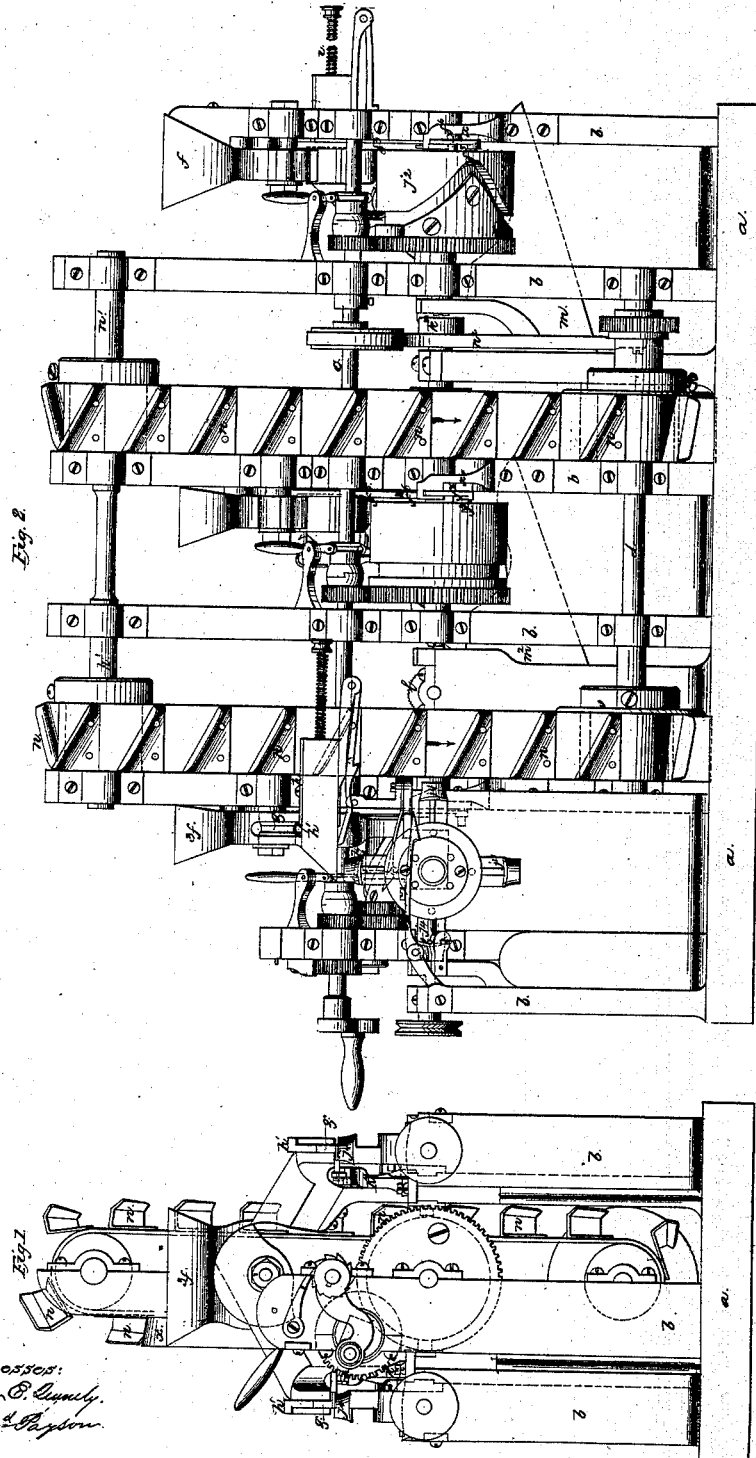


H. A. Harvey,

Making Wood Screws,

N<sup>o</sup> 47,548.

Patented May 2, 1865.



Witnesses:  
Chas. B. Lundy.  
John L. Payson.

