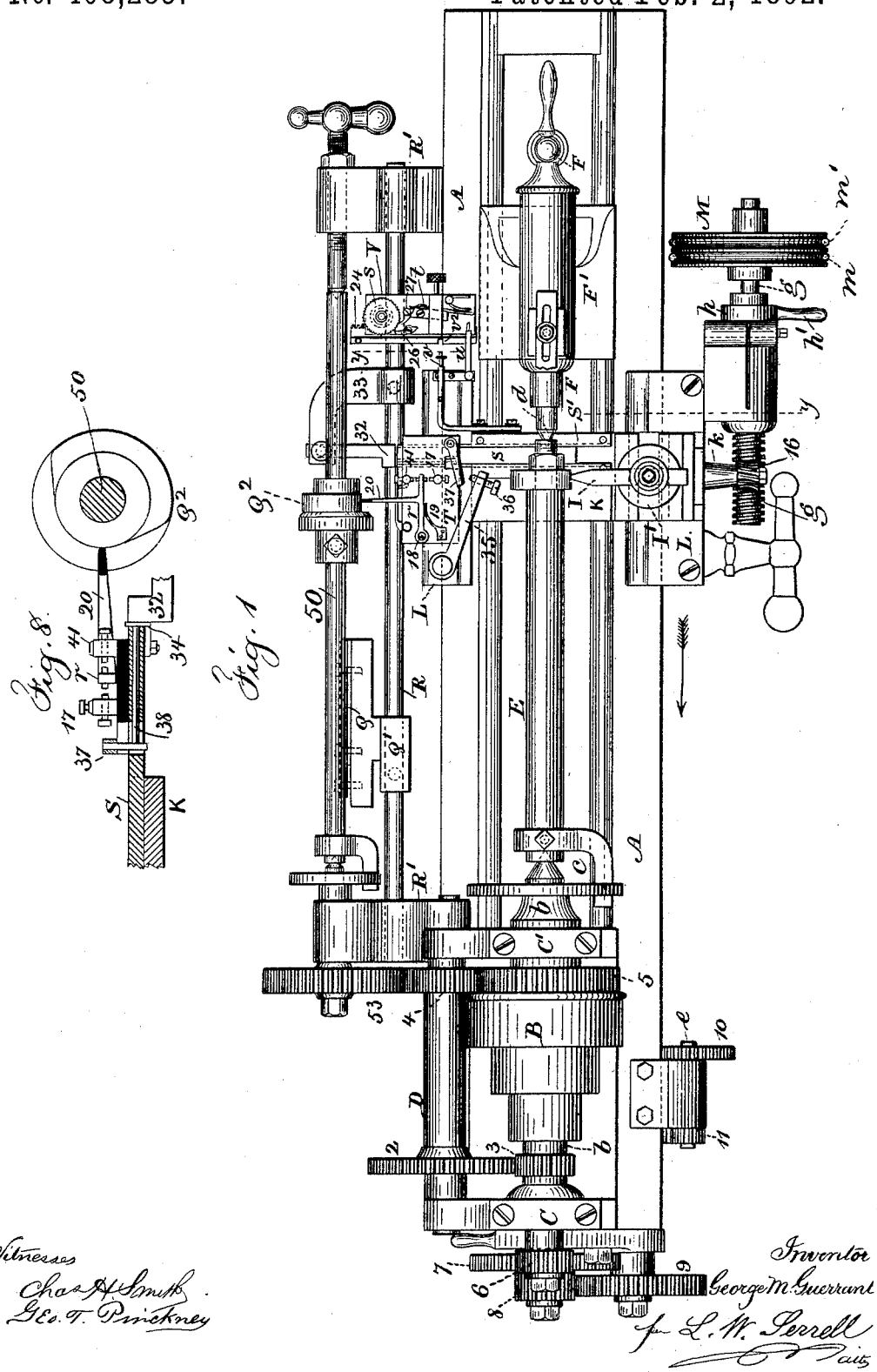
(No Model.) 5 Sheets—Sheet 1.

G. M. GUERRANT.

MEANS FOR MOVING AND GUIDING TURNING, ENGRAVING, OR PLANING TOOLS.

No. 468,283. Patented Feb. 2, 1892.



