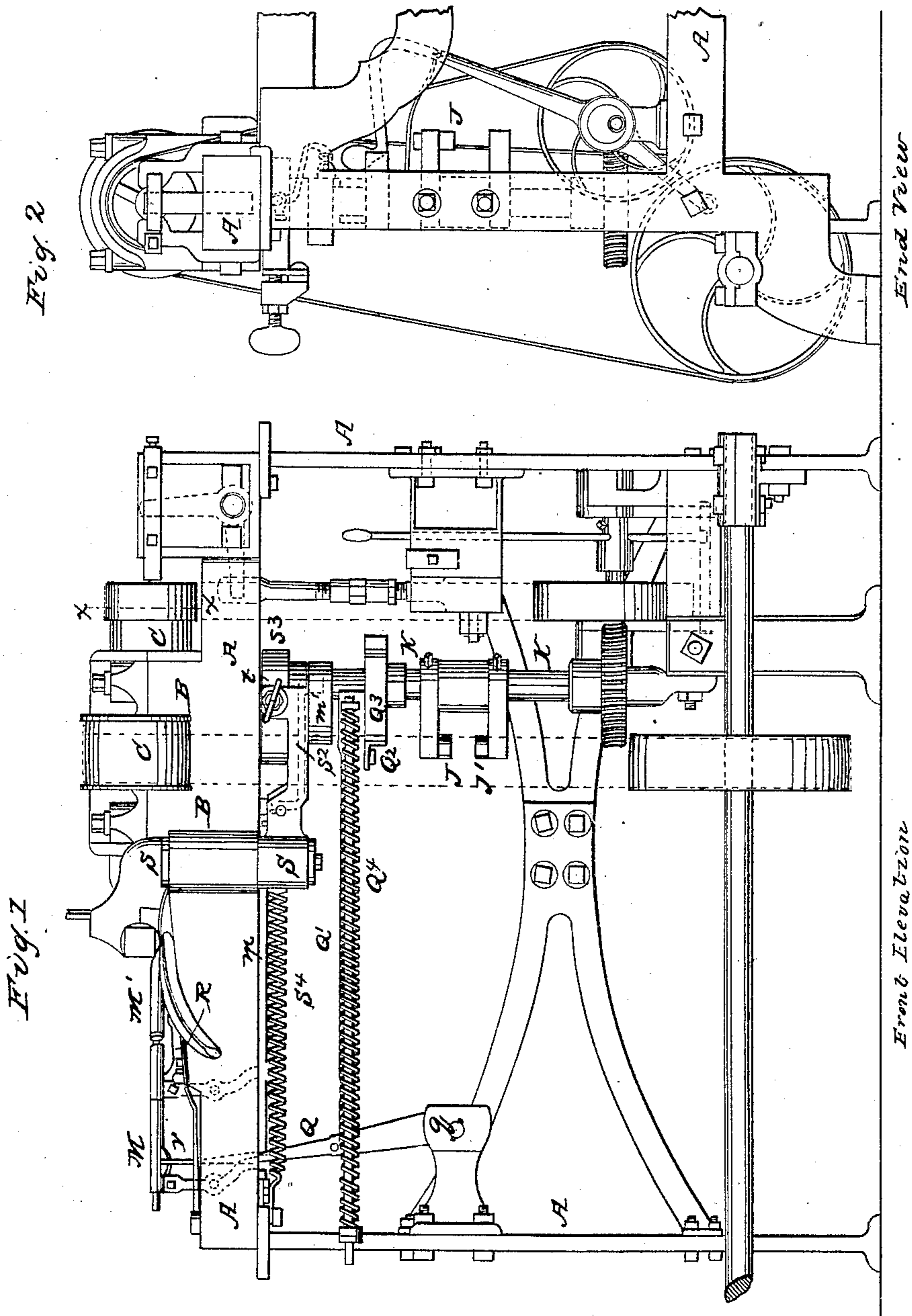


C. WHIPPLE.
Shaving Screw Heads.

2 Sheets—Sheet 1.

No. 9,460.

