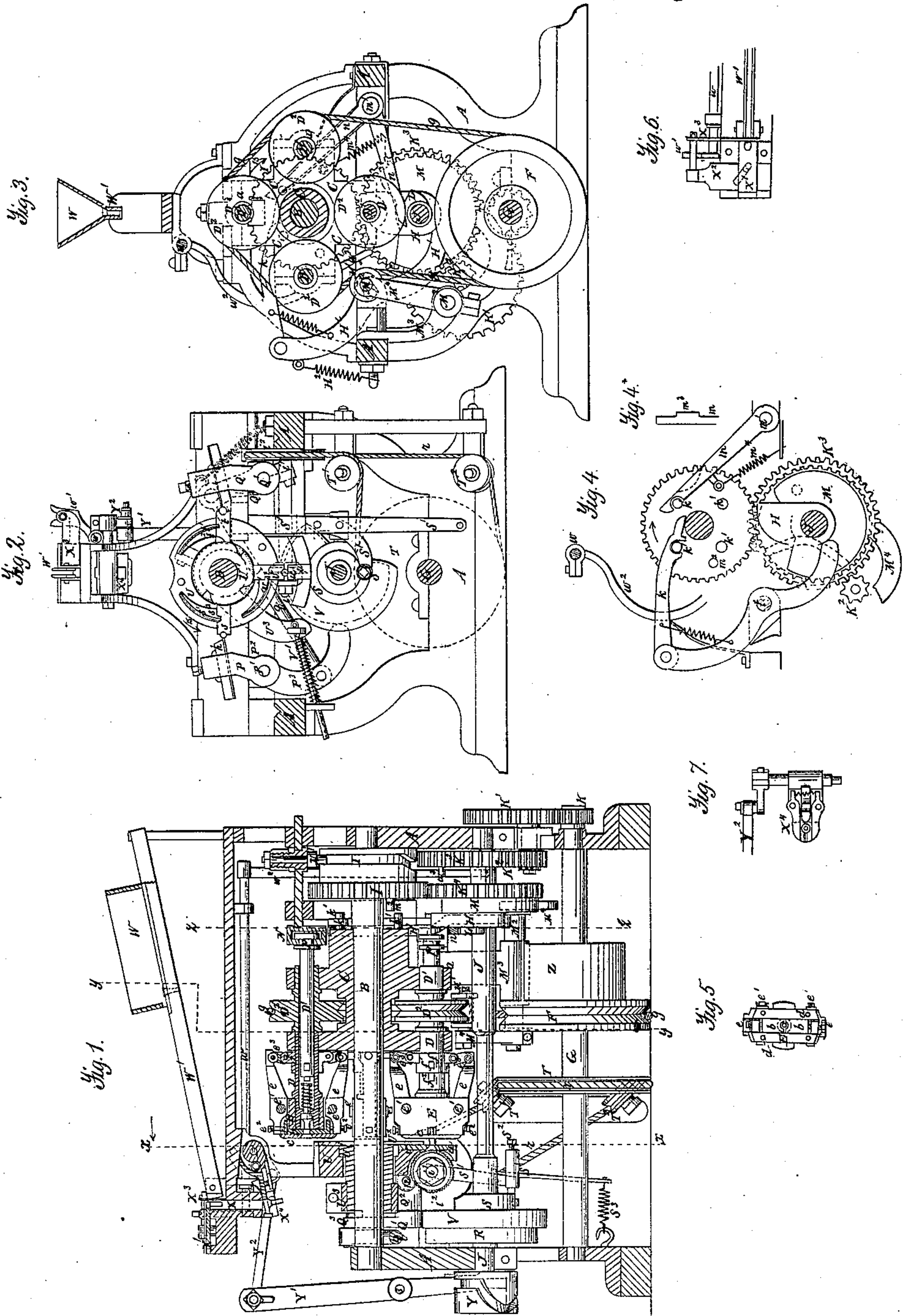


I. Griggs,
Making Wood Screws,
No 20.789, *Patented July 6, 1858.*



UNITED STATES PATENT OFFICE.

IRA GRIGGS, OF UTICA, NEW YORK, ASSIGNOR TO UTICA SCREW MANUFACTURING COMPANY.

IMPROVED MACHINE FOR TURNING THE HEADS AND FOR NICKING SCREWS.