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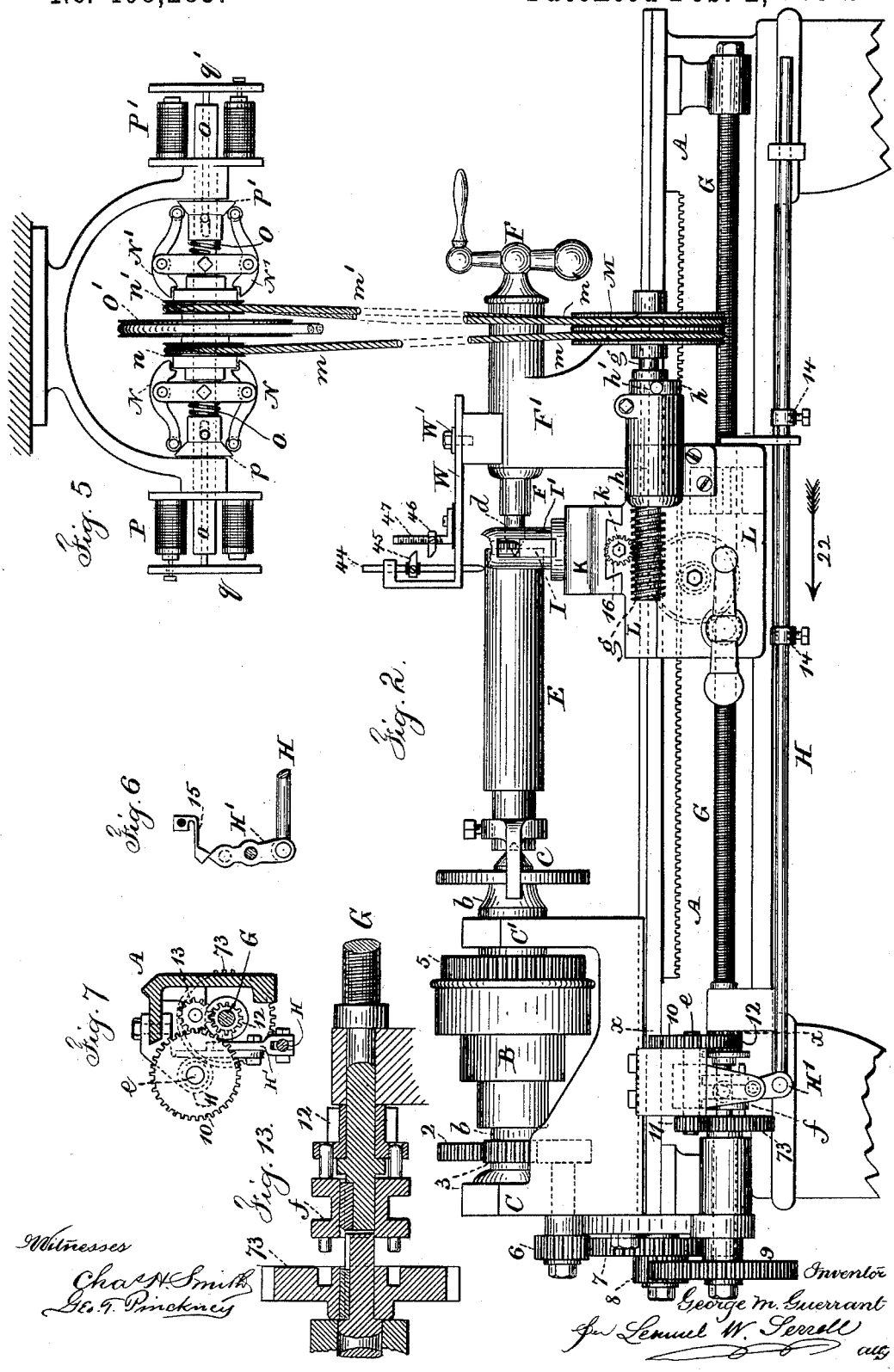

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Fig. 3.

