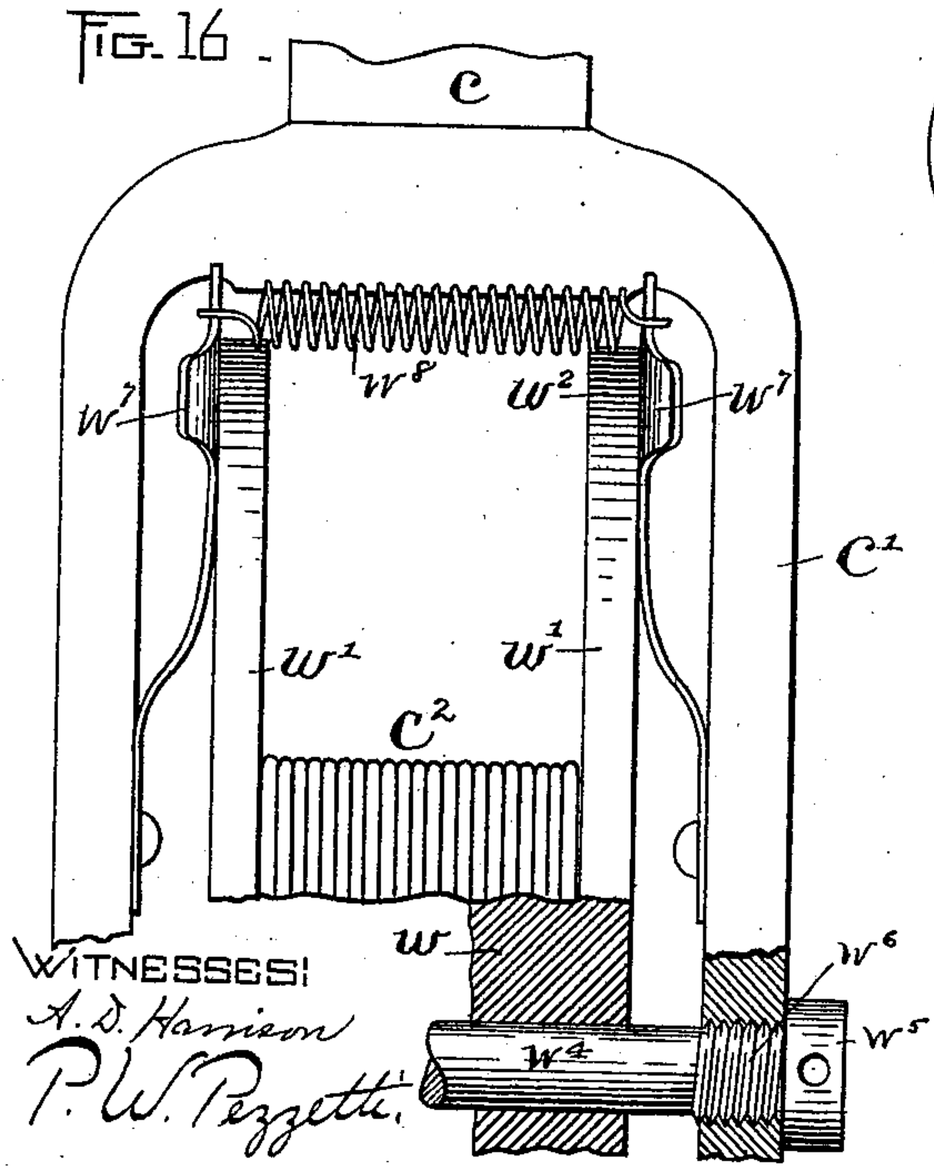
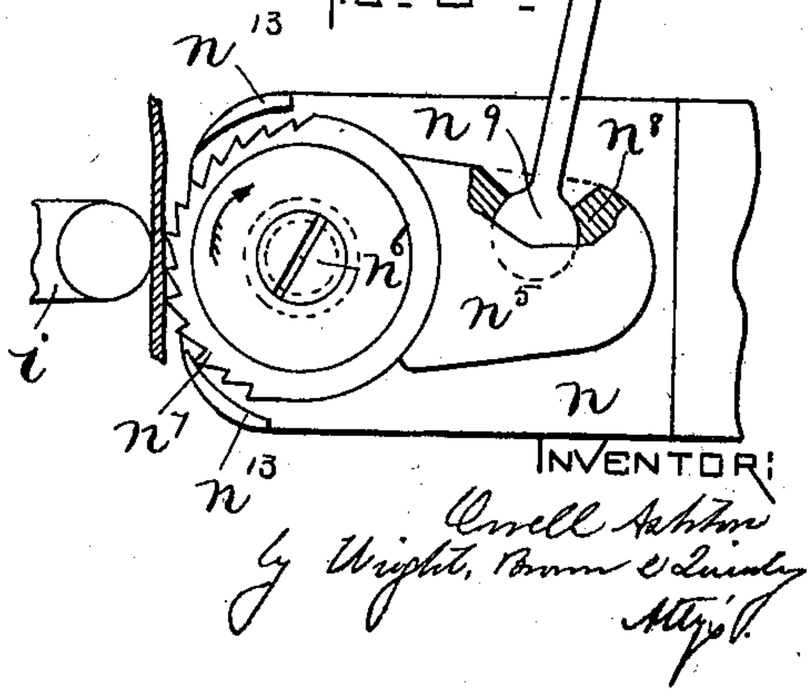


FIG. 6.