Patented, Dec. 7, 1852.



UNITED STATES PATENT OFFICE.

CULLEN WHIPPLE, OF PROVIDENCE, RHODE ISLAND, ASSIGNOR TO THE
NEW ENGLAND SCREW COMPANY.

IMPROVEMENT IN MACHINERY FOR MAKING WOOD-SCREWS, &c.

Specification forming part of Letters Patent No. 9,460, dated December 7, 1852; antedated June 7, 1852.

To all whom it may concern:

Be it known that I, CULLEN WHIPPLE, of the city and county of Providence, in the State of Rhode Island, have invented certain new and useful Improvements in Machinery for Making Wood-Screws; and I do hereby declare that the following is a full, clear, and exact description of the principle or character which distinguishes it from all other things before known and of the manner of making, constructing, and using the same, reference being had to the accompanying drawings, making part of this specification, in which—

Figure 1 is a side elevation of the machine. Fig. 2 is an end elevation, and Fig. 3 is a plan, of the same. Fig. 4 is an elevation, on an enlarged scale, of the mechanism for holding and liberating the blank, a portion of the hollow mandrel being removed to expose its interior; and Fig. 5 is a transverse section through the rear end of the mandrel at the line $x\ x$ of Fig. 1.

The first part of my invention relates to the method of transferring screw-blanks one by one from a hopper or other receptacle to jaws, by which they are held while undergoing certain of the operations of finishing; and it consists of a feeding-trough with a close bottom and open top and composed of yielding sections held together by springs or otherwise, into which the blank drops from the hopper and arranges itself in the proper position before a traversing-rod, which pushes it out of the trough in between the jaws.

The second part of my invention relates to the method of setting the blank in a position at which the cutting instrument can act upon it with the best effect; and it consists in operating the instrument that transfers the blank from the feeder into the gripping-jaws by a spring or its equivalent and making the instrument that gages the distance which the blank is permitted to enter between the jaws adjustable, so that more or less of the blank will be left projecting beyond the jaws, as may be found expedient.

The third part of my invention relates to the manner of gripping and holding the blank in a rotating mandrel; and it consists in a method of operating the jaws of the mandrel and holding them closed upon the blank with suf-

ficient force to hold it firmly under the action of the cutter without producing end strain upon the mandrel by means of toggle or knuckle joint levers, which are thrown past centers when the jaws are closed to hold them closed, in connection with a pair of long-shanked nippers, which by their elasticity admit of the toggle being thrown past centers without releasing the grip of the jaws upon the blank.

The last part of my invention consists of a spring discharging-punch constructed and arranged in such manner that the same shall be compressed by the entrance of the blank between the gripping-jaws and shall throw the blank out of the jaws the instant they relax their hold of it sufficiently to permit it to pass out, such pushing out of the blank depending upon such relaxation of the jaws, and the action of the spring-punch being entirely independent of the motion of any other part of the machine.

The machine represented in the accompanying drawings consists, mainly, of a hollow mandrel which carries a pair of gripping-jaws to grasp a screw-blank to hold it while under the action of the cutter and to liberate it when the operation is finished, of a reciprocating tool-holder which carries the tool forward to shave the head of the blank and withdraw it when the shaving is completed, and of driving and cam shafts with pulleys, cams, and other mechanism to give motion to the several acting members of the machine.

The different parts of the machine are mounted upon a strong bench whose form and construction may be made to suit the place in which the machine is to be used.

Upon the bench A two puppet-heads B are secured, which support the revolving mandrel C in suitable boxes. That portion of the mandrel between the puppet-heads is enlarged and turned into the proper form to act as a pulley for the belt which puts the mandrel in motion. This mandrel carries the gripping-nippers D, which are supported between a pair of lugs C' that project from the extremity of the mandrel, and are secured thereto by joint-pins a , which pass through both the lugs and the limbs of the nippers. The shanks D' of the nippers are made long