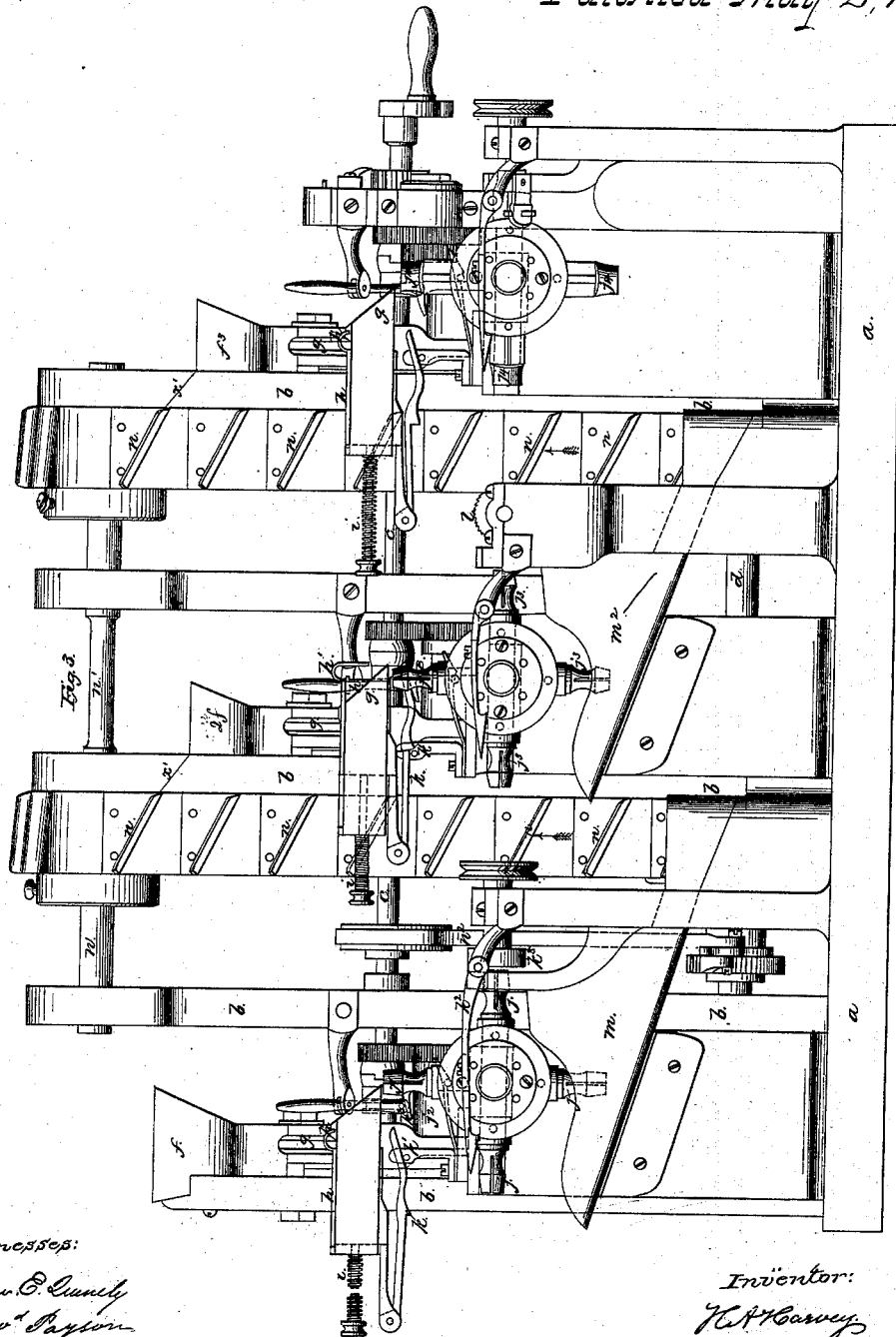
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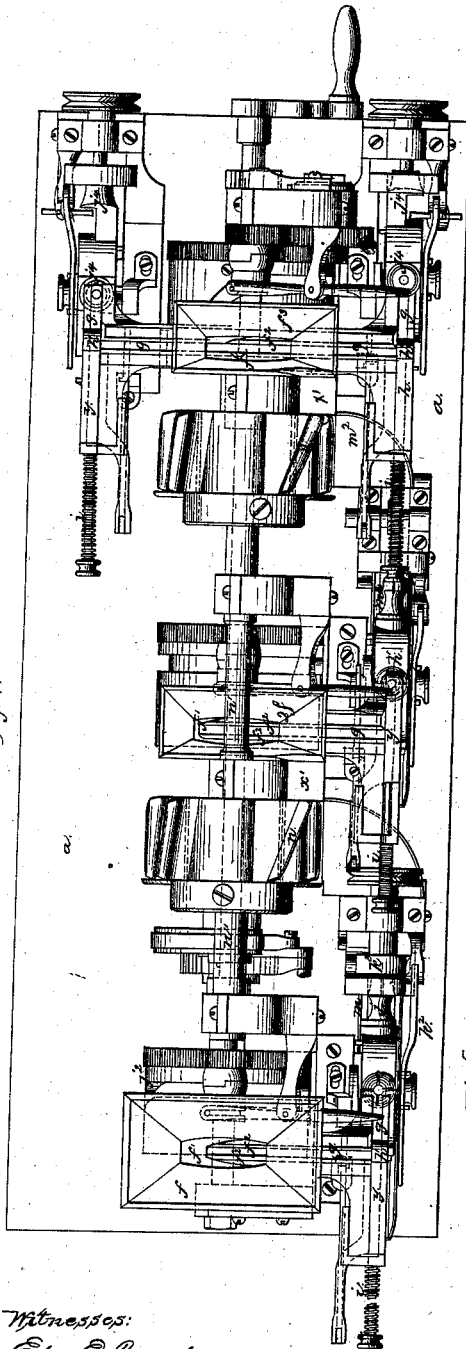