WITNESSES:
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P. W. Pezzetti.

INVENTOR:
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UNITED STATES PATENT OFFICE.

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MACHINE FOR NAILING SOLES TO UPPERS.

SPECIFICATION forming part of Letters Patent No. 602,184, dated April 12, 1898.

Application filed June 24, 1897. Serial No. 642,101. (No model.)

To all whom it may concern:

Be it known that I, ORRELL ASHTON, of Lawrence, in the county of Essex and State of Massachusetts, have invented certain new and useful Improvements in Machines for Nailing Soles to Uppers, of which the following is a specification.

This invention has relation to machines for nailing or securing together the upper and sole of a boot or shoe, and relates more particularly to that class of nailing-machines wherein a corrugated or threaded wire is screwed into the sole a proper distance, the feed of the wire being automatically regulated according to the thickness of the sole.

The invention consists of a machine provided with certain features of construction and arrangement of parts, such as clearly illustrated upon the accompanying drawings and now to be described in detail, and pointed out in the claims hereto annexed.

Reference is to be had to the accompanying drawings, and to the letters marked thereon, forming a part of this specification, the same letters designating the same parts or features, as the case may be, wherever they occur.

Of the drawings, Figure 1 represents in side elevation one form of machine which I have selected for the purpose of illustrating an embodiment of the invention. Fig. 2 represents a side elevation of the head of the machine somewhat enlarged. Fig. 3 represents a front elevation of the same. Fig. 4 represents an elevation from the other side of the machine. Fig. 5 represents in vertical longitudinal section the spindle. Fig. 6 represents in detail the work or shoe feed. Fig. 7 shows a section on the line 7 7 of Fig. 5 and represents automatically-operating devices for feeding the wire. Figs. 7^a and 7^b show in detail a different mounting for the feed-rolls. Fig. 8 represents in longitudinal vertical section a portion of the spindle and the mechanism for holding the wire against back thrust. Figs. 9 and 10 show in detail another arrangement for preventing the backward movement of the wire. Figs. 11, 12, 13, and 14 show in detail the mechanism which controls the reciprocation of the horn and prevents the horn from being moved when there is no work between it and the nose or the guard-plate. Fig. 15 represents in detail the cams and levers for actuating the shoe or work feeding devices and the mechanism for operating the cutters which sever the wire after it has been fed a sufficient distance into the work. Fig. 16 shows in detail the friction devices for the wire-reel. Figs. 17 and 18 illustrate the arrangement of the foot-levers and the manner of supporting them.

Before proceeding to describe the machine referred to in the foregoing brief description of the figures of the drawings I desire to have it understood that that particular machine has been selected by me only for the purpose of illustrating one embodiment of the invention and that I do not limit myself to the particular details of construction thereof, as the invention is capable of being expressed in many different ways, and the parts thereof may be varied as desired to suit particular requirements.

Referring to the drawings, a indicates a standard having a base a' and a head a^2, the latter being secured upon the standard by bolts a^{23} in the ordinary manner. The standard is formed or provided with brackets a^3, which provide bearings for the main driving-shaft b, which is mounted therein and which is rotated by a band wheel or pulley, as is usually the case. On its end the shaft has keyed thereto a band-wheel b', from which a belt b^2 passes around idler-pulleys b^3 b^3, suitably journaled in an extension of the head a^2, and around a pulley b^4 in threaded engagement with the upper end of the spindle c.

A belt-tightener consisting of a lever b^5, journaled on the shaft b and having on its end a loose pulley b^6, is pressed against the belt b^2 by a spring b^7, as shown in Fig. 1.

The spindle c, before referred to, is arranged vertically, as it is usual, and is provided with a yoke c' to receive a wire-reel c^2, from which the wire is fed through a longitudinal aperture c^3, which extends through the spindle, as shown in Fig. 5, from the yoke to the lower end thereof. The head a^2 is formed with a spherical casing a^4 to receive the yoke and the wire-reel c^2, there being a hinged door a^5 to cover an aperture in its face, through which

access may be had to the reel to pass the wire through the duct or aperture in the spindle *c* to the wire-feeding devices.

The wire-reel c^2 is formed with a hub *w* and end flanges *w'*, each of which has an unbroken friction-rim w^2, as shown in Fig. 2, and three apertures w^3, through which access may be had to the wire to remove the binders therefrom. Through the hub of the reel passes a pin w^4, having an enlarged head w^5 and a portion w^6 next to the head, which is formed with a left thread to engage internal threads in the yoke *c'*. The outer end of the pin, which is not shown, is smooth and non-threaded, the threads w^6 being alone relied upon for holding it in place. Secured to the yoke are friction-shoes w^7, bearing against the friction-rims w^2 of the reel and drawn toward each other by a spring w^8. Thus the rotation of the wire-reel is frictionally retarded to prevent the wire from being drawn from it too rapidly, so as to loop or bend.

To the upper portion of the tubular casing is secured a cap a^6, having a bearing consisting of a tubular extension a^7, which is flared at a^8. A hard brass bushing a^9 is inserted between the spindle *c* and the tubular extension, and in the flaring portion of the latter there is a hard-metal ring a^{10}, between which and the ring a^{11}, upon which the hub of the pulley b^4 rests, is placed a series of antifriction-cones a^{12}.

