(No Model.) 3 Sheets—Sheet 1.

B. F. WHEELER.

SCREW MAKING MACHINE.

No. 499,070. Patented June 6, 1893.

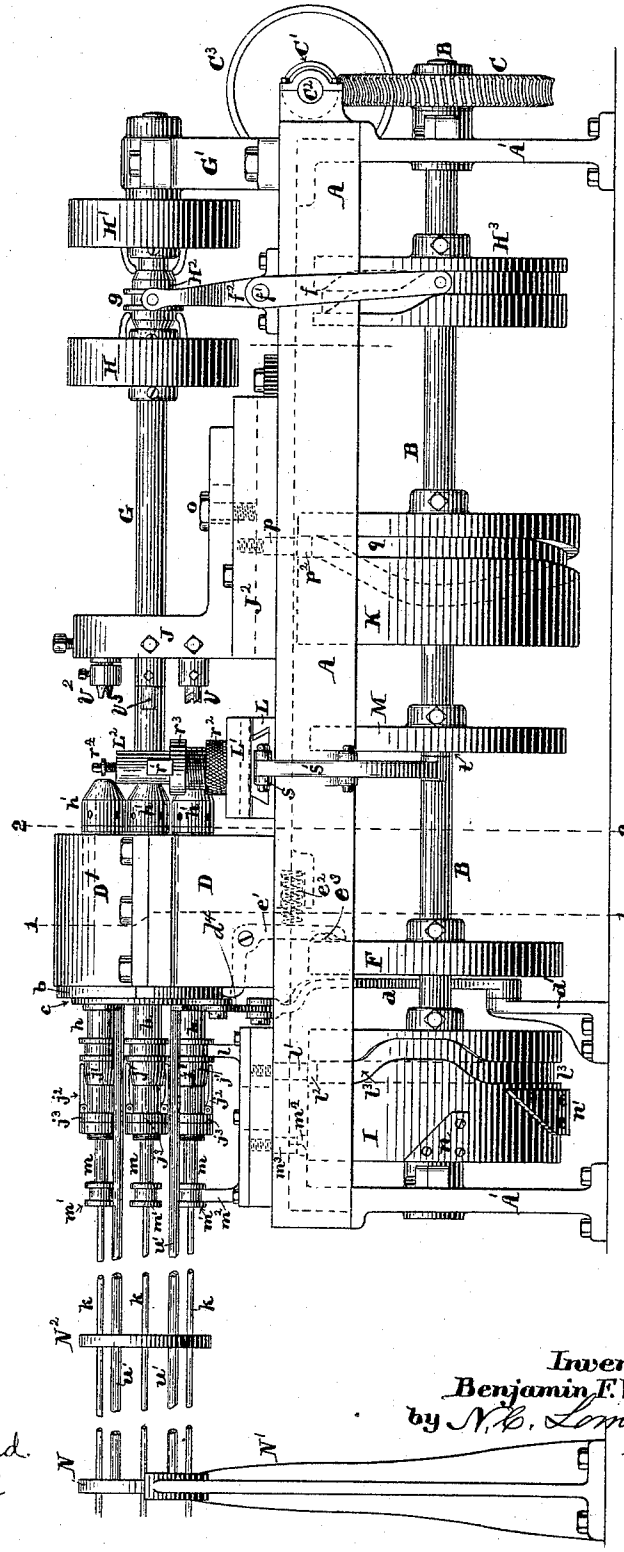

Fig. 1.

Witnesses:
Walter E. Lombard.
Geo. E. Mitchell

Inventor:
Benjamin F. Wheeler,
by N. E. Lombard
Attorney.

(No Model.)

3 Sheets—Sheet 2.

B. F. WHEELER.

SCREW MAKING MACHINE.

No. 499,070. Patented June 6, 1893.