Fig. 4.

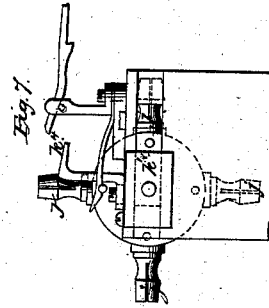


Fig. 1.

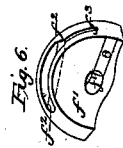


Fig. 6.

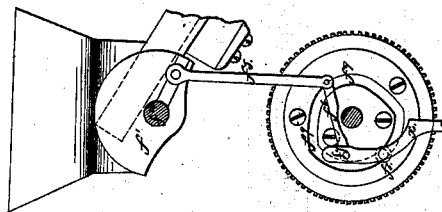


Fig. 5.

Witnesses:  
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Inventor:  
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# UNITED STATES PATENT OFFICE.

H. A. HARVEY, OF NEW YORK, N. Y.

## IMPROVEMENT IN MACHINERY FOR MAKING SCREWS.

Specification forming part of Letters Patent No. 47,548, dated May 2, 1865.

*To all whom it may concern:*

Be it known that I, HAYWARD A. HARVEY, of the city, county, and State of New York, have invented certain new and useful improvements in the manufacture of screws, consisting of certain combinations of machinery by means of which screw-blanks may be converted into screws without handling, the chief peculiarity in the transfer of blanks from one machine to another in the process of manufacture being the employment of elevating apparatus in combination with screw shaving, nicking, and threading machinery; and I declare that the following, taken in connection with the drawings, is a full, clear, and exact description thereof.

In the drawings, which illustrate the invention in the mode preferred by me, Figure 1 is an end elevation of the whole contrivance. Fig. 2 is a rear elevation thereof. Fig. 3 is a front elevation thereof. Fig. 4 is a plan or top view thereof; and Figs. 5, 6, and 7 are detail drawings of certain portions of the apparatus.