In a bearing a^{33} in the lower portion of the casing a^4 is another bushing a^{42}, through which the spindle passes, so that the spindle is mounted in bearings both above and below the reel, whereby it is held against lateral vibration in case the corrugated or threaded wire is wound unevenly upon the reel.

The head a^2 is provided with a third bearing on an arm a^{13}, through which the spindle also passes, there being another bushing a^{14} arranged between the spindle and the bearing thus afforded, this last-mentioned bearing being relatively near the lower end of the spindle, whereby the latter is held in bearings at its ends and at a point intermediate thereof and is at all times properly centered.

I shall now proceed to describe the devices which feed the wire through the spindle.

In the lower end of the spindle is inserted a throat-piece *d*, the aperture or throat of which is only large enough to receive the wire, which fits snugly therein, said throat-piece being held in place by a screw *d'*, as shown in Fig. 5. Surrounding the lower end of the spindle is a sleeve d^2, having inwardly-projecting guides d^3, secured thereto by screws d^4 and projecting into grooves c^4 in the spindle. Preferably there are three of these guides, although I may use any other number, if desired. The sleeve is provided at its upper end with a shoulder d^5, between which and a collar d^6, threaded thereon, is placed a ring d^7, there being suitable antifriction-cones d^8 inserted between the ring and the collar and the shoulder. The ring d^7 is supported in the yoke *e'* on an arm *e*, secured to a vertically-reciprocatory shaft e^2, as shown in Fig. 2, and which I shall afterward describe. Thus the sleeve is connected with the spindle, so as to turn therewith, but is free to be reciprocated longitudinally thereof to feed the wire therethrough by feeding-disks supported by the sleeve.

The spindle and the throat-piece are provided with three longitudinal slots in alinement with the grooves c^4, and in each slot there is placed a serrated wire-feed roll *f*. Each roll is placed in a cavity in a friction-block *f'* and is provided with studs or gudgeons projecting loosely into enlarged sockets in two bell-crank levers f^3 f^3, arranged on both sides of the block *f'*. The levers and the block are pivoted upon a screw-pin f^4, passed through apertures in the sleeve, such as shown in Figs. 6 and 7, there being a spring f^5 for each pair of levers f^3 f^3, by which the feeding-disks are held in engagement with the wire.

By examining Fig. 5 it will be noticed that the axes of the feed-rolls *f f* are in a plane below the plane of the axes of the screw-pins f^4, so that, although the rolls will roll over the wire when the sleeve *d* is being raised, they will tightly wedge or grip the wire between them when the sleeve d^2 is moved downward, so as to carry the wire with them through the aperture in the spindle and the throat-piece.

I may dispense with the additional bell-crank levers, if desired, and also with the springs by forming the friction-blocks as shown in Figs. 7^a and 7^b and by placing the rolls loosely in the cavities therein. In this event the blocks f^7 f^7 for the rolls are relatively wide and are provided with upwardly-projecting ends f^8 f^8, which operate as weights by centrifugal action to throw the rolls inward to grip the wire when the roll-carrying sleeve is moved upward.

In order to prevent any backward or upward movement of the wire when the sleeve d^2 is being raised for the disk to obtain a fresh grip prior to feeding the wire down through the spindle, I employ a backstay or locking mechanism for the wire, such as shown in Fig. 8 or in Figs. 9 and 10.

First, referring to Fig. 8 in connection with Fig. 5, it will be seen that a collar *g* is secured to the spindle by one or more screws *g'*, and that placed loosely upon the spindle above said collar is a cup or flanged collar g^2, having oppositely-arranged leaf-springs g^3. The spindle is formed with a transverse aperture d^9 to receive two roll-carrying friction-blocks g^4 g^5, between which are placed rolls g^6 g^7, having serrated edges to engage the wire between them. In this case the rolls g^6 g^7 are maintained at the same distance apart, but their rotation may be retarded by the springs g^3 g^3 bearing against the block g^5. By this arrangement the block g^5 will yield when the wire is drawn down between the rolls; but as soon as the tension upon the wire ceases the

rolls are immediately locked against rotation by the springs g^3 pressing the block g^5 upward and the wire is prevented from moving in the slighest degree backward past the disks. The tension of the springs g^3 may be increased or diminished by rotating the flanged collar g^2 about the spindle, as will be readily understood.

In Figs. 9 and 10 another backstay or locking mechanism for the wire is shown in which the toothed or serrated rolls are movable toward and from each other and are held against backward rotation by the engagement of their friction-blocks. Instead of the blocks g^{10} being divided horizontally, as in Fig. 8, they are divided vertically and each is provided with a socket to receive one of the rolls g^6 or g^7 and also with an aperture g^{11} to receive the wire. The springs g^{12} are secured to the collar g^2, so as to bear inwardly against the friction-blocks, and by this arrangement the rolls allow the wire to be drawn down freely under the draft of the feed-rolls, but operate to prevent any backward movement thereof, except under a powerful draft from above. The pressure of the springs g^{12} may be increased or decreased by rotating the collar g^2.

