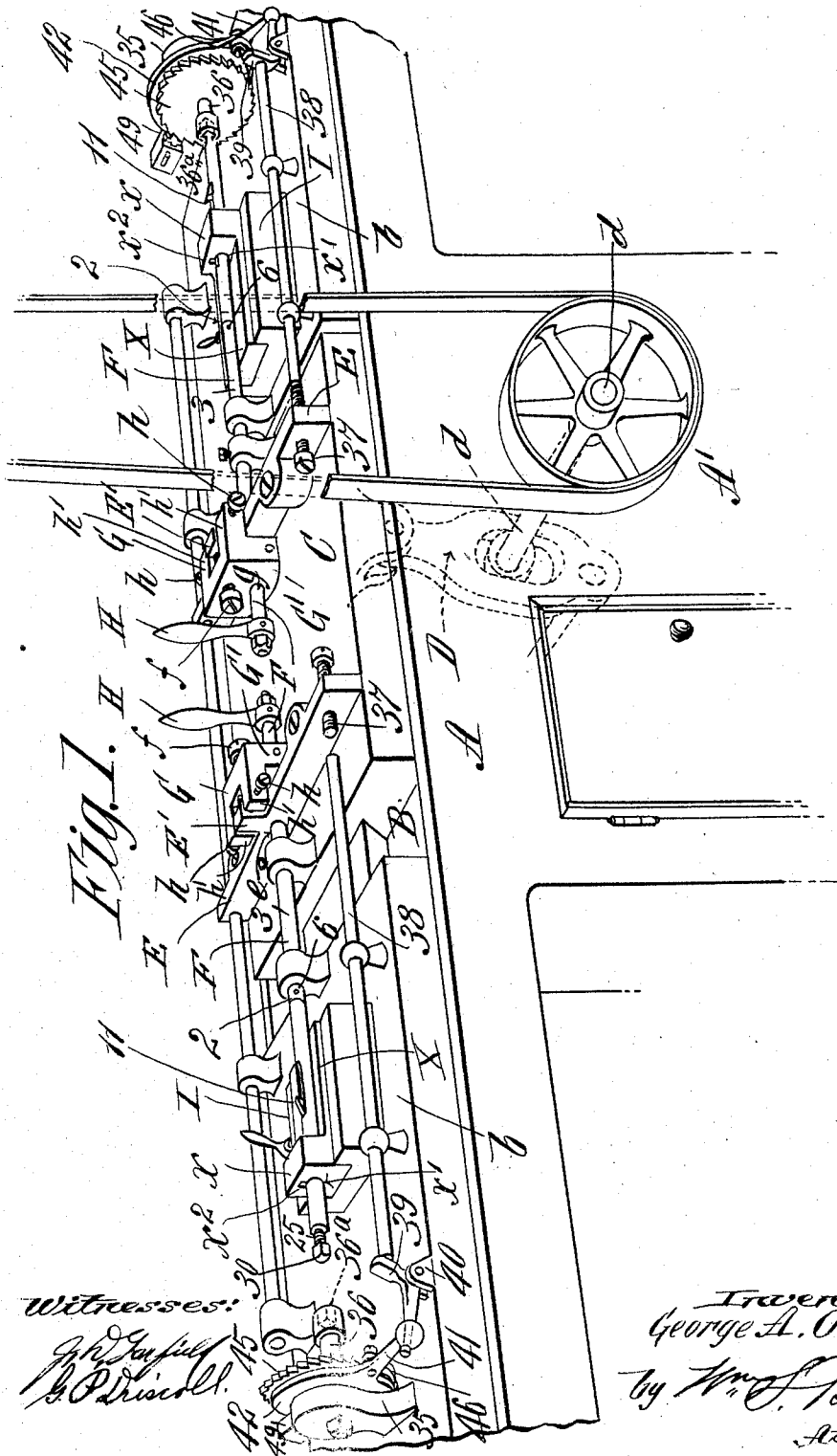


No. 822,012.

PATENTED MAY 29, 1906.

