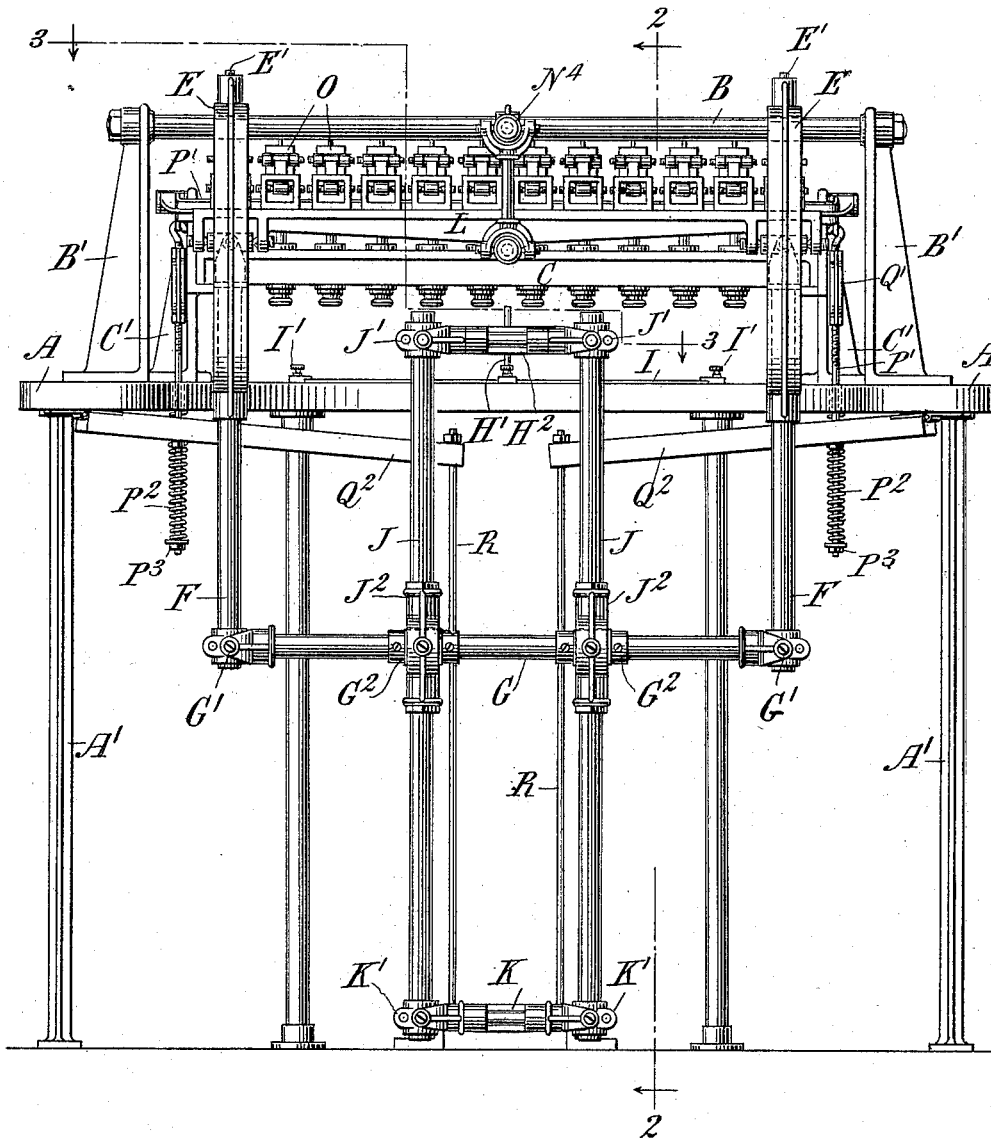


W. S. EATON.  
ENGRAVING AND ORNAMENTING MACHINE.

No. 584,335.

Patented June 15, 1897.

