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J. STEHLI.

METAL SCREW MACHINE.

No. 302,525. Patented July 22, 1884.

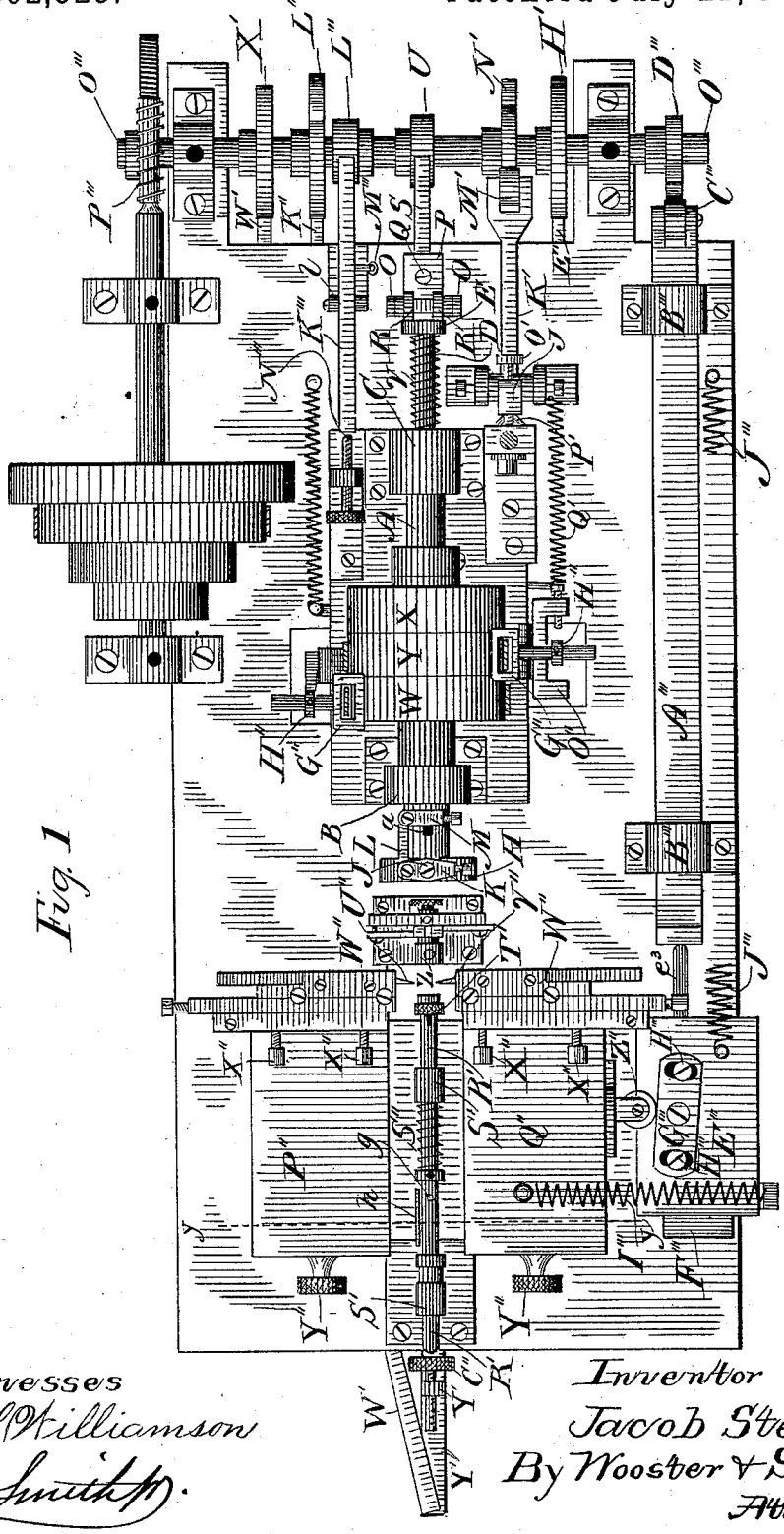

Fig. 1

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