2 sheets
Sheet 1.

# J. A. Bidwell

## Threading Screws.

No. 75350 Patented Mar. 10, 1868.

Fig. 2

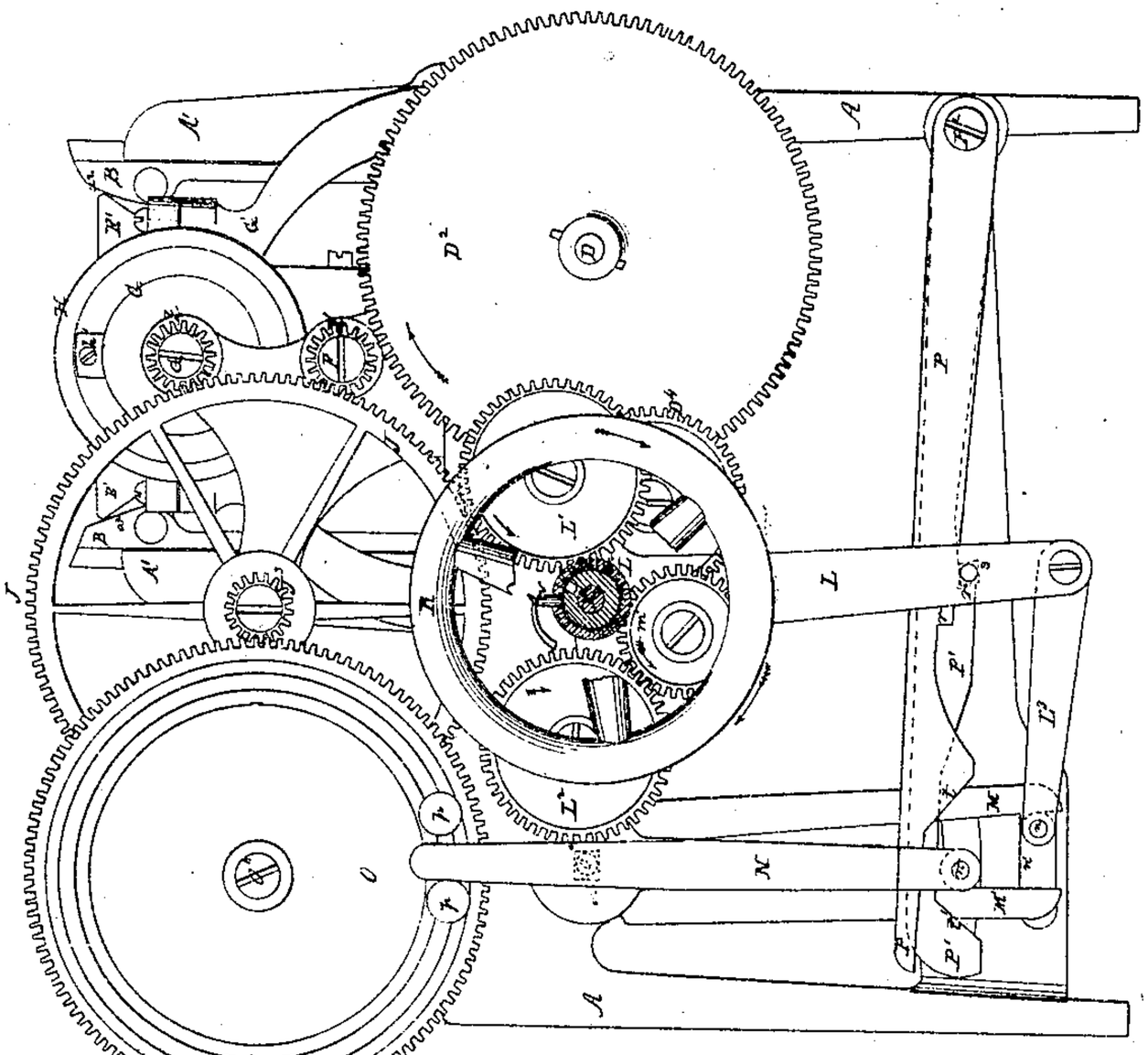
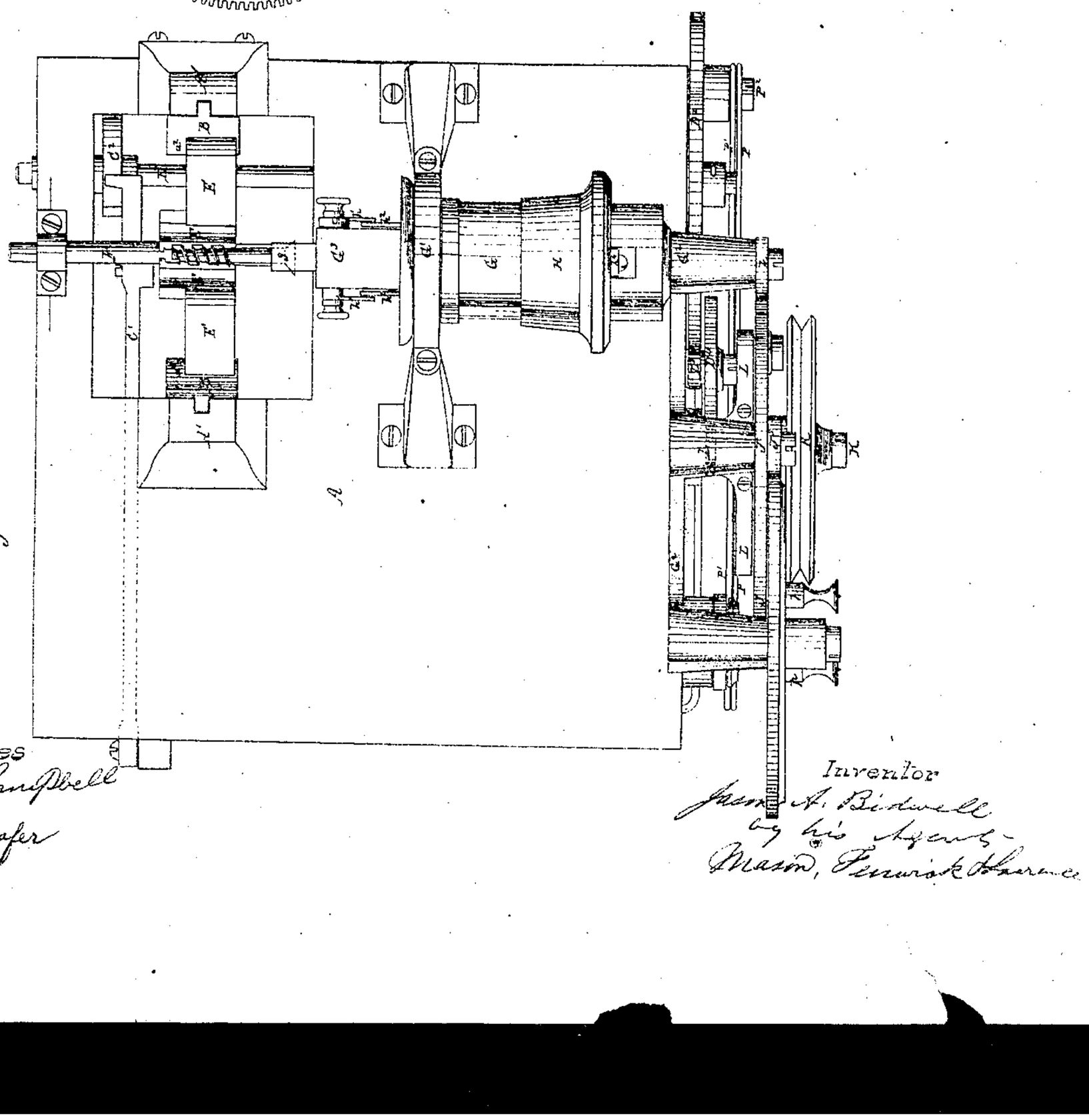