In the manufacture of screws from screw-blanks, which are pieces of wire with heads thereon, it is customary, first, to shave the heads; second to nick them, and lastly to cut the threads, and it is customary to feed each of the machines performing these operations by hand or to put the blanks by hand into inclined ways from which they are delivered by proper apparatus to some one machine, or thirdly, to place the blanks in mass in arranging apparatus of various kinds from which they are transferred to the inclined forwarding-ways by proper machinery, and thence delivered to the machines, as before stated. It has also been essayed in various ways to construct a single machine performing more than one of the operations necessary to convert a blank into a screw, in which the blanks, after one operation had been performed upon them, were transferred to other parts of the machine by means of spring-fingers or tubes, with punches acting in them; but up to the present time such inventions have, on account of various objections which it is unnecessary to recite, failed to come into practical use.

In the plan herein described the various machines are separate and distinct, as usual, and any one may be used when the others are out of order, and the chief mechanical agent

in the transfer of blanks from one machine to another is an elevating apparatus or endless belt, or its equivalent, provided with shelves or paus, which transfer blanks in various stages of manufacture from the delivery or discharging point of one machine to a receptacle, or hopper, or arranger in connection with another machine, through the intervention of suitable apparatus. The machinery, as a whole, must be so arranged that blanks are forced to travel from their first entrance to the final point or points of delivery through the shaving, nicking, and threading machines in the order in which they are named.

The principle upon which the apparatus is based is as follows: Blanks are to be thrown into an arranger, thence, by means of ways, they are forwarded to a delivering apparatus, which delivers them to a shaver, and as they fall or are discharged from the shaver they are received by an elevator, which elevates and discharges shaved blanks into a second arranger, hopper, or receptacle, which delivers them to ways whose ends are in connection with delivering apparatus, which delivers them to a nicker, and as the blanks fall or are delivered from the nicker they are by a similar train of machinery delivered to a threader or threaders, from whence they fall or are discharged finished screws.

My invention is not based upon or confined to any special kinds of machines for operating upon blanks, any special kind of delivering apparatus, or any special kinds of hoppers, receptacles, or arrangers, although I have herein described machines and delivering apparatus invented by myself and claimed in other patents, and, notwithstanding that, there is described herein a hopper or arranger which is herein claimed as new and useful by itself.

In the drawings, a bed-plate, table, or stand is represented at *a a*, from which rise standards *b b b*, supporting the various parts of the apparatus. In these standards are mounted shafts *c d*, which impart motion to the whole apparatus through the agency of proper connections. At one end of the whole contrivance is an arranging apparatus, *f*, which may be of any proper or usual construction so long as it arranges blanks thrown into it, causing them to hang by their heads in the ways *g*. In the drawings, this apparatus is represented

as shaped like an ordinary four-sided pyramidal hopper, and by reference to Figs. 4, 5, and 6 it will be perceived that it has a slot in its bottom closed, by an oscillating agitator and discharger,  $f'$ . This agitator has its upper surface curved, so as to fit the concaved lower edge of two sides of the hopper, and is slotted, substantially as shown in the drawings, with a slot wide and deep enough to contain the bodies or barrels of blanks hanging by their heads upon shelves or ledges, as at  $f^2 f^2$ , and the slot extends to the upper periphery of the agitator, in lines substantially coincident with two of the sides of the hopper. That part of the slot which contains the barrels of blanks must extend outward to the periphery, as shown at  $f^3$ , Fig. 6, and may extend through the agitator, so as to discharge blanks in two directions. The agitator may be oscillated upon its supporting pivot or shaft  $f^4$  by any proper mechanism, that shown in the drawings (see specially Fig. 5) (consisting of a link,  $f^5$ , pivoted at one end to the agitator and at the other to a bell-crank,  $f^6$ , which is pivoted at  $f^7$  on a bracket,  $x$ , and is provided with a pin or friction roller,  $f^8$ , which enters and is actuated by a cam-groove,  $f^9$ ,) answers the purpose well.