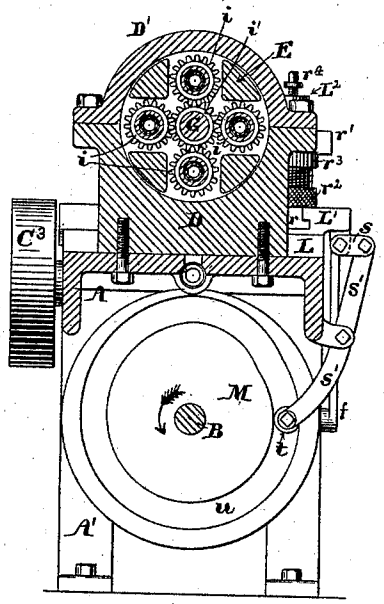

Fig. 4.

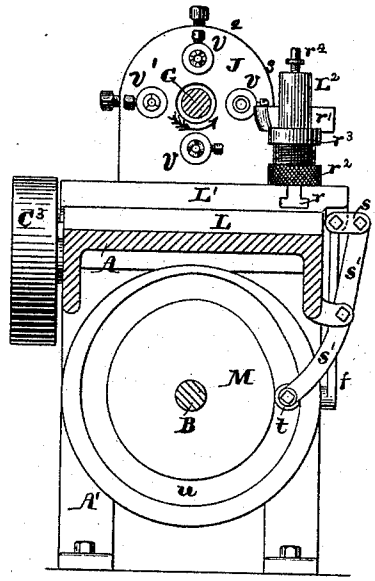

Fig. 5.

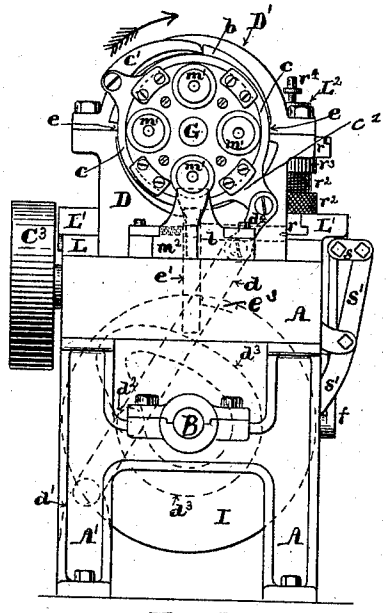

Fig. 3.

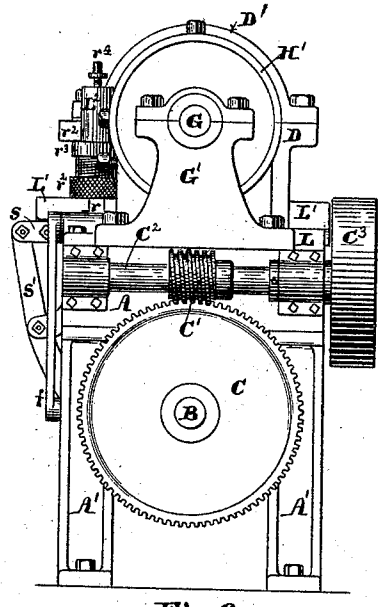

Fig. 2.

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(No Model.) 3 Sheets—Sheet 3.

B. F. WHEELER.

SCREW MAKING MACHINE.

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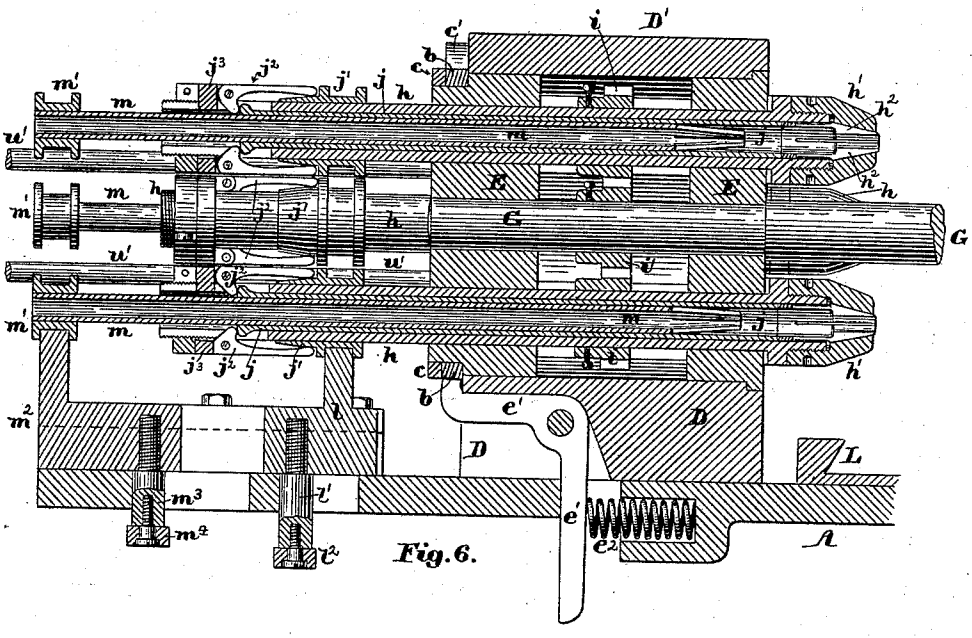

