Jan. 23, 1923.

1,442,989.

T. J. ALEXANDER.

NAIL FORMING MACHINE.

FILED JAN. 20, 1921.

3 SHEETS—SHEET 1.

Fig 1.

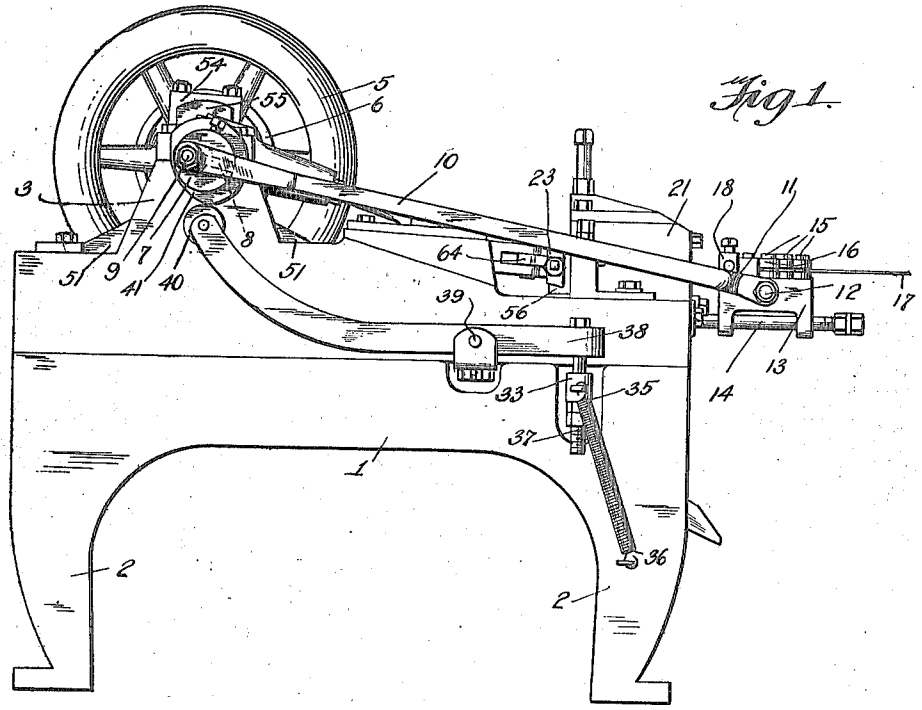
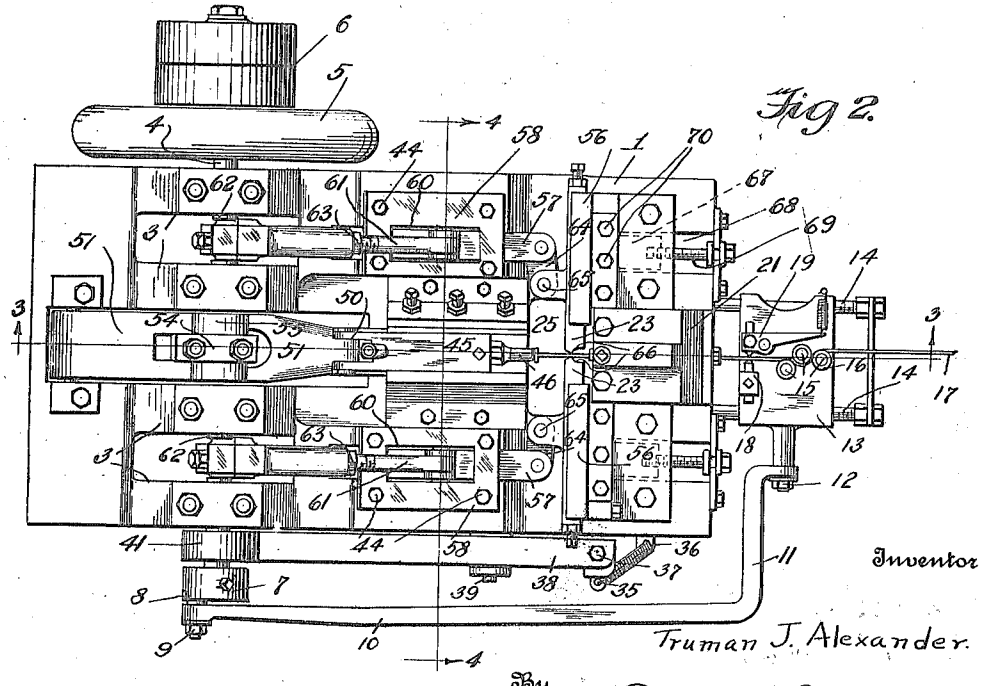


Fig 2.



