(No Model.) 2 Sheets—Sheet 1.

J. A. STAPLES & C. BUSH.

NAIL MACHINE.

No. 602,024. Patented Apr. 5, 1898.

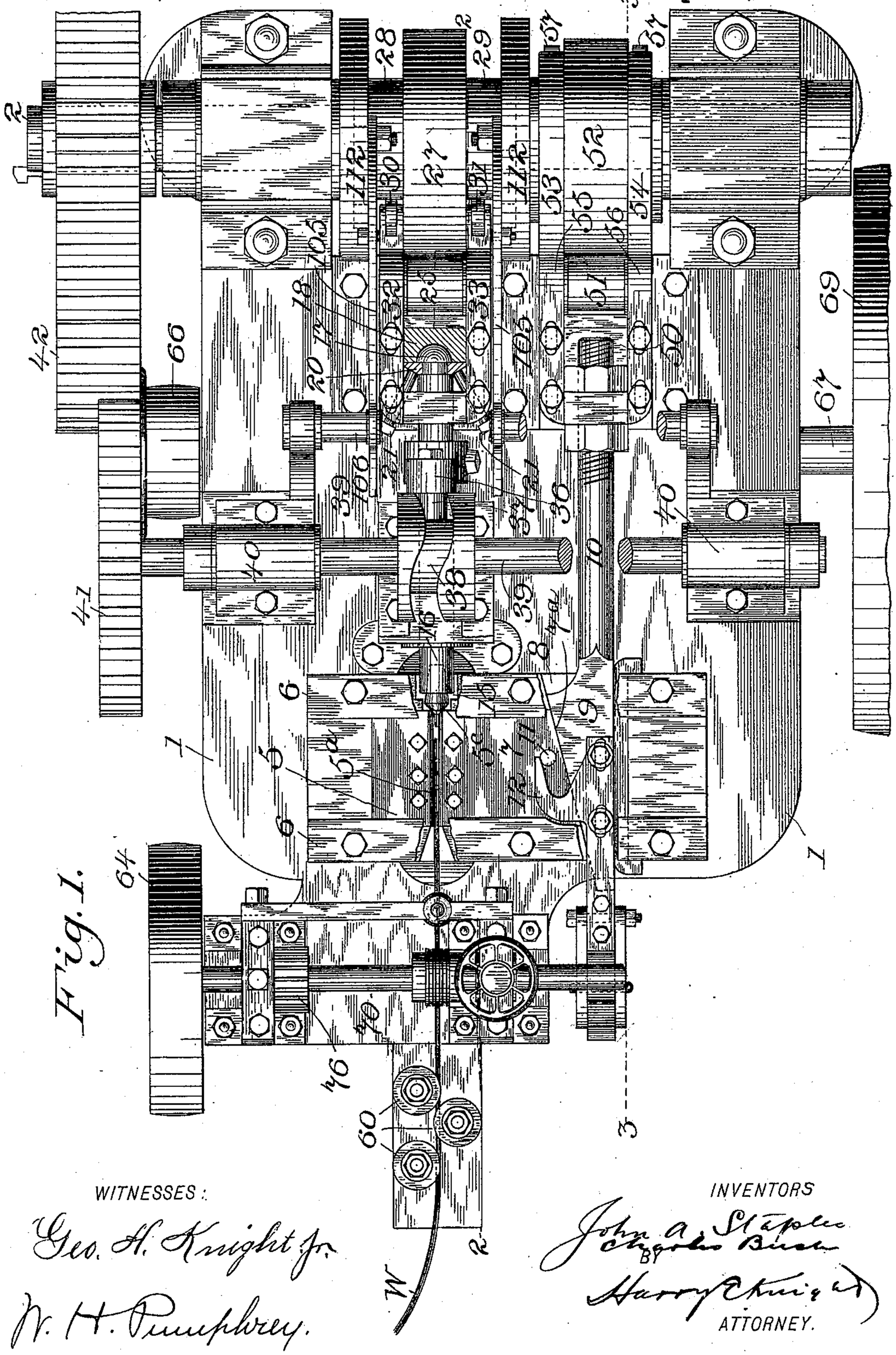

Fig. 1.

