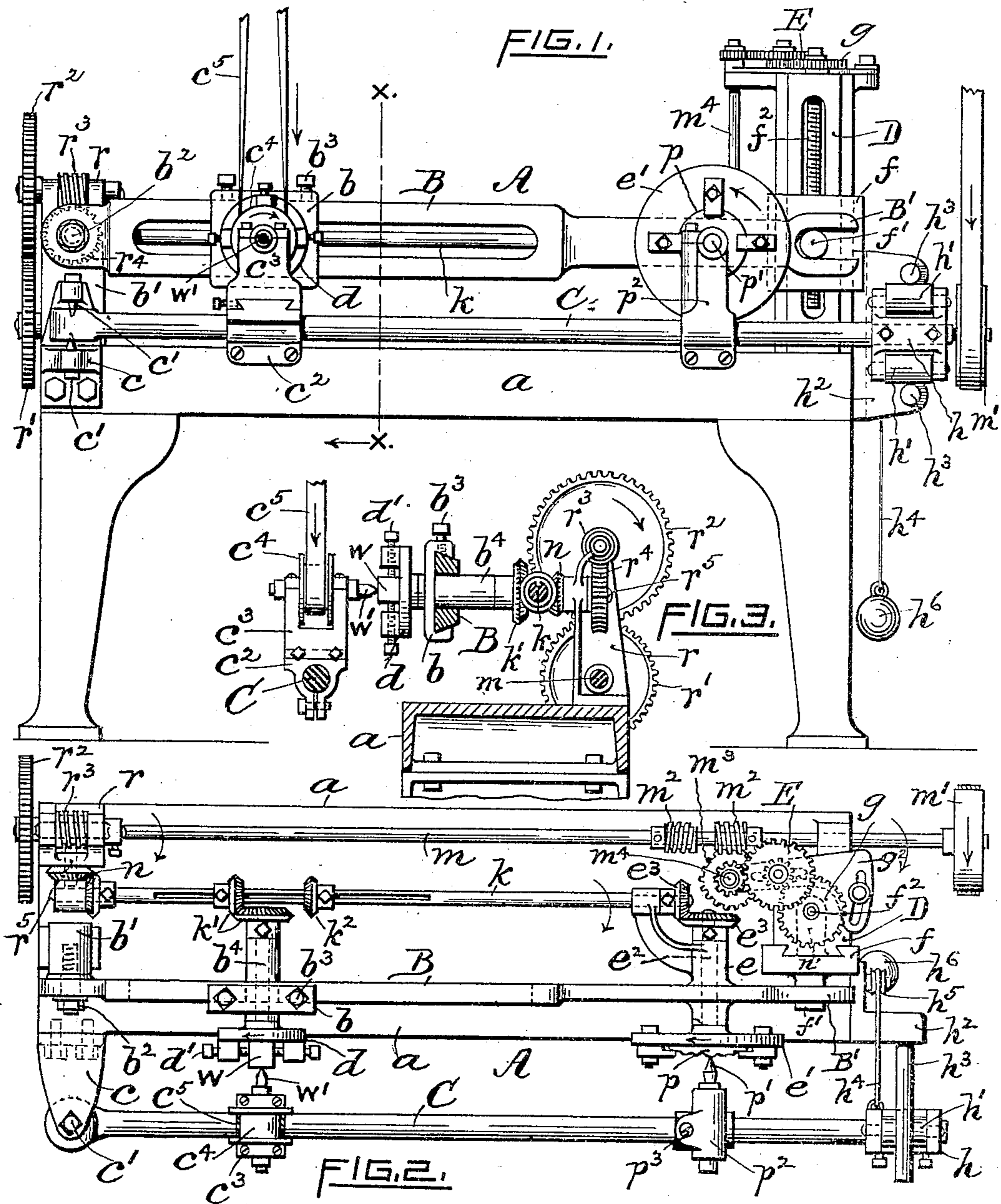


No. 814,611.

PATENTED MAR. 6, 1906

A. J. LOEPSINGER.  
DIE ENGRAVING MACHINE.  
APPLICATION FILED APR 19, 1905.



WITNESSES.

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# UNITED STATES PATENT OFFICE.

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## DIE-ENGRAVING MACHINE.

No. 814,611.

Specification of Letters Patent.

Patented March 6, 1906.

Application filed April 19, 1905. Serial No. 256,420.

*To all whom it may concern:*

Be it known that I, ALBERT J. LOEPSINGER, a citizen of the United States of America, and a resident of Providence, in the county of Providence and State of Rhode Island, have invented certain new and useful Improvements in Die-Engraving Machines, of which the following is a specification.