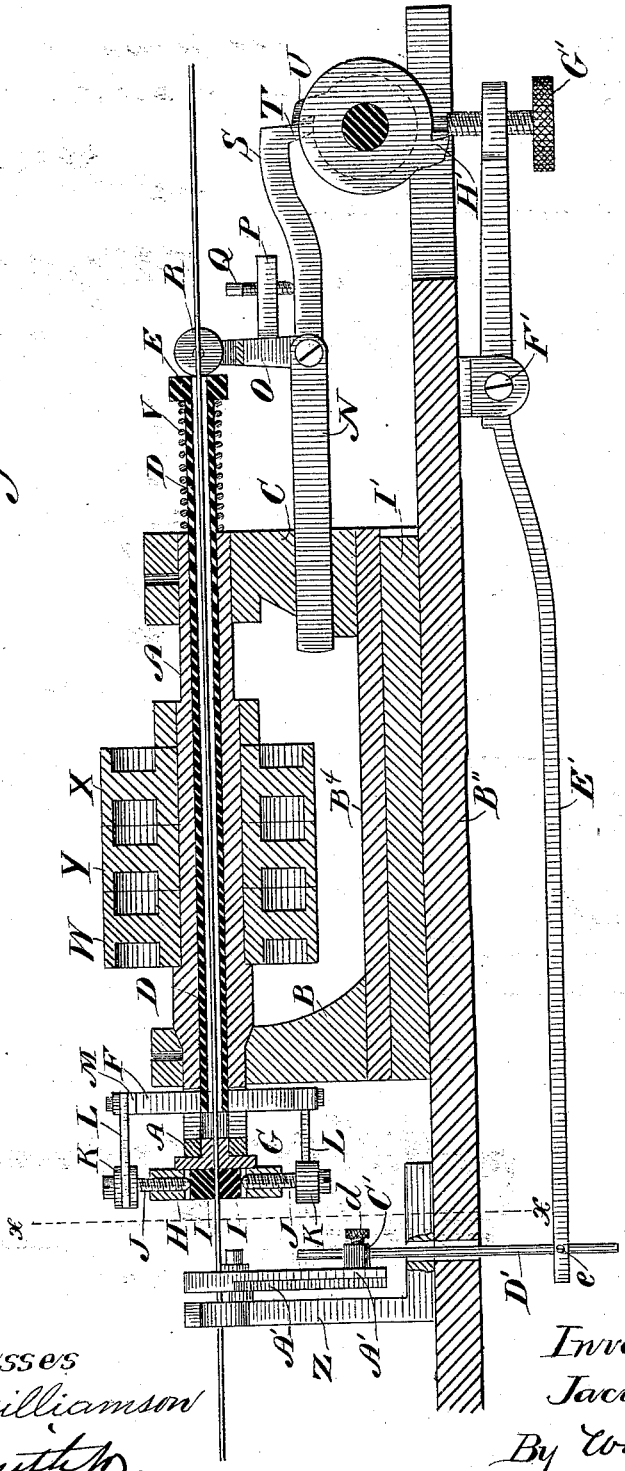
Fig. 2



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METAL SCREW MACHINE.

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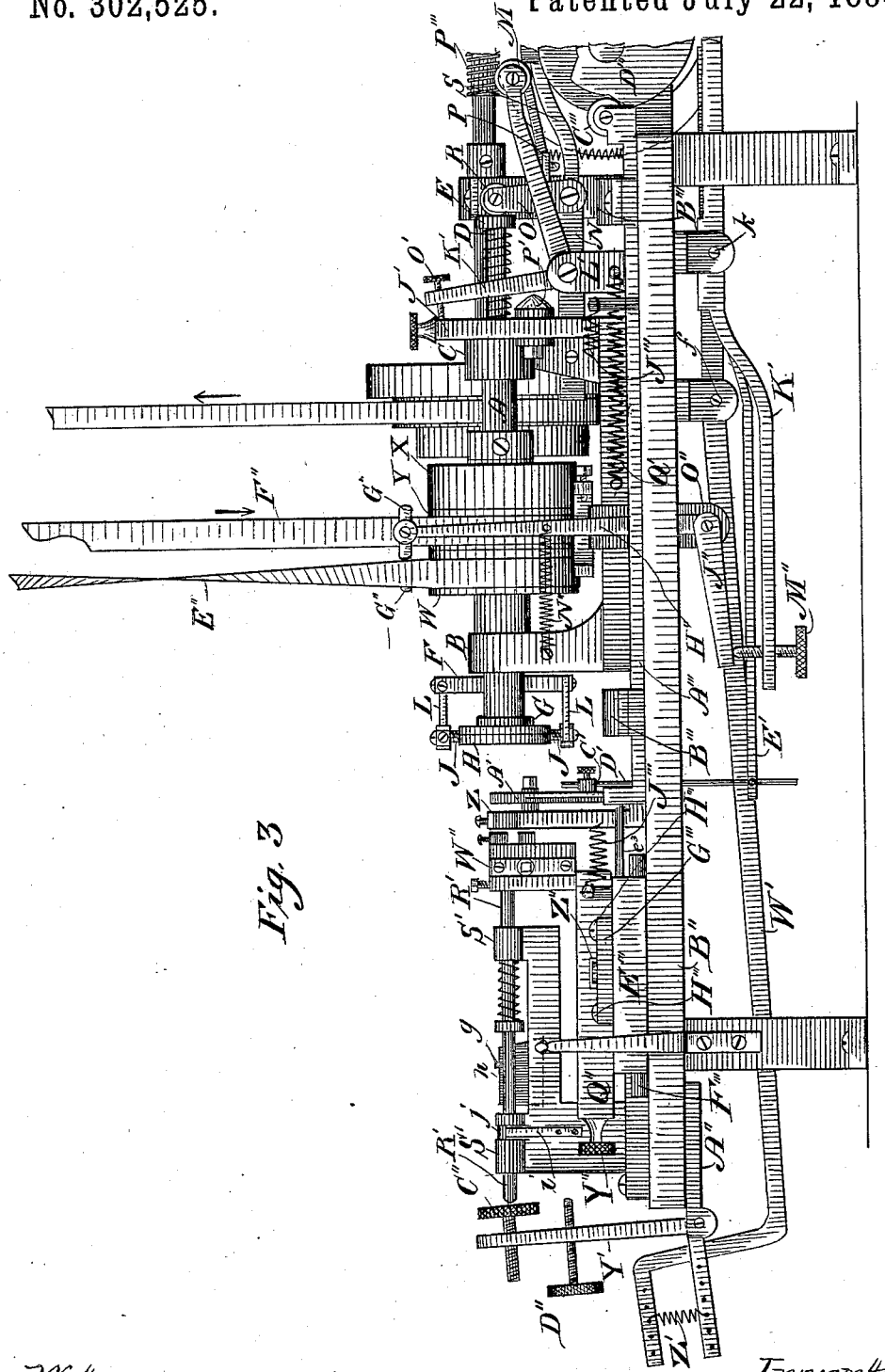