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3 SHEETS—SHEET 2.

Fig 3.

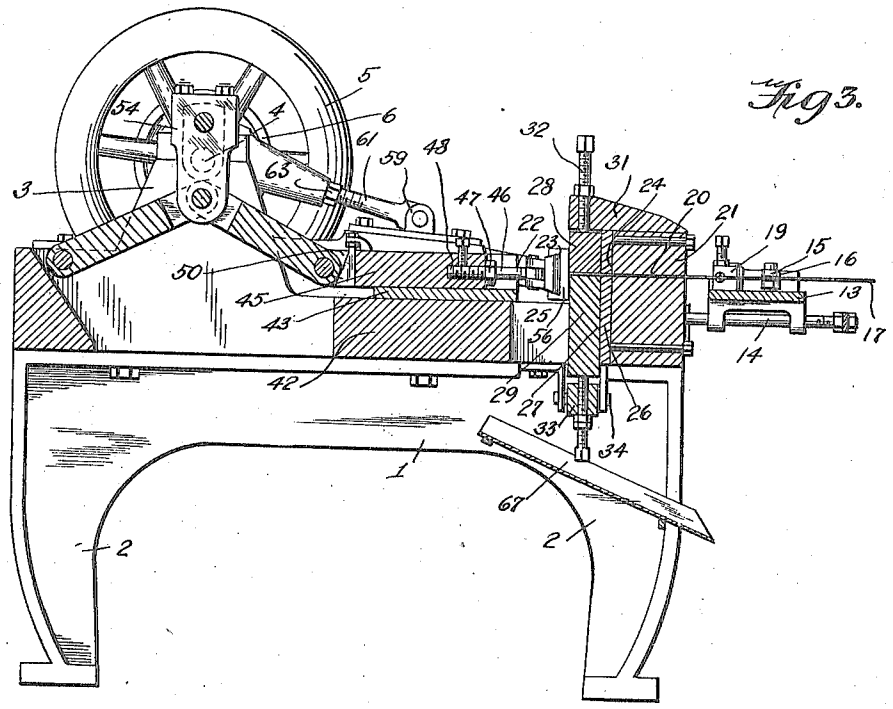
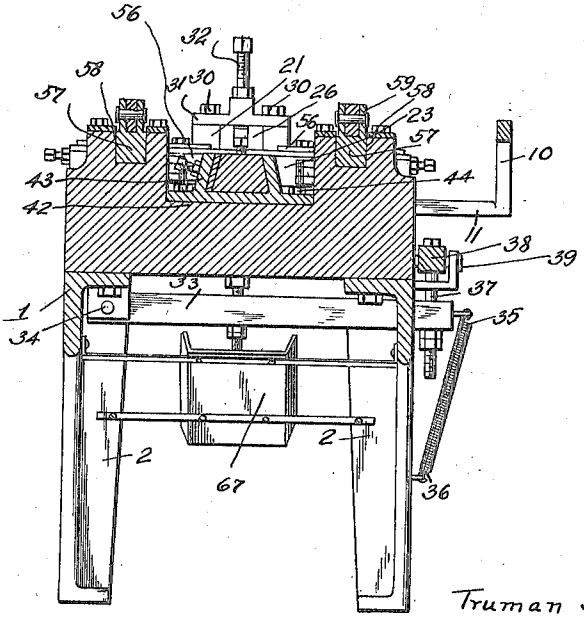


Fig 4.



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3 SHEETS—SHEET 3.

Fig 5.

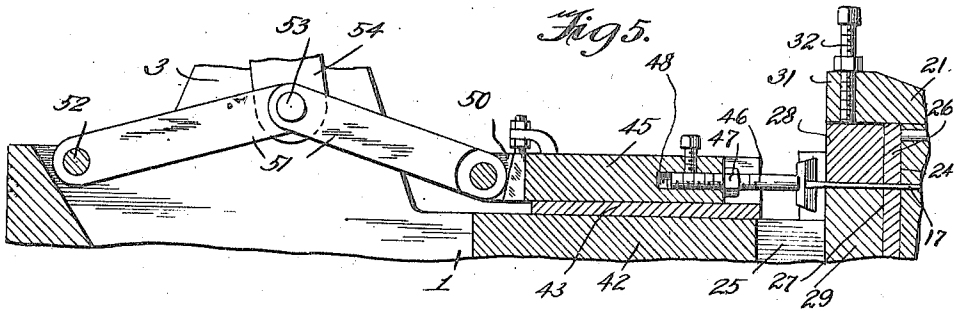


Fig 6.