WITNESSES:

Geo. H. Knight Jr.

W. H. Pumphrey.

INVENTORS

John A. Staples
Charles Bush
BY
Harry C. Knight
ATTORNEY.

(No Model.) 2 Sheets—Sheet 2.

J. A. STAPLES & C. BUSH.

NAIL MACHINE.

No. 602,024. Patented Apr. 5, 1898.

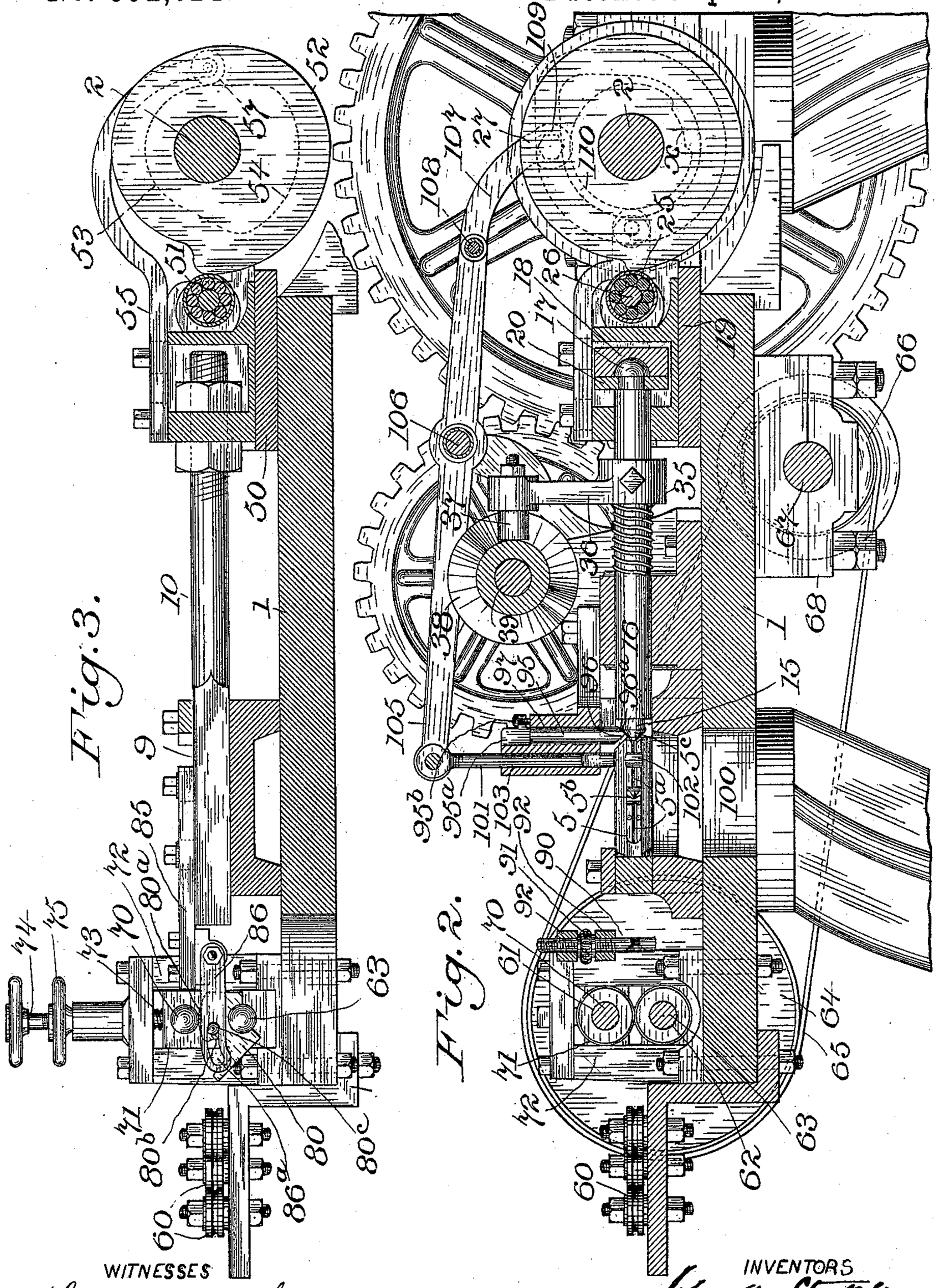

Fig. 3.