Fig. 3

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Fig. 6.

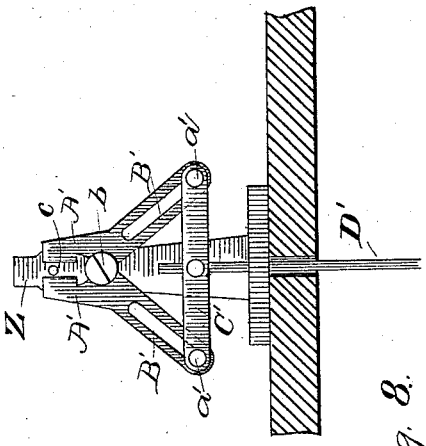

Fig. 8.

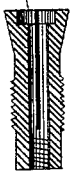

Fig. 5.

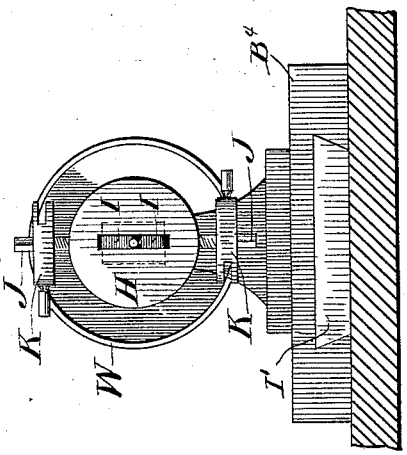

Fig. 7.

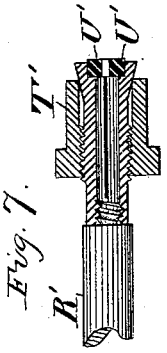

Fig. 4.

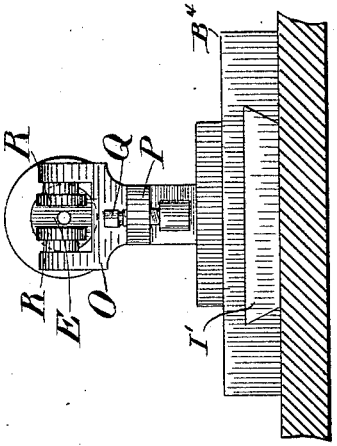

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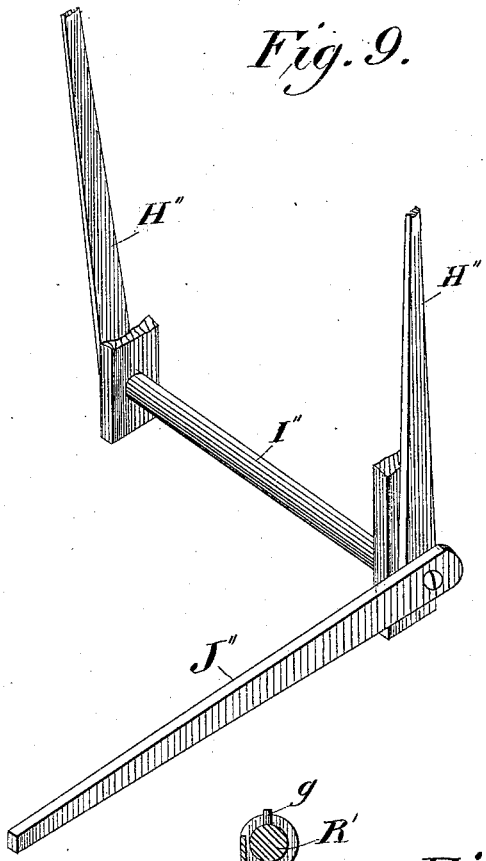
Fig. 9.



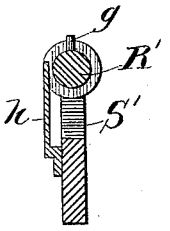
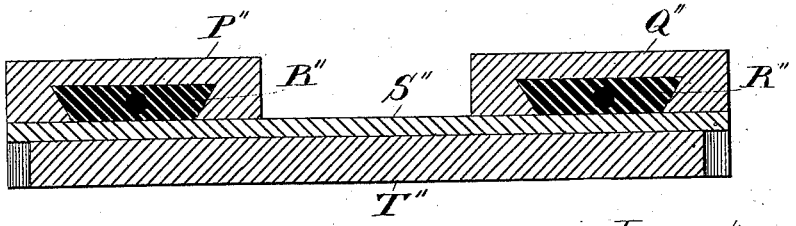


Fig. 10.