Specification forming part of Letters Patent No. 20,789, dated July 6, 1858.

To all whom it may concern:

Be it known that I, IRA GRIGGS, of Utica, in the county of Oneida and State of New York, have invented certain new and useful Improvements in Machinery for Turning the Heads of Screws and Cutting the Notches Therein; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a longitudinal vertical section of a machine with my improvements. Fig. 2 is a transverse vertical section of the same in the plane indicated by the line *x x*, Fig. 1, seen looking in the direction of the arrow shown near that line. Fig. 3 is a transverse vertical section in the plane indicated by the line *y y* of Fig. 1, seen looking in the opposite direction to Fig. 1. Fig. 4 is a transverse vertical section, taken in the plane indicated by the line *z z*, but showing only the principal moving parts of the machine. Fig. 5 is a front view of the screw-blank holder with the front plate removed. Fig. 6 is a plan of part of the feeding apparatus of the machine. Fig. 7 is a plan of another part of the feeding apparatus, which occupies a position below Fig. 6.

Similar letters and figures of reference indicate corresponding parts in all of the several figures.

This invention consists in a certain mode of applying and operating a series of screw-blank holders in a machine, in combination with a suitable arrangement of the feeding apparatus to supply the blanks to the said holders of the turning-cutters for turning the heads, and of the saw for cutting the notches therein, whereby a greater number of blanks can be operated upon in a given time, and the operation is performed in a very perfect manner.

It also consists in a certain relative arrangement of the driving-shaft of the machine, the blank-holders, and rotating stock which contains them, and of the turning-cutters and saw for cutting the notches, whereby the driving-belt which rotates the blank-holders on their axes to turn and finish their heads is rendered inoperative during the cutting of the notches therein.

It also consists in a series of rests applied and operated, as hereinafter described, to support the necks of the screws for the purpose of keeping the heads steady during the action of the turning-cutters and saw.

It also consists in a certain method of applying and adjusting the dies or jaws of the blank-holders to make them grip the blanks firmly and adapt them to blanks of different sizes.

It further consists in an improved method of applying a spring-punch, in combination with the plunger which operates the jaws or dies of the holder, for the purpose of discharging the screw-blanks from the holders by the movement of said plunger.

To enable others to make and use my invention, I will proceed to describe its construction and operation.

A is the framing of the machine. B is a stationary horizontal shaft, to which the stock C which carries the blank-holders is fitted to rotate freely.

D D are the shafts of the blank-holders, four in number, made hollow throughout and fitted to rotate in bearings *a a* in the stock C, the said shafts being arranged parallel with the shaft B, at equal distances apart in a circle concentric to the said shaft. To the front end of each of these shafts D is screwed a box E, which contains the holding-dies *b b*, (see Figs. 1 and 5,) which grip and hold the screw and blanks during the operations of turning their heads and cutting the notches in them.

The holding-dies consist of quadrangular plates of steel, having notches in their adjacent ends to receive the blanks, and being fitted to slide perpendicularly to the shaft D in a parallel groove within the box E, and are confined therein by a plate *c*, (see Fig. 1,) which is attached by four screws *d d*, which are shown in section in Fig. 5, in which figure the plate *c* is supposed to be removed to expose the dies.

The holding-dies *b b* are operated to grip and liberate the screws by means of two levers *e e*, (see Figs. 1 and 5,) which are arranged to work on fulcrum *e' e'*, secured in the box E, the said levers being furnished at their front ends with screws *e² e²*, whose ends abut against the backs of the dies, and being connected at

their back ends by toggle-links $e^3 e^3$ with a sliding collar f , fitted to the exterior of the shaft D. This collar f is connected by a key f' , which passes through slots f^2 in the shaft, with a plunger D' , which works within the shaft and protrudes from the rear end thereof. By drawing the plunger D' backward from the shaft the sliding collar f is made to operate the toggle-links $e^3 e^3$ in such a manner as to cause the levers $e e$ to close the dies, and by driving it forward the levers are drawn back from the dies, which are thus allowed to open.

The screws $d d$ serve to regulate the closing of the dies upon the screw-blanks so that they may grip them without straining the mechanism of the blank-holder and enable said holder to be adapted to screw-blanks of different sizes.