G. A. OWEN.  
SLOTTING MACHINE.  
APPLICATION FILED NOV. 16, 1904.

2 SHEETS—SHEET 1.

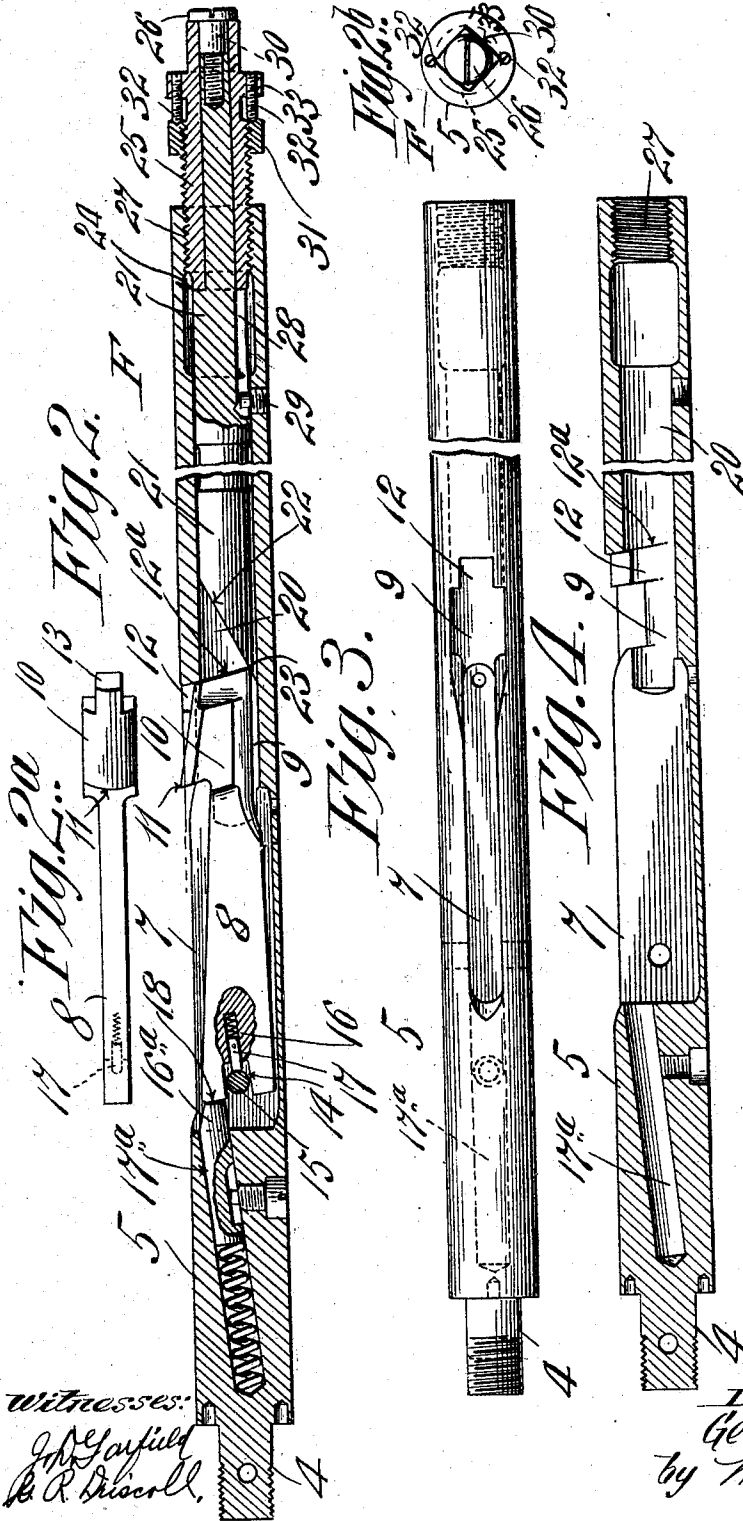


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# UNITED STATES PATENT OFFICE.

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## SLOTTING-MACHINE.

No. 822,012.

Specification of Letters Patent.

Patented May 29, 1906.

Application filed November 16, 1904. Serial No. 232,979.

*To all whom it may concern:*

Be it known that I, GEORGE ALFRED OWEN, a citizen of the United States of America, and a resident of Springfield, in the county of Hampden and State of Massachusetts, have invented certain new and useful Improvements in Slotting-Machines, of which the following is a full, clear, and exact description.