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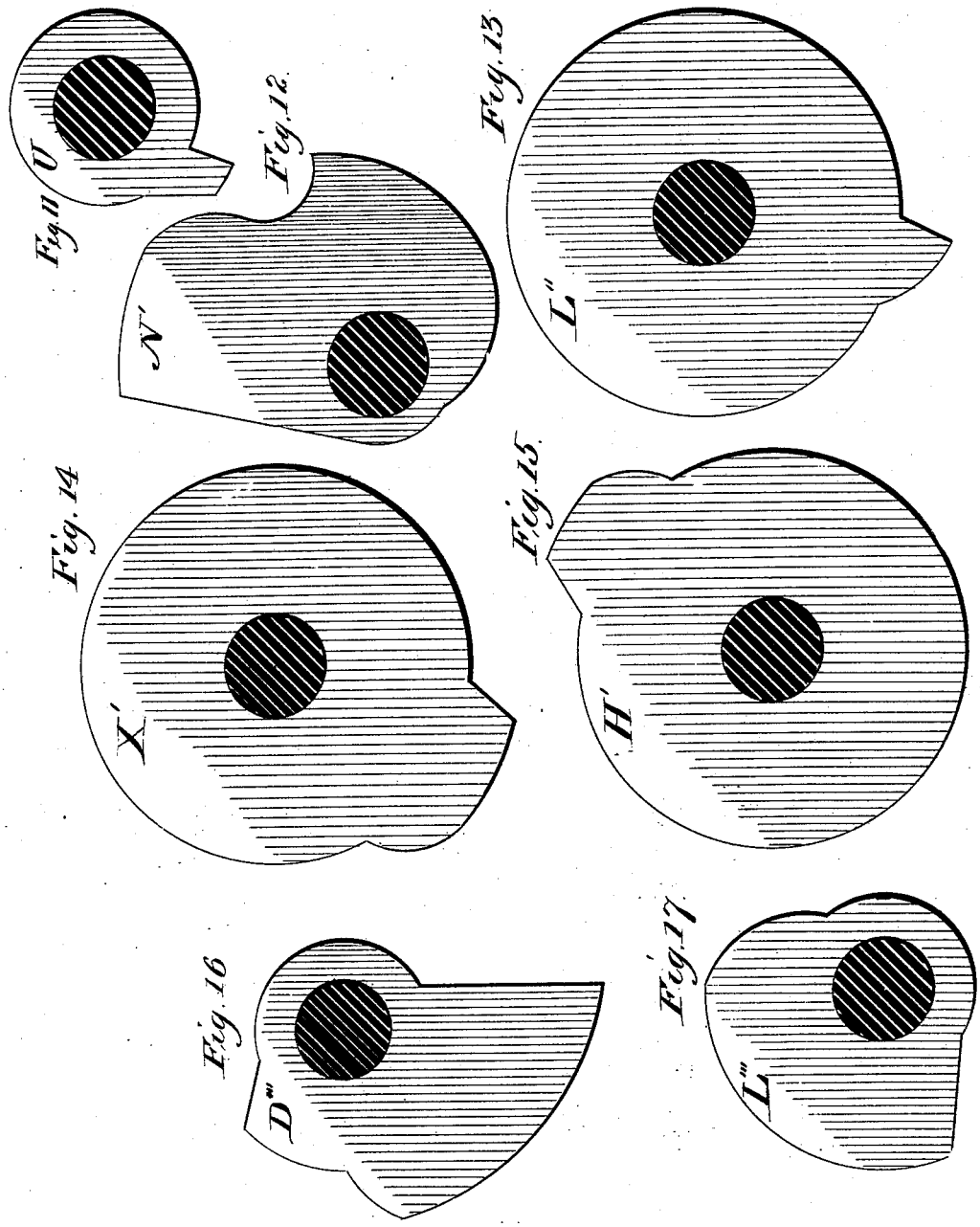

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UNITED STATES PATENT OFFICE.

JAKOB STEHLI, OF DANBURY, ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, TO HIMSELF, AND AMOS F. CHAMPLIN, OF HARTFORD, CONN.

METAL-SCREW MACHINE.

SPECIFICATION forming part of Letters Patent No. 302,525, dated July 22, 1884.

Application filed September 17, 1883. (No model.)

To all whom it may concern:

Be it known that I, JAKOB STEHLI, a citizen of Switzerland, residing at Danbury, in the county of Fairfield and State of Connecticut, have invented certain new and useful Improvements in Machines for Manufacturing Metal Screws; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to certain novel and useful improvements in machines for the manufacture of metal screws, and has for its object to provide such a machine as shall be uniform, automatic, and constant in its movements, while at the same time the work accomplished shall be superior in every respect; and with these ends in view my invention consists in the details of construction and combination of elements hereinafter fully and in detail explained, and then specifically designated by the claims.