Fig. 6.

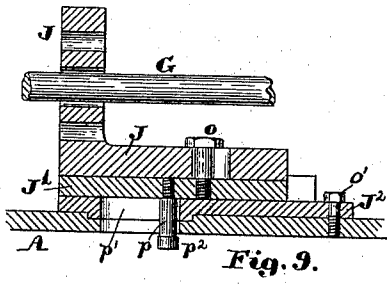

Fig. 9.

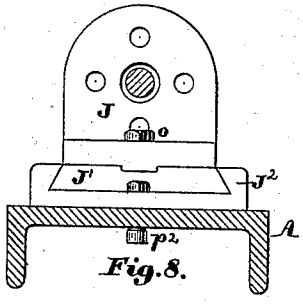

Fig. 8.

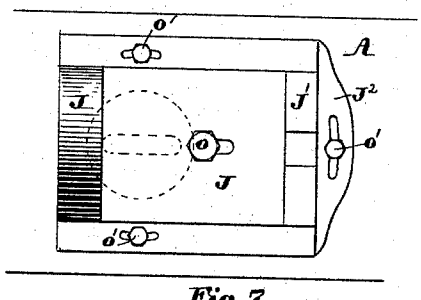

Fig. 7.

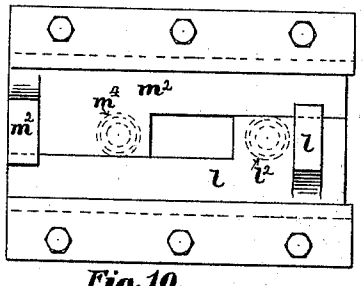

Fig. 10.

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UNITED STATES PATENT OFFICE.

BENJAMIN F. WHEELER, OF BOSTON, MASSACHUSETTS, ASSIGNOR TO JAMES BARRETT, TRUSTEE, OF SAME PLACE.

SCREW-MAKING MACHINE.

SPECIFICATION forming part of Letters Patent No. 499,070, dated June 6, 1893.

Application filed April 1, 1892. Serial No. 427,376. (No model.)

To all whom it may concern:

Be it known that I, BENJAMIN F. WHEELER, of Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Screw-Making Machines, of which the following, taken in connection with the accompanying drawings, is a specification.

My invention relates to screw making machines and it consists in certain novel features of construction, arrangement and combination of parts which will be readily understood by reference to the description of the accompanying drawings and to the claims hereinafter given and in which my invention is clearly pointed out.

Figure 1 of the drawings is a front elevation of a machine embodying my invention. Fig. 2 is an elevation of the same looking at the right hand end of Fig. 1. Fig. 3 is an elevation of the opposite end. Fig. 4 is a vertical transverse section on line 1, 1, on Fig. 1 and looking toward the right of said figure. Fig. 5 is a similar section on line 2, 2, on Fig. 1 looking in the same direction. Fig. 6 is a vertical longitudinal section through the axes of two of the work carrying spindles and their carrying cylinder. Figs. 7, 8, and 9 are respectively a plan, an end elevation and a longitudinal section of the tool holding carriage. Fig. 10 is a plan of the shipper slides for operating the rod clamping and feeding mechanisms.

In the drawings A is the bed of the machine supported upon the legs A' A' which may be stepped in a shallow pan for catching the surplus oil in the usual manner, which pan may be supported upon suitable legs or a bench at the desired height in a well known manner.