Fig. 1



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Mason, Fenwick & Lawrence

2 Sheets
Sheet 2

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Fig. 4

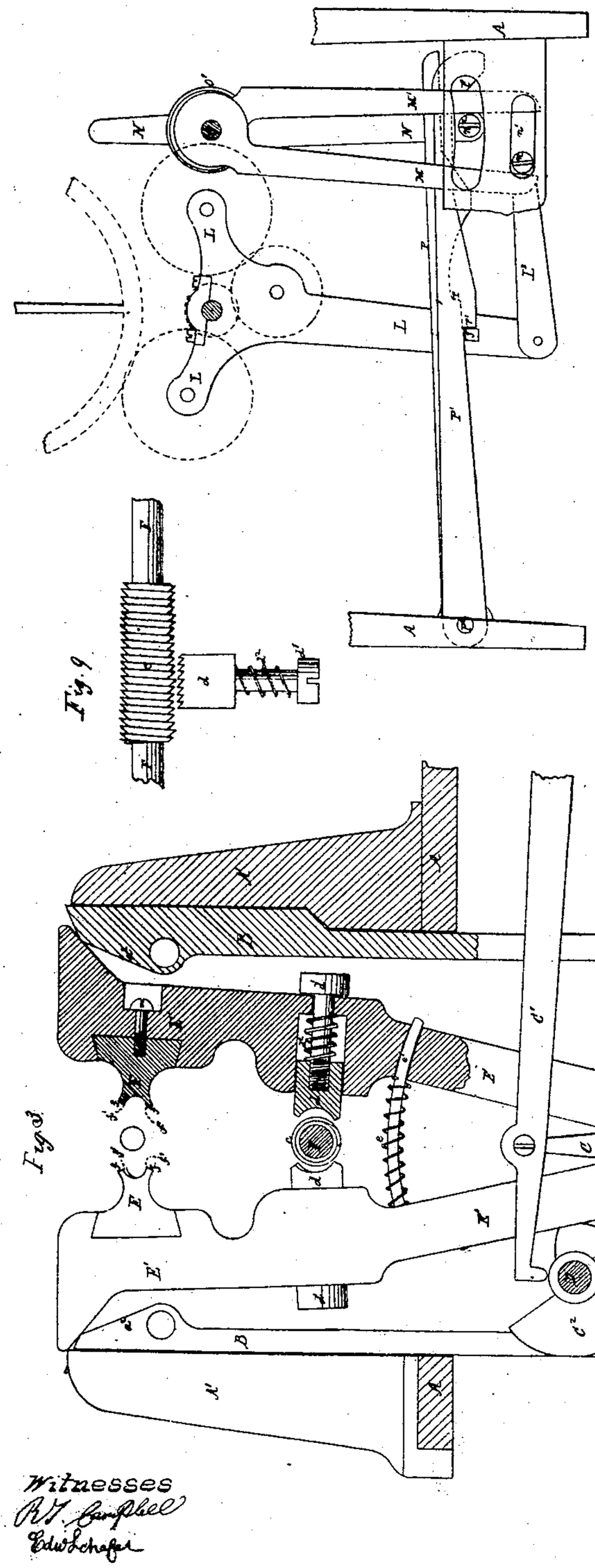

Fig. 5

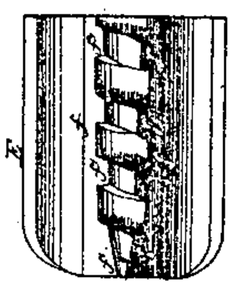

Fig. 6

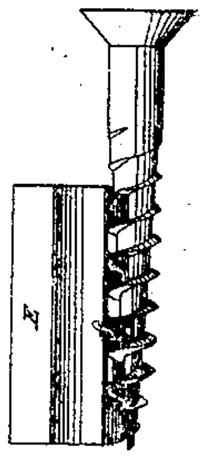

Fig. 7.