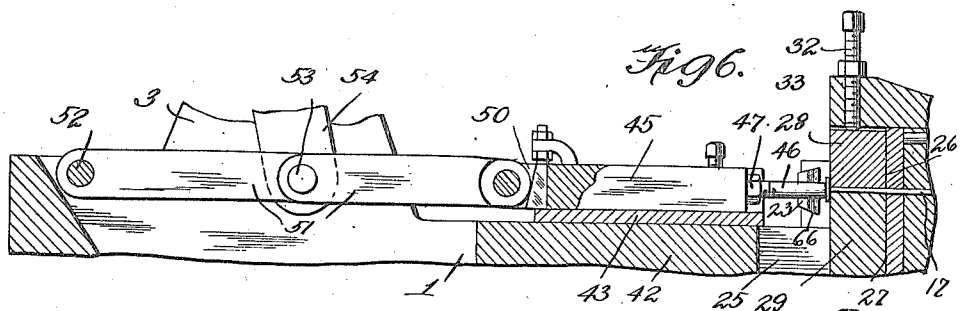


Fig 7.

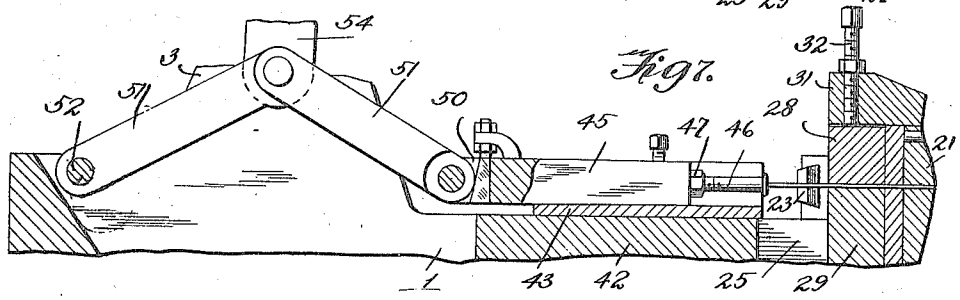
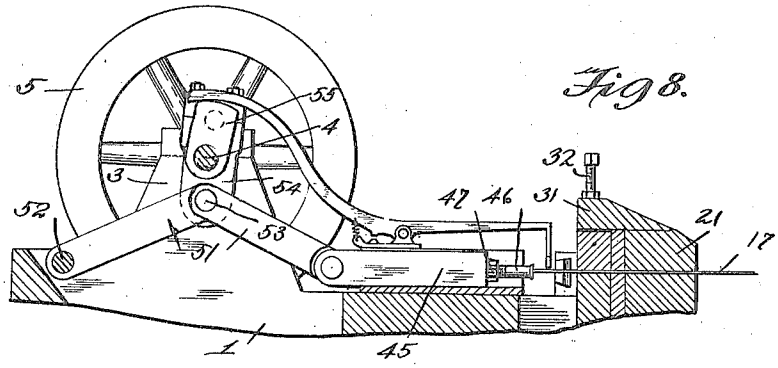


Fig 8.



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Patented Jan. 23, 1923. 1,442,989

UNITED STATES PATENT OFFICE.

TRUMAN J. ALEXANDER, OF ASHLAND, KENTUCKY.

NAIL-FORMING MACHINE.

Application filed January 20, 1921. Serial No. 438,543.

To all whom it may concern:

Be it known that TRUMAN J. ALEXANDER, a citizen of the United States, residing at Ashland, in the county of Boyd and State of Kentucky, has invented certain new and useful Improvements in Nail-Forming Machines, of which the following is a specification.

This invention relates to nail making machines, and has for its object to provide a machine whereby nails may be automatically and expeditiously manufactured in large quantities and in an accurate well formed manner.