Fig. 2.

WITNESSES

Geo. H. Knight jr.

W. H. Pumphrey.

INVENTORS

John A. Staples

Charles Bush

BY

Harry E. Knight

ATTORNEY

UNITED STATES PATENT OFFICE.

JOHN A. STAPLES AND CHARLES BUSH, OF NEWBURG, NEW YORK, ASSIGNORS TO CHARLES H. HANFORD, OF SAME PLACE.

NAIL-MACHINE.

SPECIFICATION forming part of Letters Patent No. 602,024, dated April 5, 1898.

Application filed July 14, 1897. Serial No. 644,585. (No model.)

To all whom it may concern:

Be it known that we, JOHN A. STAPLES and CHARLES BUSH, citizens of the United States, residing at Newburg, in the county of Orange and State of New York, have invented certain new and useful Improvements in Nail-Machines, of which the following is a specification.

The objects of our invention are to simplify and improve the structure of wire-nail machines and to obviate the objectionable noise and the wear and tear incident to the operation of such machines as they are now commonly constructed.

As now commonly constructed wire-nail machines are provided with dies or anvils, which are brought against the end of a rigidly-held wire blank with a blow or shock similar to the blow of a hammer for forming the nail-head. This action is not only very noisy and objectionable, but it is very wearing upon the machine and materially lessens its life. To overcome this great objection, we propose to form the head upon the end of the wire blank by firmly pushing or forcing the heading punch or die against the blank and simultaneously imparting a slight circumferential rotation, oscillation, or similar motion to the heading punch or die in a direction transverse to the line of thrust to cause the uniform spreading of the metal in the wire at its end to form the head.

A second feature of importance in our improved wire-nail machine is an automatic throw-out for the wire-feeding mechanism. This throw-out comprises, essentially, a wedge or block supported between the journals of the wire-feed rolls and normally allowing the feed-rolls to be in operative relation and mechanism connecting said block or wedge with the operating mechanism of the holding and cutting-off die, whereby the block or wedge will be operated when a blank is cut off to arrest the feed of the wire for the moment that the nail is being headed.

A third important feature of our improved machine consists in forming the cutting-off and holding dies in one—that is, a stationary and a movable member having the complementary parts of the holding and cutting-off dies formed on their working faces—so that the blank will be cut off from the continuous supply of wire and grasped firmly for the heading operation by a single movement of the combined cutting-off and holding die. This feature of our invention differs from previous machines known to us in that separate dies with separate operating mechanisms have been heretofore employed for effecting the cutting off and holding of the blank.

Another important feature of our improved machine consists in utilizing the heading punch or die as a stop or gage for the wire blank, the operating mechanism of the header being so arranged that the header will automatically recede sufficiently to allow a slight movement of the blank toward the header while the cutting-off knives are operated. This is a very important feature in connection with the gaging of the blank by the header-die, as the nail-blank would be bent or twisted between the header and cutting-off knives if the header did not have a slight receding motion while the cutting-off dies are operating.

In addition to the above main features in our machine there are other features of construction of minor importance, which will hereinafter be described in connection with the main features, with particular reference to the accompanying drawings.

In said drawings, Figure 1 is a plan view of our improved wire-nail machine, having parts broken away and parts omitted for the purpose of clearly illustrating the important features. Fig. 2 is a longitudinal sectional elevation of the machine, taken on the line 2 2 of Fig. 1. Fig. 3 is a detail longitudinal sectional view taken on the line 3 3 of Fig. 1.

Mounted upon a suitable stout supporting-framework 1 are the head-forming die or punch, the laterally-operating holding and cutting-off die or clamp, the operating-wedge for the movable member of said holding and cutting-off die, the main power-shaft with its cams, and the wire-feeding mechanism, all arranged in practically the same horizontal plane and operated from the single power-shaft, which has the operating-cams arranged side by side.

