(No Model.) 3 Sheets—Sheet 1.

A. JOHNSTON.

METAL SCREW MACHINE.

No. 267,215. Patented Nov. 7, 1882.

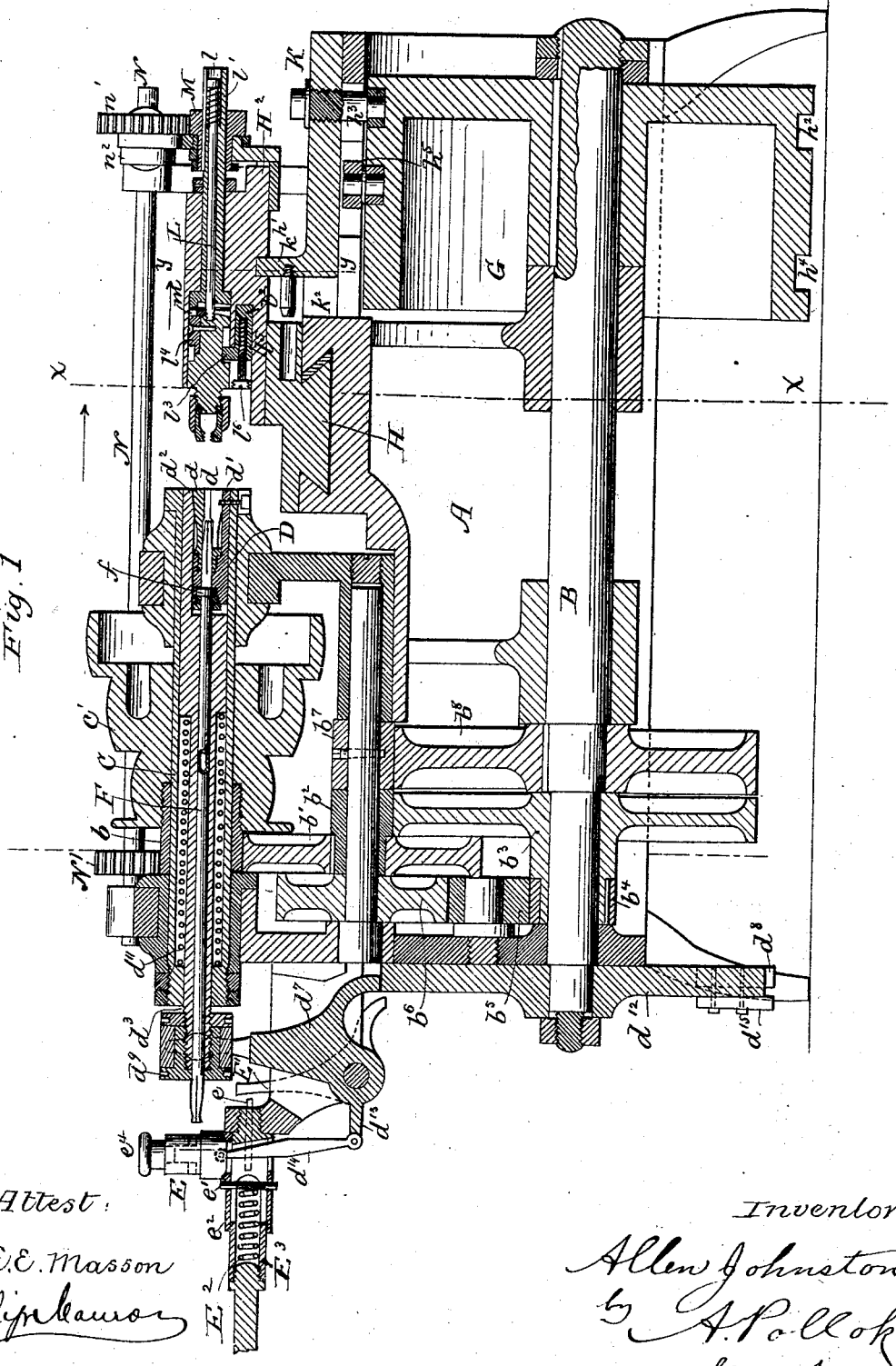

Fig. 1

Attest:

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his Atty

(No Model.) 3 Sheets—Sheet 2.