The present invention consists essentially in improving the machine invented jointly by G. Giesler and T. J. Alexander, the latter being the present applicant, said machine forming the subject matter of United States Letters Patent No. 884.577, and dated April 14, 1908, the improvement over said machine residing essentially in providing novel and improved means for effecting the slidable operation of the movable shearing or cutting members, whereby such members will be positively operated by means of link connections, whose movement is operated from and timed by a main operating shaft, the link connection being of such nature as to permit of rapid and positive operation of the machine, to increase the output thereof, and to enable the same to be operated at relatively high speeds without breaking or interfering with the timed operation thereof.

A further object of the invention resides in forming the machine comprising the present invention to include a common operating shaft which is formed to provide means whereby power will be imparted to the various moving elements of the machine and in such manner that the movements of said elements will take place at proper intervals in order to effect the several operations of the machine; in the provision of means for automatically advancing the wire stock through the machine; in controlling the size of the head formed by the machine and in rendering the various elements adjustable and replaceable so as to compensate for the effects of wear and to maintain proper operative relationship between the various parts.

With these and other objects in view, the invention consists in the novel features of construction, combinations of elements and arrangements of parts, hereinafter to be more particularly described and to have the scope thereof pointed out in the appended claims.

In the accompanying drawing:

Figure 1 is a side elevation of the nail forming machine comprising the present invention.

Figure 2 is a top plan view thereof.

Figure 3 is a vertical sectional view taken along the plane disclosed by the line 3—3 of Figure 2.

Figure 4 is a transverse sectional view taken along the line 4—4 of Figure 2.

Figure 5 is a detailed sectional view disclosing the advance of the head forming plunger toward the end of the stock gripped between the dies.

Figure 6 is a detail view disclosing the extreme advanced position of the plunger into head forming engagement with the stock,

Figure 7 is a detail view disclosing the plunger retracted to allow the shearing operation, and

Figure 8 is a detail view showing a modified form of structure for forceably breaking a formed nail from the original stock.

Referring more particularly to the drawings, the numeral 1 designates the main frame of the machine, which is supported from suitable legs 2, and is provided, contiguous to its rear end, with vertically upstanding bearing members 3, which are transversely spaced to provide for the rotatable support of a main transversely extending crank shaft 4. One end of said shaft being provided with a fixed balance wheel 5 and with fast and loose pulleys 6, by means of which power may be suitably imparted to effect the rotation of the shaft and the consequent operation of the machine.

Fixed upon the end of the shaft 4 opposite to the pulley 6 is a disk 7, which has its face provided with a radially extending slot 8, in which is adjustably mounted a crank pin 9, the latter being movable within the slot 8 in order that the throw of a link 10 connected therewith may be adjusted. The link 10 extends forwardly substantially the full length of the machine and is provided with an in-turned portion 11, which is swiveled as at 12 to a sliding feed block 13. This block is movably positioned upon a pair of spaced longitudinally extending rods 14, which project from the frame 1, and the construction is such that upon the rotation of the shaft 4, horizontal reciprocating move-

ment will be imparted to the feed block, the extent of movement of said block being, in turn, regulated by adjusting the positions of the pin 9 with respect to the axis of the disk 7.

The upper surface of the block 13 is provided with upstanding pins 15 located in staggered relationship, the said pins being equipped in this instance with guide rollers 16, between which the wire stock 17, usually wound about a rotatably supported reel, is passed. Also, the feed block 13 is provided with a stationary jaw 18 and a movable spring pressed jaw 19. The free end of the stock 17, after being trained around and through the roller 16, is directed between the jaws 18 and 19, and is adapted to be frictionally engaged thereby, so that when said block is slidably advanced, the stock will be moved in unison therewith and projected into a guide opening 20 provided in an anvil head 21, the latter in this instance being formed with the upper surface of the frame 1, and the opening 20 is so disposed as to extend longitudinally therethrough. Thus, by the instrumentality of the block 13, the wire stock will be advanced, in a timed manner, through the opening 20, so that the stock may be subject to the subsequent operations of a heading plunger 22 and to transverse cutters 23. After the stock has been advanced to its fullest extent through the opening 20, the same is gripped in conjunction with the head 21 and is retained stationarily within said opening during the retraction of the feed block 13, the movable jaw 19 of the latter serving to permit the block 13 to move outwardly without gripping the wire. However, the jaws impart sufficient pressure to the wire, when the block 13 is moving outwardly, to stretch or straighten such portions of the stock as are confined between the jaws 18 and 19 and the anvil head 21.