to give them considerable elasticity, and they pass through the mandrel to its rear end. They are forced toward each other by springs *b* to keep the jaws open at all times when they are not pressed together to grasp a blank. The jaws of the nippers are shut by forcing their shanks apart, and this is effected in this instance by means of a pair of knuckle-joint levers *E*, which diverge from a central block *F*. The latter has two arms *e* at right angles with the levers, which are fitted to slide longitudinally in corresponding grooves formed in the hinder extremity of the mandrel to direct the block in moving. This block forms the head of a rod *F'*, whose axis is in line with that of the mandrel and whose hinder extremity is swiveled to a cross-head *F²* between a pair of standards *G*, which are fixed at the hinder extremity of the bench. The inner sides of these standards have grooves formed in them on a level with and parallel to the axis of the mandrel, so that the cross-head may slide freely therein toward and from the end of the mandrel. The inner extremities of the knuckle-jointed levers are fitted into sockets in the head *F*. Their outer extremities are received in boxes *g*, seated in sockets formed in the hinder extremities of the shanks of the gripping-jaws and are fitted with set-screws *g'*, by means of which the positions of the boxes can be adjusted to cause the jaws to approach within a greater or less distance to adapt them to gripping blanks of different sizes and with varying degrees of pressure.

Beneath the cross-head *F²* of the rod *F'* an elbow-lever *H* is pivoted to the bench. One arm of this lever enters a hole made in the cross-head to receive it, so that whenever the arm is vibrated the cross-head *F²*, with the rod *F'*, will be moved to and fro. The other arm of the lever enters a hole in the upper extremity of a rod *I*, which slides up and down in suitable guides, and whose lower extremity has an anti-friction wheel *h*, pivoted to its side in such a position that it comes within the range of two revolving cams *J J'* on the shaft *K*, by which it is alternately elevated and depressed to raise and lower the rod *I* and to vibrate the bent lever *H*. The horizontal rod *F'*, when moved backward, will flex the knuckle-joint levers *E* and allow the springs *b* to force the shanks of the nippers together to open the jaws, and when the rod *F* is moved forward the levers *E* will be forced into a line with each other to separate the shanks *D'* and close the jaws with great force upon a screw-blank placed between them.

A mechanism for discharging the screw-blank after it is shaved is arranged within the gripping-jaws. This mechanism consists of a straight rod or punch *L*, whose front extremity is arranged to slide in the same grooves in which the blank is held in the adjacent faces of the jaws of the nippers. The hinder extremity of this rod enters a socket in the head-block *F*, which guides it in mov-

ing. A collar or stop is formed near the front extremity of the punch, to prevent it from protruding beyond the jaws when the blank is discharged. A spring is coiled upon the punch, which constantly tends to force it forward endwise between the gripping-jaws.

Immediately in front of the gripping-nippers the feeding apparatus is placed. It consists of a stock *M*, mounted on the upper extremities of a pair of arms *i*, which project from a rock-shaft *m* at the side of the bench. This shaft is operated by a cam *m'* and a spring *Q¹* in such manner as to vibrate the stock from the middle of the bench in a line with the axis of the mandrel to the side of the frame, where it passes under the hopper or other receptacle for the blanks to be dressed.

On the front extremity of the stock *M* a pair of nippers *M'* are secured by means of pivots *o*, on which they turn to open and shut. These jaws are constantly pressed together by means of spiral springs *p*, inserted between an arm on each jaw and a corresponding projection of the stock. The upper side of these jaws is hollowed or scooped out, so as to form a trough for the reception of a screw-blank, and the adjacent faces of the front extremities of the jaws have semi-cylindrical grooves cut in them of sufficient size to admit the shank of a screw-blank. Behind the jaws *M'*, and in a line with the aperture through their front extremity, a hole is formed through the stock *M*, to admit and guide a rod *M²*, which, when moved toward the jaws *M'*, will push the blank shank foremost out of the trough through the aperture formed in its end. The jaws *M* are pressed upon the blank as it passes out to guide and steady it by the springs, which yield to allow the jaws to open to permit the head of the blank to pass through on its transit from the trough to the gripping-nippers. This operation takes place when the trough is over the middle of the bench, so that the blank and the pusher will be in a line with the axis of the mandrel that the blank may enter between the jaws and force the punch *L* back to compress its spring. After a blank has thus been transferred from the feeder, the latter is immediately moved by suitable mechanism over to the side of the bench beneath a hopper, to receive therefrom another blank, which in turn is carried into line with the axis of the mandrel and transferred into the nippers. Simultaneously with the movement of the feeder toward the hopper a bent tube *P* is moved toward the nippers until its upper extremity is brought into line with the blank being operated upon, to receive the latter when dressed and conduct it into a box or other suitable receptacle. Neither the hopper to contain the supply of blanks, nor the mechanism for delivering the blanks therefrom to the feeder, are described, as they form no part of my invention.

