(No Model.) 2 Sheets—Sheet 1.

G. E. WITHERELL.

MACHINE FOR MAKING SCREWS OR THE LIKE.

No. 563,994. Patented July 14, 1896.

Fig. 1.

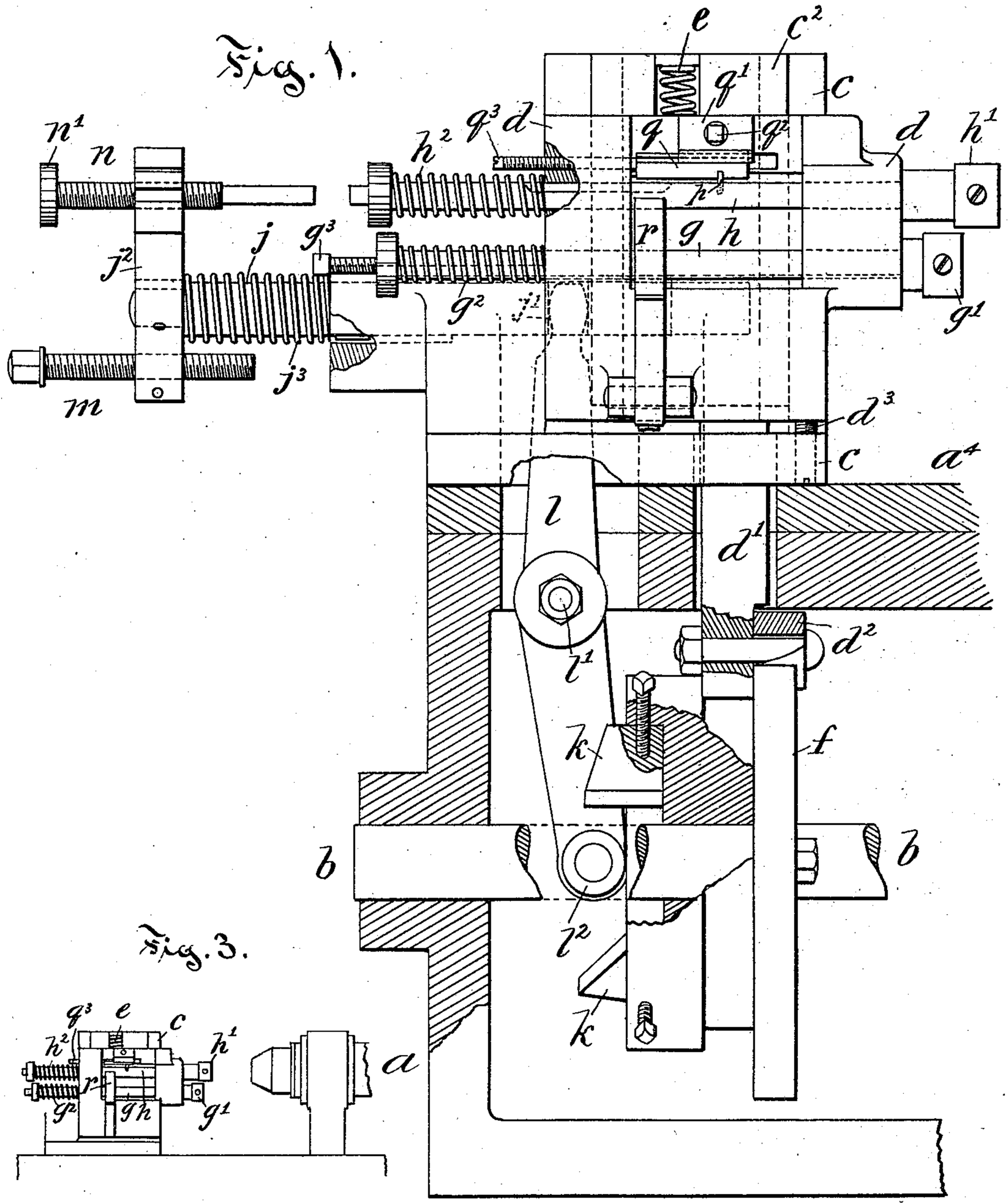

Fig. 3.

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(No Model.) 2 Sheets—Sheet 2.