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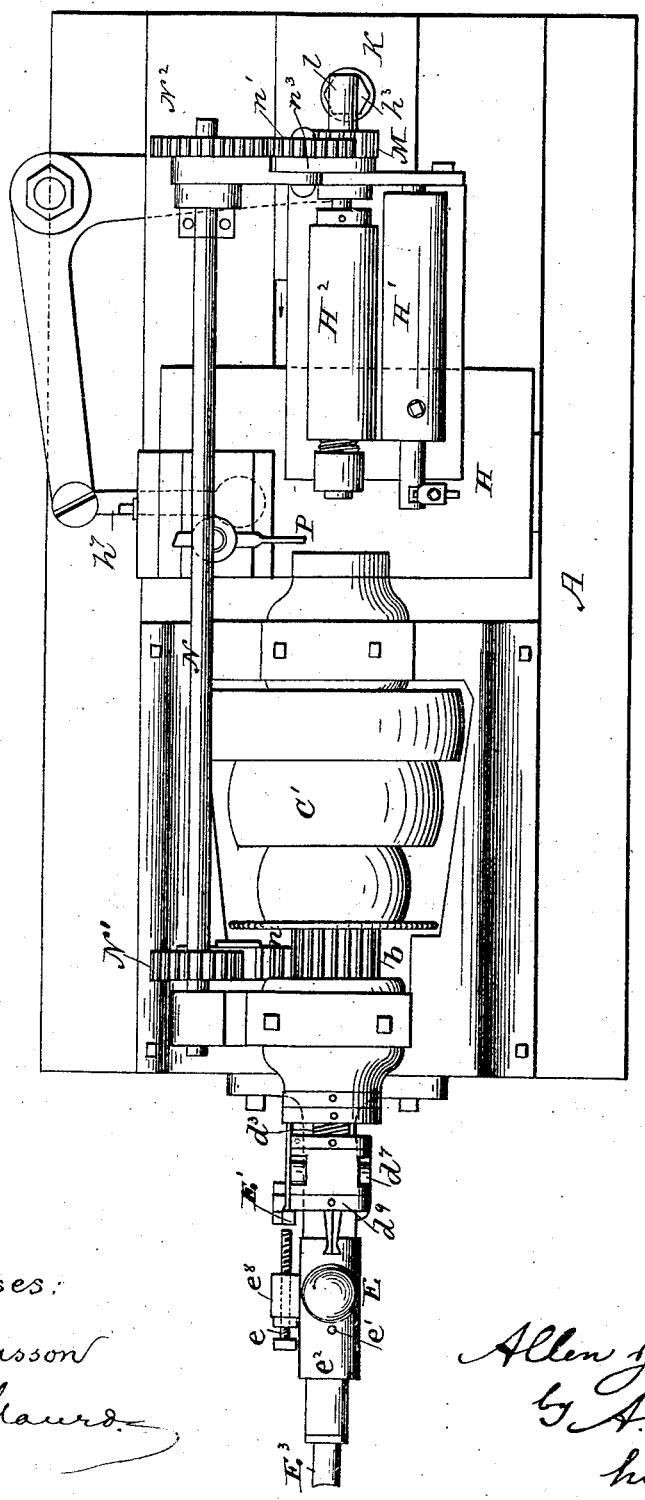
Fig. 2



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METAL SCREW MACHINE.