5 is the stationary member of the holding and cutting-off die or clamp, having a longitudinal wire-receiving groove 5^a, in which the

blank is held or clamped, the cutting-off die 5^b, which severs the blank from the continuous supply of wire, and the head molding or forming half-socket 5^c. The stationary member 5 is securely fastened in the transverse channel or groove formed by cross-bars 6, which are securely bolted to the table of the supporting-frame.

7 is the movable or sliding member of the laterally-operating cutting-off and holding clamp or die, which is formed with a working face corresponding to that of the stationary die just described. The movable member is slidingly mounted in the channel formed by the bars 6 and is formed with a cam or inclined face 7^a at its outer end, which projects into an inclined or angular opening 8 of the machine-frame, in which operates the wedge 9, formed on the end of the bar 10. The wedge 9 impinges upon the inclined or cam surface 7^a of the movable member 7 to cause said movable member to move inwardly against the blank and cut it off and clamp it against the stationary member when the bar 10 is thrust longitudinally.

11 is a lug or pin projecting from the upper face of the movable member 7 of the clamp-die, and 12 is a cam-hook secured to the wedge 9 and engaging the lug or pin 11 to cause the movable member 7 of the clamp or die to be pulled back away from the stationary member 5 when the wedge 9 is retracted in a manner hereinafter to be explained.

15 is a blank-gaging and head-forming punch or die which fits securely in a socket formed in the end of the cylindrical bar 16, which constitutes the combined oscillating and longitudinally-movable member of the header. The bar 16 is formed with a semi-cylindrical head 17 at its rear end, which fits snugly in a similarly-shaped socket formed in a thrust block or bearing 18, mounted in a sliding head 19. 20 is a ring or washer engaging the head 17 and secured in position by bolts 21.

25 is an antifriction-roll journaled upon a pin or shaft 26 of the sliding head 19, and 27 is the main heading-cam, keyed to the main power-shaft 2 of the machine. The cam 27 is of such shape that the header will be given a gradual longitudinal forward motion during about one-quarter of its revolution for forming the head upon the blank.

28 and 29 are cams arranged on either side of the main heading-cam 27, and 30 31 are friction-rolls journaled in the bifurcated ends of arms 32 33, which are rigidly secured to the sliding head 19 of the longitudinally-movable portion of the header. The rolls 30 31 travel normally upon the cams 28 and 29 and support the header in partially-retracted position, with the antifriction-roll 25 out of contact with the main header-cam 27. The cams 28 29 are formed with a depression, (indicated by dotted lines at x in Fig. 2,) which allows the header to recede to its farthest rearward position, which action takes place at the moment that the blank is cut off from the continuous supply of wire, the severed blank being given a slight longitudinal motion toward the header by the act of cutting off. This receding of the header also brings the antifriction-roll 25 into peripheral contact with the main heading-cam 27 at the moment when the gradual rise in the cam begins to operate for imparting the gradual pushing or forcing forward of the header.

It will be observed that the header, as above described, comprises a longitudinally-movable portion 19, supporting the parts described, and a combined longitudinally and circumferentially oscillating portion 16.

35 is a spiral spring surrounding the bar 16 for holding the header normally against the cams.

36 is an arm mounted upon the bar 16 and projecting upwardly therefrom and carrying at its upper end a pin or roll 37, which engages in the grooved cam 38. The cam 38 is keyed to a transverse shaft 39, journaled in bearings 40 and carrying at one end a gear-wheel 41, which meshes with the main power-gear 42, keyed to the end of the main power-shaft 2. By the operation of the cam 38 upon the arm 36 the bar 16 of the header is given a continuous oscillatory motion, the cam-groove being of sufficient depth to allow the longitudinal movement of the header without throwing the pin 37 out of engagement with the cam.

The bar 10, carrying the operating-wedge 9, is adjustably secured to a longitudinally-sliding head or box 50, which carries an antifriction-roll 51, operating constantly in peripheral contact with the cam 52, keyed to the power-shaft 2 to one side of the header-operating cams 27, 28, and 29. Alongside of the cam 52 are the cams 53 and 54. (Indicated by dotted lines in Fig. 3 and partly shown in Fig. 1.)

55 and 56 are arms rigidly secured to the sliding box or head 50 and extending over and curving downward to the farthest side of shaft 2.