B is a cam shaft mounted in bearings on the legs A' and having secured upon its right hand end the worm wheel C with which the worm C' on the shaft C^2 engages to impart to said cam shaft a rotary motion, said shaft C^2 having secured upon its rear end the pulley C^3 by which and a suitable belt, not shown, rotary motion is imparted to said shaft C^2.

D is a housing bolted to the bed A and having a removable cap D' secured thereto, within which is mounted, so as to be revoluble therein, the spindle carrying cylinder E having secured thereon at its left hand end the ratchet wheel *b*, and has loosely mounted upon a hub projecting therefrom the ring *c* to which is pivoted the pawl *c'* in position to engage with the teeth of said ratchet wheel *b* as shown in Fig. 3. A lever *d* is fulcrumed on the stand *d'* and has mounted on a stud set therein a truck d^2 which fits into and is acted upon by the cam path d^3 formed in the side of the cam disk F mounted upon the shaft B, said path and truck being shown only in dotted lines in Fig. 3, the movable end of said lever *d* being connected by the link d^4 to the arm c^2 projecting from the ring *c* as shown in said Fig. 3.

The ratchet wheel *b* has formed therein in close proximity to the shoulder of each tooth a detent notch *c* see Fig. 3, with which the movable end of the horizontal arm of the elbow lever *e'* engages to lock the cylinder E after each intermittent movement of said cylinder about its axis, said locking lever being pressed into engagement with said detent notch by the spring e^2 shown in Fig. 6; and is disengaged therefrom by the cam projecting e^3 on the right hand side of the cam disk F as shown in dotted lines in Figs. 1 and 3.

G is a shaft mounted in bearings in the cylinder E and the stand G' and having loosely mounted thereon the pulleys H and H' constructed and arranged to be revolved in opposite directions by means of an open belt leading from an overhead counter-shaft to one of said pulleys and a crossed belt leading from said counter-shaft to the other of said pulleys. Each of the pulleys H and H' is provided with a friction clutch constructed and arranged in any well known manner to be thrown into or out of action by an endwise movement of the tapered ended sleeve H^2 mounted upon said shaft G between said pulleys so as to be movable endwise thereon and revoluble therewith, said endwise movement of the sleeve H^2 being produced by the action of the cam H^3 upon the lever *f* mounted upon the rocker shaft *f'* which has secured thereon the forked stripper lever f^2 the forked end of which engages with the annular groove *g* in said sleeve all as shown in Fig. 1.

The cylinder E has mounted in suitable bearings formed therein a plurality of hollow

spindles h, four being shown in the drawings, but a greater or less number may be used if desired for any special class of work, said hollow spindles or sleeves h being so fitted to said cylinder that they are free to be revolved therein but cannot be moved endwise therein, and each spindle has firmly secured thereon a spur gear wheel i the teeth of which are engaged by the teeth of a similar gear wheel i' secured upon the shaft G as a means of imparting a rotary motion to all of said spindles at the same time and at a uniform speed, all as shown in Figs. 4 and 6.

Each sleeve or spindle h has secured to its inner end the frusto-conical nose piece h' the bore of which is also made conical to receive the split collet h^2 constructed and arranged to be moved toward the smaller end of said nose piece by the sleeve j and thus grip the metal rod k from which the screws are to be cut, said sleeve j being moved toward the right of Figs. 1 and 6, to contract said collet by the action of the frusto conical hub j' upon the elbow levers j^2 j^2 pivoted upon tbe collar j^3 carried by the sleeve or spindle h. The hub j' is mounted upon the sleeve h and is moved endwise thereon at the proper time by the shipper stand l having set in its under side the stud l' carrying at its lower end the truck l^2 which fits into and is acted upon by the cam path l^3 in the periphery of the cam cylinder I firmly secured upon the shaft B as shown. Within the sleeve j is fitted so as to be movable endwise therein the sleeve m the inner end of which is split, slightly compressed and then tempered, said sleeve being made of fine spring steel, so as to grip the rod k at its inner end, and has firmly secured upon its outer end the circumferentially grooved collar m' which when in its lowermost position engages with the upper end of the arm of the shipper slide m^2 having set in its under side the stud m^3 carrying at its lower end a truck m^4 with which the cam lugs n and n' secured upon the periphery of the cam cylinder I alternately engage to impart to said sleeve an intermittent reciprocation for the purpose of feeding the rod of metal through the spindle the distance required for forming a new screw after one has been cut therefrom.