The blank-holders have a rotary movement on their own axes imparted to them by a belt g , running from a pulley F on the driving-shaft G of the machine around pulleys $D^2 D^2$ on their several shafts, and they have also a movement round the shaft B, produced by the movement of the stock C in said shaft, the latter movement being only a quarter-revolution at a time, so that each may be made to change places with that next on one side of it; but the two movements of the holders above specified never occur together, each being suspended while the other is taking place. The first-mentioned movement is to give the blanks (which are shown in the drawings in the several views in blue color) the necessary motion to turn their heads to the required shape, and the second to carry them from where they are received from the feeding apparatus—viz., a position directly over the shaft B—to the turning-tool h , Fig. 2, which turns the heads, thence to the circular saw i , Figs. 1 and 2, which cuts the notches, and thence to the turning-tool j , Fig. 2, which turns off the burrs produced in cutting the notches.

The stock C derives its motion on shaft B from a dog k , attached to a lever H' , which works on a fixed fulcrum l , secured to the frame A, and which derives motion at intervals from a cam H on a horizontal shaft J, which is arranged above the driving-shaft G of the machine, and which derives a continuous motion at a slow speed from the latter through four gears K K' K^2 K^3 , (shown in Figs. 1 and 3,) the said dog acting alternately on four studs $k' k'$, arranged at equal distances apart on the rear end of the stock C. The lever H' is kept in contact with the cam H by a spring H^2 . The stock is locked during the retreat of the dog k by a pawl m , which is attached by a pin m' to the framing A, dropping onto one of the studs $k' k'$ as the advance of the dog k is completed. The pawl m is kept in operation on the stud by a spring m^4 till it is lifted to unlock the stock prior to the advance of the dog k by a pin m^2 , attached to a spur-gear I, which is fitted to turn loosely on the shaft B, the said gear being of

the same size as and deriving motion from a gear K^4 on shaft J, and said pin m^2 acting upon a projection m^3 on the back side of the pawl. This projection is represented in dotted outline in Fig. 4, and is also shown in Fig. 4*, which is a side view of a portion of the pawl. The dog k is lifted off the pin k' after it has completed the movement of the stock C by means of an elbow-lever n , whose fulcrum is the pin m' , before mentioned, and which is operated by a small cam L on the shaft J. The suspension of revolution of the whole of the blank-holders upon their axes during their movements around the shaft B is produced by relieving the belt g from the pressure of a tightening-pulley M' , which is attached to a lever M^4 , whose fulcrum is a short rock-shaft M^2 , working in a hanger M^3 , attached to the frame A. This lever is so acted upon by a cam M on the shaft G that during the time the holder-stock C is stationary the tightening-pulley is caused to press upon the belt and make it hug the pulleys F and C C, but that the pressure of the pulley on the belt ceases just before the motion of the holder-stock takes place.

By the arrangement of the driving-shaft G relatively to the position occupied by the blank-holders during the intermissions in their movements around the shaft B (which position is represented in Figs. 1 and 3) the belt g is caused to be operative on three of the blank-holders, and the fourth—viz., the lowest one—which is in a position for the blank which is in it to be operated upon by the saw to cut the notch, and for such operation requires to be stationary, is in the opening of the belt where the latter is inoperative upon it.

N, Fig. 1, is a clutch arranged at the back of the stock C opposite to the highest position reached by the blank-holders in their revolution—viz., a position directly over the shaft B—in which position they receive and discharge the blanks. This clutch is for the purpose of giving to the plungers $D' D'$ the necessary longitudinal movements to operate the levers $e e$ to open and close the holding-dies $b b$, and for such purpose it is fitted to slide back and forth in suitable guides in the framing A A in a direction parallel to the axes of the holder-shafts D D. It derives the sliding motion aforesaid from a cam I, carried by the gear I, the said cam being grooved to receive the end of a stud N, attached to the said clutch. The head of the clutch is so formed that the back ends of the plungers $D' D'$ pass into it as they severally arrive in the position above mentioned, and the ends of the plungers are so formed with collars $p p$, Fig. 1, that they may be permitted to be moved longitudinally by and with the said clutch without causing the rotary motion of the holders on their own axes to be interfered with.