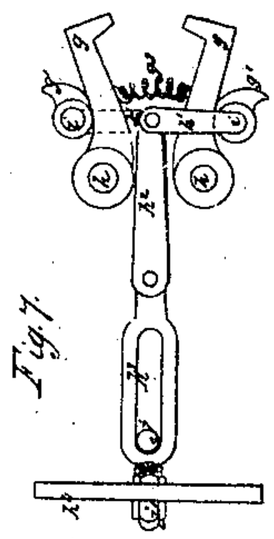

Fig. 8

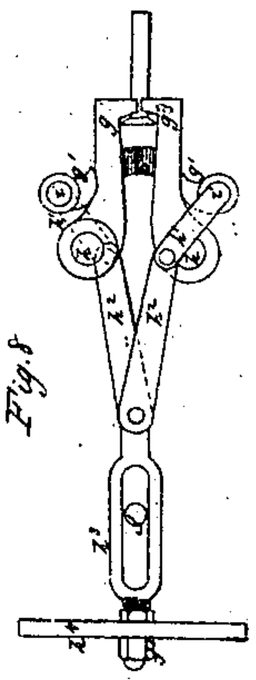

Fig. 9.



Fig. 3



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# UNITED STATES PATENT OFFICE.

JASON A. BIDWELL, OF EAST BOSTON, MASSACHUSETTS.

## IMPROVEMENT IN MACHINES FOR THREADING SCREWS.

Specification forming part of Letters Patent No. **75,350,** dated March 10, 1868.

*To all whom it may concern:*

Be it known that I, JASON A. BIDWELL, of East Boston, in the county of Suffolk and State of Massachusetts, have invented certain Improvements in Machinery for Threading Screw-Blanks; and I do hereby declare the following to be a full, clear, and exact description thereof, reference being had to the accompanying drawings, making part of this specification, in which—

Figure 1, Sheet 1, is a top view of the machine, showing a screw-blank in process of being threaded. Fig. 2, Sheet 1, is an elevation of one side of the machine, showing the index-wheel, the shifting-gear, and the right and left lifting-latches. Fig. 3, Sheet 2, is a sectional elevation, in detail, of the devices for threading the screw-blanks. Fig. 4, Sheet 2, is a view, in detail, showing the shifting-gear frame, the right and left latches, tripping-lever, and spring-arms. Fig. 5, Sheet 2, is an enlarged inside view of one of the threading-clamps. Fig. 6, Sheet 2, is an enlarged top view of one of the threading-clamps. Figs. 7 and 8, Sheet 2, show the devices for griping and holding the screw-blanks by their shanks. Fig. 9, Sheet 2, shows the leading-screw and one of its yielding half-nuts.

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

This invention relates to certain novel improvements on machinery which is designed for cutting threads upon screw-blanks in the manufacture of wood-screws.

The nature of my invention consists in producing the threads upon screws by means of what I shall denominate "threading-clamps," which are counterparts of the threads and cores of screws it is designed to form, and which are applied to jaws that have a vibrating and rectilinear-reciprocating motion, so that while the blanks are being rotated or oscillated the threading-clamps will traverse back and forward in a direction with the length of the axis of the blanks, and gradually reduce the cores so as to leave the perfect threads, as will be hereinafter described.

It also consists in the application to the jaws carrying the threading-clamps of elastic yielding half-nuts, which, when brought in contact with the leading-screw, that gives a rectilinear-reciprocating motion to said jaws, will yield and allow the threading-clamps to accommodate themselves to their work and to the gradual diminishing diameter of the screws as the work of producing the threads progresses, as will be hereinafter described.

It also consists in the employment of movable cams in conjunction with pivoted griping-jaws, which latter are adapted for holding the screw-blanks by their shanks during the threading operation, and which are pivoted to a spindle, said cam being so applied to the griping-jaws as to admit of the latter being opened sufficiently wide for receiving between them the heads of the screws, and then to close the jaws firmly upon the screw-shank, as will be hereinafter described.

It also consists in the employment, in conjunction with griping-jaws, which hold screw-blanks during the operation of threading them, and which give the blanks an axial, rotary, or oscillating motion, of an annular index-wheel for determining the number of right and left revolutions of the griping-jaw spindle in a given time and according to the length of the screws to be produced, as will be hereinafter described.

It also consists in a novel mechanism, combined with the oscillating index-wheel, for giving right and left rotations to the spindle which carries the griping-jaws or blank-holders, as will be hereinafter described.