Fig. 1,



WITNESSES:

*C. E. Ashley*  
*H. W. Lloyd.*

INVENTOR:

*William S. Eaton*  
By *His Attorneys*  
*Palmer, Davidson & Wright*

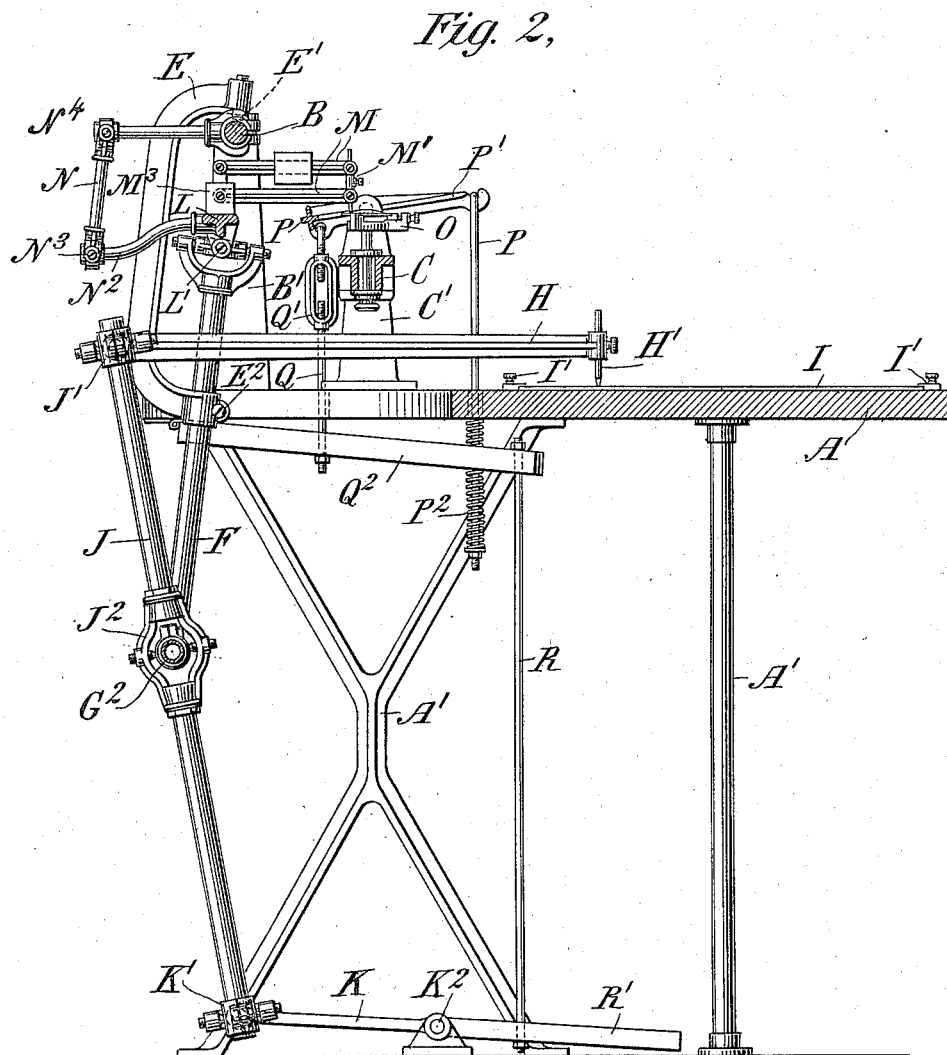
(No Model.)

4 Sheets—Sheet 2.

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(No Model.)