This invention particularly relates to machines in which are carried for back-and-forth motions arbors or mandrels which constitute the tool or cutter carrying part or parts employed in the work of slotting, grooving, splining, or broaching.

The invention especially relates to mechanism included in the machine in which the arbor is used on a reciprocating carriage, and which mechanism is cooperative with the arbor for automatically and intermittently causing at each reciprocation of the carriage and arbor the increasingly-prominent positioning of the cutting-tool and which is also automatically operable to insure the successive back-and-forth motions of the arbor-carrier, and the present improvements are of such character as to render the machine double-ended or duplex, whereby the motion of a carriage for backwardly carrying or retiring one arbor or mandrel or a plurality thereof constitutes the motion of such carriage for giving the forward or working motion to an oppositely-endwise-located arbor or mandrel or plurality thereof.

The invention furthermore and otherwise relates to subordinate structural features and devices in detail, hereinafter particularly referred to.

The invention consists in the combination or arrangement of mechanism and appliances and in the construction of parts and the combinations of parts, all substantially as hereinafter fully described, and set forth in the claims.

The improvements are illustrated in the accompanying drawings, in which—

Figure 1 is a perspective view of a slotting-machine in which the present invention is embodied. In the example of the machine here illustrated a machine of double character is shown—that is, one in which two tool-carrying arbors are shown, together with two sets of automatic mechanism for intermittently setting up the tool for successive cuts. Fig. 2 is a longitudinal section of the cutting-arbor, certain parts thereof being shown in elevation. Fig. 2<sup>a</sup> is a plan view of

one of the cutters. Fig. 2<sup>b</sup> is a right-hand end view of the arbor. Fig. 3 is a plan view of the receiver for the tool of the arbor. Fig. 4 is a longitudinal section of the tool-receiving portion of the arbor, the parts to be held therein being absent.

Similar characters of reference indicate corresponding parts in all of the views.

The machine-body A, comprising a table portion or bed B, with the usual oil-pan having flanged edges, has at either end thereof the raised surfaces *b*, between which the carriage C is moved to and from said surfaces *b* on a suitable slideway by means of the cam-operated rocking arm D on the power-driven shaft *d*, which operating devices are mounted in the hollow base A' of the machine. Extending across either end of the carriage C and secured thereto are the ribs E, centrally located on which are the holes *e*, through which are passed one end of the cutting-arbors F.

Centrally formed on each rib E is an upstanding lug E', with which is engaged an L-shaped block G by means of longitudinally-adjustable screw *f*. Through the downwardly-extending portion G' of these duplicated blocks G are holes *g*, through which the cutting-arbors F also pass and are pinned therein. The extremities of the cutting-arbors F beyond the blocks G' are provided with handles H, by which the said cutting-arbors F (with the blocks G pinned thereto) may be turned slightly for close rocking adjustment and are held securely in such adjusted positions by the set-screws *h* transversely penetrating the ear-lug members *h'* and binding against the lug E', and it will be stated in this connection that the lower edges of the ears or lugs *h'*, as shown at the left middle portion of Fig. 1, are somewhat above the upper surface of the upstanding ribs E, so that there is at this place no obstructing engagement of the parts to prevent sufficient degree of rocking movements of the arbors and of the blocks G, which are fixtures thereof.

Securely attached to the bed B and in direct alinement with the cutting-arbors F are work-holding clamps I of suitable form to hold the work to be slotted, grooved, or otherwise operated on.

In Fig. 1 a block or piece of work X is shown, having an offset portion *x*, through which a hole *x'* (the same size as the diameter of the cutting-arbor) is provided, and the

adjustment of the cutting-arbor F, as illustrated, is such as would cut a longitudinal slot or keyway  $x^2$  in the upper side of the drill-hole  $x$ .

5 The "cutting-arbor," as here termed, comprises various parts organized in a novel manner as a unitary structure and constitutes the subject-matter of a separate application for Letters Patent of the United States, filed  
10 by me September 23, 1905, under Serial No. 279,791, and in order to impart an adequate understanding of the nature and capabilities of the arbor as an appliance employed in the mechanism of this invention the description  
15 thereof will be given as follows:

The cutting-arbor F as a whole comprises a receiver portion 5, made, preferably, of round bar-steel, and as the arbor is of necessity of considerable length it is usually made  
20 in two parts jointed together, as shown at 2 in Fig. 1, the part 3 having a screw-threaded hole into which the turned-down and threaded portion 4 of the receiver portion 5 screws and is then further secured by the pin 6.