The turning-cutters h and j are secured in two vibrating stocks P and Q, which are se-

cured to short rock-shafts P' and Q' , fitted to work in hangers P^2 Q^2 , that are bolted to the framing. These rock-shafts are furnished, respectively, with lever-arms P^3 Q^3 , which are connected together by a rod q . The arm P^3 of the shaft P' , which carries the cutter h , is operated upon to move the cutters to a position to operate on two of the blanks by a cam R on the shaft J , the connection of the rock-shafts by the rod q causing both cutters to be acted upon simultaneously. This movement of the cutters takes place immediately after the movements (every quarter-revolution) of the blank-holders around the shaft B . The cutters are moved out of the way to permit the movements of the blank-holders around the shaft B by a spring R' , applied to the arm Q^3 .

The spindle i' of the saw i is fitted to rotate in a suitable bearing in a lever S' , the fulcrum 12 of which is attached to the framing A , and which is acted upon to bring the saw to an operative position after every quarter-revolution of the blank-holders around the shaft B by a cam S upon the shaft J . The lever S' is fitted with a screw S^2 to bear against the cam S , the said screw permitting the adjustment of said lever for the proper depth of cut of the saw. The said lever has a spring S^3 applied to it to move the saw out of the way previously to every quarter-revolution of the blank-holders around shaft B . The saw is rotated by a belt r , running from a pulley T on the driving-shaft G around guide-pulleys T' T^2 to a pulley i^2 on the spindle i' .

s t are two rests for the purpose of supporting the necks of the screw-blanks during the operations of turning the heads. These rests consist of parallel-sided steel plates with notches in their ends, fitted to slide in grooves radial to the shaft in a stationary box U , (see Figs. 1 and 2,) which surrounds the said shaft. These rests are moved outward to support the blanks immediately after each quarter-revolution of the blank-holders around the shaft B is completed by the action of a cam U' within the box U , and returned again immediately before the commencement of the next quarter-revolution by springs s' and t' , applied within cavities s^2 and t^2 in the box U .

v is a rest, like s and t , applied in a similar manner, and also similarly operated by the cam U' and spring v' , for the purpose of holding the blanks firmly down upon a stationary rest w below the box U during the operation of cutting the notches in the heads. The rests s t v are confined in their respective grooves in the box U by a plate U^2 . (See Fig. 1.) This plate is omitted in Fig. 2 to expose the rests and their springs and the cam U' . This cam U' does not rotate, but simply has a short oscillating motion on the shaft B , said motion being produced in the direction to force out the rests by the action of a cam V on the shaft J upon a lever-arm U^3 , attached

to the former cam, and the return motion being produced by the action upon the said arm U^3 of a spring V' .

The feed apparatus of the machine consists principally of a hopper W to receive the blanks, an inclined grooved slide W' to convey them by gravitation in single file to an upright tube X , through which they are allowed to drop one at a time by the action of slides X' X^2 X^3 into a vibrating carrier X^4 , which deposits them in the holders as the latter severally become stationary above the shaft B . The slides X' X^2 X^3 are operated by an arm w' of a rock-shaft w , which derives the necessary motion through the action on its arm w^2 of a stud w^3 , secured to the wheel K^3 . The vibrating carrier X^4 receives motion through its connection by a rod Y^2 with a lever Y' , which works on a fulcrum 8, secured to the framing A , and which is actuated by a cam Y on the shaft J . This feed apparatus is for the most part well known, and therefore needs no further description than that above given, which is sufficient to enable the operation of the machine to be understood.

9, Fig. 1, is one of the discharging-punches which occupy the front portions of the interiors of the hollow shafts D D of the blank-holders. This punch has coiled round it a spring 10, which rests against a pin inserted transversely through the rear portion of said punch, and a collar 11 on the interior of the shaft, and which thus exerts a tendency to draw back the punch into the holder. The drawing back of the punch farther than is necessary for the insertion of the blanks properly into the holder is prevented by its being made with a collar 13, which comes against the collar 11 in the shaft.

The movement of the punch that is necessary for the discharge of the blanks is produced by the plunger D' , which after having moved forward far enough to cause the opening of the holding-dies and release of the blank comes into contact with the punch and drives it forward. The spring 10 as the plunger retreats draws back the plunger till it is stopped by the shoulder 11, and thus makes room for the next blank. This mode of operating the discharging-punch by the plunger which operates the holding-dies makes its action more positive than when it is driven forward by a spring in the manner commonly adopted, as it prevents the possibility of its sticking or the sticking of the screw-blank, while the employment of the spring to draw back the punch before the insertion of a new blank in the holder obviates the many objections which exist to the forcing back of the punch by the insertion of the blanks, and in this office the spring can hardly fail, as there is no obstacle to the drawing back of the punch after the retreat of the plunger.