57 57 indicate friction-rolls carried in the ends of the arms 55 and 56, which work constantly upon the peripheries of cams 53 and 54. It will be observed that the cam 52 gives the operating-wedge 9 its forward thrust for cutting off and clamping a blank, while the cams 53 and 54 retract the wedge and withdraw the movable member of the cutting-off and holding clamp or die.

W indicates the wire, which may be led from any suitable reel (not shown) to the straightening-rolls 60, from which the wire passes between the two peripherally-grooved feed-rolls 61 and 62. The lower grooved feed-roll 62 is mounted upon a shaft 63, journaled in suitable stationary bearings in the supporting-frame and having at one end a belt-pulley 64, over which passes a band or belt 65, leading from a similar belt-pulley 66, keyed to the end of a transverse shaft 67,

journaled beneath the machine-frame in bearings 68. The shaft 67 is geared to the main gear 42 by a small gear, which is not shown, and its opposite end carries a main driving belt-pulley 69, by which power is applied to the machine. The upper grooved feed-roll 61 is keyed to a shaft 70, which is mounted in vertically-movable bearings 71, supported in suitable vertical guide-frames 72 and held downwardly with a yielding pressure by springs 73, the pressure of which is regulated by adjusting hand-screw 74 and clamp-nut 75.

To the left of the machine the shafts 63 and 70 project beyond the bearings, and loosely mounted upon the lower shaft 63 is the throw-out wedge or block 80, which has a concave bearing-socket fitting over the shaft 63, a curved or wedge projection 80^a, adapted to engage the upper shaft 70, and a socket or cut-out portion 80^b, into which the upper shaft 70 may fall.

85 is a bar rigidly attached to the wedge 9 and supporting parallel links 86, which are pivoted to the bar 85 and are formed with slots 86^a in their outer ends, which engage lugs or projections 80^c of the wedge or block 80. As shown in Fig. 3, the wedge or block 80 is in position to hold the feed-rolls 61 and 62 apart to arrest the feed of wire to the machine. When a blank has been cut from the wire, the wedge 9 will be in the position shown in Fig. 3; but as soon as the wedge 9 recedes to withdraw the movable member of the cutting-off and holding die the operation of the shafts 63 and 70 of the feed-rolls will roll the block 80 forwardly to cause the shaft 70 to drop into the recess or socket 80^b, thereby allowing the feed-rolls to come into operative position, when the feed of wire will be continued. The shaft 70 is driven by gear 76, which meshes with a small gear on the shaft 63.

From the feed-rolls 61 and 62 the wire passes through the eye of a wire-guide 90, which is a simple rod having a flared opening through it and a threaded upper end. 91 is a thumb-nut mounted upon the threaded upper end of the wire-guide 90, between the supports 92, in which said wire-guide is mounted. By the rotation of the nut 91 the guide 90 can be adjusted vertically. The wire passes through the eye of guide 90 into the complementary grooves on the stationary and movable members of the cutting-off and holding clamp, and should the end of the wire project too high it would come into contact with the beveled face 96 formed upon the lower end of the vertically-movable guide-rod 95. The guide-rod 95 is mounted loosely in a socket 97 of the frame and is formed with a head 95^a at its upper end, in which is seated an adjusting-screw 95^b, adapted to engage the wall of the socket 97 to limit the downward movement of the guide-rod. It will be observed that the lower beveled end 96 of the guide-rod will guide the wire into position in the grooves of the clamp. The guide-rod 95 is also formed with a beveled face 96^a, which is adapted to be engaged by the conical face or shoulder of the heading punch or die when the header comes up into position to form the head, thereby raising the guide-rod 95 out of its way.

Directly beneath the cutting-off and holding clamps or dies is an opening 100 for the nails to drop out.

101 is a knocking-off rod formed with a thin lower end which is adapted to work vertically in the slot 102, formed between the movable and stationary guides. The rod 101 works in a vertical opening 103, formed in the machine-frame, and is hung at its upper end upon the end of a lever 105, which is journaled upon a shaft 106 and has a bifurcated forward end forming two arms 107, which are braced by a tie-rod 108 and carry at their lower ends friction-rolls 109, working in cam-grooves 110. (Indicated by dotted lines in Fig. 2.) The cam-grooves 110 are formed in the faces of cams 112, arranged upon opposite sides of the cams 28 and 29. By the operation of the cams 112 the knocker-off rod 101 is given a downward stroke just after the nail is headed.