Blanks are to be thrown into the hopper and will roll to the bottom, the shape of the hopper tending to cause them to lie with their axes parallel with the slot in the agitator. The motions of the agitator will cause the lowermost ones or some of them to descend into the slot therein, hanging by their heads on the ledges, and when the agitator is thrown over so that the ledges are inclined sufficiently, such blanks as hang by their heads will slide out of the slot into the agitator into the ways  $g$ , whose slot is at that time a continuation of the slot in the agitator. From the hopper or arranger leads the ways  $g$ , slotted as such ways usually are, so as to hold a column of blanks by their heads. This way is bent at its lower end and in the bent part plays a gate or slide,  $h$ , fitting in the slot of the ways and moved in one direction by a spring,  $i$ , coiled around a rod attached to the gate and acting on a button on the end of the rod. The gate is moved in the other direction by a pawl,  $k$ , pivoted to the gate and actuated by a sliding pin,  $k'$ . When this slide is drawn away from the end of the ways by the spring, a screw-blank will descend by gravity and lie in front of it. When the gate is moved toward the end of the ways it will push the blank in front of it out of the ways, the head of the blank sliding down the ways and the gate holding back those blanks that are in the part of the ways above the bend. When the gate returns again, the slots or channels in both parts of the ways will be in communication, and the lowest blank above the bend will slide down in front of the gate in readiness to be delivered by its next forward motion. A V-shaped piece of metal,  $h'$ , may be attached to the slide and will prevent blanks

from being thrown too fast by the blow of the gate when the contrivance is moving rapidly. This gate, acting in connection with the bent ways, constitutes a separating and delivering apparatus, and as many kinds of apparatus performing the same office are known, they or suitable apparatus performing these offices may be located at the end of the ways, as substitutes for the apparatus herein specially described. A shaving-machine is located in proximity to this delivering apparatus in such manner that it shall receive and act upon blanks fed into it by suitable machinery, as described. This machine may be of any suitable or usual kind, but I prefer the machine invented by myself, (Letters Patent for which were allowed upon the 26th day of January, A. D. 1864,) one of whose features is a series of rotating and sliding receivers, such as are represented at  $j j$ , mounted on a star-wheel, carried by a slide,  $k'$ , which is actuated by a cam,  $j^2$ , the cam-groove embracing a pin which projects from the slide. These holders are spring-holders, and as the slide  $k'$ , which carries the wheel on which they are mounted draws it away from the revolving head  $k^3$ , containing the shaving-tools, one of the pins on the wheel strikes against the pawl  $k^2$ , which causes the wheel to revolve through an arc equal to that between any two receivers. When so revolved, one of the receivers will lie immediately under the corner formed by the bend in the ways, and the gate will be drawn back so that the slot in both parts of the ways is in connection, and a blank will lie in the corner and in front of the gate. As the gate is advanced by the pawl  $k$ , hooked on the pin  $k'$ , which is fastened upon the slide that carries the star-wheel, that receiver which is under the corner will advance just as fast as the gate does, and the blank in front of the gate will gradually enter the receiver. The pawl is now released from the pin by an unlatch,  $k^4$ , (see specially Fig. 7,) and the spring retracts the gate. At a subsequent motion of the slide, another receiver will be brought under the corner and a second blank received and the first submitted to the action of the shaving-tools, and so on in succession. After each blank is shaved, the receiver containing it will rotate so that the blank can drop out into the inclined chute or conductor  $m$ . As this shaver forms no part of this invention, and as other suitable shaving machinery may be substituted for the one shown in the drawings, and as various machines are well known to those conversant with wood-screw machinery, further description of a shaver is deemed unnecessary; but whatever shaving-machine may be used must be located so as to receive blanks from a delivering apparatus and discharge them so as to be transferred by an elevator or conveyer, which is in connection with a nicking-machine, substantially as hereinafter described.