The construction and make up of the several spindles and the devices for gripping the wire or rod from which the screws are to be formed is old and not of my invention.

J is a tool carrying head mounted upon the intermediate plate J', so as to be adjustable thereon in the direction of the length of the shaft G, and to be firmly clamped thereto by the bolt o, said head having secured therein as many tools as there are spindles carried by the cylinder E. The plate J' is fitted to a dovetailed guideway in the base-plate J^2, so as to be freely movable endwise therein, and said base-plate J^2 is pivoted to the bed A, and is adjustably secured thereto by the bolts o' o' o', which pass through curved slots in said plate and are screwed into the bed A as shown in Figs. 1, 7, 8, and 9. The plate J' has set in its under side the stud p which projects through the slot p' cut through the plate J and carries at its lower end the truck p^2 which is acted upon by a suitable cam K, which may be provided with the path q as shown, or have cam lugs or projections detachably secured thereon in the same manner as the lugs are secured on the cam cylinder I.

L is a plate or bar secured upon the bed A just to the right of the housing D and having formed in its upper side a dovetailed groove or guideway extending transversely of said bed and having fitted therein so as to be movable therein, transversely of said bed, the plate or bar L', which has formed in its upper side a T-shaped groove r extending transversely thereof, in which is adjustably mounted the tool post L^2 provided with a slot to receive the cutting off tool r', which is secured in position therein by means of the collar r^2, the threaded sleeve r^3 and the set-screw r^4, all in a well known manner. The bar L' is connected by the link s to the upper end of the two armed lever s' which is fulcrumed on the bed A and carries, at the free end of its lever arm a truck t which fits into, and is acted upon by, the path u in the side of the cam disk M to move said cutting off tool toward and from the center of shaft G for cutting off the screw after it has been turned and threaded.

As it is designed to form screws from rods some eight or ten feet long and as four or more rods are in the machine and being acted upon at the same time, and as they are intermittently rotated about the axis of the cylinder E and also about their own axes it is necessary that the outer ends of said rods should be supported so as to keep them parallel with each other. To this end I screw into the outer end of the cylinder E between the spindles h a plurality of rods u' corresponding in number to the number of spindles in said cylinder, the outer ends of which rods are secured in a disk N provided with a plurality of holes in line with said spindles and of a size to allow the free passage of the rod k and form a bearing therefor. The periphery of said disk N is fitted to a bearing in the stand N' the upper end of which surrounds and incloses about one half the circumference of said disk.

N^2 is a second disk fitted upon the rods u' about midway between the disk N and the cylinder E and provided with holes for the passage of the rods k the same as described for the disk N, said disk N^2 serving to support the ends of the rods k after they have been withdrawn from the disk N.

The tool carrying head J has set therein, at v, a tool for rough turning the shank of a screw on the end of the rod presented thereto, at v', a tool for finishing the turning of said shank to the desired size, at v^2, a thread forming die, and at v^3 a tube to inclose said threaded screw, and receive it when severed from the rod by the cutting off tool r.

The shaft B revolves when in operation in the direction indicated by the arrow on Fig. 4, and the shaft G revolves in the direction indicated by the arrow on Fig. 5 when the pulley H is in engagement with the clutch as shown in Fig. 1, and in the opposite direction when the pulley H′ is in engagement with the clutch.