The head 21 is provided with a vertically extending inner face 24, which lies adjacent to a discharge opening 25 provided in the frame 1. The face 24 is formed with a vertically extending groove in which is fitted a gib 26, the latter being provided, in turn, with a dove-tailed groove 27, in which are positioned in the upper and lower portions respectively thereof a stationary die 28, and a movable die 29, the said dies being maintained in sliding separate relationship in order that the stop from the opening 20 may pass therebetween. The stationary die is preferably maintained in position by means of a longitudinal screw 30, which passes through the head 21, through an opening in the gib 26 and is threaded into the die 28 proper so as to maintain the latter against movement within the groove 27. Upward pressure is imparted to the die 28 by the movable die 29, in a manner to be hereinafter more fully described, and the effects of this upward pressure may be taken care of by providing the removable cap 31 of the head with a vertically extending set screw 32, the lower end of which engages the upper end of the die 28 so as to prevent movement on the part of the latter and to relieve the screw 30 of undue pressure. The movable die is freely supported for vertical reciprocation within the groove 27 and the lower end of the movable die engages at all times with a transversely extending bar 33, which is pivoted as at 34 to the under portion of the frame 1 and extends in such manner so that the lower end of the movable die will engage with the intermediate portion thereof. Manifestly, by operating the bar 33, the said movable die may be raised or lowered into or out of clamping relationship with respect to the die 28.

Therefore, in order to operate the bar 33, the free end thereof is preferably extended through a slot provided in the side of the frame 1, and to this free end there is connected a coiled spring 35, which has its opposite end connected as at 36 to the frame 1, the normal tendency of the spring 35 being to retain the bar in its lowered position. However, this influence of the spring is governed by providing the free end of the bar with an adjustable vertically extending screw 37, which has its upper end connected with a lever 38, pivoted as at 39 upon the side of the frame 1. The rear end of the lever 38 is equipped with an anti-friction roller 40, which normally engages, by the action of the spring 35, with the peripheral surface of a cam 41, fixed for rotation upon one end of the shaft 4, and immediately adjacent to the disk 7. By this construction it will be manifest that the cam 41 may be so formed and timed for operation that when the feed block 13 is advancing inwardly, with the wire stock gripped thereby, the said dies will be separated so as not to interfere with the movement of the stock as controlled by the feed block. However, when the feed block is retracted, or in other words moves outwardly, the cam 41 will be timed and positioned so as to raise the bar 33 and consequently the movable die 29 and to thus grip the wire stock between said dies, so that the outward movement of the feed block will not withdraw the stock from its advanced position within the machine, the reason for which will hereinafter appear.

The first essential step in the process of completing a nail by use of the present machine, is to produce a head thereon. This is effectively accomplished by providing the upper surface of the frame 1 centrally and longitudinally, and immediately to the rear of the discharge opening 25 with a pair of fixed guides 42, capable of receiving a U-shaped gib 43, which may be retained in po-

sition by set screws 44. Slidably mounted within the gib 43 and arranged to move longitudinally of the machine toward and away from the end of the guide opening 20, is a movable block 45, in the forward end of which is provided an adjustable heading plunger 46. This plunger may be adjusted longitudinally by threading a portion of the length of the same to receive a nut 47, which engages with the forward face of the block 45 and limits the inward movement of the plunger within a bore 48 formed in said block. A vertical set screw 49 passes through the block 45 and engages with the end of the plunger 46 situated within the bore 48 and thus effectively retains the plunger against longitudinal displacement, the pressure exercised by the plunger in heading a nail being taken care of by the nut 47. As shown in Figures 5, 6 and 7, the plunger 46 moves longitudinally of the frame toward and away from the opening 25, or the line of juncture between the dies 28 and 29. By means of cutters, to be hereinafter described, the wire stock is severed so as to leave a portion thereof projecting beyond the outer faces of the dies 28 and 29 so that when the plunger is advanced forwardly of the machine, the outer end thereof will be brought into engagement with the protruding end of the stock, gripped between the dies to produce a head thereon of any desired formation. It will be understood that the amount of material which projects beyond the dies will control the final size of the head produced.