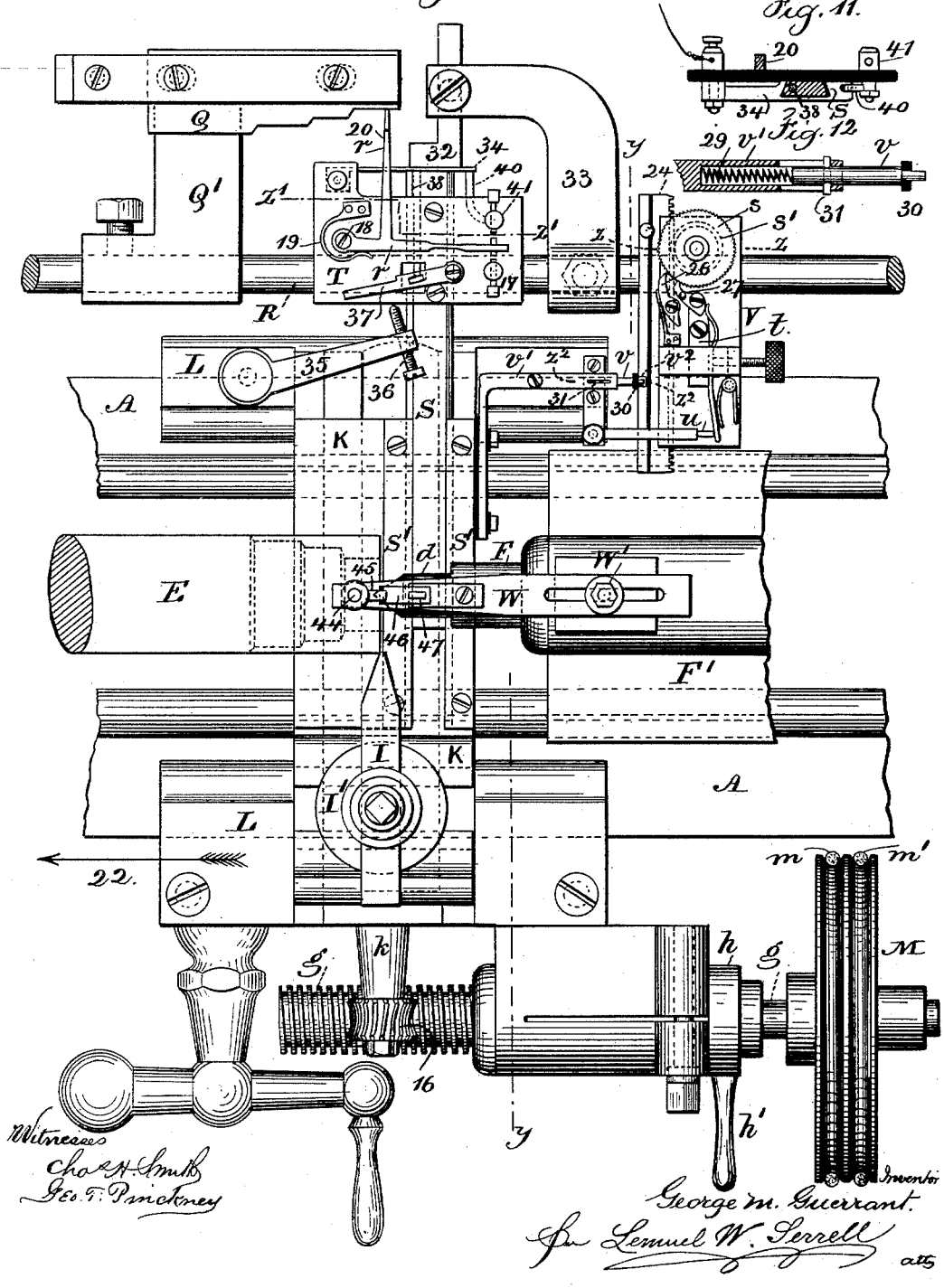

Fig. 11.

Fig. 12.

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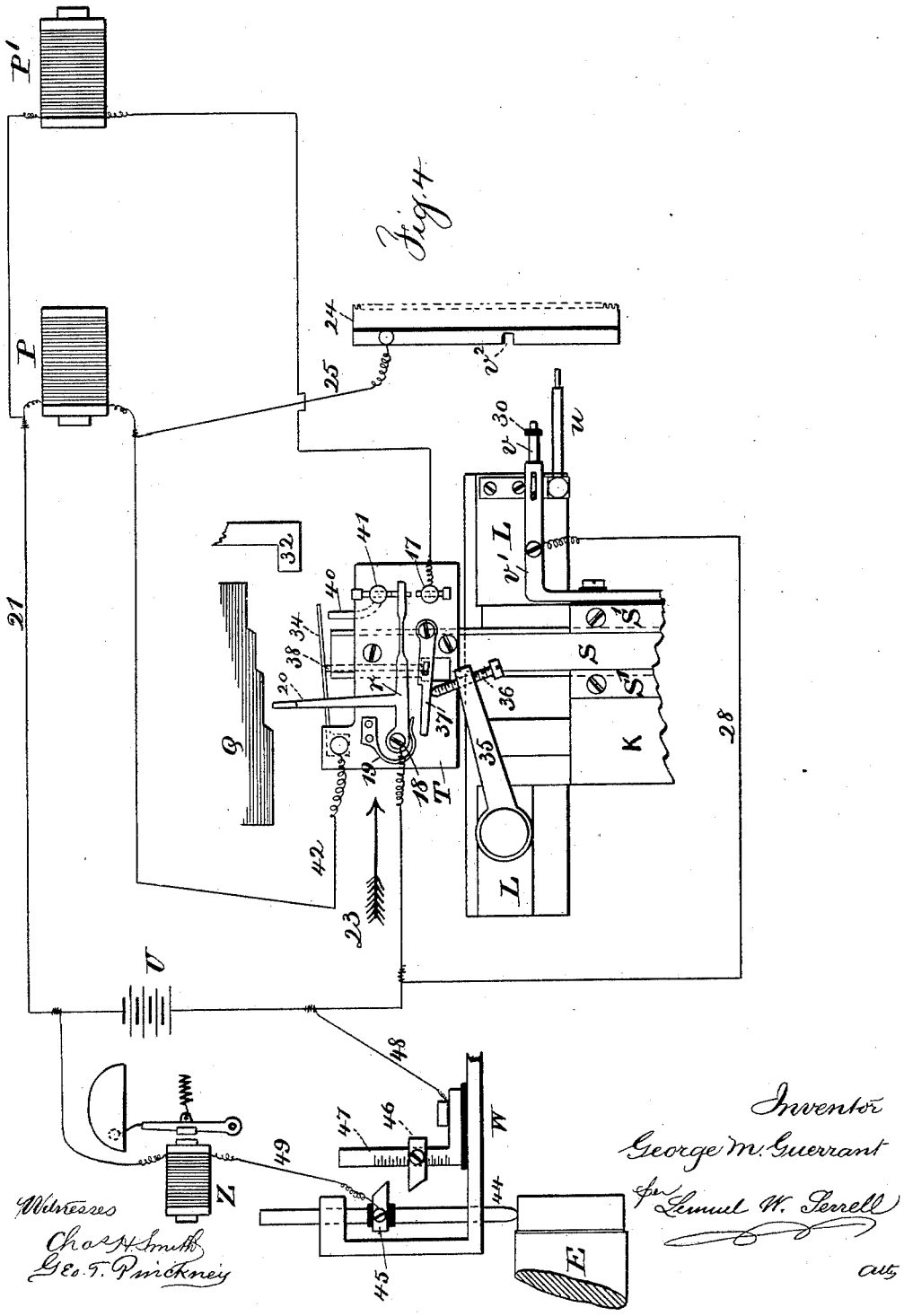

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(No Model.) 5 Sheets—Sheet 5.