25 A mortise-like cut or trough-shaft recess 7 is provided about midway of receiver 5, into which snugly fits the shank of a cutting-tool 8, and at one end of this cut 7 is a slightly-widened continuation 9, in which the cutting-head 10 of said tool 8 closely fits, the cutting-point 11 projecting above the surface of receiver 5.

30 In a further continuation of the cut is a narrow cut 12, the end of which is inclined or undercut, as shown in Figs. 2 and 4 at 12<sup>a</sup>, and a narrow extension 13 of cutter-head 10, which fits into and is guided by this cut 12, has its end inclined or beveled to correspond with the inclined portion of the cut 12 described.  
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The other end portion of the shank of the cutting-tool 8 has a deep notch 14, the sides of which are parallel and fit closely to a guide-pin 15. (Shown in section in Fig. 2.)  
45 Projecting into this notch 14 from a socket 16 in the tool 8 is a spring-plunger 17, which bears against the guide-pin 15, thus keeping the tool 8 pressed against the beveled end 12<sup>a</sup> of cut 12, which pressure tends to keep the cutting-head 10 down to the bottom of its mortise 9, and to insure a more positive action a second and much stronger spring-plunger 16<sup>a</sup> is provided in a hole 17<sup>a</sup> in the solid end of receiver 5 and is adapted to press  
55 against the end 18 of the shank of tool 8. Extending from one end of the receiver 5 into the cut 12 is a centrally-drilled hole 20, in which a round cam-rod 21 is adapted to slide. (See Fig. 2.) This cam-rod 21 has a cam-surface 22, here shown wedge-formed adjacent the cut 12, which is adapted to engage the lower corner 23 of cutter-head 10. The opposite portion of cam-rod 21 for some distance from its extreme end is of reduced diameter and has a square shoulder 24. (Shown  
65