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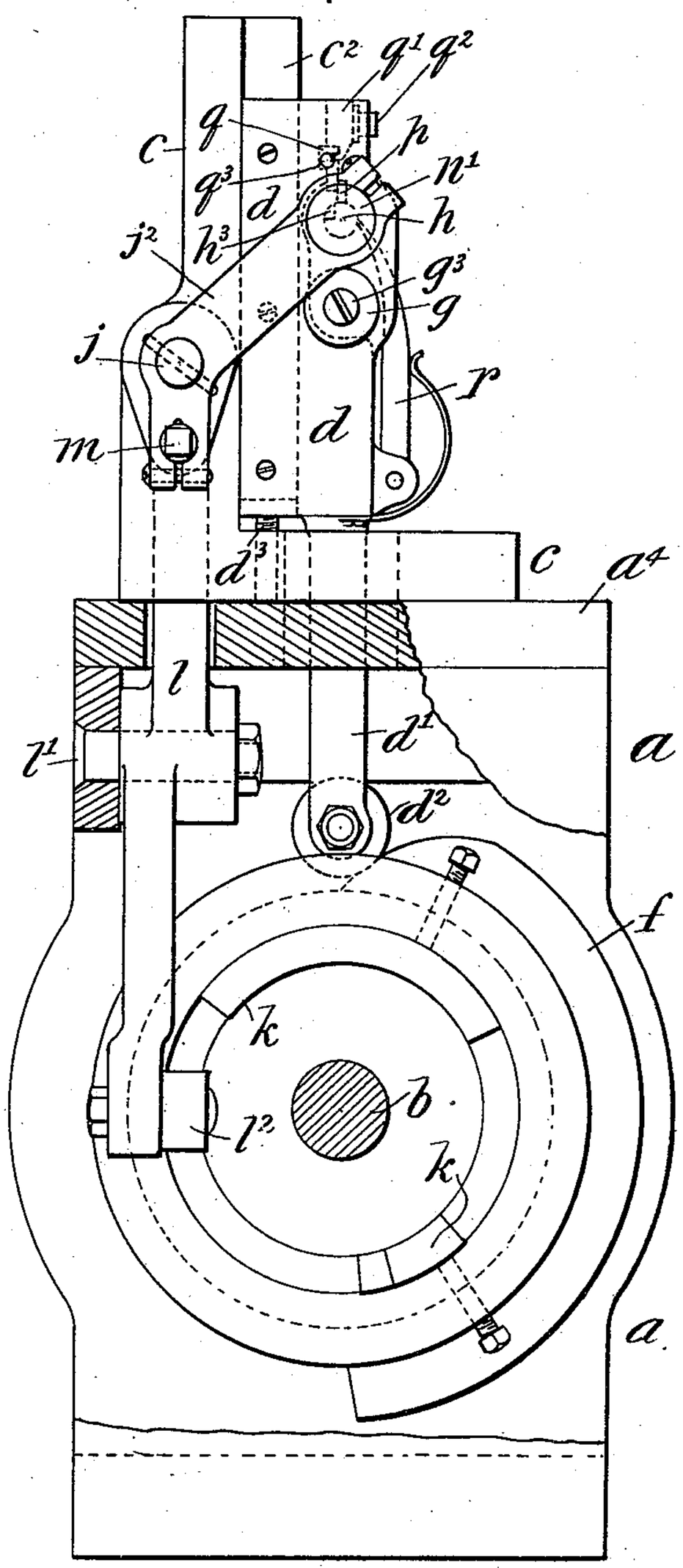
Fig. 2.



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UNITED STATES PATENT OFFICE.

GEORGE E. WITHERELL, OF HARTFORD, CONNECTICUT, ASSIGNOR TO THE HARTFORD MACHINE SCREW COMPANY, OF SAME PLACE.

MACHINE FOR MAKING SCREWS OR THE LIKE.

SPECIFICATION forming part of Letters Patent No. 563,994, dated July 14, 1896.

Application filed March 27, 1894. Serial No. 505,356. (No model.)

To all whom it may concern:

Be it known that I, GEORGE E. WITHERELL, a citizen of the United States, residing at Hartford, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in Machines for Making Screws or the Like, of which the following is a full, clear, and exact description, whereby any one skilled in the art can make and use the same.

My invention relates to the class of machines used for the production of screws, screw-nuts, and other small articles, and particularly to machines of this class in which the work is rotated about its axis and the various tools are by suitable mechanism fed to and moved away from the work.

The object of my invention is to provide a machine of this class in which a number of tool-holders provided with suitable tools for performing the work required may be arranged to be moved across the line of the axis of the work to bring them successively into alinement with such axis and when in this position to be fed up to the work to perform the operation required and then moved away, the mechanism for causing these actions of the tool-holders being automatic in its operation and so timed each with the other that each step shall be performed at the required time.