The sleeve d^2 on which the feed-disks are mounted is reciprocated by the following devices: The shaft e^2, before referred to, which was described as having an arm e with the yoke e' to receive the ring d^7, is mounted in bearings a^{15} a^{16}, as shown in Fig. 2, projecting out from the head a^2. The shaft is held raised by a strong spring e^3, having one end attached to the shaft and the other end placed over a hook e^4, extending out from the casing a^4. A sleeve e^5 is secured to the shaft e^2 by a clamping-bolt e^6 and a screw e^7 and is provided with a forwardly-projecting arm e^8, constructed with downwardly and laterally extending arms e^9, in which is journaled a roll e^{10}. One of the arms e^9 is extended, as shown in Fig. 4, and is provided with another roller e^{11}, placed on the outer face thereof. A horizontal shaft h is mounted in bearings a^{17} a^{18} and is provided with a worm-wheel h', intermeshing with a worm c^{12}, rigidly secured upon the spindle c. A cam h^2 is secured upon the end of the shaft h by a collar h^3 and is provided with two rises h^4 h^5, as shown in Fig. 3, and it extends between lips or lugs e^{12}, projecting upwardly from the arms e^9. These lips or lugs operate to center the shaft e^2 and to hold the roll e^{10} in parallelism with the cam h^2. Now it will be seen that as the spindle c rotates it transmits power to the shaft h through the worm and worm-wheel c^{12} h', and that, therefore, a complete rotation of the cam h^2 causes two reciprocations of the shaft e^2 by the rises on the cam engaging the roll e^{10}, mounted on the sleeve e^5.

It is necessary that the degree of movement given to the shaft e^2 and the sleeve d^2 should be regulated by the thickness of the sole of the shoe which is being nailed in order that a nail of the proper length should be screwed into the sole, and hence I provide means for varying the length of feed of the wire, as I shall now describe.

The horn i is mounted or secured to a shaft i', movable in a vertical guideway or bearing i^2, supported by the standard or post a, and to the lower end of the shaft i' is secured an arm i^3, which is connected by a connecting-rod i^4 with a lever i^5, fulcrumed at its center upon a stud i^6, extending out from the head a^2. On its end the lever i^5 is formed with a block i^7 to operate as a stop to limit the upward movement of the shaft e^2, the arm e on the last-named shaft being provided with an arm i^{15}, in which is journaled a roll i^{18} to strike against the said block. The horn is held raised by a spring j, coiled about the extension j' of the shaft i' and having its ends abutting against a collar j^2, threaded on said extension, and a stud j^3, projecting out from the standard a.

When the tip of the horn i is immediately below a guard or work plate k, situated beneath the end of the throat-piece d, the lever i^5 is tilted so that the block i^7 prevents the shaft e^2 from rising; but if the tip of the horn be lowered to receive a sole between it and the said guard-plate k the block i^7 will be raised a corresponding distance, so that the shaft e^2 may be reciprocated through a distance equal to the thickness of the sole. The rises h^4 h^5 on the cam h^2 always force the shaft e^2 down to the same point; but the distance traversed by the shaft e^2 in rising, and therefore by the sleeve d^2 and the feed-disks, will be only equal to the distance the tip of the horn has been moved from its normal position by the sole being placed between it and the plate k. Therefore when the spindle is rotating and the machine is in operation the nails or screws will be forced into the sole for a distance equal to the thickness of the sole, and after they have been thus fed they will be cut off by cutting mechanism consisting of two cutters l l', as shown in Figs. 5 and 15. Two disks l^2 l^3 are journaled on the stud extending out from the head a^2, and in guideways in each disk is placed one of the cutters, there being suitable means, as set-screws l^4, for adjusting the said cutters toward and from each other. The two disks are provided with oppositely-extending ears or lugs l^5, which are connected by connecting-rods l^6 with a stud l^7, extending through a lever l^8, fulcrumed at l^9. A spring l^{10} bears against a stationary part of the head and against the lever, so as to hold the edges of the knives apart a distance sufficient to allow the wire to pass freely between them, as shown in Fig. 5. On the end of the lever l^8 is a hard-metal bar or block l^{11}, with which two cam-blocks m m on the disk m' alternately engage to tilt the lever and operate the knives to cut the wire. The cam-blocks m m may be made of hardened steel and may be replaced when worn out, being removably mounted in the

cam-disk m' and held therein by screw m^2. The said cam-disk m' is mounted upon the shaft h, as shown in Fig. 4.

The parts are so timed that as soon as the feed-disks have reached the lowest limit of their movement, so that the wire has been fed in through the sole of the shoe a proper distance, the cutters $l\,l'$ are brought together with an equal movement, and the wire is severed before the sleeve d^2 begins to move upward. The guard or work plate k is secured to one of the holders for the knives.

In order to feed the shoes or work laterally, I provide the improved mechanism shown in Figs. 2, 4, 6, and 15. A rack-slide n is mounted in guides below the head a^2 and is adapted to be moved in and out by a handle n', clamped on the end of a shaft, on which is mounted a small pinion n^2, as shown in dotted lines in Fig. 2. By turning the handle the slide may be adjusted to any desired position, but is held from movement, except under considerable pressure, by pins n^3 and flat springs n^4, which press the pins against the slide at the sides thereof. At its front end the slide is cut away, as shown in Fig. 6, to receive a lever n^5, pivoted at n^6 and having segmental ratchet-teeth n^7, which are eccentric or in a spiral line with respect to the pivot n^6. The end of the lever is provided with a spherical socket n^8 to receive the ball-like end n^9 of a connecting-rod n^{10}, pivoted to a pin or swivel n^{11}, set in the end of a cam-lever n^{12}, as shown in Fig. 15. The end of the slide n is provided with upwardly-projecting flanges or guards n^{13}, (best shown in Fig. 3,) beyond which the teeth of the segmental lever project.