The chute or conductor into which the shaved blanks fall is an inclined trough, with

its bottom on such a slant that blanks will slide down it by gravity, and it must, when used, extend so as to receive shaved blanks from the shaver and convey them to an elevator, next to be described. This elevator or conveyer is represented in the drawings as a leather belt provided with pans or shelves *n*. The belt surrounds pulleys upon a supporting-shaft, *n'*, and upon the actuating-shaft *d*, which is caused to rotate with an interrupted motion by an eccentric rod, *n<sup>2</sup>*, operated by the shaft *c*. This rod vibrates a sleeve on the shaft *d*, and upon the sleeve is secured a pawl, which takes into a ratchet-wheel attached to the same shaft. It is preferred to move the elevators by an interrupted motion, as the jars aid the delivery of blanks from the pans; but the belt may be moved by pulleys having a continuous rotary motion and by any competent machinery, so long as so arranged as to receive blanks, elevate, and deliver them. The pans or shelves upon the belts are inclined, and the blanks which roll into them from the chute are prevented from sliding out endwise by one of the standards *b*, which is so arranged as to close as with a wall the lower ends of the ascending pans. At the point *x'* the standard is cut away so that blanks may slide out, and the top of the standard forms an inclined chute, which conducts shaved blanks into a second arranger, receptacle, or hopper, 2 *f*.

I intend at times to extend the second hopper or arranger so as to receive blanks directly from the shelves, without the aid of the upper chute, *x'*. I also intend to arrange the elevator in such wise that blanks may fall or be discharged directly upon it, thus dispensing with the chute *m*, one good arrangement being to make the elevator, as a whole, inclined, and lie directly under the delivery-point of the shaver, and thence extend upward and rearward, so as to deliver blanks into a second hopper or receptacle, lying behind the first hopper, instead of at one side thereof, as represented in the drawings. The shelves upon the elevator may, moreover, be so shaped as to hold blanks without the aid of the wall *b* and may deliver the blanks at the proper point by the turning over of the shelves as they pass the upper pulley, or in other ways known to builders of elevators. The shelves may also be mounted upon and carried by a wheel, but this plan, although equivalent to the one represented, would be an inferior one. I prefer the plan represented in the drawings, and the employment of the lower chute, as by such arrangement the shaver, nicker, and threader may be all arranged so as to be easily accessible, the elevators being out of the way. All these various arrangements or formal changes of construction must, however, embrace common features—viz., the elevator must receive blanks, discharged or falling from a shaver, transfer and deliver them into a hopper or receptacle, from which blanks are, by means of

inclined ways and a delivery apparatus, forwarded to a nicking-machine.

The hopper, receptacle, or arranger for receiving shaved blanks transferred by the elevator is shown at 2 *f*, it being the same in all respects as the one before described, and provided, like it, with ways and a separating and delivering apparatus, the remarks applying to the kind of arranger and delivery apparatus used first in the series applying to these, but whatever be the precise kind of arranger or delivery apparatus they must be so located in reference to an elevator or conveyer that the arranger receives shaved blanks conveyed by and discharged from the elevator, and that the separating and delivering apparatus delivers shaved blanks to a nicking-machine.

The nicking-machine is so located as to receive shaved blanks from the second delivering apparatus, and the drawings illustrate a machine, invented by myself, with a series of sliding and revolving receivers and holders, *j<sup>2</sup>*, acting like those before described, in so far as they receive and hold blanks, transfer them to be operated upon, and drop them after they have been acted upon by the machine. A nicking-saw is represented at *l*. As this nicker is described in a patent allowed to me on the 26th day of January, 1864, and as other suitable machines which may be substituted for it in the combination are well known to those learned in the art of making screws, a minute description of a nicking-machine is deemed unnecessary, but when used in this combination the nicking-machine must be so located as to receive shaved blanks, transferred by a conveyer from a shaver, dropped into a receptacle or hopper, and thence, by means of ways and a delivery apparatus, delivered to the nicker.

Nicked blanks discharged from the nicker are received upon a chute, *m<sup>2</sup>*, which is in construction and in arrangement, with reference to the machine that delivers the blanks, and to an elevator or conveyer, (clearly shown on the drawings,) like that before described; and this conveyer, by means substantially like those before described, transfers the blanks into a hopper, arranger, or receptacle, 3 *f*, from which nicked blanks are delivered to one or more machines for cutting threads thereon. All the remarks as to construction of elevators and the pans or shelves thereof, and the arrangement of elevators, in reference to chutes and a method of dispensing with chutes, and all the remarks as to variety of form or construction of hoppers, made with reference to the elevators and hoppers and chutes before described apply to these, but this second set of conveyers or elevators must receive nicked blanks and convey them to a hopper or receptacle, whence they are to be delivered to a threader or to threading-machines.