Having now described all the parts of the machine and their functions, I will proceed to trace the blanks through the successive stages of the operation of the machine. Motion hav-

ing been communicated to the machine by a belt running to the pulley Z on the shaft G, the screw-blanks are supplied to the hopper W, whence they pass down the slide W' and are dropped one at a time into the vibrating carrier X⁴. During every intermission in the movement of the holder-stock and blank-holders around the shaft B, and immediately following the opening of the dies in the uppermost holder by the forward movement of the plunger D', produced by the operation of the clutch N by the cam I, the vibrating carrier X⁴ descends to deposit a blank in the holder, and just before the blank enters the holder the plunger commences its retreat, so that when the blank enters the holder the plunger has retreated far enough to permit the retreat of the punch to permit the entry of the blank. The continued retreat of the plunger closes the holding-dies upon the blank and secures it, after which the holder-stock C and holders make a quarter-revolution around the shaft B in the direction of the arrows 15 (shown in Figs. 2 and 3) and bring the holder which has just received the blank opposite the rest s. Immediately after the completion of the aforesaid movement of the holder-stock and holders, during which the holders have been caused to cease revolving on their axes, the rest s is forced out to support the blank, and the cutter-stock P is caused to bring the cutter h to an operative position relatively to the blank. As the blank arrives between the rest and the turning-tool the belt g is tightened and the revolution of the holders (all but the lowest one) on their axes commences. This revolution of the holders is continued long enough to turn the head, and then ceases, and the holder-stock and holders make another quarter-revolution around the shaft B, which brings the blank before referred to opposite the saw and between the rests v w, where it is secured by the rest v moving down upon it, and as soon as the latter movement is completed the saw is carried toward the blank and caused to cut the notch in its head, the holder being now in the opening of the belt g and not operated thereby. When the notch has been cut and the saw and rest have moved out of the way, the holder-stock with the holders make another quarter-revolution around the shaft B and bring the blank between the rest t and the cutter j, where its holder begins to revolve again on its axis. The rest t then moves out to support the blank, and the cutter j comes into operation to turn off the burr. The next quarter-revolution brings the holder containing the blank to the first-named position, and while it remains in that position the plunger is moved forward to open the dies of the holder and drive forward the punch to expel the blank,

and as the plunger again retreats another blank is deposited in the holder, in the manner above specified, to be subjected to a similar operation. While the first blank is being turned by the tool h another is being received by the next holder. While the first is having its notch cut the second is being cut by cutter h and the next holder is receiving a third, and while the first is being finished by the cutter j the second is having its notch cut, the third is being turned by the cutter h, and the next holder behind it receives a fourth. Hence the machine at all times, except during the short interval between the discharge of the finished blank and the reception of a new one, contains four blanks, and three blanks are always being operated upon at a time.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The arrangement of a series of rotating blank-holders in bearings at equal distances apart in and at equal distances from the center of a stock which has an intermittent rotary motion for the purpose of presenting each of the series in succession to the feed apparatus, to the cutter for turning the heads, to the saw for cutting the notches, and to a cutter for finishing the heads after the notches have been cut, substantially as herein described.

2. The relative arrangement of the driving-shaft, the blank holders and their rotating stock, the turning-cutters, and the saw for cutting the notches, substantially as described, whereby when the blank-holders severally arrive opposite the saw the driving-belt which gives them the rotary motion on their axes to effect the turning is inoperative upon them.

3. The series of movable rests s t v, applied and operating, substantially as herein described, to support the screw-blanks and hold them steady during the operation of the cutters and saw.

4. Combining the holding-dies b b with their operating-levers e e by making the said dies detached from their levers and fitting them to slide within guides in the holder, and applying adjusting-screws to the levers at their bearing upon the dies, substantially as herein specified.

5. Applying the discharging-punches of the blank-holders with springs to retract them within the holders after the discharge of the blanks, and in such manner that the plungers after opening the holding-dies or jaws will drive them forward to expel the blanks, substantially as herein set forth.

IRA GRIGGS.

Witnesses:

GEORGE S. DANA,
SAML. A. HERRICK.