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Fig. 10.

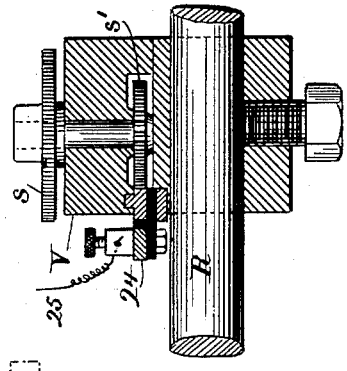
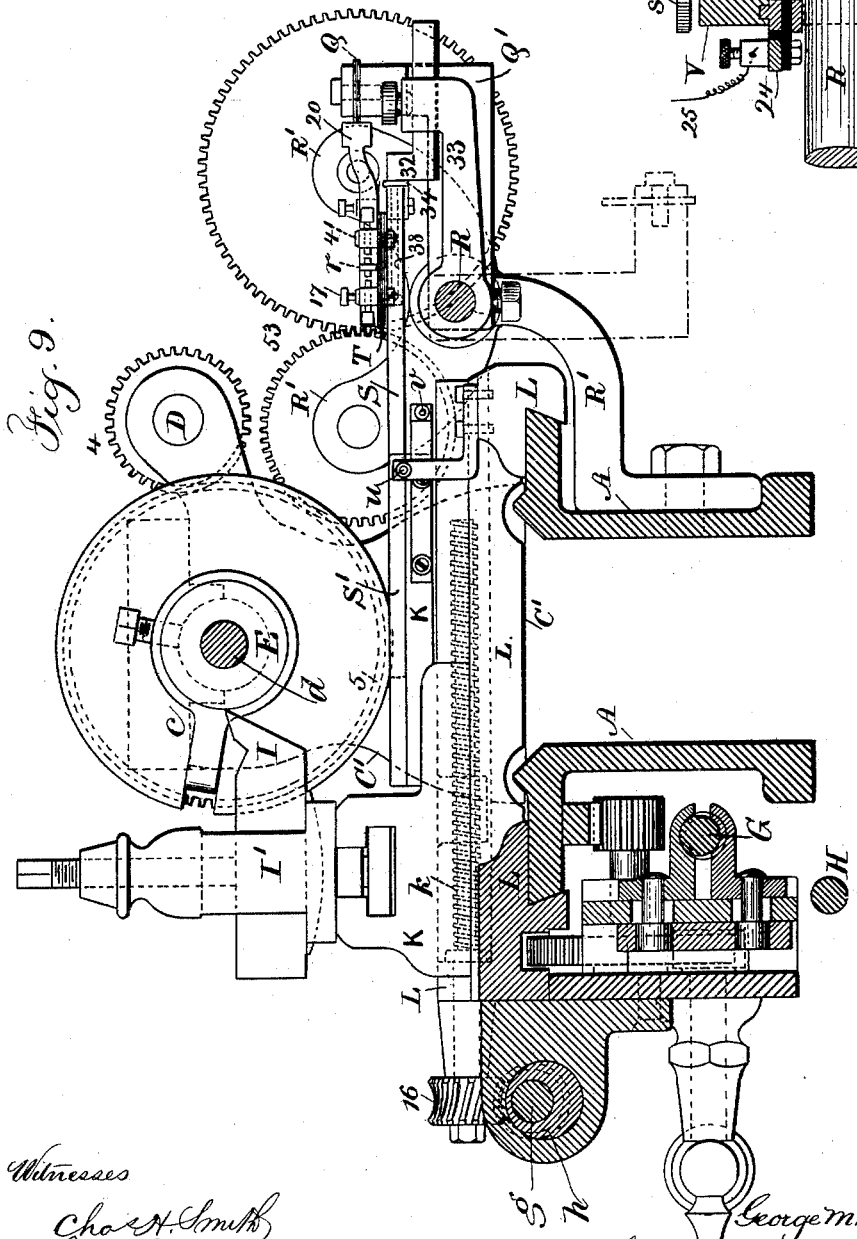


Fig. 9.



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UNITED STATES PATENT OFFICE.

GEORGE M. GUERRANT, OF NEW YORK, N. Y., ASSIGNOR TO J. TURNER MOREHEAD, OF LEAKSVILLE, NORTH CAROLINA.

MEANS FOR MOVING AND GUIDING TURNING, ENGRAVING, OR PLANING TOOLS.

SPECIFICATION forming part of Letters Patent No. 468,283, dated February 2, 1892.

Application filed July 27, 1891. Serial No. 400,810. (No model.)

To all whom it may concern:

Be it known that I, GEORGE M. GUERRANT, a citizen of the United States, residing in the city and State of New York, have invented an Improvement in Means for Moving and Guiding Turning, Engraving, or Planing Tools, of which the following is a specification.

In Letters Patent No. 431,578, granted to me July 8, 1890, the tool that is operating upon the article is guided by a compound movement derived from a motor brought into action electrically by a pattern.

The present invention is an improvement upon the aforesaid invention whereby I am enabled to control the tool with more accuracy and reliability and to follow patterns of different characters and to run the tool back to the place of beginning with rapidity and to ring an alarm automatically when the turning or finishing operation has been completed.