In order that those skilled in the art to which my invention appertains may more fully understand its construction and operation, I will proceed to describe the same in detail, referring by letter to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a plan view of my improvement; Fig. 2, a central vertical longitudinal section through the mandrel; Fig. 3, a side elevation of the machine. Fig. 4 is a rear view with the table in section, showing the arrangement of the bed-plate on the dovetailed bearings, and also the friction-rolls which operate on the head of the quill. Fig. 5 is a cross-section looking backward, taken at the line *x x* of Fig. 2. Fig. 6 is a view looking forward, taken at the line *x x* of Fig. 2. Fig. 7 is a detail sectional view of the die-holder with the dies clamped therein; Fig. 8, a similar view of the die-holder without the sleeve and dies; Fig. 9, a detail perspective showing the mechanism for shifting the belts; Fig. 10, a cross-section taken at the line *y y* of Fig. 1; and Figs. 11, 12, 13, 14, 15, 16, and 17 are detail views of the several cams used in my improvement.

Similar letters denote like parts in the several figures of the drawings.

A is a mandrel mounted within standards B C, secured to or formed integral with a sliding bed-plate, B^4. Within this mandrel is a quill, D, provided with head E at one extremity and secured at the other end within a cross-bar, F. This cross-bar is a straight piece of metal extending through the mandrel and projecting above and below, as shown, the opening in the mandrel through which said cross-bar extends being elongated, in order to allow a suitable play to the latter, as will be seen by reference to Fig. 2.

G is the cap-piece, secured to the outer end of the mandrel, and H the chuck, rigidly attached to said cap. Within this chuck are jaws I, adapted to grasp and hold the wire.

J J are set-screws passed through the chuck, above and below, and bearing against the jaws. On the heads of these screws are short crank-arms K, (see Figs. 1 and 2,) which are connected at one extremity, by connecting-rods L, to a cross-piece, M, on each extremity of the cross-bar F. (See Figs. 1, 2, and 4.) It will be readily understood that movement of the cross-bar in the elongated slot *a* will operate the set-screws J, and thereby tighten or release the jaws I, as the case may be.

N is a projecting arm secured within the standard C. Pivoted within this arm is an upright fork, O, (see Figs. 1, 2, and 4,) provided with lug P and adjusting-screw Q.

R R are anti-friction rollers pivoted to the branches of the fork O, whose function will be presently explained.

S is a lever pivoted at the same point with the fork O, and provided with lug T. This lug is operated upon by the cam U, all of which will be hereinafter set forth. By operating the screw Q the fork is thrown nearer to or farther from the head E of the quill, as the case may be, so that when the lever S is lifted by the cam U the fork will be forced forward more or less. The quill D is so arranged within the mandrel as to slide freely and to return to its normal position by the action of a coil-spring, V, placed around the quill and confined between the head E and the mandrel.

The action of the cam U raises the lever S, and forces the rollers R against the the head E, thereby pushing the quill inward and causing the cross-bar to operate the set-screws J, as hereinbefore set forth, and the adjustment of the screw Q determines the extent to which the quill is moved. Arranged on the mandrel are loose pulleys W and X and fast pulley Y, the latter of which operates to cause the mandrel to revolve, and thereby impart a like motion to the cross-bar F and chuck H. When the quill revolves and the rollers R are brought against the head E, they will be likewise revolved by said head, and unnecessary friction thereby obviated.

Z is an upright post secured to or cast integral with the bed-plate. Pivoted to this post are jaws A′, constructed after the manner of scissors, and having slots B′ extending through their lower portions.

C′ is a cross-bar having pins *a′* projecting at its extremities, which travel in the slots B′.

D′ is a rod adjustably attached to said cross-bar and to the lever E′. This lever is pivoted, as seen at F′, to the bed-plate, and is provided at its heel end with an adjusting-screw, G′, which projects upward within the field of movement of the cam H′. The bevel of the cam during its revolution strikes against the screw G′, and the latter rides down said bevel, thereby forcing down the rear end of the lever E′ and raising the forward end. The rod D′ being attached to the lever E′ and cross-bar C′, the movement of the lever will cause the said rod to force the said cross-bar upward, and the pins *a′* traveling in the slots B′, it follows that the portions of the jaws below the pivot-point *b* will be spread farther apart, and the upper or grasping portions of the jaws will be brought closer together, for the purpose presently explained. In the post Z is a small hole, *c*, for the wire to pass through, and which acts as a support for the wire. The movement of the jaws A′ is regulated by the throw of the rod D′, and this depends upon the adjustment of the screw G′, by means of which the cam H′ is caused to operate, so as to force the rear end of the lever E′ down more or less, thereby increasing or decreasing the upward throw of the forward extremity of said lever. The rod D′ may be adjusted vertically by means of the screws *d e*, in order to compensate for any decrease or increase in the throw of the lever E′. The bed-plate B⁴, having the standards B C, is arranged to slide on a dovetailed block, I′, secured to the table B³, (see Figs. 2, 4, and 5,) said bed-plate being actuated as follows: A post, J′, projects upward from the bed-plate B⁴. A bell-crank lever, K′, is pivoted to an upright, L′, secured to the table B″. One end of this lever is provided with an anti-friction roll, M′, which rests upon a cam-wheel, N′, the other end being adapted, by means of an adjusting-screw, O′, to abut against the post J′, as will be presently explained.