The pushing-rod *M²* has a boss *r* depending

from its under side, which has a recess formed in it to receive the upper extremity of a lever Q , whose lower extremity is pivoted to a bracket q on the leg of the bench. This lever is connected near its middle with one extremity of a horizontal rod Q' , whose opposite extremity is forked to embrace the shaft K , which guides it, and on which it is free to slide back and forth. The front or guided extremity of the rod has a short lateral arm Q^2 depending from it, which is within the range of motion of a cam Q^3 on the upright shaft K , so that as the cam turns it will push the rod Q' and lever Q with the pushing-rod M backward from the gripping-nippers D , where it is held until the cam has passed the arm Q^2 , when a spring Q^4 , which is coiled round a rod sliding at one end in a bracket attached to the leg of the frame and at the other end connected with the rear end of the rod Q' , which it constantly tends to press toward the jaws of the nippers, and thus causes the lever Q and pusher M^2 instantly to return into the position whence they were moved by the cam Q^3 , and to discharge the blank from the feeder into the jaws of the gripping-nippers. A set-screw R is passed through a snug projecting from the top of the bench at the front extremity of the slot Q^5 , through which the lever Q passes, that gives motion to the pushing-rod M . This set-screw limits the movement of the lever Q and that of the pusher M^2 , and consequently gages the depth to which the shank of the screw-blank is made to enter between the gripping-jaws and the distance which its head is left projecting therefrom. This is a point of very considerable importance, as it admits of the head of the blank being set exactly in range with the cutter that dresses it, so that the cutter may be clamped firmly to the holder, instead of being made adjustable at the expense of firmness and solidity.

The tool-holder consists of an upright oscillating shaft S , mounted in a bracket on the side of the bench, and carrying at its upper end an arm S' , on the extremity of which the cutter T is secured by clamp-screws or otherwise. The lower extremity of this shaft carries a second arm S^2 , upon which a cam S^3 on the shaft K acts to force the tool T against the screw-blank to be dressed. This arm has a set-screw t in its end, by the adjustment of which the tool will be caused to approach within a greater or less distance of the axis of the blank; or, in other words, will dress it down more or less. When the most protuberant part of the cam S^3 is not acting against the arm S^2 , the latter is pulled inward by a spring S^4 to turn the upper arm S' outward to remove the cutter out of the way of the feeder and of the receiving-tube P , so as to allow both to perform their functions properly. The tool, when mounted in a holder thus constructed and arranged, will approach the head of the blank to shave it at about an angle of forty-five degrees to its axis of rotation. This

mode of operating a tool of the proper form to shape the head, as shown in Figs. 1 and 3 of the drawings, will cause the under or inclined side of the head to be shaved first, and then the top, so that the tool will press mainly in the direction of the length of the blank and toward the mandrel, so that the pressure of the tool will have but little tendency to wrench the blank out of the jaws. By this means the blank can be held while being shaved with sufficient firmness without the use of a rest to support it against the pressure of the cutter, and will consequently rotate freely on its axis, so that when finished its head will be round, whether in its rough state it be round or not. This oblique movement of the cutter may be produced by carrying the tool-holder toward and from the nippers on ways or guides inclined to their axis of rotation, instead of employing the swinging or oscillating arm to carry it; but I do not deem it necessary to describe in detail the various means which might be used to carry the tool obliquely to the blank, as I deem the idea to be new, and that my invention is not dependent upon any particular form or arrangement of mechanism that may be adopted for carrying it practically into effect.