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Fig. 4

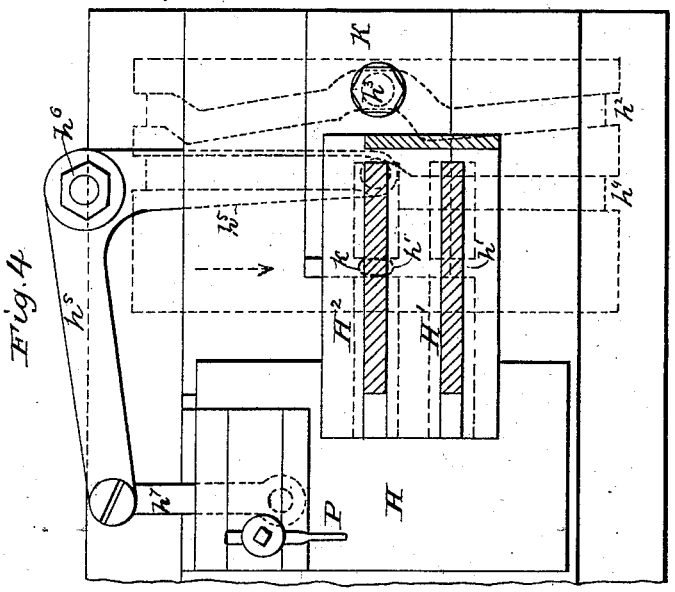


Fig. 6

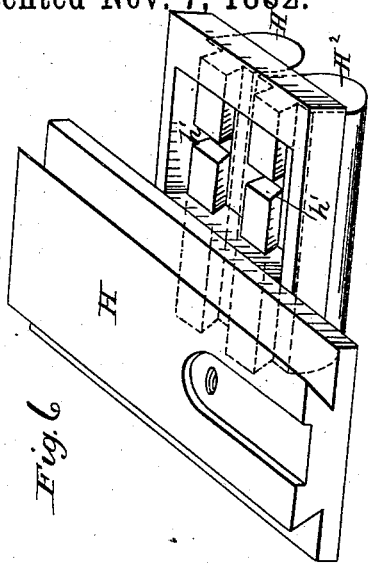


Fig. 3

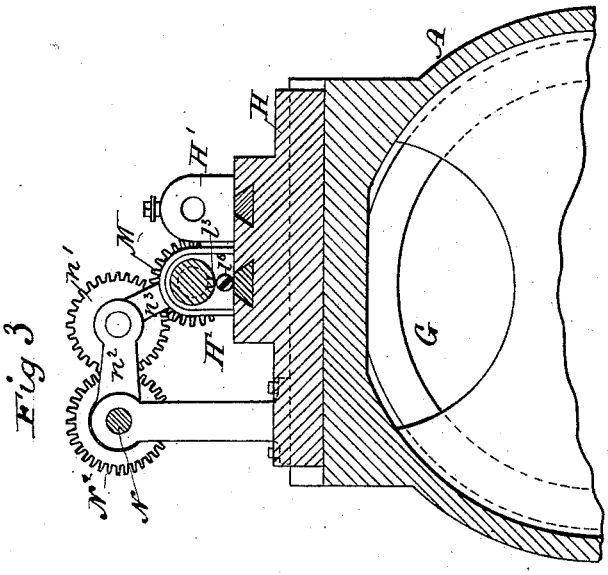


Fig. 5

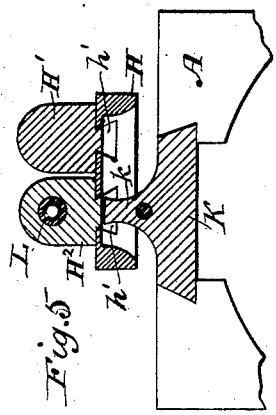
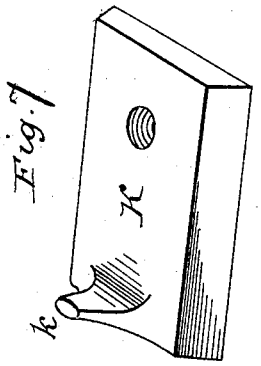


Fig. 7



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UNITED STATES PATENT OFFICE.

ALLEN JOHNSTON, OF OTTUMWA, IOWA.

METAL-SCREW MACHINE.

SPECIFICATION forming part of Letters Patent No. 267,215, dated November 7, 1882.

Application filed July 5, 1882. (No model.)