The operation of our improved machine is as follows: By the action of the feed-rolls 61 and 62 a sufficient length of wire is fed forward between the stationary and movable members of the cutting-off and holding clamp, the end of the wire being guided into position, as above explained, and coming into contact with the heading punch or die. As soon as a sufficient length of wire has been fed forward the wedge 9 moves, forcing the movable member of the cutting-off and holding die against the stationary member. This causes a blank to be cut from the continuous wire, forcing the blank forward slightly, the header receding sufficiently to allow for the free forward movement of the blank by reason of the friction-rolls 30 31 entering the recesses x of the cams 28 and 29. Immediately after the blank is severed from the continuous wire the movable member of the clamp continues to move inwardly toward the stationary member until the blank is securely clamped in position. Immediately after this has taken place the main header-cam 27 comes into play and forces the header against the rigidly-held blank to form the head, the header being at the same time given a rapid oscillation to cause the even spreading of the metal in the head. It will be observed that the header has a gradual forward movement with sufficient pressure to form the head, the combined thrust and oscillation producing a perfectly uniform head in all the nails. As soon as the head has been formed the knocker-off rod 101 descends, the clamps opening at the same time to allow the formed nails to fall through the opening 100.

The operation of the machine is practically noiseless. No jarring occurs, and the machine has great economy in operation, because much less force is required for the action of the header in performing its gradual motion to

shape the head than would be required if a positive blow were given. The oscillation of the header gives its forward motion the effect of a shearing blow for spreading the metal. The header punch or die being removable, dies of different sizes may be employed to form nails of different sizes and shapes.

While we prefer to employ the oscillatory movement of the header to cause the spreading of the metal into the die as it is being pressed against the blank, because this movement produces the most satisfactory results, still we would have it understood that we consider our invention to be sufficiently broad to cover a rotary movement of the header in a plane transverse to the line of thrust while it is being forced or pressed against the end of the nail-blank. The cam which operates the wedge of the cutting-off and holding clamp is so shaped that the clamp will be held closed while the header is operating.

By forming the cutting-off and holding die in one we greatly simplify and improve this part of the structure of a nail-machine, as machines heretofore employed used two distinct clamps or dies for accomplishing the cutting-off and holding of the blank.

Having thus fully described our invention and the manner of carrying the same into practice, the following is what we claim as new therein and desire to secure by Letters Patent:

1. In a nail-machine, the combination of means for holding a nail-blank, with a nail-heading punch or die, means for gradually pushing or forcing the punch or die against the end of the blank, to spread the metal into a head, as distinguished from a sudden blow, and means for imparting a movement to the punch or die in a direction transverse to the line of thrust during the gradual spreading thrust of the die against the blank, said transverse movement assisting the spreading of the metal, substantially as and for the purpose set forth.

2. In a nail-machine, the combination of means for holding a nail-blank, with a nail-heading punch or die, means for gradually pushing or forcing the punch or die against the end of the blank, to spread the metal into a head, as distinguished from a sudden blow, and means for imparting an oscillatory motion to the punch during the gradual head-spreading thrust of the die against the blank to assist in the formation of the head, substantially as set forth.

3. In a nail-machine, the combination of a suitable clamp for holding a blank, a longitudinally and circumferentially movable header carrying a heading-die, means for gradually moving the header longitudinally for forcing the die against the blank, to spread the metal into a head, and means for simultaneously imparting a circumferential movement to the header, to assist the spreading action, substantially as set forth.

4. In a nail-machine, the combination of a suitable clamp for holding a blank, a longitudinally-movable and circumferentially-oscillating header adapted to receive a metal-spreading heading punch or die, means for imparting a gradual longitudinal spreading movement to the header longitudinally, as distinguished from a sudden blow, means for simultaneously oscillating the header, to assist the spreading action, and means for operating the clamp, substantially as set forth.