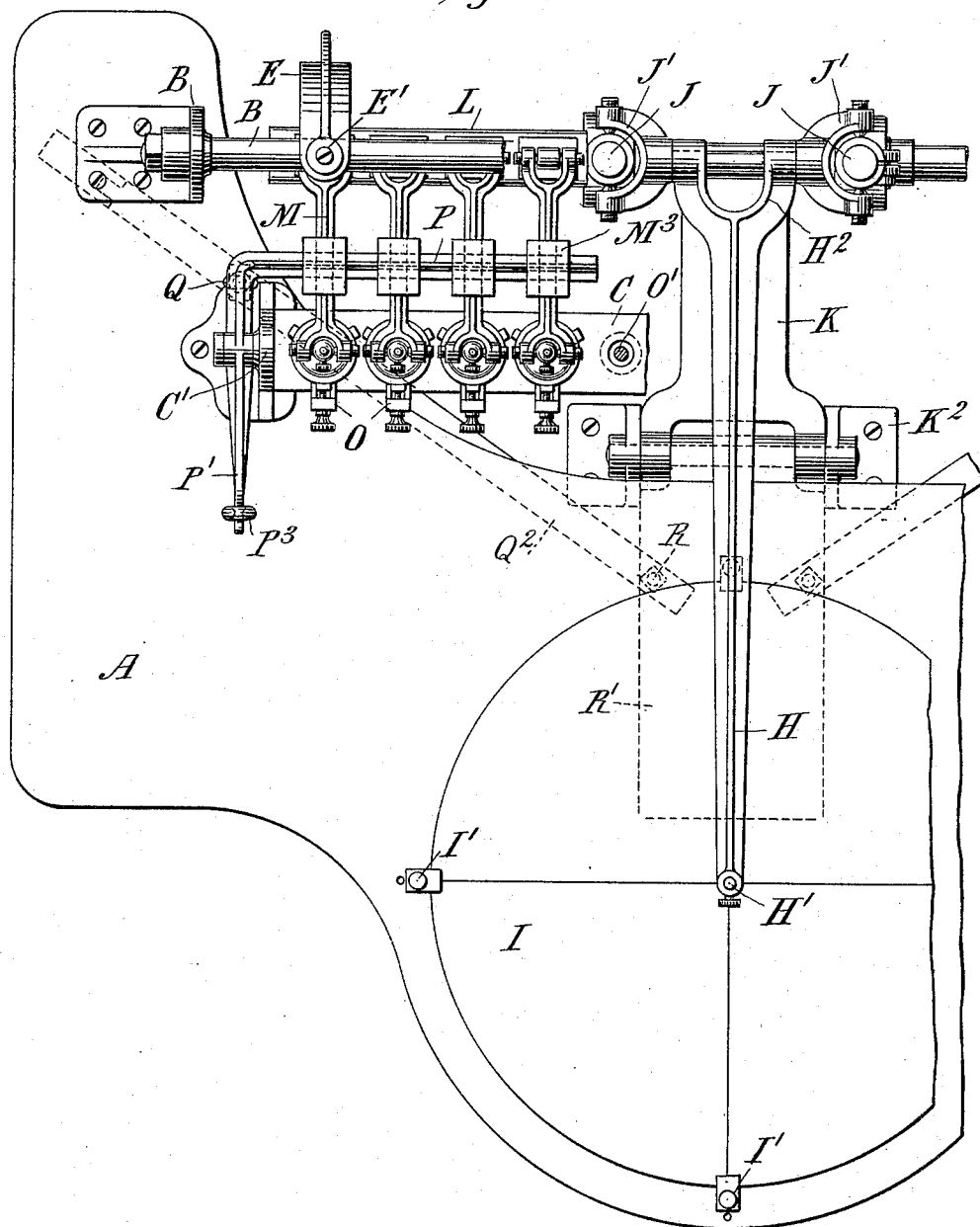
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W. S. EATON.  
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*Fig. 3.*



WITNESSES:

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*H. W. Lloyd.*

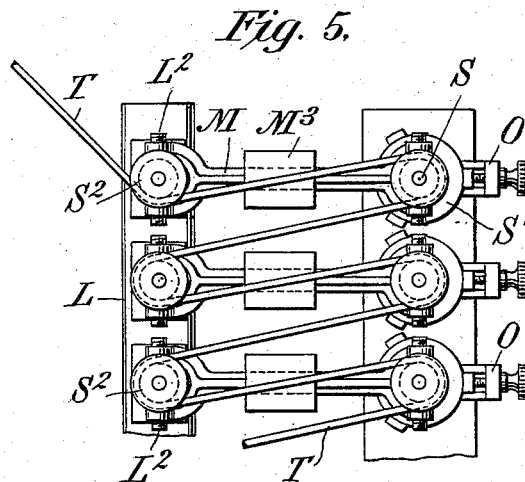
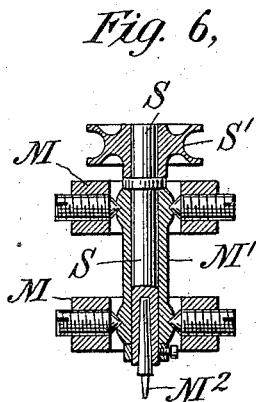
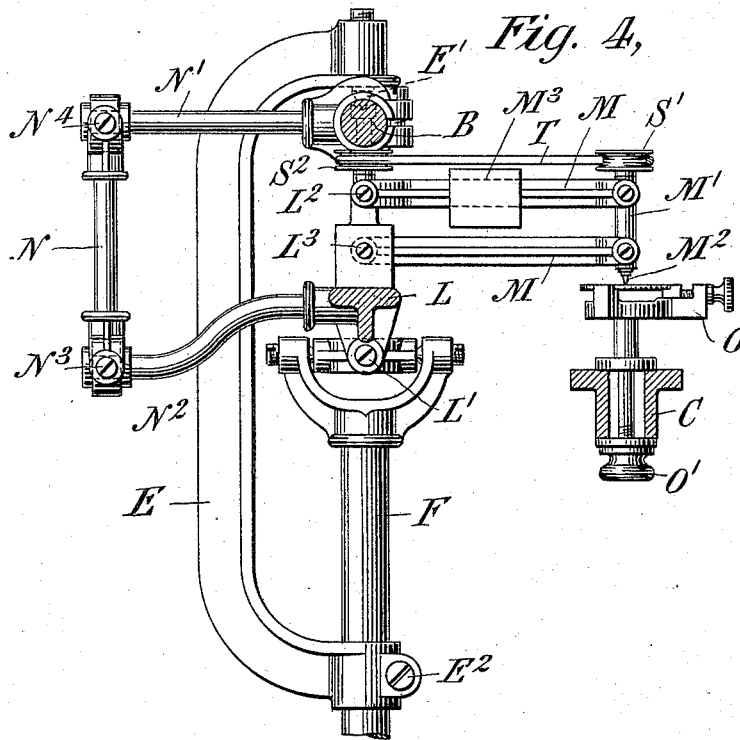
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W. S. EATON.  
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No. 584,335.

Patented June 15, 1897.



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# UNITED STATES PATENT OFFICE.

WILLIAM S. EATON, OF SAG HARBOR, NEW YORK.

## ENGRAVING AND ORNAMENTING MACHINE.

SPECIFICATION forming part of Letters Patent No. 584,335, dated June 15, 1897.

Application filed February 14, 1896. Serial No. 579,233. (No model.)

*To all whom it may concern:*

Be it known that I, WILLIAM S. EATON, a citizen of the United States, residing at Sag Harbor, in the county of Suffolk and State of New York, have invented certain new and useful Improvements in Engraving and Ornamenting Machines, of which the following is a specification.

The improvements in engraving and ornamenting machines forming the subject of this invention involve generally the application of the principle of the pantograph; and it consists, specifically, in novel constructions and arrangements of parts whereby such principle is utilized to its fullest extent in the production of a machine adapted to perform singly and in multiple or gang work all kinds of engraving, damaskeening, and ornamental work, the work while in process of production, as well as the larger sample or copy of which miniature reproductions are made, being conveniently located and within easy view of the operator.