P′ is a pin secured within the post J′ and projecting therefrom, as shown at Fig. 3.

Q′ is a coil-spring attached to the bed-plate B⁴ and to the upright L′, which returns said bed-plate to its normal position after it has been moved forward by the action of the lever K′. When the cam-wheel N′ operates on the roll M′, the forward extremity of the lever K′ is thrown toward the post J′, and the screw O′ abuts against the latter and forces the bed-plate B⁴ and standards B C forward, and the mandrel A and chuck H will also be moved forward accordingly. The timing of the movements of the quill and bed-plate is such that the forward movement of the latter takes place when the backward movement of the former has caused the set-screws J to close the jaws I on the wire, so that it will be readily understood that the wire being gripped by the jaws, the said movement of the bed-plate will cause the wire to be fed forward. The pin P′ is vertically adjustable within the post J′, said post being slotted for this purpose, and the lower portion of the lever K′ will strike said pin before the screw O′ abuts against said post. The action of the lever against the pin, and the consequent movement of the bed-plate, takes place while the wire is being turned down by the turning-tool, and the subsequent action of the screw O′ throws the wire within the threading device. This device consists of a rod, R′, mounted in bearings S′, the rear end of this rod being hollow and threaded externally, as seen in Figs. 7 and 8.

T′ is a sleeve running on said rod. The rod is conical and split, as seen in Figs. 7 and 8, so as to have a spring movement. The said screw-threading dies U′ are placed in a recess, V′, in the split rod, and clamped by simply running the sleeve T′ up the incline or conical part of said rod. The rear or threaded portion of the rod R′ may be made detachable from the rod itself, in order to facilitate the changing of dies or making necessary repairs.

W′ is a rod pivoted at *f* and operated by the cam X′, as will be seen by reference to Figs. 1 and 3. When the rear end of this rod is forced down by the said cam, the forward end flies up, the construction and operation of the cam and rod being precisely like that of the previously-described cams and rods. The forward extremity of the rod W′ is connected to a bell-crank lever, Y′, by means of a spring, Z′, said lever Y′ being pivoted to a support, A″, projecting from the table B″ of the machine.

C″ is an adjusting-screw which determines the extent to which the rod R′ is moved by the action of the lever Y′. When the movement of the rod W′ raises the lower portion of the bell-crank lever Y′, the upper portion will be thrown toward the rod R′, and the screw C″ will strike said rod and move it within the bearings S′, and thereby carry the dies U′ toward the wire. In order to prevent the lever from throwing too far, an adjusting-screw, D″, is passed through said lever so as to abut against the forward standard, S′.

g is a lug projecting from the rod R′. When

the revolving wire enters the dies U′, they and the rod will of course be turned around by friction; but the lug *g* will strike against the ledge *h*, and prevent any further rotation until said rod has been forced backward, so that the pin will pass the ledge, and this latter movement is so timed that it occurs immediately after the operation of threading has been finished. The rod is then free to revolve, which of course prevents the thread from being mutilated or torn off. When the belts are shifted, a pawl, *i*, and ratchet *j* prevent the reverse rotation of the rod R′, so that the screw may be readily withdrawn from the dies.

E″ F″ are belts running in opposite directions, and G″ are the shifters attached to rods H″. (See Figs. 1, 3, and 9.) These rods are rigidly secured to a cross-bar, I″, having a laterally-projecting arm, J″, the construction and relation of said cross-bar and arm thus forming a rock-shaft, while the movement of the arm J″ and the rods H″ is that of a bell-crank lever.

K″ is a lever pivoted at *k*, and operated by the cam L″ in precisely the same manner as in the case of the levers and cams previously referred to and specifically designated. The forward end of the lever K″ at its upward movement will operate the arm J″ through the medium of the adjusting-screw M″. The latter regulates the throw of said arm. The result of the upward movement of the arm J″ is to operate the rods H″ and shift the belts on the pulleys W Y X, for the purpose of reversing the movement of the fast pulley Y.

N is a coil-spring attached to one of the rods H″ and to the standard B, and operates to return the said rods to their normal position, and thereby reshift the belts after the cam L″ has ceased to operate the lever K″.

O″ are brackets projecting laterally from the bed-plate B^4, and extending downward. Within these brackets the cross-bar I″ is journaled, so that it will be readily understood that when the bed-plate B^4 is moved the arms H″ will be carried along with it. The timing of the shipping of the belts and the mechanism which operates to thread the screw is such that the former movement takes place immediately after the screw has been threaded, and withdraws the screw from the dies U′, the movement of the bed-plate being timed accordingly, and the action of the rod W′ and its operating-cam being likewise regulated in order to properly time the motion of the rod R′.

P″ Q″ are the cutter and turning tool carriers, respectively, arranged to travel longitudinally on dovetailed bearings R″ on the connecting-plate S″. This plate is constructed to reciprocate laterally on a dovetailed bearing, T″, (see Fig. 10,) on the table B″ of the machine.