The operation of my invention is as follows: The rods *k k* having been inserted through the holes in the disks N and N² and into and through the sleeves *m m* and the collets *h*² so as to be firmly clamped at their inner ends by the said collets, and the several parts of the machine being in the positions shown in the drawings, if power is applied to the pulleys C³ and H to cause the shafts B and G to be revolved at the proper relative speeds, the cam projection *e*³ disengages the locking lever *e′* from engagement with the detent notch *e*, when the cam path *d*³ acting upon the truck *d*² vibrates the lever *d* and causes a movement of the ring *c*, pawl *c′*, ratchet wheel *b*, and cylinder E about the axis of the shaft G in the direction indicated by the arrow on Fig. 3 a distance equal to the angular distance between two of the rod carrying spindles. When this motion is completed the lever *e′* is immediately pressed into a detent notch *e* to lock said cylinder against further movement about its axis until the shaft B has completed its revolution. This rotation of the cylinder E causes the spindle on the front side of said cylinder or in the same horizontal plane as and in front of the shaft G to be moved, with the rod carried thereby, in a position directly below the shaft G and in axial line with the tool for rough turning the shank of the screw to be formed therefrom. When this is done the cam path *l*³ in the cam cylinder I, acting upon the shipper *l*, through the stud *l′* and truck *l*², moves the conical hub *j′*, with which said shipper is for the time being engaged, toward the cylinder E to release the pressure of the levers *j*² *j*² upon the outer end of the sleeve or tube *j*, and thus relieve the pressure of the collet *h*² upon the rod *k*, when the cam block *n* comes in contact with the truck *m*⁴ on the stud *m*³ and through it moves the shipper *m*² toward the cylinder E thereby moving the sleeve *m* and the rod *k* contained therein and gripped thereby, in the same direction a distance equal to the length of the screw to be made. When the feeding of the rod is completed the path *l*³ acting through the shipper *l* moves the conical hub *j′* toward the left of Fig. 1, thereby moving the sleeve *j* and collet *h*² toward the right and causing said collet to firmly grip said rod *k* and hold it against the pressure of the tools in the tool head, when it is fed toward said rods to cause said tools to perform the different operations thereon. The path *q* in the cam cylinder K now begins to act upon the tool head J through the medium of the truck *p*², the stud *p* and the plate J′ to move said head toward the cylinder, the tool *v*, during such movement acting upon the lowermost rod *k* to rough turn the shank of a screw thereon, to tool *v′*, acting upon a rod *k* at the rear of the shaft G to finish the sizing of the shank of a screw previously rough turned the tool *v*² cutting a thread upon a rod *k* directly above said shaft G, and the tool *v*³ passing over the threaded screw on the end of the rod *k* directly in front of said shaft and at the same time the tool *r* is being fed toward said shaft G to cut a threaded screw from said last mentioned rod *k* by the action of the path *u* upon the lever *s′*.

The operations described in the last paragraph take place in the order named except that in commencing work with a series of fresh rods supplied to the series of spindles no tool carried by the tool head except the roughing tool would perform any work at the first movement of the tool head toward the cylinder E because only the lower rod *k* would be projecting beyond the end of the spindle nose *h′* any farther than just sufficient to allow the tool *r* to cut the ends of the front rod to the desired smooth slightly rounded shape. At the second movement of the tool head toward said cylinder the rod that has previously had a screw shank roughly turned thereon is at the rear of the shaft G, another rod has been moved from in front of said shaft to a position beneath it, bringing the groove on the conical hub *j′*, surrounding the spindle in which said rod is supported, into engagement with the shipper arm *l*, and the groove of the collar *m′* into engagement with the shipper arm *m*² and said rod has been moved toward the tool head a distance equal to the length of the screw to be made, and the tools *v* and *v′* act at the same time upon said two rods to rough turn the shank of a screw upon one and finish the turning to size a screw shank upon the other rod. At the third forward movement of the tool head a screw shank is rough turned on one rod, a second screw shank turned to size on another rod, a third screw shank is threaded on another rod, and the fourth rod has its end cut off, and at the fourth and each subsequent forward movement of said tool head a completed screw is cut from the rod in front of the shaft G and deposited in the tube *v*³. A shank is rough turned on another rod, a shank is turned to size on a third rod and a screw is threaded on a fourth rod, until the rods are all worked into screws. When the tool head has arrived at the extreme of its forward movement the path of the cam H³ acting upon the lever *f* moves the clutch sleeve H² toward the right of Fig. 1 thus releasing the pulley H from the clutch and causing the pulley H′ to engage the clutch and reverse the motion of the spindles at the same time that the cam path *q* acts to move the tool head toward the right of Fig. 1 or away from the spindles to dis-engage the tools from the rods, so that said rods with the spindles and the cylinder carrying the same may be moved about the axis of said cylinder to

change the positions of the rods *k* relative to the screw forming tools after the completion of each screw.