In the drawings, Figure 1 is a general plan of a lathe fitted with my improvement. Fig. 2 is an elevation of the same. Fig. 3 is a partial plan, on a larger scale, of the actuating devices. Fig. 4 is a diagrammatic view of the circuit connection. Fig. 5 is an elevation of the actuating mechanism upon the power-shaft. Fig. 6 is a detached view of the clutch-shifting device. Fig. 7 is a detached elevation of the gearing and section of the bed at the line x x, Fig. 2. Fig. 8 is a detached view of the electric devices in connection with the turning of an oval or eccentric figure. Fig. 9 is a section of the bed and elevation of the turning mechanism at about the line y y of Figs. 1 and 3. Fig. 10 is a detached section at the line z of Fig. 3. Fig. 11 is a detached sectional view of the insulator carrying the connections for the electric-circuit wires at the line z', Fig. 3. Fig. 12 is a detached section in larger size of the yielding circuit-closing finger at the line z^2, Fig. 3. Fig. 13 is a section in larger size of the clutch or coupling for the feed-screw.

I have represented the present improvements in connection with a turning-lathe; but their mode of application to mechanism for grinding, polishing, ornamenting, or planing will be apparent from the following description.

The bed A is supported upon suitable legs, and it is of proper dimensions for receiving the work and the actuating mechanism. The cone of pulleys B is upon the mandrel b, and this mandrel is supported in suitable bearings or head-blocks C C', and the countershaft D is provided with a gear 2 to the pinion 3 on the mandrel and with a gear 4 to the wheel 5 on the mandrel, and these are adapted to be connected or disconnected in the manner usual in turning lathes for driving the mandrel with a fast or slow motion, and I have represented a dog c upon the shaft E or other article to be turned up, such shaft or article being centered at its ends by the point of the mandrel b and by the center d in the screw F of the tail-stock F'.

The pinion 6, gear 7, pinion 8, and gear 9 are made use of for driving the feed-screw G, and I remark that the before-described parts are well known in lathes and may be of any desired character.

I prefer to make use of the auxiliary feed-shaft e, pinion 11, and gear 10, meshing into the pinion 13, gearing into the pinion 12 upon the screw G, and the wheel 73 upon a short shaft connected with the wheel 9, and there is a coupling f sliding upon the feed-screw and engaging either the pinion 12 or the wheel 73, so as to drive the feed-screw with either a fast or slow motion. This coupling is upon a feather upon the projecting end of the feed-screw. Hence when it is slipped along to engage the wheel 73 the feed-screw is driven at the same speed as the wheels 9 and 73, and when the coupling is slipped to engage the pinion 12 the feed-screw is driven with an accelerated movement by the wheels 73 acting upon the pinion 11 and the wheel 10 acting upon the pinion 12; but in order to employ this accelerated speed when the feed-screw is running the tool back to the place of beginning the intermediate pinion 13, between the gear 10 and the pinion 12, is required to reverse the direction of rotation of the feed-screw, and the shifting-rod H, with the tappets 14, is provided to act upon the lever H', that shifts the clutch or coupling f, and there is a spring 15 (shown in Fig. 6) to hold the coupling in either one position or the other.

The tool I is held by a tool-post I′ upon the slide-rest K, and this slide-rest is upon dovetailed ways upon the traveling bed L, which bed L is connected with and moved by the feed-screw G in any usual manner, and there is a screw *k* for giving motion to the slide-rest K, which screw may have upon its projecting end pulleys, to be driven as hereinafter described; but I have represented a worm-pinion 16 upon the end of the feed-screw *k* and a screw-shaft *g* supported in eccentric bearings *h* in a bracket upon the traveling bed L, and these eccentric bearings *h* can be moved by a lever or handle *h′* to bring the shaft *g* into contact with the worm-pinion 16 or to disconnect them for allowing the screw *k* to be rotated by hand in adjusting the parts.

The pulleys M are represented as upon the projecting end of the shaft *g;* but, as before intimated, they might be upon the projecting end of the screw *k*, and there are belts *m m′* to the pulleys *n n′* upon the counter-shaft *o*, that is rotated by suitable power applied by a belt or otherwise to the pulley *o′*. As in my aforesaid patent, the counter-shaft *o* and pulley *o′* are continually revolved and the pulleys *n n′* are loose upon the counter-shaft *o*, and there are clutches N N′ pivoted upon cross-bars, connected to the counter-shaft *o* and acting at their ends by friction upon the disks or hubs of the pulleys *n n′* whenever the conical collars *p p′* are moved endwise by the action of the electro-magnets P P′ upon their respective armatures *q q′*, which are provided with pins passing axially through the tubular ends of the counter-shaft *o* and acting upon pins that pass transversely through longitudinal slots in the counter-shaft, said pins also going through the respective conical collars *p p′*. In consequence of the belt *m′* being crossed, a movement will be given to the pulleys M and to the screw *k* and tool I in the opposite direction from the motion that will be given by the straight belt *m*. Thereby the tool will be moved either in one direction or the other, according to whether the magnet P is energized or the magnet P′, and it will now be understood that the tool I is moved along progressively by the feed-screw G and that it is pressed toward or drawn back from the article E by the electric action as the turning operation progresses, such electric action being controlled by the pattern and appliances, as hereinafter described.