To this end my invention consists in the details of the several parts making up the device as a whole and in the combination of such parts, as more particularly hereinafter described, and pointed out in the claims.

Referring to the drawings, Figure 1 is a view in side elevation, partly in vertical longitudinal section, and showing so much of a machine as relates directly to my invention. Fig. 2 is an end view in elevation, partly in section, of that portion of the machine shown in Fig. 1. Fig. 3 is a diagram view showing the relative location of the driving-spindle and tool-holders.

In the accompanying drawings the tool-holders are shown mounted in a vertically-movable slide, which is raised and lowered by means of suitable mechanism to bring the tool-holders successively into operative position, a longitudinally-movable rod or bar being provided for feeding the tools to the work, this mechanism being mounted upon one end of a table or bed; and only so much of the machine as is necessary to a proper understanding of my invention is herein shown, it being understood that the work is to be rotated in both directions by suitable well-known mechanism, said work-holding device and rotating mechanism being included in that part of the machine not shown in the drawings.

In said drawings the letter *a* denotes a portion of the frame of the machine, in which is supported in suitable bearings the main shaft *b*, on which the various operating-cams are fixed.

The letter *c* denotes a bracket or head rigidly secured upon the table a^4 and provided with a suitable guide c^2, on which a slide *d* is arranged to be moved across the line of the axis of the work. The slide *d* is held down by a spring *e* and is provided with an arm *d'*, which extends downwardly through an aperture in the table a^4 and is furnished with an antifriction-roller d^2. This roller bears against the peripheral surface of a cam *f*, fixed on the shaft *b*.

The letters *g* and *h* denote two rods or spindles mounted parallel to each other in the slide *d*, so that they may be freely moved longitudinally therein. These spindles are provided with sockets *g' h'*, respectively, to receive drills, taps, or other tools. When, for example, as in the manufacture of screw-nuts or the like, a longitudinal hole is to be drilled and tapped in the work, the drill is secured in the tool-holder *g'* and the tap in a tool-holder *h'*. The said spindles *g* and *h* are provided with springs g^2 and h^2, whereby they are held in the position shown relatively to the slide *d*. An adjusting-screw d^3 is fitted in the head *c*, whereby the position of the slide, when lowered, may be so determined that the spindle *h* will be in line with the axis of the work. For feeding the tools successively to the work I provide a rod or bar *j*, fitted to slide longitudinally in the head *c* and arranged to be operated by a cam *k* on the shaft *b* through the medium of a lever *l*, pivoted at *l'* and provided with an antifriction-roller l^2, bearing against the said cam;

The other end of the said lever works in a slot j' in the bar j. Any convenient device, such, for instance, as a feather working in a slot, may be employed to prevent rotation of the said bar about its axis while permitting longitudinal movement thereof. This bar is provided with an arm j^2, in which is secured an adjusting-screw m for limiting the travel of the bar j, and an adjustable pin n, provided with a milled head n', and which, when the slide d is in its lowermost position, is in line with the spindle h. The bar j is also provided with a spring j^3 for effecting its return movement.

The adjusting-screw m is provided for the purpose of affording a finer adjustment for determining the extent of inward movement of the spindles g and h than can be had from the use of a cam or cams operating on a lever, for the reason that the cams will vary to a greater or less extent and the lever will have more or less spring action. In use the adjusting-screw is set so as to allow the cams to pass the end of the lever with considerable pressure.

The drilling-spindle g is restrained from rotation by means of a pin working in a longitudinal groove in the head c or by other suitable means. This spindle is provided with an adjusting-screw g^3 for determining the depth of the hole to be drilled by regulating the distance through which the pin or rod n must be moved before it encounters the end of the spindle g. To limit the forward movement of the tapping-spindle h, the following device is provided: A projecting pin p, fixed in the said spindle, engages with an adjustable stop q and prevents rotation of the spindle h about its axis while the tap is entering the hole previously drilled in the work. The stop q is held in place by a clamp q', secured to the slide d by a screw q^2, and its adjustment on the clamp is effected by means of a screw q^3. The said stop is so adjusted that when the tap has entered the hole to the required depth the pin p will have passed the end of the said stop, and the spindle h can then freely rotate with the work. To prevent rotation of the said spindle in the reverse direction, when the direction of rotation of the work (not shown) is reversed in order to effect the withdrawal of the tap from the hole, a spring-pawl r is provided, which engages with a groove h^3 in the spindle h, thus preventing rotation of the spindle while permitting the required movement thereof.