My improved engraving and ornamenting machine comprises a suspended rectangular frame the members of which are connected together by universal joints, as gimbal-joints, in such manner as to be free to swing in all directions, a guiding and controlling arm carrying at its outer end a tracer, adapted to be moved in all directions over the sample or copy to be imitated held on a table beneath it, the arm at its inner end being connected to the lower horizontal bar of the swinging frame by a connection consisting, preferably, of rods universally jointed at their central parts to said horizontal bar and similarly jointed to the end of the guiding-arm, and with their lower ends controlled so as to be free to rock in all directions and to travel in vertical planes only. Such connections provide for perfect control over the swinging frame and reduce the movements of its lower horizontal bar to about one-half of that of the tracer. A tool-carrying bar is connected by means of universal joints to the side members of the swinging frame in such manner as to move in unison with the lower horizontal bar, but in a reduced degree, in proportion to their relative distances from the upper points of suspension of the side members, said side members being preferably made in

two parts to provide for adjustment as to their lengths, and the tool-carrying bar is connected to the lower parts thereof. The tool-holders arranged vertically are each connected to the tool-carrying bar by means of parallel horizontal links arranged in vertical planes, and to retain said tool-holders in position when the rectangular frame is swung in different inclined positions the tool-carrying bar is prevented from rocking on its longitudinal axis by means of a link universally pivoted to an arm projecting from it and to a stationary point of the main frame and arranged parallel to the plane of the swinging rectangular frame. The work or pieces of work to be operated upon are held on a stationary bed or series of chucks secured to the bed located beneath the tools and a short distance above the main table, the work and copy or sample being thus readily seen by the operator at all times without necessitating change of his position. The tools are normally held away from the work by means of a spring-actuated frame located beneath and bearing against the lower ones of the parallel links of the tool-holders, and the tools are allowed to fall and bear on the work by the depression of this frame through the medium of a treadle connected to it. These features of construction with other minor structural improvements will now be fully described by reference to the accompanying drawings, in which—

Figure 1 is a rear elevation of my improved engraving and ornamenting machine. Fig. 2 is a vertical sectional elevation taken on the line 2 2 of Fig. 1. Fig. 3 is a part plan of the machine, taken on the irregular line 3 3, Fig. 1. Fig. 4 illustrates, on an enlarged scale, one of the tool-holding devices provided with means for rotating the tool and its attached controlling parts of the machine. Fig. 5 is a plan of a few of such rotating tool-holding devices, and Fig. 6 is a vertical section of one of the tool-heads.

The stationary parts of the machine consist of the table A, supported by the legs A' A', the bar B, rigidly connected to the standards B' B', the bed C, carrying the work-holding chucks O O and supported by the standards C' C' and located a short distance above the main table A. The side members of the

swinging frame are, as shown, composed of two parts, the upper parts E E being offset frames which are provided with downwardly-projecting supporting-points E' E' at their upper offset ends, arranged to seat in hardened plugs set in recesses formed in the top of the stationary bar B (shown by dotted lines in Fig. 4) in such manner as to allow the side members to swing in all directions, and the lower offset ends being bored to receive the lower parts F F of the side members and provided with clamping devices, as screws E<sup>2</sup> E<sup>2</sup>, by means of which the two parts E and F may be rigidly connected when adjusted as desired. The lower ends of the parts F F are connected to the lower horizontal bar G, by means of the pivotal-fork connections G' G', in such manner that the lower ends of the side members are caused to move with the bar G and are maintained in parallelism in all positions they are caused to assume.

The guiding and controlling arm H, located over the table A, is provided with the tracer H' at its free end, adapted to be freely moved over the copy I to be imitated, which is clamped by any suitable means, as dogs I' I', to the table A. The inner end H<sup>2</sup> of this arm H is connected to the upper ends of the two rods J by means of the universal joints J' J', and these rods are provided with yokes J<sup>2</sup> J<sup>2</sup> at their central parts, which embrace the horizontal bar or member G of the swinging frame and are connected thereto through the medium of collars G<sup>2</sup> G<sup>2</sup>, fitted on the bar G to rotate only, and pivoted to the yokes J<sup>2</sup> J<sup>2</sup> by means of pivotal screws, so that, while the rods J J are free to assume various positions relative to the bar G, said bar G is caused to move with the yokes J<sup>2</sup> J<sup>2</sup> of the rods J J. The lower ends of the rods are connected to the link or piece K by means of the universal joints K' K', and the other end of this link K is fitted to rock on the stationary shaft K<sup>2</sup>, so that the rods J J can be moved in all directions from points at their lower ends and can also be raised and lowered with the lower part of the swinging frame when the side members thereof are being adjusted.