The devices illustrated in Fig. 3 and in the diagram Fig. 4 are especially designed for turning circular articles, and with this object in view a pattern Q is made use of, the edge of the same corresponding to the shape of the circular article that is to be turned up, and, as shown in Fig. 3, the circular article is represented in position ready for the turning operation to be commenced, and the dotted lines upon said article E indicate the shape to which the article is reduced by the turning operation, and this shape corresponds to the shape of the edge of the pattern Q; but this pattern is to be adapted to the article that is to be produced. For convenience such pattern Q is represented as supported by an arm Q′ upon the longitudinal shaft or rod R, which is held permanently by the end brackets R′, projecting from the bed A, and this arm Q′ can be adjusted to the proper position longitudinally of the rod R and held by a set-screw.

Upon the slide-rest K there is a slide-bar S between the dovetailed holding-bars S′, which are screwed to the bed K and clamp the bar S sufficiently to prevent it moving when in use; but this bar S can be moved endwise by hand in adjusting the apparatus and preparing the parts for use, or automatically, as described hereinafter, and upon the slide-bar S is a plate T, which may be of insulating material, and said plate carries the electric connections next described. Upon this plate T the contact-lever *r* is secured by the pivot 18, and there is a post 17 for one of the circuit-wires and a spring 19 to move the contact-lever *r* away from the screw of the post 17 and into contact with the screw or post 41. This contact-lever has an arm 20, extending out toward the pattern-plate Q. When the arm 20 comes into contact with the pattern-plate Q, the electric circuit is closed from the battery U, through 18 *r* 17 to the electro-magnet P′, and from thence by the return-wire 21 to the battery U, and the electro-magnet being energized acts through the clutch to cause the movement of the belt *m′*, and in so doing the tool I is drawn back by the screw *k*, and the moment the arm 20 is released from its pressure against the pattern-plate Q the electric circuit is broken between *r* and 17, and may then be closed between *r* and 41, so that the tool will be moved by the belt *m* and screw *k* toward the work. In this way the end 20 is made to follow the pattern and move the tool toward or from the axis of the work as it is revolved. The tool is drawn along progressively in the direction of the arrow 22, Fig. 3, and the turning operation progresses and the tool is drawn back from time to time as the arm 20 may come into contact with the pattern Q sufficiently to close the circuit between *r* and 17, and it is moved up toward the work whenever the circuit is closed between *r* and 41, and it is to be understood that the turning operation is performed when the parts are being moved in the direction of the arrow 22, Fig. 3, and that the parts are in the position indicated in Fig. 4 when the tool is being run back and out of action, and after one cut has been made the parts are moved sufficiently to bring the tool up for the next cut by the devices next described, and these operations are repeated until the article has been turned down to the required diameter, when a signal will be given, as also hereinafter specified.

Supported by the rod R is a block V, having at one side a rack 24 with an insulated face, to which an electric-circuit wire 25 is connected, and there is a ratchet-wheel *s* upon

the block V, and this carries a gear-wheel s' within the block V and acting upon the teeth of the rack 24, as seen in the section, Fig. 10, and there is a spring-holding pawl 26 and a lever-pawl 27 to move the ratchet-wheel s progressively, and the lever t, that carries the pawl 27, has a spring-tail, against which a finger u is caused to act, such finger u being supported adjustably in an arm that projects from the bed L. Hence as the bed and slide-rest are moved in the opposite direction to the arrow 22 by the reverse rotary movement given to the feed-screw G, as before described, this finger u presses against the spring-tail of the lever t and turns the ratchet-wheel s and moves the rack 24 the proper distance, corresponding to the depth of cut to be made by the tool I. The insulated spring-finger v is in the same horizontal plane as the rack 24, and the stock v' of this insulated spring-finger is connected to the slide-rest K, and the finger itself is within the tubular end of the stock v', as represented in Fig. 12, and there is a spring 29 to project this finger, there being a cross-pin 31 to limit the motion, and around the end of the insulated spring-finger is a washer 30 of hard rubber or other insulating material.

When the traveling bed L is being moved in the direction of the arrow 23 to return the tool to the place of beginning, such tool is out of action and the parts are in the position indicated in Fig. 4, and the finger u comes first into contact with the spring-tail of the pawl-lever t and turns the ratchet-wheel s one or more teeth and moves the rack 24 endwise. At this moment the clutch of the feed-gear G is disconnected by the shifting-rod H, and the end of the spring-finger v, coming into contact with the metallic surface of the insulated rack 24, closes the electric circuit from the battery U through the wire 28, spring-finger v, insulated face of the rack-bar 24, wire 25 to the electro-magnet P, which brings into action the pulley and belt m to turn the screw k and move the tool-holder, tool, and slide-rest K toward the work, and during this movement the spring-finger v is carried by the slide-rest K until the end of the finger comes opposite the notch v^2, at which moment the end of the spring-finger is projected into the notch and the insulating washer 30 causes the circuit to be broken, and the further movement of the tool toward the work is thus arrested, and it will be observed that in the movement of the rack 24 the notch v^2 changes its position the amount necessary for setting up the tool the distance required for each successive cut.

An adjustable stop 32 is provided at the end of the movable arm 33, supported by the rod R, and upon the plate T is the insulated spring 34, that is between the extreme end of the slide S and the said stop 32 at the commencement of the cut. Hence as the tool is run up to the work the slide-bar S comes up against the spring 34, and these are arrested by the stop 32 just before the movement of the slide-rest K and tool toward the article terminates, as aforesaid. Hence the slide-rest K and the holding-bars S' move along upon the slide-bar S a distance equal to the cut of the tool. I avail of the aforesaid movement for accomplishing another electric connection, as next described.