I prefer to use a third hopper, 3 *f*, similar in all respects to those formerly specially described, except in that I continue the slot *f<sup>3</sup>* through the agitator, and give to the agitator

such an extent of rocking motion that blanks are alternately slid out on each side thereof first into one and then into another of two sets of forwarding-ways, in connection with this last hopper, as shown in the drawings. Each of these forwarding-ways is provided with a separating and delivering apparatus like those before described, (see drawings,) and other separating and delivering apparatus may, as before recited in reference to the former separating and delivering apparatus, be substituted therefor, but the delivery apparatus used must receive nicked blanks and transfer them to threading-machines.

I prefer to use threading-machines of my own invention (Letters Patent for which were granted April 26, A. D. 1864) in this combination, and the rotating and vibrating receivers and holders of two such machines, acting to receive, hold, and discharge blanks, as before described, are represented at  $j^4 j^4$  in the drawings, but any suitable threading-machines may be used so long as they are located, substantially as represented, to receive blanks delivered from a nicking-machine, through the agency of an elevator or conveyer, a hopper or receptacle, forwarding-ways, and delivering apparatus. As any suitable or proper threading-machine may be employed, so long as it is located and receives nicked blanks as before stated, a precise description of a threading-machine is deemed immaterial.

In the use of the whole combination thus described, headed blanks are to be thrown into the first arranger, from which they are delivered to a shaver and have their heads shaved. As shaved blanks are dropped or discharged from the shaver they fall into the chutes, are then received and transferred by the elevator or conveyer and discharged into the second receptacle or hopper, where they are arranged and then delivered to the nicker, which nicks the heads, and nicked blanks are dropped or discharged from the nicker into the second chute which delivers them to the second elevator or conveyer, which transfers and discharges them into the third hopper or arranger. From this third hopper nicked blanks are delivered to the threading-machines which thread and discharge them, and no manual labor is needed during the time that a headed blank is being converted into a finished screw.

Experience in screw machinery has proved that nickers and shavers can, when run at a

proper speed, operate upon about twice as many blanks can be threaded by a single threader. I have therefore shown two threaders in connection with the last hopper, but, if preferred, one only may be used.

If the shaver should get out of order, shaved blanks are to be thrown by hand into the middle hopper, until the machine is repaired. If the nicker gets out of order, blanks suitable to be acted upon by each machine may be thrown into the hoppers of the shaver and threader.

I intend at times to use a shaver and nicker, connected by an elevator or conveyer, and a hopper and its accessories, without any threader in the same series, and at other times to use a nicker connected in the same manner with one or two threaders, without any shaver in the series.

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

1. The combination, substantially as described herein, of hoppers or receptacles, forwarding-ways, delivering apparatus, and two sets of conveyers or elevators, with shaving, nicking, and threading machines, whereby headed blanks may be thrown into a hopper and converted into screws without manual labor, as described, the blanks being transferred from one machine to the hopper or receptacle of another by elevators or conveyers operating in the combination, substantially as specified.

2. The combination of a shaving-machine and nicking-machine with an elevator and a hopper and its accessories, substantially as described, whereby headed blanks may be converted into nicked blanks, substantially as specified.

3. The combination of a nicking-machine and a threading-machine with an elevator and a hopper and its accessories, substantially as described, whereby shaved blanks may be converted into screws, substantially as set forth.

4. A pyramidal hopper or receptacle provided with an oscillating agitator, constructed and operating substantially as specified.

In testimony whereof I have hereunto subscribed my name.

H. A. HARVEY.

In presence of—

EDW. E. QUIMBY,  
EDWD. PAYSON.