To enable others skilled in the art to understand my invention, I will describe its construction and operation.

In the accompanying drawings, A represents the frame or table, upon which the screw-cutting mechanism is supported.

A′ A′ represent two standard-guides, which are erected upon the bed of table A, near one end, and which have their opposite faces parallel to each other and in planes perpendicular to said table-bed, as shown in Figs. 1 and 3. These perpendicular faces of the standard-guides are grooved vertically for receiving tenons or ribs, which are formed on the backs of vertically-reciprocating cam-faced rods B B, and serving as guides for keeping these rods in their places and allowing them to ascend and descend. These rods extend down through the table-bed, and are connected

together by a horizontal yoke, B′, through the ends of which the screw-threaded ends of the rods B pass, as shown in Fig. 3. This yoke is secured to its rods by means of adjusting-nuts *a a* and jam-nuts *a′ a′*, which admit of its being adjusted higher or lower, as may be required. The inner or opposite faces of the rods B B have inclined planes $a^2$ $a^2$, formed near their upper ends, for the purpose of causing the jaws which carry the threading-clamps to approach each other, as will be hereinafter described.

The yoke B′ has a slotted tubular socket, *b*, formed on it, in the middle of its length, for receiving a cylindrical pivot, *b′*, which is on a slotted pitman-rod, C, and forming a rocking-joint connection of this rod with the yoke B′. The upper end of rod C is pivoted in a suitable manner to a vertically-vibrating lever, C′, one end of which is pivoted to fixed pendant on frame A, and the other end is supported upon the periphery of a scroll-shaped cam, $C^2$, on the horizontal shaft D, as shown in Figs. 1 and 3. By the rotation of the cam $C^2$ the two cam-rods B B are caused to rise and descend slowly and to close, and also allow of the separation of the threading dies or clamps at the proper times.

The threading-clamps E E, which I shall hereinafter particularly describe, are secured to the inner faces, and near the upper ends of two jaws, E′ E′, which are jointed and pivoted to a horizontal rod, $E^2$, so that their upper ends will vibrate about the axis of this rod, which axis is in a vertical plane intersecting the axis of the spindle carrying the screw-blank-griping jaws, and consequently in a vertical plane intersecting the axis of a screw-blank when held by said jaws. The rod $E^2$ has its bearings in pendants projecting down from bottom of the table-bed A, and it is allowed to have a free endwise-reciprocating motion, which it receives from a leader-screw, *c*, on the horizontal shaft F. The jaws E′ E′ have half-nuts *d d* inserted into recesses made in their inner or opposite faces, the threads of which correspond with those of the leader-screw *c*, with which they both engage when the two jaws are caused to approach springs $d^2$, which are introduced into their recesses, as shown in Fig. 3. These springs $d^2$ will allow the threading-dies to approach each other after the half-nuts have been engaged with their leader-screw *c* during the operation, and producing a thread upon a screw-blank.

Directly below the leader-screw shaft F a spring, *e*, is interposed between the two jaws E′ and held in place by the curved rod *e′*, (shown in Fig. 3,) for the purpose of opening the two jaws and holding them open when the cam-rods B are depressed. The spring *e* presses the upper ends of the jaws E′ outward against the cam-faces $a^2$ $a^2$ of the vertically-reciprocating rods B B, so as to always be in contact therewith, and so that when these rods are caused to rise by the action of cam $C^2$ the threading-clamps will approach each other and act uniformly upon a screw-blank which is held by the griping-jaws, as shown in Fig. 1. As the work of cutting the thread upon a screw-blank and the reduction of the core of the screw progresses the cam-rods B B will slowly rise and feed both threading-jaws toward the axis of said screw until the work is completed, when the free end of lever C′ will drop down into the notch in cam $C^2$, as shown in Fig. 3, and allow the jaws B to open and release the finished screw.

The threading clamps or dies E E are constructed as shown in Figs. 1, 3, and 5. They may be produced by first making a steel screw-tap of the required size and shape of the screws which it is desired to produce in the machine, and then cutting with this tap a counterpart between two steel blocks. These blocks are then beveled and shaped, as shown at *f f* in Figs. 3 and 5, to produce the cutting-edges *f′ f′*, which remove the metal between the threads, leaving the threads as shown in Fig. 6.