Upon the bed L is clamped an arm 35, having through the end of it a screw 36 adjacent to a lever 37, that is pivoted upon the plate T, and it has a pendent ear adjacent to the end of the push-pin 38, which is in the slide-bar S, as indicated in Fig. 11. It is now to be understood that as the turning operation progresses and the tool is moved in the direction of the arrow 22 such tool is drawn back and the pattern Q is to be such that the tool draws back entirely clear of the article E at the extreme movement in the direction of such arrow 22, and in so doing the slide-rest K and slide-bar S are drawn back sufficiently for the lever 37 to be brought into contact with the screw 36 and moved by the same, so that the pin 38 pushes the spring 34 outwardly into the position shown in Fig. 4, and in this position the electric circuits will all remain broken during the time that the reversed movement of the feed-screw G causes the traveling bed L and tool to move in the direction of the arrow 23, Fig. 4, and after the cutter has passed beyond the article E and the finger u has turned the wheel s and moved the insulated rack 24 the circuit is closed between v and 24 to energize the electro-magnet P and carry the tool toward the work and bring the spring 34 against the stop 32, and in so doing the pin 38 and lever 37 (having passed away from the screw 36) will be restored into their normal position, as indicated in Fig. 3, and the end of the spring 34 will be in contact with the insulated arm 40 to the binding-post 41, and the circuit-wire 42 leads from the spring 34 to the electro-magnet P. The moving end of the lever r plays between the adjusting-screws of the posts 17 and 41, and should the arm 20 of the lever r draw back from the pattern Q or separate therefrom in consequence of the peculiar shape of said pattern Q the circuit will be closed from 18 through the lever r, post 41, arm 40, spring 34, wire 42 to the magnet P, so that such magnet P will cause the cutter to move up toward the article until a separation is effected between r and 41. Hence by these combined electric connections the movements of the lever are made automatic.

In addition to the foregoing it is important to indicate when the article that is being turned or otherwise acted upon is completed. With this object in view I provide upon the tail-stock F' a projecting arm W, that is slotted so as to be adjusted to any desired position and held by a clamp-screw W', and the outer end of this arm is formed with an upwardly-extending bracket, through which slides a pin or stud 44, and the lower end of

this stud rests upon the article that is being turned at any desired place, and upon this stud is an insulated circuit-closer 45, and adjacent thereto upon the arm W is a movable circuit-closer 46 upon an insulated gage 47, and one circuit-wire 48 is connected with the gage 47 and the other circuit-wire 49 is connected with the circuit-closer 45, an electro-magnet Z, and bell included in the circuit to the battery U. Hence when the article E has been turned down to the required size the circuit-closer 45 will rest upon the circuit-closer 46 and the bell will be rung, so as to indicate that the article has been turned down to its proper size. Hence with this appliance the machine needs but little personal attention, and a workman can attend to two or more machines with facility.

The operations and devices before described are made use of when a circular pattern Q^2 is substituted for the pattern Q, as indicated in Fig. 1. In this case an auxiliary shaft 50 is rotated in unison with the mandrel *b* by suitable gearing, such as shown at 53, Figs. 1 and 9, and the pattern Q^2 may be oval, elliptical, cam-shaped, or otherwise formed, and the arm 20 of the contact-lever *r* is adjacent to this revolving pattern Q^2, and it is to be understood that the mandrel and the pattern are revolved sufficiently slow for the lever *r* to close contact with either 17 or 41 and bring the tool in either one direction or the other, causing it to follow the shape of the revolving pattern Q^2, because when the revolving pattern presses against the arm 20 the circuit will be closed through *r* and 17 to the electro-magnet P′, that causes the tool to be drawn back, and when the revolving pattern draws away from the arm 20 sufficiently to cause the lever *r* to close the circuit through 41, 40, 34, and 42 the electro-magnet P is energized to cause the tool to be brought up to the work.

This last-described device with a rotary pattern is especially available where a milling-tool is made use of in place of a turning tool or cutter.

It will be apparent that when the revolving pattern Q^2 is made use of the shaft 50, that carries the same, is to be introduced between its centers, so as to be revolved by the wheel 53, and while this circular pattern is in use, as represented in Fig. 1, the pattern Q is out of position and use, the same having been turned down into the position indicated by dotted lines in Fig. 9, and this shaft 50 and the revolving pattern Q^2 are to be removed when the pattern Q is swung up, so as to be in position for use, as shown in Fig. 3 and by the full lines in Fig. 9.

The circuit-closing or contact lever *r* is preferably yielding, so that it may not be broken or bent by pressure of the end 20 against the pattern before the electrically-actuated parts have time to act in drawing back the tool and arm 20 from such pattern. With this object in view that arm of the lever *r* between the circuit-closing points 17 and 41 may be in the form of a spring between the lever and the end of the arm 20.

I claim as my invention—

1. The combination, in a lathe or other machine, of a tool holding and moving device, a work holding and moving device, a pattern, a continuously-rotating motor, connections from the same for moving the tool in one direction or the other, clutches for connecting the motor to the tool-moving devices, electro-magnets for bringing into action such clutches, a circuit-closing lever and circuit connections to the electro-magnets, and a spring for closing the one circuit through the lever to move the tool in one direction, the pattern acting against the circuit-closing lever to close the other circuit to move the tool in the opposite direction, substantially as set forth.