When the shoe is placed upon the horn, the edge of the sole is held against the segment-lever by the operator, so that when said lever is rocked in the direction of the arrow in Fig. 6 the work will be fed forward, and by reason of the teeth being eccentric the work will be released as the teeth move backward, as will be readily understood. The lever n^{12} is provided with an elongated hub n^{14} and is fulcrumed on a sleeve o, supported in a bearing a^{19}, afforded by a bracket extending out from the head a^2. The free end of the lever n^{12} is provided with a roll n^{15}, bearing against a cam p, secured upon the shaft h, and is also provided with a bunter or adjustable screw n^{16}, which is arranged to strike against the bearings a^{18} and limit the inward movement of the said upper end of the lever n^{12}. Upon the hub n^{14} of the lever n^{12} is clamped an arm n^{17}, having a roll n^{18}, bearing against a cam p' on the shaft h, the cams $p\,p'$ being placed on both sides of the cam-disk m', before referred to. The said cams $p\,p'$ are oppositely formed, the former operating to rock the lever n^5 in the direction of the arrow in Fig. 6 to feed the work forward and the cam p' operating against the arm n^{17} to return the lever n^5 to its original position. I find it desirable to employ this positive mechanism for returning the segment-lever to its normal position after having fed the work forward, for the reason that unless a mechanism of this kind be employed in lieu of a spring the segment-lever will sometimes remain in engagement with the work and will not return at the end of a stroke.

When the work is being fed forward, the horn is depressed and the sleeve in which the wire-feed rolls are mounted is at rest, so that the work is free; but when the work-feed lever is returned to its normal position after having fed the work forward the work is clamped against the guard k by the horn, so that the said lever is free to return without it.

The movement of the feed-lever may be varied to regulate the distance between the nails in the sole by adjusting the bunter-screw which limits the rearward movement of the said lever and adjusting the arm n^{17} around the hub n^{14} of the lever n^{12}, so that when it is forced outward to its greatest extent by a rise on the cam p' the bunter will be against the bearing a^{18}.

I provide for automatically raising and lowering the horn to grip or release the shoe or work by the following devices: Upon the shaft h is placed a path-cam q, which extends through an aperture in the head a^2 and which is formed with its groove to receive a roller on the end of a forked lever q', journaled on a stud-shaft q^2, extending through a bearing a^{21}, formed in the head, as shown in Figs. 2 and 11. In the end of the lever q' is journaled a toothed wheel r, having an axially-arranged stop-bar r' and formed in one face with clutch-teeth r^2, so that the said wheel constitutes one member of a clutch. A stationary sleeve r^3 is threaded into the arm q^4 of the forked lever q' and is likewise formed with clutch-teeth r^4, so as to constitute a stationary member of a clutch with which the movable rotatable clutch may be engaged. Passing through the said sleeve r^3 is an axially-movable stud-shaft r^5, rigidly connected to the clutch-wheel r, and which when moved acts to disengage it from the stationary clutch member, and which also has a conical head r^7.

A spring r^8 is arranged in a socket in the opposite arm q^5 of the forked lever q' and operates to normally hold the two members of the clutch together, whereby the clutch member r is prevented from rotating in one direction, but is free to slip over the teeth of the stationary member in the other direction—that is, the direction of the arrow in Fig. 13. In the said arm q^4 of the lever q is secured an adjustable stop r^9, against the end of which the end of the stop bar or block r' may engage to hold the two clutch members apart. Normally—*i. e.*, when there is no work in the machine—the two stops are in alinement and contact with each other. A roll r^{10} is journaled upon a stud r^{11}, extending between the two arms $q^4\,q^5$ of the shaft q', and operates to hold a rack s in engagement or in mesh

with the toothed clutch member r. The said rack s is threaded upon the end of a rod s', whose lower end is pivoted to the end of a lever s^2, fulcrumed upon the pivot pin or stud j^4 and having its other end connected to the extension j' of the shaft i', before referred to. A foot-lever s^3 is connected to the stud j^4, so that by depressing the said lever the horn may be lowered for the insertion of work between it and the guard k below the spindle. When the horn is so lowered, the connecting-rod s' is raised slightly, as will be readily seen, which it is free to do, since the clutch r is always at liberty to rotate in the direction of the arrow in Fig. 13.

A stationary cam t is mounted in a bracket t' on the head a^2 and engages the conical end r^7 of the stud-shaft r^5 when the lever q' is in its lowest position to thrust the said shaft longitudinally and disengage the clutch member r from the clutch member r^3, whereby the said member r is free to be revolved in either direction.

When there is no work in the machine, the stops r' and r^9 are in alinement and in contact and the clutches are held apart, so that the reciprocation of the lever q' does not affect the clutch r, as the face of the stop r^9 slides against the face of the stop r', which is elongated for this purpose.