The operation of the device is as follows: At a suitable period in the several operations performed by the machine the cam f, acting upon the arm d', moves the slide d, so as to bring the spindle g into line with the work. The cam k then actuates the lever l, so as to cause said lever to move forward the bar j. In this movement of the said bar the pin n comes in contact with the adjusting-screw g^3 and moves forward the spindle g. A hole of the required depth is thus drilled in the work, the depth of the hole being determined by the adjustment of the screws g^3 and n. The lever l is then released by the cam k, and the drill is withdrawn by the spring g^2, the spring j^3 effecting the return movement of the bar j. The cam f then permits the depression of the slide d by the spring e, so that the spindle h is brought into line with the previously-drilled hole, the parts being then in the position shown in Fig. 1, when the cam k again actuates the lever l, thus forcing the tap carried by the spindle h into the previously-drilled hole. When the hole is tapped, the pin p having moved clear of the stop q the spindle h rotates freely about its axis. After the lever l has been released by the cam k, the direction of rotation of the work (not shown) is reversed to effect the withdrawal of the tap from the hole, this withdrawal being assisted by the reaction of the spring h^2, and the rotation of the spindle h about its axis being prevented during such withdrawal by the engagement of the pawl r with the groove h^3.

A machine constructed with the improved mechanism above described can be readily adapted for making screws by simply removing the cam f or throwing it out of gear and fixing in the spindle h suitable screw-threading dies. If desired, one or more additional spindles may be mounted in the aforesaid slide and the cam for raising and lowering the same may be modified, so that three or more suitable tools may be used, to suit the exigencies of the work to be done by the machine.

It is obvious that the details of construction of my improved mechanism may be somewhat modified without departing from the nature of said invention that comprises also the provision of suitable means for adjusting the parts of the mechanism to regulate the action of the same according to the work to be performed, and that said improvements may also be applicable to other machines for the same or like purposes.

I claim as my invention—

1. In combination in a screw-machine, a frame, a cam-shaft borne on the frame, a reciprocating support mounted vertically over the cam-shaft and movable in a direction to and from the same, across the line of axis of a work-holding spindle, the work-holding spindle, tool-holding spindles mounted in the support and adapted to be brought successively into line with the axis of the work-holding spindle, a sliding bar movable toward and from the work-holding support, a pin borne on the bar and adapted to engage each of the work-holding spindles, a lever mounted in the frame and in engagement with the sliding bar, and a cam on the cam-shaft adapted to operate the lever, all substantially as described.

2. In combination in a screw-machine, a frame, a cam-shaft borne on the frame, a reciprocating support mounted vertically over

the cam-shaft and movable in a direction to and from the same across the line of axis of a work-holding spindle, the work-holding spindle, tool-holding spindles mounted in the support and adapted to be brought successively into line with the axis of the work-holding spindle, an arm secured to the bar and extending in a diagonal line toward the work-holding spindles, a pin adjustably borne in the end of the bar and adapted to engage each of the work-holding spindles, a lever, pivoted to the frame to one side of a vertical line drawn through the cam-shaft and the reciprocating slide, and a cam to operate the lever, all substantially as described.

3. In a screw-machine in combination, a live-spindle, a reciprocating support movable across the axis of the work-holding spindle, longitudinally-movable tool-holding spindles mounted parallel to each other in the movable support, means for reciprocating the support, a sliding bar adapted to engage each of the tool-holding spindles, a pivoted lever with one end in engagement with the sliding bar, means for oscillating the lever, a pin located on one of the tool-holding spindles and engaged by an adjustable stop for a portion of the path of its movement, a shouldered groove in the spindle, a spring-pawl adapted to engage the groove to prevent a reverse movement of said spindle, and an adjusting-screw located in the slide with one end projecting to the outer surface and the inner threaded end in engagement with a threaded socket in the adjustable stop, all substantially as described.

4. In a screw-machine in combination, a movable support, longitudinally-moving tool-holders mounted in the support, means for reciprocating the support across the line of axis of the live work-holding spindle, the work-holding spindle, a sliding bar, a lever in engagement with the bar, means for oscillating the lever, an arm secured to the bar and having in one end a pin adapted to engage each of the tool-holding spindles, and in the opposite end an adjusting-screw adapted to engage a fixed support, and the fixed support, all substantially as described.

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