2. The combination, with the tool and mechanism for moving the same in opposite directions and means for presenting the article to be operated upon to the tool, of a continuously-rotating motor, connections from the same to the tool-moving devices, electro-magnets and friction devices controlled by the same for bringing into action the devices for moving the tool in one direction or the other, a circuit-breaking device brought into action at the termination of the movement of the tool in one direction for rendering the electric devices inoperative during the time that the tool is run back to the point of beginning by the lathe or similar mechanism, and an automatic device for moving the circuit-breaker and restoring the electric connections when the tool arrives at the place for beginning the work, substantially as set forth.

3. The combination, with the tool and mechanism for moving the same in opposite directions and means for presenting the article to be operated upon to the tool, of a continuously-rotating motor, connections from the same to the tool-moving devices, electro-magnets and friction devices controlled by the same for bringing into action the devices for moving the tool in one direction or the other, a circuit-breaking device brought into action at the termination of the movement of the tool in one direction for rendering the electric devices inoperative during the time that the tool is run back to the point of beginning by the lathe or similar mechanism, an automatic device for moving the circuit-breaker and restoring the electric connections when the tool arrives at the place for beginning the work, and an electric-alarm and a circuit-closing mechanism operated automatically by the article that is being made when such article has been turned or otherwise reduced to the proper size, substantially as set forth.

4. The combination, with the tool-holder and the mechanism for moving the same, of the slide-bar S, the contact-lever *r*, carried by the same, the circuit connections 17 and 41 at opposite sides of the moving end of the lever *r*, the spring 19 and circuit connections, a pattern with which the contact-lever is brought

in contact, electro-magnets in the respective circuits, clutch mechanism acted upon by the same, a continuously-revolving motor, and connections to the tool-moving mechanism, whereby the tool and contact-lever are moved toward the pattern by the magnets in one electric circuit when the contact-lever does not touch such pattern and away from the pattern by the other electric circuit when such contact-lever bears upon the pattern, so that the contact-lever and tool are caused to follow the pattern, substantially as set forth.

5. The combination, with the tool-holder, tool, and mechanism for moving the same toward and from the work, of the slide-bar S, the contact-lever *r* and its circuit-closing devices 17 and 41, the electro-magnets in the respective circuits and the motor mechanism controlled by such electro-magnets, the spring 34, push-pin 38, lever 37, and an adjustable stop 36 for breaking one of the electric circuits at the termination of the movement of the tool in one direction, and the adjustable stop 32 for restoring the parts to their normal position as the lathe mechanism restores the tool to the place of beginning, substantially as set forth.

6. The combination, with the mechanism for moving the article, the tool-holder, and the tool, of a motor, an electrically-controlled mechanism for bringing the tool-moving mechanism into action in one direction or the other, a circuit-breaking mechanism for throwing the electric devices out of action during the time that the tool is drawn away from the work and returned to the place of beginning automatically, an automatic mechanism for feeding the tool toward the work, an insulated circuit-closing finger, a rack acted upon by the feed mechanism and having an insulated face, the circuit connections to the electro-magnet that controls the mechanism that feeds up the tool to the work, an insulating device 30 for breaking the circuit at the spring-finger when the tool is brought up to the work, a pattern, and circuit-closing devices actuated by such pattern for controlling the movements of the tool during the turning operations, substantially as set forth.

7. The combination, with the lathe or other mechanism and the tool for acting upon the article, of mechanism for moving the tool in either one direction or the other, electrically-controlled motor mechanism for moving the tool, a pattern and a circuit-closing lever controlled by the pattern, the stationary arm W and circuit-closing devices 45 and 46, and a battery and an electric alarm, whereby the alarm is brought into action when the article has been reduced to the standard size, substantially as set forth.

8. The combination, with the lathe mechanism having a mandrel and means for rotating the article, a feed-screw, gearing, and clutch mechanism for rotating the screw in either direction, of the traveling bed acted upon by the feed-screw, a tool-holder and tool and mechanism for moving the tool toward or from the work, a motor, connections therefrom to the tool-holding mechanism, electro-magnets and clutch mechanism that move the tool in one direction or the other, a pattern, a circuit-closing lever controlled by the said pattern and circuit connections to the electro-magnets, a circuit-breaking mechanism and automatic devices for controlling the same for throwing out of action the electro-magnets while the feed-screw is returning the tool to the place of beginning, an automatic circuit-closing mechanism for closing the circuit to the electro-magnet that controls the mechanism for feeding the tool up to the work, and an adjustable stop for automatically restoring the electric circuit to the magnets, so that the tool is controlled by the pattern, substantially as set forth.

9. The combination, with the tool-holder and mechanism for moving the same toward and from the work, of a motor, electrically-controlled clutch connections for actuating the tool-moving mechanism, a revolving pattern, a circuit-closing lever acted upon by such pattern, a spring to press the circuit-closing lever toward the pattern, and electric-circuit connections to the respective electro-magnets, substantially as set forth.

Signed by me this 20th day of July, 1891.

GEORGE M. GUERRANT.

Witnesses:
GEO. T. PINCKNEY,
WILLIAM G. MOTT.