To operate the plunger, the block 45 has its rear end bifurcated as at 50, to pivotally receive the forward end of a pair of toggle links 51, the other of said links having its rear end pivoted as at 52 within the frame 1, and the intermediate or adjoining ends of said links are pivotally connected as at 53 to a strap 54, which in turn is connected with a crank 55 provided upon the shaft 4. By this construction, the rotation of the shaft 4 will result in raising or lowering the links 51 and in the consequent progressing or retraction of the plunger 46. It will be understood, however, that the plunger is adapted to be moved forwardly and into head forming relationship with the end of the stock when the latter is gripped between the dies 28 and 29 and while the feed block 13 is advancing outwardly.

After the head has been produced, the plunger is retracted, and the feed block 13 is timed to move inwardly in unison with the retracting movement of the plunger. This results in advancing the headed stock immediately after the plunger, it being understood that when the plunger is retracted and the feeding head is moving inwardly, the dies 28 and 29 are relatively separated to permit of the feeding action of the block 13. When the block 13 reaches substantially its fullest extent of inward movement, the stock is severed by means of the cutters 23, which cut the stock into nails of desired length and simultaneously provide the same with their pointed ends. These cutters are preferably mounted for sliding movement transversely of the frame 1 in bearing blocks 56, which are mounted upon the upper surface of the frame 1 contiguous to the head 21. These blocks have their inner faces provided with grooves in which are mounted gibs for the slidable reception of the cutters 23.

To effect the reciprocation of the cutters at proper intervals, the present invention comprises an actuating mechanism therefor which consists of a plurality of bars 57 which are mounted for sliding movement within bearings 58 provided longitudinally of the frame 1 and to each side of the plunger construction. These blocks are provided with upstanding ears 59 which project through slots 60 provided in the upper portions of the bearings, and these ears are adapted to pivotally receive the forward ends of a pair of connecting rods 61, the rear ends of said rods being swiveled to cranks 62 provided upon the shaft 4, the said rods 61 being adjustable by means of the nut construction 63 for the purpose of lengthening or shortening the rods to regulate the throw or extent of movement of the bars 57. Obviously, by the rotation of the shaft 4, reciprocatory motion will be imparted to the bars. The forward ends of the bars 57 are pivotally connected with links 64 which extend inwardly of the machine and are, in turn, pivotally connected as at 65 with the cutters 23. By this construction the rotation of the shaft 4 will result in reciprocating the bars 57 and then, by reason of the link connection 64, reciprocatory movement will be imparted to the cutters. The inner or adjoining ends of the latter are suitably beveled as at 66 to produce shearing surfaces, whereby when the cutters assume their extreme inward position, the surfaces 66 thereof will serve to sever the portions of the wire stock projecting from the dies 28 and 29. Thus, in operation, it will be seen that the wire stock is fed into the machine by the block construction 13, and the end of the stock is forced between the dies 28 and 29 when the latter are separated. The plunger is then advanced and the dies are brought into gripping relationship with the wire positioned therebetween. When the plunger engages with the end of the stock, the material projecting beyond the dies is upset so as to produce a head of any desired characteristic. Following the head forming operation, the plunger is retracted, and the wire stock, having a head formed thereon, is moved longitudinally of the machine by

the in-feeding motion of the block 13. When the block 13 reaches its extreme inward position, the cutters are then operated so as to be brought close together, thereby severing the headed stock from the balance of the stock and producing a pointed end thereon, which results in producing a finished nail. This nail is then permitted to drop through the opening 25 upon a trough 67, upon which it gravitates toward the front end of the machine for deposit into a suitable container. It will be observed that the beveled surfaces 66 of the cutters are so disposed with respect to the dies 28 and 29 that when a nail is produced by the cutters, a portion of the stock will be left projecting beyond or inwardly of the said dies, and it is this projecting portion of the stock that is held by the clamping action of the dies to be operated on by the plunger for the purpose of producing the head.

In order that the size of the head produced by the plunger may be varied, the said cutters are movable relative to the dies 28 and 29. This may be accomplished by providing the cutter bearings with depending lugs capable of being received within grooves 68 provided in the upper surfaces of the frame 1. These lugs are provided with threaded apertures for the reception of longitudinally extending screws 69 which are rotatably journaled within the grooves 68. Apparently, by rotating the screws 69, the said cutter bearing blocks may be adjusted longitudinally, thus varying the positions of the cutters with respect to the dies 28 and 29 to result in leaving more or less of the stock projecting from the dies after the said stock has been severed by the cutters. Vertical bolts 70 may be utilized for retaining the cutter bearing blocks in their fixed positions after adjustment by means of the screws 69.