To all whom it may concern:

Be it known that I, ALLEN JOHNSTON, of Ottumwa, county of Wapello, and State of Iowa, have invented a new and useful Improvement in Metal-Screw Machines, which improvement is fully set forth in the following specification.

This invention relates to automatic machines for making screws from a rod or long screw-stock, and has particular reference to the mechanism for bringing the tools—such as the milling and threading, with or without other tools—successively into action upon the rod or screw-stock. These tools, as herein shown, are carried by independent longitudinal slides, which move in ways in a cross-slide and are brought successively into line with the chuck by automatic mechanism which shifts said cross-slide, and when brought in line are advanced independently, also by automatic mechanism.

In the accompanying drawings is represented a machine constructed in accordance with the invention, Figure 1 being a central vertical longitudinal section; Fig. 2, a plan; Fig. 3, a partial cross-section on line *x x*, Fig. 1; Fig. 4, a partial view in horizontal section and in plan; Fig. 5, a vertical cross-section on line *y y*, Fig. 1; Fig. 6, a bottom view in perspective of the longitudinal and cross slides; and Fig. 7, a perspective view of an auxiliary slide, through which motion is imparted to the longitudinal slides.

Before entering upon a description of those parts of the machine wherein the present invention resides it may be well briefly to explain the other elements, which may be of any ordinary or suitable construction, but which, as shown, embody certain new improvements, subject-matter of my application filed July 21, 1881, and numbered 38,250, whereof the present application is a division and continuation.

A is the machine-frame; B, the cam-shaft; C, the hollow chuck-spindle, having a pulley, C′, fixed thereto, and geared to cam-shaft B through the train of spur-gears b b' b^2 b^3 b^4 b^5 b^6 b^7 b^8; D, a tube slotted at the end and secured in the head of the chuck-spindle, the chuck being screwed thereto.

The chuck-jaws d are pressed inward to clamp the rod or screw-stock by means of wedges d^2, formed on the end of the tube d^3, and working between the inclined interior surface of the chuck-jaws and the interior of the head of the chuck-spindle, and between the stay-pieces d', formed on the end of the tube D. The tube d^3 is advanced to close the chuck-jaws by means of a spring, d^{11}. It is retracted at intervals by means of a cam, d^8, on the disk d^{12}, keyed to the cam-shaft B, the said cam d^8 acting through a lever, d^7, fulcrumed on an extension of the machine-frame, and engaging by a forked upper end a collar, d^9, on the tube d^3. When the pressure of the chuck-jaws is relieved the rod or screw-stock is advanced by means of the clamp E. This clamp is carried by a slide, e^2, working on the hollow rod E^3, and moved forward by the spring E^2 acting against the pin e' and back by the lever E′ acting against the set-screw e, tapped into the boss e^8. The lever E′ is operated by the cam d^{15} on disk d^{12}, to withdraw the clamp E before the pressure of the chuck-jaws is released, and to allow the spring E^2 to advance the feed-clamp while said pressure is relieved. During this advance movement the clamp E, which has an upper and a lower jaw, is closed by the depression of the upper jaw through the arm d^{13} on the lever d^7 and the link d^{14}. A tube, F, having friction-fingers at each end, and held loosely in the chuck-spindle by the collar f, prevents the rod or screw-stock from being drawn back with the feed-clamp, and otherwise assists in the feeding operation.

The milling-tool, or tool for turning down the rod to the diameter required for the screw-thread, is of any ordinary or suitable construction.

The threading-tool, as shown, comprises a die carried by a spindle, L, a sleeve, l, surrounding the spindle, a clutch, m, between the sleeve and the spindle, a spring, l', tending to engage said clutch, a gear, M, for rotating the sleeve l and for revolving also the die and die-spindle L through said sleeve and the clutch m, and a safety stop-clutch, l^2 l^3 l^4 l^5 l^6, for holding the die and die-spindle stationary when required.