The two dies E E, which I have shown in the drawings, are secured by dovetail grooves into their respective jaws E′, so that they can be removed and others introduced in their stead, and these dies are adapted for producing pointed screws of the character shown in Fig. 6. In constructing these dies or half-dies I remove so much of the metal between the elevated cutting portions *f f* as to allow of the smoothing and polishing of the screw-threads and cores after the work of cutting is complete, thereby producing a perfectly-formed and marketable screw without further manipulation.

It will be seen that the dies commence to cut at or near the point of the screw-blanks, and that the blanks are gradually reduced from point to shank, the threads and cores of the screw produced being a counterpart of the dies.

The devices which gripe and hold the screw-blanks firmly during the operation of the threading clamps or dies are applied to a hollow cylindrical spindle, G, which is supported in a horizontal plane by means of standard-bearings G′ $G^2$, so that its axis shall exactly coincide with the axis of the screw-blank when it is centered between the threading-dies, as shown in Figs. 1 and 3. The screw-blank is held between the hooked ends of the griping-jaws *g g*, which jaws are pivoted to the contracted end $G^3$ of spindle G at *h h* and curved so that they will open as far as desired for receiving between them the heads of the screw-blanks, so that the latter can be griped and held by their shanks, as shown in Fig. 8. Two cams or eccentrics, *g′ g′*, are also pivoted to the end of the spindle G outside of the jaws *g g*, and connecting to a sliding collar, H, on spindle G by means of arms *h h′*, jointed rods $h^2$ $h^2$, slotted rod $h^3$, and a cross-head, $h^4$, as shown in Figs. 7 and 8. The cams or eccentrics *g′ g′*

are secured upon rocking pins *i i*, which have the arms *h h'* secured to their ends on opposite sides of the contracted portion G³ of the spindle G, as shown in Fig. 1. The rods $h^2$ $h^2$ are pivoted to their respective arms *h'* at their front ends, and at their rear ends they are pivoted to the slotted rod $h^3$. This rod is guided by the pin *j*, which passes diametrically through the spindle G and through its slot, and is connected centrally to the cross-head $h^4$ by nut *j'*, so that by adjusting these nuts any wearing of the faces of the cams may be compensated for and the griping-jaws caused to hold the blanks firmly by their shanks.

The cams *g' g'* being connected to the loose collar H as described, it will be seen that by moving this collar backward in a direction with the length of the spindle G the jaws *g g* will be caused to approach each other. When the collar is moved forward said jaws will be opened by the extension of spring $g^3$, which is compressed between them, as shown in Figs. 7 and 8. The cams *g'* are both made of the same shape and size, and their axes are at equal distances from the axis of the spindle to which they are applied, so that the jaws will close around a screw-blank and hold it firmly, with its axis coinciding with the axis of the spindle G. The collar H upon spindle G will be automatically moved at proper times by means of devices which I have not shown in the drawings. The reduced rear portion of the spindle G passes through the bearing-frame G², and has a pinion spur-wheel, *k*, keyed upon it, which engages with the teeth of a large spur-wheel, J, that also has its bearing in frame G², as shown in Figs. 1 and 2. Directly beneath the pinion *k*, and in a vertical plane intersecting the axis of the spindle G, another pinion, *k'*, engages with the large wheel J, which pinion is keyed on the shaft F, carrying the leader-screw *c*. The cam-shaft D carries on its front end a large spur-wheel, D², which engages with the teeth of a pinion, D³, of an intermediate spur-wheel, D⁴, that engages with a pinion, *l*, on the main driving-shaft K.