My invention relates to improvements in engraving-machines, and more particularly to the class of machines employed for automatically engraving dies and other analogous articles, wherein a rapidly-revolving endwise-movable cutting-tool acting upon the slowly-turning stock or die produces on or in the latter a reduced or enlarged facsimile of the pattern being reproduced. In machines of the type referred to it has been usual heretofore to employ a pivoted bar carrying the cutter and stylus or tracer members, said bar being mechanically actuated in both horizontal and vertical planes and having the revoluble pattern and die holders adjustably mounted on and secured to the stationary bed of the machine. There are objections to such former construction in that it is practically impossible to arrange a belt-drive for the cutting-tool that will automatically adapt or adjust itself to the ever-changing positions of the cutter-bar and at the same time keep the belt under proper tension. In most machines, too, the bar is unsupported at its free end, or at least imperfectly so, the result being that the stylus cannot faithfully follow the contour of the pattern.

The object I have in view is to produce a die-engraving machine in which the disadvantages above referred to are overcome, my improved machine being much less expensive to manufacture, simpler in construction, adjustment, and manner of operation, and also capable of performing more and better work.

In carrying out my invention I employ two pivotally-mounted swinging bars. One, carrying revoluble holders for the pattern and die, I term the "work-bar;" the other bar, arranged in front of but below the work-bar, carrying the stylus and revoluble cutting-tool, I term the "tool-bar," said bars being arranged to move in planes at right angles to each other. The cutting-tool is driven by a

sufficiently powerful belt having a substantially uniform tension at all positions of the tool-bar.

My invention consists, essentially, in the novel construction, arrangement, and manner of operation of the parts or elements, substantially as hereinafter set forth and claimed.

In the accompanying sheet of drawings, Figure 1 is a front side elevation representing my improved engraving-machine. Fig. 2 is a plan view of the same, and Fig. 3 is a transverse sectional view taken on line *xx* of Fig. 1.

The following is a more detailed description of my improved engraving-machine A and the manner of its operation.

As drawn, the work-bar B (carrying the pattern *p* and the die or reproduction *w*) is pivotally fixed at its rear end *b*<sup>2</sup> to a bracket *b*<sup>1</sup>, secured to the bed *a*, the arrangement being such that the other portion of the bar is adapted to be mechanically swung or moved through a circular arc in a vertical plane, the tool or cutter bar C being pivoted at *c*<sup>1</sup> to a fixed bracket *c* and arranged to swing through a circular arc in a horizontal plane. The said work-bar is made very stiff and is strongly supported. The free end *B*<sup>1</sup> of the bar is forked to receive a large well-fitted stud *f*<sup>1</sup>, extending horizontally from a cross-head *f*, slidably fitted to the vertical head *D*, fixed to the front end of the bed *a*. At a point near its outer end the bar is provided with a horizontal bearing *e*, in which is fitted a revoluble shaft *e*<sup>2</sup>, Fig. 2, the latter having secured to its front end a suitable chuck or holder *e*<sup>1</sup>, constructed and arranged to retain the model or pattern *p* therein. The bar is also provided with a revoluble chuck or holder *d*, having screws *d*<sup>1</sup>, which hold the work or die *w* in position while it is being cut or reproduced from said pattern. Said work-holder is secured to a horizontal short shaft arranged parallel with said shaft *e*<sup>2</sup> and is mounted to revolve in bearings *b*<sup>4</sup> of a cross-head *b*, slidably fitted on the bar B. Screws *b*<sup>3</sup> serve to maintain the member *b* in any desired position with respect to said pattern.

The mechanism for swinging the bar B upwardly from the horizontal position consists, as drawn, of a worm *m*<sup>2</sup>, secured to the main driving-shaft *m*, meshing with the toothed wheel *m*<sup>3</sup>, Fig. 2, in turn secured to