in section in Fig. 2.) An externally-screw-threaded sleeve 25 is rotatably mounted on this portion of the cam-rod 21 and is held against displacement thereon by a retaining-screw 26. The screw-threaded portion of this sleeve 25 engages at 27 a tapped or screw-threaded section of the hole 20 in receiver 5. A longitudinal slot 28 is formed in the cam-rod 21, and the point of a screw 29 in receiver 5 engages therewith and prevents the cam-rod 21 from turning in the hole 20.  
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The end of the screw-threaded sleeve 25 that projects beyond the receiver 5 has a square 30 formed thereon, Figs. 1 and 2<sup>b</sup>, and, as shown in Fig. 2, an adjustable stop-nut 31 is provided on sleeve 25 and is locked in any desired position on said sleeve by the set-screws 32 in the flange 33, which is formed on said sleeve 25.  
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As frequent sharpening of the cutting-point 11 is found necessary and a consequent grinding away of the cutting-head 10 results, it has been found to be economical to provide separable cutting-blocks 50, which are adapted to be attached to the cutting-head  
85 10 of the tool-bar 8, thus saving the cost of providing a complete cutting-tool, such as that illustrated in Fig. 2<sup>a</sup>.  
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Referring now to Fig. 1 of the drawings, in which the above-described cutting-arbor E and its contained parts are shown as mounted in the slotting-machine, the standards 35 on the raised surfaces *b* have rotatably supported thereon the short shafts 36, which are in alinement with cutting-arbors E. These shafts 36 are formed with wrench-heads—that is, they have in their enlarged inner ends the square sockets 36<sup>a</sup>, which are adapted to receive the squared ends 30 of the sleeve 25. On each reciprocation of the sliding carriage  
95 C, at which time an adjustable contact-screw 37 engages one end of a sliding rod 38, the other end in turn engages one arm of an angular lever 39, supported in a suitable bearing 40 on surface *b*. The other arm of  
100 said lever 39 engages the arm 41 of a pawl-carrying disk 42 (which is loosely supported on shaft 36) between the standard 35 and a ratchet-wheel 45, secured on said shaft 36. A retracting-spring is understood as provided for the pawl-carrying disk, as commonly employed on oscillating pawl-carriers, which are worked positively in only one direction, so that after each working impulse the carrier will move the pawl back to take  
105 a new ratchet-wheel tooth. This spring in practice is inclosed in the hollowed-out standard at the side of the pawl-carrier. The pawl 46, pivoted on arm 41 of the loosely-mounted pawl-carrying disk 42, periodically transmits a rotational movement to shaft 36 through its engagement with the ratchet-wheel 45. A retaining pawl or detent 49 holds the ratchet-wheel 45 against any possible retrograde movement.  
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The operation of the machine is as follows: Any special block or piece of work, as X, having been secured in position on work-holding clamp I, (the cutting-arbor having been first passed through the hole  $x'$  of the piece X, and the two parts 3 and 5 of the cutting-arbor F united by pin 6, and the position of the cutting-point 11 accurately adjusted by the moving of block G, as described,) power is applied to the machine, causing the backward and forward movements of carriage C, on which the cutting-arbor F by its one end is secured. The first movement of carriage C in the proper direction carries the arbor F, with its cutting-point 11, through the hole  $x'$  in the work, and such movement is of an extent to cause the squared end 30 of the cutting-tool-feed devices to enter the squared socket 36<sup>a</sup> at end of shaft 36, which manner of engagement is seen at right-hand end of Fig. 1, and at the same time the ratchet-operating devices brought into action by engagement of contact-screw 37 (on carriage C) gives the shaft 36 a partial rotation, which thus rotates sleeve 25, that has the screw engagement in the end of the receiver or arbor body, (see Fig. 2,) and imparts thereby a slight degree of longitudinal motion to cam-rod 21, about the outwardly-protruding extremity of which rod the sleeve 25 is mounted. It will be understood that the parts are constructed so that the squared end 30 of the cutting-tool-feed device enters in engagement with the socket 36<sup>a</sup> in the end of the shaft 36 before the part 38 comes to contact with the lever 39 and, further, that after the squared part 30 enters and becomes engaged in the socket it is capable of a proper degree of endwise movement freely and relatively to the shaft 36 during the time of the operation of the device for imparting the partial rotation to the shaft 36. This cam-rod 21, having the cam-surface 22 engaging lower corner 23 of the tool, raises the latter to elevate the cutting-point 11 to such height as to make the proper cut at  $x''$  in the work X. The return movement now of carriage C carries the cutting-arbor F in the opposite direction through the hole  $x'$  in the piece being operated upon. The cutting edge 11 having been slightly raised at each complete reciprocation cuts successively deeper and deeper as the work proceeds and until the desired depth of the channel groove or slot is acquired.

In Fig. 1 in order to maintain a reasonably large scale on which the view is drawn true proportions of some of the parts have not been strictly observed, and while the range of movement of the carriage C is shown as comparatively slight it is manifest that the machine may be constructed so that the carriage may have long back-and-forth runs, as might be required for the making of channel-like cuts through long pieces of work, and,

again, the arbor may be so mounted in the machine as to make instead of a top cut, as here illustrated, side cuts or a bottom cut.

Various changes may be made in the minor details of construction without departing from the present invention.

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

1. In a machine of the character described, a bed or support having a reciprocatory carriage located at its intermediate portion, a plurality of work-holders on said bed, a plurality of arbors mounted on and bodily movable with the carriage, and each arbor having an adjustable cutting-tool, and a tool-adjusting means comprising a member rotatively movable relatively to the arbor, and at the outer end portion thereof, combined with shafts located at the opposite ends of the machine and in alinement with the arbors, each of said shafts having at its inner end a wrench-head with which said rotatable member comprised in the tool-adjusting means alternately moves to, and withdraws from, engagement, ratchet-wheels affixed on said shafts, oscillatory carriers having pawls coacting with the ratchet-wheels, and a device, adjacent to and operable on each pawl-carrier, and with which the carriage in its alternating endwise movements engages for the purposes set forth.