Upon the main shaft K a T-shaped vibrating lever-frame, L, is pivoted, carrying upon its lateral arms the twin spur-wheels L' L², which are of an equal diameter, and which are caused to engage alternately with the spur-wheel J, as will be hereinafter described. The wheel L' is driven in one direction by the pinion *m* on the driving-shaft K, and the wheel L² is driven in an opposite direction by means of the pinion *m* and an intermediate pinion, *m'*, which latter has its bearing upon a stud projecting from lever-frame L, so as to vibrate therewith. One end of a pitman-rod, L³, is pivoted to the lower end of the lever-frame L, which rod has a stud, *n*, projecting from its opposite end through an oblong horizontal slot, *n'*, (shown in Figs. 2 and 4.) The slot *n'* is of such length as to allow the teeth of wheels L' L² to engage alternately with the large spur-wheel J as lever-frame L vibrates. The slot *n'* should not be of such length as to allow the teeth of said wheels L' L² to strike the wheel J with a shock when thrown into gear therewith.

It is designed to have the stud *n* strike the ends of said slot, and thus relieve the teeth of the said spur-wheels from injury. The intermittent vibrating movement is imparted to the lever-frame L by means of two vibrating arms, M M', which are pivoted to a stud at *o*, Figs. 2 and 4, and which are acted upon by a strong spring-yoke, *o'*. Said arms are arranged so that their lower ends act upon both sides of the stud *n*, the arm M moving the lever-frame L in one direction and engaging the wheel L² with the wheel J, and the arm M' moving the frame L in an opposite direction, so as to engage wheel L' with the wheel J.

A vibrating lever, N, which has its fulcrum at *o*, carries a stud, $n^2$, upon its lower end, which projects between the two spring-arms M M' and operates upon these arms at proper times, as will be hereinafter described. The upper shortest arm of lever N is acted upon by means of dogs *p p* upon the face of an oscillating spurred index-wheel, O, so as to give this lever a vibrating movement. The index-wheel turns upon a fixed stud, O', projecting from the bearing-frame G², and the teeth upon the circumference of this wheel engage with the teeth of a pinion, J³, upon the shaft of large spur-wheel J, as shown in Fig. 2.

Near the lower end of the long arm of lever-frame L is an angular stud, *s*, (shown in Figs. 2 and 4,) upon which rest two latches, P P', which are pivoted at P² to the table or frame A of the machine. These latches are constructed with right and left catches *r r'*, arranged so as to receive and arrest the lever L at the termini of its strokes, and they are also constructed with right and left cams or inclined planes *t t'* near their free ends, which are arranged so that the stud $n^2$ on lever N will alternately act upon them as this lever vibrates, and thus alternately raise said latches and release the lever L. The pivot or axis P² is so arranged with reference to the angular stud *s* on lever L that when the latches are raised they will not draw back upon said stud, but leave it with a sudden movement.

The stud $n^2$, which alternately lifts the latches, as above stated, may be provided with anti-friction collars or rollers, so as to reduce as much as possible the friction, and the stud *n*, which plays in the slot *n'*, may also be provided with an anti-friction collar or roller, so that it will move freely.

The belt-wheel R is applied upon the shaft K by means of a spring-latch, *b*, so that should anything become deranged this latch will release the band-wheel and allow it to turn freely around its shaft.

The dogs which are applied upon the face of the index-wheel O are designed to be adjustable so that they can be moved and set at any required distance apart according to the num-

ber of right and left turns which it is desired to give the spindle. These dogs may be set into holes drilled through the index-wheel at proper points; but I prefer the attachment shown in the drawings, which consists in applying the dogs by means of screws to nuts, which are inserted into an annular T-shaped groove made in the face of said wheel. By this arrangement the dogs can be adjusted and set to a nicety.

The index-wheel O is for determining the number of right and left revolutions of the griping-jaw spindle in a given time, according to the length of the screw required to be cut. By moving the dogs *p p* nearer together they will operate with greater rapidity and the oscillations of the index-wheel will be shorter, and by adjusting these dogs farther apart the oscillations of the said wheel will be longer.