The upper ends of the parts F F of the side members of the swinging frame carry the tool-carrying bar L by means of the gimbal-joints L' L', the longitudinal axis of this bar being located in the plane of the swinging frame and parallel to the upper and lower horizontal joints thereof. The distance of the axis of said bar from the upper supporting-bearings determines the movements of the bar and the tools carried thereby relatively to the movements of the lower bar G. From two pivotal joints L<sup>2</sup> L<sup>2</sup> for each of the tools, which are arranged in line with the longitudinal axis of the bar L, horizontally extend the two parallel links M M, which are pivoted to the head M', which carries the tool M<sup>2</sup>. To hold the tools down to the work, adjustable weights M<sup>3</sup> are placed on the top horizontal link M.

Now to hold the tools substantially vertically the plane, including the two pivotal points L<sup>2</sup> L<sup>2</sup> and the longitudinal axis of the bar L, is maintained in substantially vertical positions during the swinging of the rectangular frame by the link N, connected at its upper end to the arm N', secured to the bar B, and at its lower end to the arm N<sup>2</sup>, projecting from the bar L, by means of the universal joints N<sup>4</sup> and N<sup>3</sup>, respectively.

The work to be operated upon is held in the chucks O, which may be of any suitable construction and which are adjustably clamped to the bed C in any suitable manner—as, for instance, by means of bolts and nuts O'—said bolts passing through enlarged holes in the bed, as clearly shown in Figs. 2 and 4. It is evident that work may be held at the outer ends of the links M M and the tools held stationary on the bed C.

The tools are normally held away from the work in the chucks O O by means of the bar P, which has bent ends P' P', pivoted to the upper ends of the standards C' C', said bar P being held in upper position to act on the lower links M M and so raise the tools by means of the springs P<sup>2</sup> P<sup>2</sup>, surrounding the lower parts of the rods P<sup>3</sup> P<sup>3</sup>, extending from the ends P' P' of the bar P down through holes in the table A. From the bar P also depend the rods Q Q, which pass through holes in the table and are provided with length-adjusting means, as turnbuckles Q' Q'. The lower ends of these rods Q Q connect with levers Q<sup>2</sup> Q<sup>2</sup>, pivoted to the under side of the table, and the outer ends of these levers are connected by the rods R R to the treadle R', which is fitted to rock on the shaft K<sup>2</sup>, the bearing of the treadle on this shaft being between the two bearings of the link K, as shown at Fig. 3.

Now when the machine is in operation and the tools are required to act on the work the treadle is depressed by the foot of the operator, which action allows the tools to descend, and upon releasing said treadle the tools are removed and held away from the work.

When routing or cutting operations or damaskening ornamentation are to be performed by the machine, then I propose to construct the tool-head as shown in Figs. 4, 5, and 6, providing them with spindles S S, adapted to carry the tools at their lower ends, and having small pulleys S' S' secured to their upper ends, and locate guide-pulleys S<sup>2</sup> S<sup>2</sup> on studs carried by the bar L immediately over the joints L<sup>2</sup> L<sup>2</sup> of the links M M. The cord or belt T shown passing around the pulleys S' S<sup>2</sup> is for the purpose of imparting rotary motion to the spindles S S and may be driven from any suitable source, such driving connections being so common and well understood I have thought it unnecessary to illustrate them here.

It will be observed that by reason of this mechanical adaptation of the pantograph principle the proportional movements of the

tracing device and the working tools may be varied in any degree desired, the proportions shown in the drawings being about eight to one, and that within certain limits the proportional movements of any given machine may be varied by adjustment of the side members E F of the swinging frame, and that both the work being done by the machine and the sample or copy are in easy view of the operator.