U″ V″ are the cutter and turning tools, respectively, and they are arranged in any ordinary boxes, W″, secured to the carriers P″ Q″.

X″ are screws, by means of which the boxes may be adjusted.

Y″ are the screws for adjusting the carriers.

Z″ is an anti-friction roll, journaled in bearings secured to the carrier Q″.

A‴ is a rod housed in sockets B‴, so as to have a free longitudinal action. At the rear end of said rod is an anti-friction roll, C‴.

D‴ is a cam which operates on the said roll, so as to throw the rod forward. At the forward extremity of said rod A‴ is arranged a sliding block, E‴, which travels longitudinally on a dovetailed bearing, F‴, a projection, e^3, on said sliding block impinging against the forward end of the rod A‴.

G‴ is a piece of metal pivoted on the upper face of the block E‴, and adjustable by means of screws H‴, which forms a track or bearing surface for the roll Z″. This bearing-surface is always inclined, and the adjustment is merely for the purpose of changing the inclination. When the cam D‴ acts on the roll C‴, the rod A‴ will be thrown forward and the inclined track G‴ will be forced ahead against the action of the spring J‴, and the resiliency of the spring I‴ will cause the roll Z″ to travel down said track, thereby causing the carriers P″ and Q″ to slide on their bearings toward the track, as will be readily understood. The spring J‴ keeps the roll C‴ in constant contact with the cam D‴, so that a proper action may be insured.

K‴ is a stop-lever, pivoted, as seen at *l*, and operated by the cam L‴. A spring, M‴, returns this lever to its normal position when the operation of the cam has ceased. The timing of the movement of the bed-plate B^4 and of the operation of the mechanism for cutting off the screws is such that during the backward slide of the said bed-plate, and immediately before the cutter U″ commences to perform its function, the cam L‴ will operate on the rear end of the lever K‴, and thereby throw the forward extremity thereof down, so that the adjustable abutment N‴, secured to the bed-plate, will strike against the said lever and hold the said bed-plate against any further backward movement until the cutter has entirely done its work, when the cam L‴ will in its revolution leave the lever, and the action of the spring M‴ will return the latter to its normal position and allow the bed-plate to slide back to its full extent. The cams herein mentioned are all ordinary peripheral cams secured on the common shaft O‴, the latter being revolved by the ordinary worm-shaft P‴.

The operation of my improvement is as follows: The bed-plate B^4 is forced forward by the action of the cam N′, as hereinbefore explained, and as the jaws I are closed on the wire the latter is fed forward. While the wire is being fed, the cam D‴ will have ceased to force the rod A‴ forward, and the resiliency of the spring J‴ will operate to draw the block E‴ backward and cause the roll Z″ to travel up the inclined track G‴, thereby forcing the

carriers P″ Q″ to slide on their bearings against the action of the spring I‴ and in a direction opposite to that previously set forth, and bringing the turning-tool V″ into position so as to reduce the wire to the diameter of the desired screw. The continued movement of the bed-plate now forces the wire within the threading device, while at the same time the latter is forced against the wire by the operation of the cam X′, as set forth, the mandrel and all the parts connected therewith, including, of course, the wire, being meantime rapidly revolved by the action of the fast pulley Y. When the operation of threading has been accomplished, the belt on the fast pulley is shifted by the action of the cam L‴ and the direction of the movement of said pulley reversed, all as hereinbefore fully set forth, and the threaded screw is thereby withdrawn from the dies, the rod R′ returns to its normal position, and the bed-plate B⁴ moves backward. When the screw has been carried backward by the bed-plate to the desired position opposite the cutting-tool U″, the latter will operate, as hereinbefore explained, and immediately before this operation the cam L‴ will operate the stop K‴, and the bed-plate will remain stationary until the screw has been cut off, when the said stop will fly up and the bed-plate slide back to its limit. Immediately before the latter movement of the bed-plate the cam U will operate to throw the quill forward, and thereby cause the jaws I to release the wire, as hereinbefore set forth, while at the same time the jaws A′ will be caused to grip the wire through the action of the cam H′, the object of this being that the mandrel and the several parts connected thereto may slide back with the bed-plate without carrying the wire, the jaws A′ operating merely to hold the wire and prevent it from being drawn back by friction. The several parts of the machine are now in their normal position, and the operation continues as above described.

My improvement is also adapted for making pinion and balance shafts, in which case the threading mechanism would be dispensed with, the wire being fed forward and revolved, as hereinbefore described, and the turning and cutting tools performing their usual functions; also, by substituting any suitable drill in place of the threading device, I am enabled to make hollow shafts or collars and the like.

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

1. In a machine for making metal screws, the bed-plate supporting the standards, in which rests the mandrel, in combination with means for reciprocating said bed-plate longitudinally, and mechanism for gripping the wire, whereby the latter is fed, substantially as described.

2. The mandrel having arranged thereon the loose and fast pulleys, as described, and supported within the standards projecting from the bed-plate, in combination with mechanism for actuating the said bed-plate, the quill and clamping devices, and means for actuating the same, and the devices for turning down, threading, and cutting off the screw, substantially as set forth.