It will be seen from the above description that the cam-shaft D receives a motion continuously in one direction from the driving-shaft K through the medium of spur-wheels $D^2$, $D^3$, $D^4$, and *l*, and that the spindle G and leader-screw shaft F both receive motion alternately in opposite directions from a large wheel, J, which is driven by means of a pinion, *m*, on the main shaft K, acting through the medium of shifting-gearing. When motion is communicated to the driving-shaft K in the direction indicated by the arrow in Fig. 2 rotary motion will be transmitted to the large spur-wheel $D^2$ on cam-shaft D continuously in one direction. The cam on this shaft D will cause the cam-faced rods B B to rise at proper times and with proper speed for feeding the threading-dies E E up to their work of cutting the threads upon the screw-blanks. The cam $C^2$ raises the cam-rods B and allows them to descend once in every revolution. The large spur-wheel J engages with the spurred pinions K K′ on the ends of the spindle G and leader-screw shaft F, and gives motion to both of said parts simultaneously. This spur-wheel J receives an intermittent rotary or oscillating motion, as the case may be, from the twin spur-wheels L′ $L^2$ on the ends of the transverse arms of the lever-frame L. The pinion $J^3$, which turns with the large wheel J, gives motion to the index-wheel O, which, in turn, vibrates the lever N. The dogs *p p* on the face of the index-wheel O, being adjusted at the required distance apart, according to the length of the screw to be cut and the number of right and left turns required of the griping-jaw spindle, these dogs will cause the pin or stud $n^2$ on lever N to raise the right and left latches P P′ and release the lever-frame at the proper times, and thus allow the spring-arms M M to vibrate said lever-frame, and thus alternately engage and disengage the wheels J and L′ $L^2$.

I have described the threading dies or clamps as being applied to jaws which have a rectilinear-reciprocating motion in a direction with the length of the screw while being cut; but, if desirable, an endwise movement may be given to the screw-blanks while being threaded between the threading-dies by giving the spindle to which said blanks are confined an endwise movement. In this case the threading-dies will have a lateral movement only for the purpose of moving them up to and from the screws or screw-blanks.

Having described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The construction of the threading clamps or dies E E with cutters and recesses in such manner as to form counterparts of the screws which they are designed to produce, substantially as described.

2. The application of threading-clamps E E to laterally-vibrating jaws or carriers E′, in combination with a device for holding screw-blanks while they are being threaded, substantially as described.

3. The laterally-vibrating and rectilinear-reciprocating die-carriers E′ E′, in combination with the leader-screw *c*, substantially as described.

4. The application of elastic yielding half-nuts *d d* to vibrating threading die-carriers E′ E′, substantially as described.

5. The combination of closing-cams B B and opening-spring *e* with the threading-die carriers E′, substantially as described.

6. The combination, with the machinery, substantially as herein described, for producing threads on screw-blanks, of the griping-jaws *g g* and cams *g′ g′*, applied and arranged so as to operate substantially as herein described.

7. In a machine for producing threads upon screw-blanks, the griping-jaws *g*, cams *g′*, and toggles *h′*, combined with a sliding collar, K, and applied to a spindle, all substantially as described.

8. The arrangement of the devices specified for adjusting the cams *g′ g′* in the screw-blank-threading machine herein shown and described. for the purpose set forth.

9. In a screw-thread-cutting machine employing an intermittent rotating spindle carrying the blank-holders, the index-wheel O, with its dogs *p p*, applied substantially as described.

10. In combination with the wheel O and its dogs *p p*, the vibrating lever N, latches P P′, and lever L, said parts being applied to a screw-cutting machine so as to operate substantially as and for the purposes described.

11. The spring-arms M M, the lifting-lever N, right and left latches P P′, and the vibrating lever-frame L, carrying the shifting-gear L′ $L^2$, all combined and applied to a screw-threading machine, substantially as described.

12. The pitman-rod $L^3$, with its check-stud *n*, and the slotted guide *n*, in combination with the lever-frame L, substantially as described.

13. Providing the lever-frame L with right and left latches P P′, for arresting this frame at the termini of its strokes, said parts being

applied to a screw-threading machine and operating substantially as described.

14. The driving of the leader-screw shaft F and the griping-jaw, carrying spindle G, by means of a single wheel, J, which receives intermittent rotary or oscillating motions from shifting-wheels L′ L², substantially as described.

15. The adjustable yoke B′, applied upon the cam-rods B B, for the purpose of regulating the amount of lateral vibration of jaws E′, carrying threading dies or cutters E, substantially as described.

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