Upon the treadle s^3 being depressed and a shoe being placed on the horn the rack s is lifted and partially rotates the clutch r and throws the said stops out of alinement and contact, as shown in Fig. 13, whereupon the spring r^8 causes the engagement of the clutches. So long, therefore, as the shoe remains upon the horn the clutches will be locked together (except during those instants when the end of the shaft r^5 is in engagement with the cam t) and the lever q' will reciprocate the horn, during which period the work will be fed forward at each depression of said horn. Hence although when the machine is in operation the lever q' is continuously reciprocated, yet the horn remains quiescent except when there is a shoe upon it. In this way I am enabled to avoid a wastage of power and to greatly prolong the life of the machine, as will be readily appreciated.

I am aware that it is not broadly novel to automatically stop the reciprocation of the horn when there is no shoe upon it; but the mechanism above described is more efficient in operation than any heretofore used and is a feature of the present invention. Prior to this time a pawl and ratchet have been employed for holding the toothed wheel stationary; but they were faulty because of the entire strain being borne by a single tooth with which the pawl engaged, whereas I provide confronting clutches provided with a large number of radial teeth which engage simultaneously as the clutches are brought together, so that the strain is borne by all of them. In addition to these features I also provide mechanism for preventing a reciprocation of the sleeve carrying the feed-disks for the wire except when a shoe is on the horn, this last-mentioned mechanism being directly under the control of the operator.

Referring to Figs. 1 and 4, it will be seen that a slide u is mounted in a guideway extending out from the lower part of the bearing-arm a^{17} and is provided with a rod or extension u', which extends through the sleeve o, before referred to, and is normally held forward by a spring u^2. On the end the rod u' is provided with a collar u^3, having its face beveled off or wedge-shaped in longitudinal section. A rod v, sliding in a bearing v', is connected at its lower end to a foot-lever v^2, fulcrumed in ears in the base of the standard a, and has its upper end forked and wedge-shaped, as at v^3, so that when the foot-lever is depressed the rod is forced upward and its upper end engages the collar u^3 and moves the locking-slide u longitudinally into its guide. The sleeve e^5, which, as before stated, is secured upon the vertically-reciprocating shaft e^2 and is provided with the roll e^{11}, is so arranged with relation to the locking-bar u that when the bar u is withdrawn the roll e^{11} slides up and down in front of the end thereof, and when the said shaft e^2 is in its lowest position the roll e^{11} is directly beneath the locking-bar u. Hence the said shaft e^2 is free to be reciprocated so long as the operator keeps his foot upon the treadle or foot-lever v^2, but when the foot is removed and the rod v drops the spring u^2 throws the locking bar or stop u outward to engage the roll e', since the cam h^2 forces the roll e^{10} down far enough, as shown in Fig. 4. The locking bar or stop u holds the shaft e^2 and the sleeve d^2 against movement so long as the treadle v^2 remains undepressed. Thus the feeding mechanism is under the direct control of the operator, as he may stop the action of the said feeding mechanism after each reciprocation thereof, if he so desires.

It will be observed that the treadle v^2 is located beside and just below the horn-operating treadle s^3, so that immediately after the horn has been depressed he may shift or drop his foot from the treadle s^3 to the treadle v^2. The latter is located near the ground, so that the operator may stand with his foot upon it during the operation of nailing a shoe without experiencing any discomfort therefrom.

The operation of the machine is as follows: The parts being in the position shown in Fig. 1 the operator placing his foot upon the treadle s^3 depresses it and lowers the horn sufficiently to place a shoe upon it. The shoe is arranged with the heel to the left and with the edge of the sole bearing against the segmental feed-lever n^5. As the horn is being lowered the rod s' and the rack s on the upper end thereof are free to move relatively to the lever q', as the teeth of the clutch r will slide over the teeth of the stationary clutch, as has been previously explained. When the foot is removed from the treadle s^3, the spring

j' elevates the horn and causes it to press the sole of the shoe against the guard or work plate k, the thickness of the sole preventing the horn from returning to its original position. The clutch member r is at this time partially rotated, as shown in Fig. 13, so as to bring the stop r out of alinement with the stop-bar r^9, as shown in Fig. 13, whereby the subsequent reciprocation of the said lever q' will cause the rod s to be moved up and down with it, since the two clutch members will be engaged by the spring r^8 each time the shaft r^5 leaves the cam l. Hence so long as the shoe remains upon the horn the latter will be reciprocated by the said lever q'. The depression of the horn by the sole shifted the lever i^5, so that the block i^7 now permits the shaft e^2 to be raised a distance equal to the thickness of the sole. Then the operator, placing his foot upon the treadle v^2, withdraws the locking bar or stop u and permits the shaft e^2 to rise until the roller i^8 engages the block i^7. Then as the cam h^2 revolves one of its rises engages the roll e^{10} and depresses it, forcing down the shaft e^2 a distance equal to the thickness of the sole. As the said shaft e^2 begins to descend it carries with it the sleeve d^2, and upon the first motion of the sleeve the wire-feeding rolls engage the wire, so that as the sleeve continues to descend the wire is carried slowly down, and the spindle being rotated a relatively high rate of speed the nail is screwed into the sole of the shoe. Immediately upon the said sleeve d^2 reaching the lowest limit of its movement one of the cam projections m on the cam-disk m' strikes the lever l^8 and causes the cutters to be moved together with an equal movement to sever the wire flush with the surface of the sole. Then as the sleeve d^2 rises the horn is depressed by the said lever q', the rack s, the rod s', and the lever s^2, whereupon the lever n^{12} is operated by the cam p to swing the segment work-feeding lever n^5 in the direction of the arrow in Fig. 6 to feed the work forward. During this time the backstay prevents the wire from rising. After the work has thus been moved forward the horn is again raised and another nail is screwed into the sole by a similar cycle of operations.