5. In a nail-machine, the combination of a blank-holding clamp, means for operating the clamp, a header comprising a longitudinally-sliding portion and a circumferentially-movable portion, a heading die or punch secured to the header, and means for imparting a longitudinal movement to the header and simultaneously therewith oscillate the circumferentially-movable portion, substantially as set forth.

6. In a nail-machine, the combination of a suitable wire-feeding device, the laterally-operating holding and cutting-off clamp, combined longitudinally movable and oscillatory header, carrying a heading device or punch, a longitudinally-moving wedge engaging the movable member of the lateral clamp, a power-shaft, and cams mounted upon said power-shaft for operating said header and wedge, substantially as set forth.

7. In a nail-machine, the combination of a blank-holding clamp, means for operating the clamp, a heading punch or die, and an intermittently-operating wire-feeding device automatically thrown out of operation by the action of the clamp-operating means, substantially as set forth.

8. In a nail-machine, the combination of a blank-holding clamp, means for operating the clamp, a header, a pair of blank-feeding rolls, and means operated by the clamp-operating means for rendering the feed-rolls inoperative, substantially as set forth.

9. In a nail-machine, the combination of a blank-holding clamp, a header, feed-rolls, a block or wedge mounted between the shafts or journals of the feed-rolls, and means for automatically operating the block or wedge for moving the rolls into or out of operative relation, as set forth.

10. In a nail-machine, the combination of a blank-holding clamp, a header, coöperating feed-rolls, a block or wedge mounted upon the journal or shaft of one of the feed-rolls and adapted to engage the shaft or journal of the other feed-roll, means for forcing said block or wedge in one direction for separating the feed-rolls and said block or clamp being adapted to be moved in the opposite direction by the rotation of the shafts or journals, as set forth.

11. In a nail-machine, the combination of a blank-holding clamp, a header, coöperating feed-rolls, a block or wedge formed with a socket fitting on the shaft or journal of one

feed-roll and an elevated portion adapted to engage the shaft or journal of the other feed-roll, and means for operating said block or wedge, as set forth.

12. In a nail-machine, the combination of a blank-holding clamp having a stationary and movable member, a wedge for operating the movable member, a pair of feed-rolls, a block or wedge supported between the shafts or journals of the feed-rolls, and an arm projecting from the clamp-operating wedge and suitably connected with the block or wedge for operating it, as set forth.

13. In a nail-machine, the combination of the blank-feeding mechanism, the cutting-off and holding die or clamp, and the header and operating mechanism, the operating mechanism of the header being constructed and arranged to cause the header to recede slightly as the blank is cut off just prior to the heading operation, as and for the purpose set forth.

14. In a nail-machine, the combination of the stationary and movable blank-holding members, the header, the operating-wedge engaging the movable member of the blank-holding clamp for forcing it in one direction, and a secondary wedge on the main operating-wedge engaging a projection or shoulder on the said movable member for moving it in the opposite direction, as set forth.

15. In a nail-machine, the combination of means for feeding a wire blank, a blank-holding clamp or die, a heading die or punch, means for operating the blank-holding clamp and heading die or punch, and a guide such as 95 arranged in the path of the wire blank and adapted to center the blank in the holding clamp or die, as set forth.

16. In a nail-machine, the combination of means for feeding a wire blank, a holding clamp or die, a header, means for operating the clamp and header, and a blank-guide such as 95 adapted to guide the blank to the clamp and means for moving the guide out of the way of the header when the header comes into operation.

17. In a nail-machine, the combination of means for feeding a wire blank, a holding clamp or die, a header, means for operating the clamp and header, and a blank-guide such as 95 formed with a beveled shoulder for guiding the blank into position in the clamp, and means of engagement between the header and guide for throwing the latter out of position when the former is brought into operation, as set forth.

18. In a nail-machine, the combination of means for feeding a wire blank, a holding clamp or die, a header, means for operating the clamp and header, and a blank-guide supported in the path of the blank and movable laterally thereto; said guide having a beveled shoulder against which the end of the blank impinges to center it in the holding-clamp, and a second beveled shoulder against which the header impinges to move it out of the way when the header operates, as set forth.

JOHN A. STAPLES.
CHARLES BUSH.

Witnesses:
ALBERT H. F. SEEGER,
HENRY KOHL.