3. In a screw-making machine, the combination of a longitudinally-reciprocating bed-plate having suitable bearings, a rotary hollow mandrel supported in said bearings, and thus adapted to reciprocate with said bed-plate, a wire-conducting quill adapted to reciprocate in said mandrel and independently thereof, and mechanism for reciprocating said bed-plate and quill independently of each other, substantially as described.

4. In a screw-making machine, the combination of a longitudinally-reciprocating bed-plate having suitable bearings, a rotary hollow mandrel supported in said bearings, and thus adapted to reciprocate with said bed-plate, a wire-conducting quill adapted to reciprocate within said mandrel independently thereof, and mechanism for reciprocating said bed-plate and quill independently of each other, and wire-clamping jaws and connecting mechanism for operating said wire, substantially as described.

5. In a screw-making machine, the combination of a longitudinally-reciprocating bed-plate having suitable bearings, a rotary hollow mandrel supported within said bearings, and thus adapted to reciprocate with said bed-plate, a wire-conducting quill adapted to reciprocate within said mandrel independently thereof, and mechanism for reciprocating said bed-plate and quill independently of each other, and wire-clamping jaws and connecting mechanism for operating said wire-clamping jaws stationary with table B″, for holding the wire when the reciprocating bed-plate retreats, and means for operating said jaws, substantially as specified.

6. In a screw-making machine, the combination of a longitudinally-reciprocating bed-plate having suitable bearings, a rotary hollow mandrel supported within said bearings, and thus adapted to reciprocate with said bed-plate, a wire-conducting quill adapted to reciprocate within said mandrel independently thereof, and mechanism for reciprocating said bed-plate and quill independently of each other, and wire-clamping jaws and connecting mechanism for operating said wire-clamping jaws stationary with table B″, for holding the wire when the reciprocating bed-plate retreats, and means for operating said jaws, screw-turning-down, screw-cutting-off devices, and operating mechanism, substantially as described.

7. In a machine for making metal screws, the combination of the longitudinally-reciprocating bed-plate having attached thereto means for supporting the mandrel, and the quill adapted to operate the gripping devices, with the revolving turning-down, threading, and cutting-off mechanisms, substantially as set forth and described.

8. The carriers supporting the turning-down

and cutting-off tools, and having roll attached thereto, in combination with the inclined track mounted on a reciprocating block, and springs J''' I''', substantially as set forth.

9. The shaft O''', carrying cams X', L'', L''', U, N', H', and D''', which operate the levers W' K'' K''' S K' E' and rod A''', in combination with the threading and belt and lifting mechanisms, adjustable abutment N''', attached to the bed-plate, the quill, and means for operating the same, bed-plate, means for holding the wire during the backward movement of the bed-plate, and means for reciprocating the carriers, substantially as set forth.

10. The combination of the cam X', levers W' and Y', spring Z', rod R', mounted in bearings S', and the threading devices, substantially as described.

11. The threading devices mounted on the inner end of a rod adapted to be reciprocated longitudinally, in combination with means constructed and arranged to operate against the outer extremity of said rod, means for returning the latter to its normal position, whereby said reciprocation is effected, the bed-plate, quill, mandrel, gripping devices, and means for reciprocating said bed-plate and quill longitudinally and independent of each other, substantially as set forth.

12. The rod R', mounted in bearings S', and having lug *g*, and with its forward extremity split and inclined, as set forth, in combination with the dies U', sleeve T', ledge *h*, and means for actuating said rod, substantially as described.

13. The combination of the cam L'', lever K'', adjusting-screw M'', arm J'', cross-bar I'', arms H'', shifters G'', belts E'' F'', pulleys W Y X, and mandrel A, substantially as set forth.

14. The combination of the cam L''', lever K''', and bed-plate and means for actuating the latter, substantially as described.

15. The combination of the cam U, lever S, lug P, fork O, with rolls R, quill D, having head E, arm K, cross-bar F, connecting-rods L, set-screws J, and jaws I, substantially as herein shown.

16. The combination of the cam N', lever K', bed-plate provided with post J', having adjustable pin P', mandrel A, chuck H, having therein jaws I, quill D, cross-bar F, connecting-rods L, set-screws J, having crank-arms K, and means for operating the quill, substantially as specified.

17. The combination of the cam H', lever E', having adjusting-screw G', rod D', cross-bar C', and jaws A', substantially as described.

18. The combination, with means for feeding the wire and means for reversing the movement of the bed-plate, of the jaws A', pivoted to the post Z, and having slots B' in their lower portions, the cross-bar C', provided with pins *a'*, and mechanism for operating said cross-bar, substantially as set forth.

19. The combination of the cam D''', rod A''', block E''', arranged to reciprocate on bearing F''', and provided with adjustable inclined track G''', spring J''', carriers P'' Q'', friction-roll Z'', tools U'' V'', and spring I''', substantially as set forth.

In testimony whereof I affix my signature in presence of two witnesses.

JAKOB STEHLI.

Witnesses:
JACOB MEYERS,
JOHN R. FARNUM.