In view of the foregoing description, taken in conjunction with the accompanying drawing, it will be present that the present invention provides a nail making machine of practical, simple and substantial construction and capable of efficiently carrying out its several functions. The movable parts of the machine are all capable of being easily adjusted, repaired or replaced to compensate for the effects of wear and to provide a machine which will produce nails which will be well finished, shaped and proportioned and of standard design. By the construction described, very fine adjustments of the various parts are obtainable and consequently the nails produced by the machine will be accurately completed. By the provision of the common crank shaft 4, from which all the parts of the machine are operated, the machine will be effectively synchronized in operation so that the various functions thereof will take place at proper and timed intervals. Furthermore, the construction admits of rapid operation on the part of the machine with a correspondingly large output, a nail being produced upon each complete revolution on the part of the drive shaft. By the construction described for effecting the operation of the sliding cutters, a strong substantial and durable arrangement of parts is provided which will not be likely to become out of order, to occasion repair or to interfere with the working capacity of the machine.

What is claimed is:

1. In a nail making machine, a frame, a head having a feed opening formed therein provided in connection with the frame, a feeder operable to advance stock through said opening in one direction only, a reciprocatory heading plunger, dies operating to clamp the stock when the same is subject to the action of said plunger blocks slidable longitudinally of the frame transverse cutters slidable on the blocks operable to sever and point said stock subsequent to the heading operation, and a crank shaft capable of effecting the timed operation of said feeder, heading plunger, dies and cutters.

2. In a nail forming machine, a frame having a guide opening formed therein, a feeder for intermittently advancing stock in one direction through said opening, stationary and movable dies situated at the end of said opening and between which the end of said stock is adapted to project, a reciprocating heading plunger, means for maintaining said dies in gripping relationship with said stock when said plunger is advanced to force the stock against the dies, laterally movable cutters operative to sever the stock after the heading operation, means for moving the cutters longitudinally of the frame and link connections driven by a common shaft for effecting the operation of said feeder, dies, plunger and cutters.

3. In a nail forming machine, a frame, said frame having a guide opening formed therein for the reception of wire stock, a drive shaft, means driven by said shaft for intermittently advancing said stock through said opening, stationary and movable dies carried by said frame and capable of receiving therebetween the stock forced through said opening, a heading plunger, means whereby said dies will be maintained in gripping relationship with said stock when the latter is subjected to the action of said plunger, laterally movable cutters operative subsequent to the heading operation to sever and point the stock, and slidable longitudinally of the frame and means for adjusting said cutters relative to said dies to control the amount of stock projecting from said dies after the severance of the stock by the cutters.

4. In a nail producing machine, a frame,

said frame being formed with a guide opening, means for intermittently advancing stock through said opening, dies for clamping said stock at intervals in connection with said frame, a plunger for heading the stock gripped by said dies, slidable cutters positioned to sever the stock subsequent to the heading operation, a drive shaft for effecting the operation of said feeding means, plunger, dies and cutter and a reciprocatory locking operating connection between said shaft and said cutters.

5. In a nail forming machine, a frame, said frame having a guide opening formed therein, means for intermittently advancing stock through said opening, cutters for severing the stock projecting from said opening, said cutters comprising a pair of slidably mounted members, bearing blocks for supporting said members, said bearing blocks being adjustable longitudinally of the frame an operating shaft, a pair of reciprocatory bars, connecting rods between said bars and shaft, whereby said bars will be reciprocated upon the rotation of said shaft, and links between said bars and said cutter members for effecting reciprocation of said members upon reciprocation of said bars.

6. In a nail forming machine, a frame, a head carried by said frame and having a longitudinal opening provided therein, means for advancing wire stock through said opening, cutters for severing the stock projecting from said opening, said cutters comprising a pair of slidably mounted members having adjoining cutting surfaces, a shaft for effecting the operation of said cutters, adjustable connecting rods extending from said shaft, sliding bars pivotally connected with said rods, means for maintaining said bars in positions for longitudinal reciprocation, and inwardly directed links pivotally connected with said bars and with said cutters and serving to effect the reciprocation of the latter in unison with said bars.

In testimony whereof I affix my signature.

TRUMAN J. ALEXANDER.