From the foregoing it will be observed that I have provided a machine which though possessing a minimum of parts operates to nail a shoe in a thorough and efficient way.

The wire is fed positively into the shoe by a mechanism which grips it firmly, and it is prevented from moving backward when the feed-rolls are being carried upward to again grip the wire. By employing feeding-rolls such as I have shown in Figs. 5, 7^a, and 7^b and arranging them to grip the wire between them I am enabled to force the wire down positively and to prevent it from slipping.

The feed-rolls roll easily over the wire when their supporting-sleeve d^2 is being raised; but immediately upon the sleeve being lowered they automatically move inward to engage the wire. By forming the gripping devices in the shape of rolls the teeth of the latter remain sharp for a greater length of time than they would if said devices were in the nature of non-revoluble toothed plates or dogs.

Again, by reason of the rolls being continuously engaged with the wire (and the wire being held against backward movement and being frictionally held against downward movement) the rolls grip it immediately upon their being moved downward to the slightest degree, and hence there is no lost motion of any of the parts, and, moreover, the rolls grip the wire positively and powerfully, although they do not deface or injure it in any way, which, it will be recognized, is of considerable importance.

Upon examining Fig. 5 it will be noticed that by employing this feeding mechanism for the wire I am enabled to employ a very simple form of spindle. The throat is set into the spindle almost its entire length and is cylindrical in shape, with longitudinal slots to permit movement of the feeding-rolls. Thus it may be easily constructed and costs little when compared with the throat-pieces necessary in other machines of this class.

The mechanism for holding back or checking the backward movement of the wires is very simple; but it operates in a highly-efficient manner, since it immediately locks the wire as soon as the downward tension thereupon ceases.

Another feature of this invention is the means for holding the reel in the yoke. In employing machines of this class the dislocation of the reel frequently causes severe injury to the machine and endangers the life and limb of the operator, and hence where a nutted bolt is employed the liability of the operator forgetting to screw the nut in place is a constant source of danger. I employ, as before described, a pin having at the head end left-hand threads, whereby when it is screwed into the yoke there is no danger of its working loose and whereby it must be secured in place before the reel can be used.

There are other important features of the invention, which I have hereinbefore described and to which I need not again refer.

Having thus explained the nature of the invention and described a way of constructing and using the same, though without attempting to set forth all of the forms in which it may be made, I declare that what I claim is—

1. In a nailing-machine, in combination, a rotary spindle, and means for feeding the wire therethrough comprising loosely-mounted rolls arranged to roll over the wire when moved in one direction and to grip it between them when moved in the other direction.

2. In a nailing-machine in combination, a rotary spindle, and means for feeding a threaded wire therethrough comprising oppositely-arranged loosely-mounted toothed rolls

arranged to roll over the wire when moved in one direction and to grip it when moved in the other direction, and means for supporting and reciprocating said rolls.

3. In a nailing-machine, in combination, a rotary spindle, and means for feeding the wire therethrough consisting of a reciprocatory sleeve rotatable with the spindle, serrated rolls, and means for supporting said rolls on said sleeve, said means being constructed and arranged to permit the rolls to pass over the wire when moved in one direction, and to positively grip and feed the wire when moved in the other direction.

4. In a nailing-machine, in combination, a rotary spindle, and means for feeding the wire therethrough consisting of a reciprocatory sleeve rotatable with the spindle, a series of coacting serrated rolls, and friction-blocks for said rolls, supported by the sleeve.

5. In a nailing-machine, in combination, a rotary spindle, and means for feeding the wire therethrough, consisting of a reciprocatory sleeve rotatable with the spindle, a series of loose serrated wire-feeding rolls, and a friction-block for each roll pivoted on the said sleeve.

6. In a nailing-machine, in combination, a rotary spindle, and means for feeding the wire therethrough, consisting of a reciprocatory sleeve rotatable with the spindle, a series of loose serrated wire-feeding rolls, and a friction-block for each roll pivoted on the said sleeve, the axes of movement of the friction-blocks being out of the plane of the axes of the rolls.

7. In a nailing-machine, in combination, a rotary spindle, and means for feeding the wire therethrough, consisting of a reciprocatory sleeve rotatable with the spindle, a series of loose serrated wire-feeding rolls, a friction-block for each roll pivoted on the said sleeve, and springs for thrusting the rolls into engagement with the wire.

8. In a nailing-machine, in combination, a rotary spindle, and means for feeding the wire therethrough, consisting of a reciprocatory sleeve rotatable with the spindle, a series of loose serrated wire-feeding rolls, a friction-block for each roll pivoted on the said sleeve, and spring-held means for thrusting the rolls into engagement with the wire.

9. In a nailing-machine, in combination, a rotary spindle, means for feeding the wire therethrough, and means for checking a backward movement of the wire comprising spring-pressed serrated rollers.

10. In a nailing-machine, in combination, a rotary spindle, means for feeding the wire therethrough, and means for checking a backward movement of the wire comprising serrated rollers and friction-blocks for said rollers.

11. In a nailing-machine, in combination, a rotary spindle, means for feeding the wire therethrough, and means for checking a backward movement of the wire comprising serrated rollers and spring-pressed friction-blocks arranged to permit the rolls to rotate in one direction only.