Motion is communicated to the gear M from a gear, N^2, on the shaft N, through an idler, n', supported by links n^2 n^3, so that the said gears do not interfere with the lateral movement of

the threading-tool, imparted as hereinafter described. The shaft N is journaled in bearings of the machine-frame, and is revolved by means of the idler *n*, interposed between the gear N′ on the shaft and the gear *b*′, driven from the gear *b* on the chuck-spindle. The gearing is such that the sleeve *l* is revolved in the same direction as the chuck, but at a higher speed. The die and die-spindle partake of this revolution by engagement of the clutch *m* during the operation of cutting the thread, and at other times, except while unthreading the die, when the latter and its spindle are held stationary by the engagement of the projection l^4 on the die-spindle with the projection l^3 on the clutch-bar l^2, the clutch *m* being disengaged. The clutch-bar l^2 is non-rotative, but is capable of a slight endwise movement against the pressure of the spring l^5, held in place by the screw l^6, so that, should the projections l^3 l^4 not fairly engage, the spring will yield and prevent the stripping of the newly-formed thread from the rod or screw-stock.

For a more particular description of the various parts reference may be had to my beforementioned application, No. 38,250, wherein the same letters of reference are employed.

The parts to which the present invention relates are as follows:

The tool-holder H is supported in guides or ways in the machine, and is moved laterally back and forth by means of a cam, h^4, bell-crank lever h^5, and connecting-rod h^7. The cam h^4 is formed on the periphery of a drum, G, which is keyed to the cam-shaft B, so as to revolve with it. The bell-crank lever h^5 is pivoted at h^6 to the machine-frame, and the rod h^7 is jointed at one end to the bell-crank lever and at the other to the tool-holder H. Upon the tool-holder are carried a series of tool-slides, H′ H². Two are shown, one for the milling or turning-down tool and the other for the die or threading tool; but a larger number can be used, if necessary, for special purpose, or where deemed desirable. The tool-slides are longitudinally movable at right angles to the movement of the tool-holder, and parallel or in line with the axis of the chuck-spindle. The rear end of the tool-holder (right-hand end, Figs. 1 and 2) overhangs the longitudinal slide K and a portion of the machine-frame, and is cut away underneath (see Fig. 5) to allow the necessary freedom of motion to a projection, *k*, which operates the tool-slides. The latter have each an opening or groove, *h*′, to receive the projection *k*. The slide K moves back and forth in ways in the machine-frame, and is operated by the cam h^2 on the drum G and the pin h^3, secured to the said slide. A pin or stud, k^2, extends into a hole in the tool-holder at each advance of the slide K and prevents lateral motion of the tool-holder, and secures the exact centering of the tool in line with the axis of the chuck.

The cutting-off tool is shown at P, being adjustably connected with the tool-holder H.

In forming a screw the following operations take place: The rod is fed forward a distance equal to the length of the screw; it is turned down to the required diameter by the milling-tool; it is threaded by the die or threading-tool, and is severed from the rod by the cut-off tool. During all these operations the chuck-jaws *d* and chuck-spindle, the sleeve *l*, surrounding the die-spindle, and the cam-drum G are revolved continuously, and during all, except that of feeding, the rod to be made into screws is also revolved. In feeding, the clamp E being open, the lever E′ is operated by the cam d^{15}, and, acting against the screw *e*, pushes back the clamp E a distance equal to the length of a screw. This distance is regulated by turning the screw *e* in the lug e^8, so that it will be struck sooner or later by the lever E′. While the clamp is held back by the cam d^{15} the wedges d^2 are withdrawn, thus releasing the pressure of the chuck-jaws *d* on the rod, and the jaws of the clamp E are closed by the action of the cam d^8 on the lever d^7. The cam d^8 holds its lever in position until the lever E′ is released by its cam d^{15} and the feed-clamp has been advanced by the spring E^2, when it also releases the lever d^7. The feed-clamp is thus released, the chuck-jaws are immediately closed by the action of spring d^{11}, and the rod rotates with the chuck. In the meantime the tool-holder H has been moved by the cam h^4, so that the milling-tool is in line with the axis of the chuck. The slide K is now advanced by the cam h^2, carrying with it the slide H′ of the milling-tool, and is then returned. The cam h^4 moves the tool-holder H laterally and brings the die or threading-tool in line with the axis of the chuck. By this lateral movement the projection *k* on the slide K is made to engage with the groove in the bottom of the tool-slide H^2. The cam h^2 again advances and returns the slide K, which, at this reciprocation, carries with it the slide H^2 of the threading-tool. During the advance of this tool the die-spindle is revolved, being engaged by the sleeve *l* through the clutch *m*. The return movement of the tool-slide, which is at first quick or sharp, causes the die-spindle L to be drawn forward in the sleeve *l*, disengages clutch *m*, and effects the engagement of the projection l^4 with the projection l^3 on the clutch-bar l^2. The die or threading-tool being held from turning by the projection on the clutch-bar, the continued revolution of the rod unthreads it. Another lateral movement of the tool-holder H brings the cutting-tool into action and severs the screw just made. The tool-holder is now moved back by the cam h^4, to bring the milling-tool again in line, and during the operation a new feed of the rod takes place.