I claim as my invention—

1. In an engraving and ornamenting machine, the combination of a suspended rectangular frame having joint connections at its corners whereby it is free to move in all directions, a guiding and controlling arm connected at one of its ends to the lower horizontal member or bar of the rectangular frame and having a tracer at its free end, a tool-carrying bar connected at its ends to the side members or rods of the rectangular frame by means of universal joints, means for holding the tool-carrying bar substantially vertical or from rotating on its axis in the plane of the frame, a tool-holding device or tool-holding devices vertically arranged in front of the tool-carrying bar, and horizontal parallel links pivoted to the upper and lower ends of the tool-holding devices and to the tool-carrying bar.

2. In an engraving and ornamenting machine, the combination of a suspended rectangular frame having joint connections at its corners, whereby it is free to move in all directions, a guiding and controlling arm connected at one of its ends to the lower horizontal member or bar of the rectangular frame and having a tracer at its free end, a tool-carrying bar connected at its ends to the side members or rods of the rectangular frame by means of universal joints, a link suspended from a fixed point of the main frame, connected at its lower end to a projecting piece on the tool-carrying bar and arranged parallel to the plane of the suspended rectangular frame, a tool-holding device or tool-holding devices vertically arranged in front of the tool-carrying bar, and horizontal parallel links pivoted to the upper and lower ends of the tool-holding devices and to the tool-carrying bar.

3. In an engraving and ornamenting machine, the combination of a suspended rectangular frame having its side members and lower horizontal member jointed so as to be free to swing in all directions, rods connected at their central parts to the horizontal member by means of universal joints, a frame or link horizontally arranged, universally jointed to the lower ends of these rods and at its other end to a fixed fulcrum, a guiding and controlling arm universally jointed at one of its ends to the upper ends of these rods and carrying a tracer at its outer free end, a table beneath the tracer for holding the sample or copy to be imitated, a tool-carrying bar connected at its end by universal joints to the

side members of the suspended rectangular frame and arranged parallel to the lower member, means for holding this tool-bar from rotating on its axis in the plane of this frame, a tool or tools carried by this bar, and a work-holding bed or device located beneath the tool or tools adapted to hold the work to be engraved in position parallel to and a short distance above the tracing-table.

4. In an engraving and ornamenting machine, the combination of a suspended rectangular frame having its side members and lower horizontal member jointed so as to be free to swing in all directions, rods connected at their central parts to the horizontal member by means of universal joints, a frame or link horizontally arranged, universally jointed to the lower ends of these rods and at its other end to a fixed fulcrum, a guiding and controlling arm universally jointed at one of its ends to the upper ends of these rods, and carrying a tracer at its outer free end, a table beneath the tracer for holding the sample or copy to be imitated, a tool-carrying bar connected at its ends by universal joints to the side members of the frame between the upper swinging bearings of the frame and the tracer-arm, an arm or projection extending from the rear of the tool-carrying bar, and a link universally connected to this arm and to a fixed projection of the main frame and arranged parallel to the plane of the rectangular frame.

5. In an engraving and ornamenting machine, the combination of a suspended rectangular frame having its side members and lower horizontal member jointed so as to be free to swing in all directions, rods connected at their central parts to the horizontal member by means of universal joints, a frame or link horizontally arranged, universally jointed to the lower ends of these rods and at its other end to a fixed fulcrum, a guiding and controlling arm universally jointed at one of its ends to the upper ends of these rods and carrying a tracer at its outer free end, a table beneath the tracer for holding the sample or copy to be imitated, a tool-carrying bar connected at its ends by universal joints to the side members of the frame between the upper swinging bearings of the frame and the tracer-arm, an arm or projection extending from the rear of the tool-carrying bar, and a link universally connected to this arm and a fixed projection of the main frame and arranged parallel to the plane of the rectangular frame, a tool-holding device or tool-holding devices vertically arranged in front of the tool-carrying bar, and horizontal parallel links pivoted to the upper and lower ends of the tool-holding devices and to the tool-carrying bar.