12. In a nailing-machine, in combination, a rotary spindle, means for feeding the wire therethrough, and means for checking a backward movement of the wire comprising serrated rollers, friction-blocks for said rolls, and a collar on said spindle having springs bearing against said friction-blocks.

13. In a nailing-machine, in combination, a rotary spindle having a through-aperture, friction-blocks inserted in said aperture, coacting serrated rolls supported by the blocks, a collar on said spindle, and springs supported by said collar and bearing against the friction-blocks.

14. In a nailing-machine, in combination, a rotary spindle having an aperture in its lower end, a cylindrical throat-piece inserted in said spindle and having a projecting end, a reciprocatory sleeve, and feeding-rolls supported by said sleeve and projecting through slots in the throat-piece and spindle to grip the wire.

15. In a nailing-machine, in combination, a spindle, means for feeding wire therethrough, a roll supported by the spindle, and having friction-rims, spring-pressed friction brake-shoes bearing against said friction-rims to retard the rotation of the reel and a spring connecting said shoes.

16. In a nailing-machine, in combination, a spindle, means for feeding wire therethrough, a yoke connected with the spindle, a wire-reel supported in the yoke, and a journal-pin headed at one end and threaded at said end to engage the yoke.

17. In a nailing-machine, in combination, a rotary spindle, a reciprocatory sleeve having means for feeding the wire through the spindle, a transversely-arranged rotary shaft having a cam, a reciprocatory shaft arranged parallel to the spindle, an arm carried by said reciprocatory shaft and having cheeks or lugs embracing said cam, a roller on said arm, and means for connecting said reciprocatory shaft with said sleeve.

18. In a nailing-machine, in combination, a spindle, means for feeding the wire through the spindle, a reciprocatory shaft from which motion is transmitted to the feeding means, means for reciprocating said shaft, and mechanism for controlling the movements of said shaft, comprising a locking-stop and a foot-lever fulcrumed at the base of the machine and connected to said stop.

19. In a nailing-machine, in combination, a spindle, means for feeding the wire through the spindle, a reciprocatory shaft from which motion is transmitted to the feeding means, means for reciprocating said shaft, and mechanism for controlling the movements of said shaft comprising a sliding stop, a vertically-acting wedge to engage said stop, and a lever connected to said wedge.

20. In a nailing-machine, in combination, a

spindle, means for feeding the wire therethrough, a reciprocatory shaft for operating the wire-feeding means, an arm on said shaft having a roller, and mechanism for controlling said shaft comprising a spring-held sliding stop, a wedge to engage the stop, a connecting-rod, and a treadle to operate as described.

21. In a nailing-machine, in combination, a reciprocatory toothed feed-lever, a lever for moving the feed-lever in one direction, an arm adjustably connected to the said lever for moving said feed-lever in the other direction, and two cams for acting on the said lever and the arm connected therewith.

22. In a nailing-machine, in combination, a reciprocatory toothed feed-lever, a two-armed lever for moving the feed-lever positively in each direction, cams for acting on said arms alternately, and means for limiting the degree of movement of the said two-armed lever.

23. In a nailing-machine, in combination, a reciprocatory toothed feed-lever, a two-armed lever for moving the feed-lever positively in each direction, cams for acting on said arms alternately, means for adjusting one of said arms relatively to the other, and an adjusting-screw for limiting the degree of movement of the said two-armed lever.

24. In a nailing-machine, in combination, a reciprocatory horn, a vibrating lever, and a clutch mechanism having a laterally-movable member for connecting the lever and horn only when the horn is partially depressed.

25. In a nailing-machine, in combination, a reciprocatory horn, a vibrating lever, a rod connected with the horn and having a rack, a stationary toothed clutch on the lever, and a revoluble clutch in engagement with the rack, said parts being constructed and arranged whereby when the horn is in its inoperative position the two clutches are out of engagement.

26. In a nailing-machine, in combination, a reciprocatory horn, a vibrating lever, a rack connected with the horn, a toothed clutch-roll mounted on said lever, a stationary clutch confronting the revoluble clutch, stops on said clutches, and a spring for thrusting the clutches into engagement, said parts being constructed and arranged whereby the horn is not reciprocated when there is no shoe upon it.

27. In a nailing-machine, in combination, a reciprocatory horn, a vibrating lever, a rack connected with the horn, a treadle for depressing the horn, a stationary toothed clutch on the lever, a rotary clutch mounted on the said lever and meshing with the rack, coacting stops carried by said clutches, and a cam for acting on the rotary clutch to throw it out of engagement with the stationary clutch.

28. In a nailing-machine, in combination, a reciprocatory horn, a vibrating lever, a rack connected with the horn, a toothed clutch-roll journaled on said lever, a stationary toothed clutch on said lever, a spring for thrusting said clutches into engagement, coacting stops carried by the said clutches, and a cam for thrusting said clutches out of engagement.

29. In a nailing-machine, in combination, a spindle, means for feeding the wire through said spindle, mechanism for controlling the said wire-feeding means, a horn, means for depressing said horn, and treadles or foot-levers arranged in proximity and one below the other, one treadle connected to the horn-depressing means, and the other connected to the wire-feed controlling means.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 19th day of June, A. D. 1897.

ORRELL ASHTON.

Witnesses:
M. B. MAY,
C. F. BROWN.