On the lower part of the bench a driving-shaft is mounted in suitable boxes. This shaft carries a pulley that drives the mandrel by means of a belt which encircles both. On the rear end of the mandrel behind the puppet a second pulley is formed that drives a pulley on a counter-shaft by means of a belt. The counter-shaft carries a worm or endless screw, which gears into a worm-wheel by which the cam-shaft is turned.

When the machine is put in operation, it will perform the various movements required to shave the head of a blank in the following order: The knuckle-joint levers are fixed by the backward movement of the horizontal rod to open the jaws. The feeder, which meanwhile has received a blank from the hopper, is brought into line with the axis of the mandrel, and the blank is forced by the pusher out of the feeder between the jaws of the nippers and against the punch, which yields to permit it to enter. The knuckle-joint levers are now by the return movement of the rod extended to close the jaws upon the blank and the movement of the rod is continued until the levers are pushed slightly beyond a straight line to cause them to lean against the corners x of the sockets in the shanks, in which position they stand to hold the shanks separated and the jaws together to grasp the blank firmly without any tendency to produce endwise pressure of the mandrel against its bearings, the elasticity of the long shanks preventing any relaxation of the grasp of the jaws upon the blank when the toggles are past centers. The feeder now moves to one side and the cutter is gradually borne against the blank, which is revolving rapidly with the mandrel, until

its head is shaved down to the required size and shape, when the cutter is withdrawn and the jaws are opened again by the flexing of the knuckle-joint levers to liberate the blank, which is ejected from them into the receiving-tube by the punch. The machine is now ready to receive another blank to shave it by a repetition of this operation.

I have described my improvements as applicable to a machine specially adapted to the shaving of the heads of screw-blanks, but it will be evident to the skillful mechanic that some of the most important of them are applicable to and would greatly improve the operation of machines by which various other operations in the manufacture of screws are effected. Thus, for example, the feeder may be adapted to receive the screw-blank with its head toward the gripping-jaws, and the latter may be constructed to admit and grip the heads of screw-blanks, thus holding them firmly while their shanks are being shaved or threaded. The mechanism for imparting motion to the several moving members of the machine and for directing their movements may likewise be varied. Thus, for example, the feeder may have a longitudinal alternating movement instead of a lateral alternating movement, and the hopper will also have in such case to be adapted to this arrangement.

Instead of the knuckle-joint levers to open and close the jaws of the nippers, various other devices may be used with very good effect, although I deem these the best. These and other modifications of the mechanism will be readily carried into effect by skillful mechanics if circumstances should ever render it necessary to make them.

Having thus described my improved machinery for the manufacture of screws, what

I claim therein as new, and desire to secure by Letters Patent, is—

1. The feeder composed of a sectional trough with a close bottom and open top into which the blank drops and arranges itself before a traversing-rod, which pushes it into the gripping-jaws, substantially as described.

2. The combination of the traversing-rod, actuated substantially as described, with an adjustable stop for the purpose of setting the blank between the jaws in the exact position required, as herein set forth.

3. The method of operating the jaws and holding them closed with the requisite force to hold the blank firmly between them without end strain upon the mandrel by means of toggle or knuckle joint levers, which are thrown slightly past centers when the jaws are closed to hold them closed when they are used in connection with elastic and long-shanked nippers, substantially as herein described, whereby all end strain of the mandrel against its bearings is prevented during and by the gripping and holding of the blank.

4. The spring discharging-punch constructed and arranged in such manner that the same shall be compressed by the entrance of the blank between the gripping-jaws and shall throw the blank out of the jaws the instant they relax their hold of it sufficiently, such pushing out depending upon such relaxation and the force of the spring, and being entirely independent of the motion of any other part of the machine.

In testimony whereof I have hereunto subscribed my name.

CULLEN WHIPPLE.

Witnesses:

H. L. KENDALL,
P. H. WATSON.