Various modifications may be made in the details of construction of the improved screw-machines without departing from the spirit of the invention, and portions of the invention may be used without the others. For example, a friction or two-motion feed-clamp of ordinary

or suitable construction could be employed instead of the improved four-motion feeder described, or a length-gage could be used. It may be placed on the tool-holder, with or without being carried by a tool-slide, or in other suitable positions. So, also, the cutting-off tool could be placed in a slide to be advanced by the slide K. The tools could be carried by a common slide, instead of each having its own slide. Equivalent mechanism could be used in place of cams, such as a system of partial gearing, which give quick motions followed by periods of rest.

In another application, filed July 21, 1881, an arrangement is shown whereby lateral movements are imparted to the chuck instead of to the tools. The independent tool-slides could be used with such a chuck, and the same arrangement of gearing as hereinbefore explained could be used to convey the motion from the chuck-spindle to the die-spindle. The term "die-spindle" is employed herein as a convenient term for the spindle of the threading-tool, which, it is obvious, may be a tap for cutting internal threads as well as a die for cutting external threads. In such a case, the milling-tool would be a drill to bore out the hole to be threaded, instead of a turning-down tool. The term "lateral movement," or "lateral movement back and forth," is used herein in contradistinction to the intermittent rotary movement of the ordinary turret employed in screw-machines, and is not limited to a rectilinear movement in guides, which is the preferred movement, and which is therefore provided for in the machine shown, but includes a vibratory or to-and-fro movement in short arcs of a circle.

Having now fully described my said invention and the manner of carrying the same into effect, I would observe, in conclusion, that I do not claim in this application any of the improvements herein described except those which relate to the means for bringing the tools successively into operation on the rod or screw-stock, as the other improvements are reserved for my application No. 38,250; but

What I do claim herein is—

1. The combination, with the chuck, the series of two or more cutting-tools—such as turning, milling, or threading tools—the lateral-moving support or slide, and the series of independent longitudinal slides carrying the tools above mentioned, of automatic mechanism comprising cams and connections, or their equivalents, for operating said laterally-moving support, to bring the several tools successively into line with the chuck, and for advancing the longitudinal tool-slides separately and in succession, substantially as described.

2. The combination, with the hollow spindle, revolving chuck carried by said spindle, and the series of cutting-tools having longitudinal motion, of the cams and connections, or equivalent automatic mechanism, for bringing by lateral motion said chuck and the several tools successively in line with each other, and for advancing said tools separately and in succession, substantially as described.

3. The combination, with the laterally-moving tool-holder and the series of cutting-tools carried by independent slides supported in ways of said tool-holder, of the automatic mechanism comprising the cams and connections, or their equivalents, for shifting said tool-holder laterally, and for reciprocating the tool-slides separately and in succession, substantially as described.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

ALLEN JOHNSTON.

Witnesses:
A. G. HARROW,
J. T. HACKWORTH.