2. In a machine of the character described, the combination with a support and an intermediately-arranged, reciprocatory carriage carrying arbors provided with cutting-tools, and with tool-adjusting devices rotationally operable and respectively located at the ends of the arbors which are toward the opposite ends of the machine, of the devices at the opposite ends of the machine, each comprising a shaft having a wrench-head and a ratchet-wheel, the pawl-carriers and pawls coacting with the ratchet-wheels, and the elbow-levers 39 engaging the pawl-carrier, together with the rods 38, 38, coöperative with the elbow-levers, and the adjustable contact-screws 37, 37, on the carriage, alined with the slide-rods for the purposes set forth.

3. In a mechanism of the character described, the combination with a work-holder, and a reciprocatory carriage, having an arbor mounted thereon which comprises a tool adjustably supported therein, a cam-bar coöperative with the tool to successively set it outwardly, and a rotative position-changing sleeve coacting with the cam-bar at the end portion of the arbor and provided with wrench-head-engaging means, a shaft alined with the arbor at the end of the machine having a wrench-head, pawl-and-ratchet mechanism for rotating said shaft and intermittently operable by the coaction therewith of the reciprocatory carriage.

4. In a mechanism of the character de-

scribed, the combination with a tool-carrying arbor constructed with an opening for a tool therein and a cutting-tool in said opening, and having a cam-ended rod adjustably movable but non-rotatable within the arbor and adapted to impinge against, and outwardly set, the tool, and having a sleeve, screw-engaging and endwise movable relatively to the arbor-body, and rotatable about the cam-rod, but constrained for movement in unison with such rod, and provided with a squared end portion, in combination with an arbor-carriage, a shaft having a wrench-head in axial alinement with the arbor, and provided with a ratchet-wheel, a pawl-carrier and pawl co-acting with said ratchet-wheel, the elbow-lever 39 engaging the pawl-carrier and the slide-rod engaged by the carriage and coacting with said elbow-lever.

5. In a mechanism of the character described, the combination with a main support or bed having a stationary work-holder and a reciprocatory carriage provided with the longitudinally-ranging part 37 endwise adjustable, and with an arbor mounted on the carriage and comprising the adjustable tool, the longitudinally-movable cam-bar, and the cam-bar-advancing sleeve, rotatable relatively to the arbor, and having a polygonal end portion and screw engaging in the arbor-body, of a ratchet-wheel having a socketed portion 36, 36<sup>a</sup> into which the polygonal end of the sleeve may come to engagement, periodically, a pawl-carrier provided with a pawl, the angular lever 39 engaging the pawl-carrier, and the rod 38 cooperative with the said lever and in alinement with the said part 37, for the purposes set forth.

6. In a mechanism of the character described, the combination with the carriage C having the arbor-hole *e* and the upstanding member E', of the tool-carrying arbor-body, extended through said arbor-hole, the L-

shaped block, G provided with the separated ear-lugs *h'*, *h'*, having the arbor passed there-through and secured thereto, and the set-screws *h h* passing through the block-lugs *h' h'* to adjustment-confining engagements at opposite sides of the carriage-supported lug E'.

7. In a mechanism of the character described, the combination with the carriage C having the arbor-hole *e* and the upstanding member E', of the tool-carrying arbor-body extended through said arbor-hole, the L-shaped block, G provided with the separated ear-lugs *h' h'*, having the arbor passed there-through and secured thereto, the set-screws *h h* passing through the block-lugs *h' h'* to adjustment-confining engagements at opposite sides of the carriage-supported lug E', and the longitudinal adjusting-screw cooperative relatively between the block G and the upstanding rib member of the carriage.

8. In a mechanism of the character described, the combination with the carriage C having the arbor-hole *e* and the upstanding member E', of the tool-carrying arbor-body extended through said arbor-hole and provided with the arbor-handle H, the L-shaped block G, provided with the separated ear-lugs *h'*, *h'*, having the arbor passed there-through and secured thereto, the set-screws *h h* passing through the block-lugs *h', h'*, to adjustment-confining engagements at opposite sides of the carriage-supported lug E', and the longitudinal adjusting-screw cooperative relatively between the block G and the upstanding rib member of the carriage.

Signed by me at Springfield, Massachusetts, in presence of two subscribing witnesses.

GEORGE A. OWEN.

Witnesses:

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