6. In an engraving and ornamenting machine, the combination of a suspended rectangular frame, comprising two hanging side members each composed of an upper offset frame and a lower rod or part adjustably secured thereto, and a lower horizontal member jointed to the lower ends of the lower rods or

parts of the side members, a guiding and controlling arm connected at one of its ends to the lower horizontal member or bar of the rectangular frame and having a tracer at its free end, a tool-carrying bar connected at its ends to the upper ends of the lower parts of the side members of the rectangular frame by means of universal joints, means for holding the tool-carrying bar substantially vertically or from rotating on its axis in the plane of the frame, a tool or tools connected to the tool-carrying bar, and a bed or table located beneath the tool or tools upon which the work is held.

7. In an engraving and ornamenting machine, the combination of a suspended rectangular frame, comprising two hanging side members each composed of an upper offset frame and a lower rod or part adjustably secured thereto, and a lower horizontal member jointed to the lower ends of the lower rods or parts of the side members, a guiding and controlling arm connected at one of its ends to the lower horizontal member of the frame and having a tracer at its free end, a table beneath the tracer for holding the sample or copy to be imitated, a tool-carrying bar connected at its ends by universal joints to the upper ends of the lower rods or parts of the side members of the frame between the upper swinging bearings of the frame and the tracer-arm, an arm or projection extending from the rear of the tool-bar, and a link universally connected to this arm and to a fixed projection of the main frame and arranged parallel to the plane of the rectangular frame.

8. In an engraving and ornamenting machine, the combination of a suspended rectangular frame having joint connections at its corners whereby it is free to move in all directions, a guiding and controlling arm, connected at one of its ends to the lower horizontal member or bar of the rectangular frame and having a tracer at its free end, a tool-carrying bar connected at its ends to the side members or rods of the rectangular frame by means of universal joints, means for holding the tool-carrying bar substantially vertically or from rotating on its axis in the plane of the frame, a tool-holding device or tool-holding devices vertically arranged in front of the tool-carrying bar, and horizontal parallel links pivoted to the upper and lower ends of the tool-holding devices and to the tool-carrying bar, a spring-actuated frame extending under the lower parallel links of the tool-holders and normally holding the

tools away from the work, and a treadle connected to this frame for depressing it and releasing the tool-holders.

9. In an engraving and ornamenting machine, the combination of a suspended rectangular frame having joint connections at its corners whereby it is free to move in all directions, a guiding and controlling arm, connected at one of its ends to the lower horizontal member or bar of the rectangular frame and having a tracer at its free end, a tool-carrying bar connected at its ends to the side members or rods of the rectangular frame by means of universal joints, means for holding the tool-carrying bar substantially vertically or from rotating on its axis in the plane of the frame, a tool-holding device or tool-holding devices vertically arranged in front of the tool-carrying bar, and horizontal parallel links pivoted to the upper and lower ends of the tool-holding devices and to the tool-carrying bar, a spring-actuated frame extending under the lower parallel links of the tool-holders and normally holding the tools away from the work; and a treadle and adjustable connections between the treadle and the spring-actuated frame.

10. In an engraving and ornamenting machine, the combination of a suspended rectangular frame having joint connections at its corners whereby it is free to move in all directions, a guiding and controlling arm connected at one of its ends to the lower horizontal member or bar of the rectangular frame and having a tracer at its free end, a tool-carrying bar connected at its ends to the side members or rods of the rectangular frame by means of universal joints, means for holding the tool-carrying bar substantially vertically or from rotating on its axis in the plane of the frame, a tool-holding device or tool-holding devices vertically arranged in front of the tool-carrying bar, and horizontal parallel links pivoted to the upper and lower ends of the tool-holding devices and to the tool-carrying bar, vertical tool-carrying spindles in the tool-holding devices, pulleys on the upper ends of these spindles, guide-pulleys fitted on studs on the tool-carrying bar, and a drive-belt around the pulley.

In testimony whereof I have hereunto subscribed my name.

WILLIAM S. EATON.

Witnesses:

FRANCIS H. WALSH,  
FRANK B. GLOVER.