It will be seen that by the use of my invention a great advantage will be obtained over the screw making machines now in use in that a screw is completed at every forward movement of the tool head while with the machines now in use the several tools which perform the various operations of rough turning finish turning, threading and cutting off have to act in succession upon the same screw and as a consequence a very much longer time is required to finish a screw than is required with my machine.

In the case of using the same machine for making screws of different lengths, the cam lugs or plates *n* and *n'*, on the cam cylinder I, have to be removed and others of different lengths of throws substituted therefor, and a similar change must be effected in regard to the cam K, when it is desired to change the length of screw to be made, in order that the desired length of rod may be fed out of the spindle, and that the tool head shall have imparted to it the requisite length of reciprocation to form the desired length of screw shank upon the inner end of said rod.

It will be observed that the provision of the adjustable bed j^2, having guides between which the tool-head *j* reciprocates, and adapted to be adjusted so as to either make said guides parallel with or at an angle to the axis of the cylinder *d'*, and the provision of means for positively securing the bed j^2 at any position to which it may be adjusted, enable the tool-head j^2 to travel, when desired, in a path at an angle to the axes of the cylinder and spindles, so that, by providing the tool-head with suitable tools for taper turning, they may be caused to produce tapering pins or other articles of tapering form. It should be borne in mind, however, that the hollow mills or box tools shown in the drawings will not be used when the tool-head is reciprocated in a path at an angle to the axes of the spindles.

I claim—

1. In a screw-making machine, the combination of a rotatable cylinder carrying a plurality of hollow spindles each adapted to grasp a rod or blank, mechanism for rotating said cylinder step by step, mechanism for locking the cylinder after each step or partial rotation, rod-feeding devices longitudinally movable relatively to said spindles, a shipper-slide such as m^2 movable on a fixed guide and arranged to engage each of the feeding devices at a given point, each feeding device and the accompanying spindle being presented in succession to the shipper-slide, mechanism for reciprocating said slide to cause it to alternately project and retract the feeding device engaged therewith, a non-rotating tool-head carrying a series of operating tools and movable toward and from the cylinder, mechanism for reciprocating said tool-head to alternately project and retract its operating tools, a cutting-off tool movable in a fixed path or guide at right angles to the axes of the cylinder and arranged to act on each rod in succession, and mechanism for reciprocating said cutting-off tool, as set forth.

2. In a screw-making machine, the combination of a rotatable cylinder carrying a plurality of hollow spindles each adapted to grasp a rod or blank and each provided with a rod-feeding device, mechanism for rotating said cylinder step by step, devices for locking the cylinder after each step, mechanism for operating the feeding devices successively while the cylinder is locked, a non-rotating tool-head movable toward and from the cylinder, a guide for said tool-head adapted to be so adjusted as to direct the tool-head in a path at an angle to the axis of the cylinder and thus cause one or more of the operating tools to make a taper cut, and mechanism for reciprocating said tool-head, as set forth.

3. In a screw-making machine, the combination of an intermittently rotating cylinder, a plurality of hollow spindles mounted in bearings in said cylinder at equal distances from each other and from the axis of said cylinder and each provided with clamping mechanism for holding a metal rod and feeding it endwise therein, a tool-head, a bed pivotally connected with the supporting-frame of the machine and provided with guides for said tool-head, said bed being adapted to be adjusted to give said guides any desired angle with relation to the axis of the cylinder, means for positively securing the bed in any position to which it may be adjusted, mechanism for reciprocating the tool-head on said bed, a plurality of operating tools set in or carried by said tool-head, means having provision for intermittently moving said spindle-carrying cylinder around its axis, means having provision for locking said cylinder in position, and mechanism for rotating all of said spindles in unison, as set forth.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, on this 30th day of March, A. D. 1892.

BENJAMIN F. WHEELER.

Witnesses:

N. C. LOMBARD,

IRENE FRECHETTE.