and rotating the vertical shaft  $m^1$ , Fig. 1. The latter actuates a suitable change-gear train E at the top of said head D, the last gear  $g$  of the series being secured to the upper end of a vertically-supported revoluble screw  $f^2$ , passing through a nut  $n'$ , Fig. 2, secured to the back of said cross-head  $f$ . Upon revolving the screw in the proper direction the bar B will be slowly elevated, the forked end at the same time sliding on the stud  $f'$  a distance corresponding to the versed sine of the arc through which the bar is moved. The screw  $f^2$  may be manually revolved in either direction in any well-known manner, after moving the gear-holder  $g^2$ , Fig. 2, rearwardly to disengage the mechanically-driven gears of the train E from the said gear  $g$ . While the work-bar is being thus slowly elevated, it is obvious that the pattern and work holders must be continuously rotated concurrently in unison and at a uniform rate of speed. The means illustrated for effecting such mechanical action consists of a shaft  $k$ , disposed at the rear of, supported by, and parallel with the longitudinal axis of the bar. On said shaft are secured bevel-gears  $e^3$  and  $k'$ , meshing with similar gears secured, respectively, to the rear ends of the pattern and work holder shafts, as clearly shown in Fig. 2. The power for rotating shaft  $k$  is transmitted from the rear end of main shaft  $m$  via a spur-gear  $r'$ , secured thereon, to a fellow gear  $r^2$ , fixed to a short shaft mounted in a bracket  $r$ . To the last-named shaft is secured a worm  $r^3$ , meshing with a worm-gear  $r^4$ , in turn fast to a suitably-mounted short horizontal shaft  $r^5$  in alinement with, but at the rear of, the center or pivot point  $b^2$  of the work-bar. A pair of bevel-gears  $n$   $n$  is secured to the adjacent ends of shafts  $r^5$  and  $k$ . As thus arranged it will be seen that the speed of shaft  $m$  is much greater than that of shaft  $k$ . In order to produce in the die a reverse copy of the pattern  $p$ , gear  $k'$  on shaft  $k$  is disengaged from its fellow gear and the opposite gear  $k^2$  brought into engagement with the latter. The pattern in this arrangement does not change its turning direction.

The pivotally-mounted horizontally-movable cutter or tool-bar C possesses great rigidity and is accurately supported at its outer or free end, while at the same time permitting it to swing freely. The means shown for supporting the bar consists of a head or block  $h$  secured thereon, provided with upper and lower antifriction-rolls  $h'h'$ . These in turn are interposed between and in rolling frictional engagement with stationary guide-pins  $h^3$ , secured to a bracket  $h^2$ , rigidly fixed to the front end of the bed  $a$ , the longitudinal axes of the pins being disposed at substantially right angles to that of the bar C. As thus constructed the bar is accurately supported both vertically and laterally. To the bar C is adjustably secured a holder member  $p^2$ , its upper portion

being bored transversely or in alinement with the center of said pattern-holder to receive a suitable stylus or tracer  $p'$ , a clamp-screw  $p^3$  maintaining the tracer in position with respect to the face of the pattern. The bar C is further provided with a cutter-carrying head comprising, as drawn, a base member  $c^2$ , adjustably secured to the bar and having a transversely-movable carriage  $c^3$ , adjustably mounted on its upper side. The carriage is provided with bearings supporting a short rapidly-revoluble spindle taking its motion from a small flanged pulley  $c^4$ , secured thereon, said pulley being rotated by a vertical driving-belt  $c^5$ . The spindle is hollow and arranged to receive and hold therein a suitable drill or cutting-tool  $w'$ , the longitudinal axis of the latter and that of the die-holder  $d$  being in alinement when the bar B is in the normal or horizontal position.

Assuming now that the members or parts of my improved engraving-machine A have been constructed, arranged, and positioned substantially as represented in the drawings, the manner of its operation when employed for engraving or sinking dies, &c., is as follows: The original or pattern  $p$  to be copied is first secured in its holder or jaws  $e'$ , followed by moving the work-holder  $d$  along the then horizontal work-bar B until the point is reached which corresponds to the desired size or proportion of the reproduction to be made, the gear  $k'$  (or  $k^2$ ) being kept in engagement with its fellow gear. The holder  $d$ , gears, and die-blank are next secured in the adjusted positions. The tracer  $p'$  and cutter  $w'$  are then properly positioned, the centers being in alinement with that of the pattern  $p$  and die-blank  $w$ , respectively. Now upon starting the machine the previously-adjusted gear-train, &c., are actuated by power transmitted to the driving-pulley  $m'$ , the cutter  $w'$  at the same time being rapidly rotated by means of the traveling belt  $c^5$ , thereby slowly revolving the pattern and die in unison, the result being that the combined action of the slowly-turning holders and slowly-rising work-bar B causes the engraving-tool or cutter to describe a continuous spiral cut having a gradually-increasing diameter coincidently with a corresponding spiral path traced on the contour of the face of the pattern by the yielding engagement therewith of the hardened or non-wearing point of the stylus, the operation being continued until the entire surface of the pattern has been engaged by the stylus. It will be found that the reproduction thus formed on the face of the die  $w$  will be a perfect facsimile, except as to size, of the original pattern  $p$ . I would add that in order to maintain a suitable working contact of the stylus and cutter with the revolving pattern and die the tool-bar C is connected with a depending weight  $h^6$  by means of a cord  $h^4$  passing over an idler  $h^5$ . (See Fig. 2.)

I claim as my invention and desire to secure by United States Letters Patent—

1. In an engraving-machine of the character described, the combination of a mechanically-actuated swinging work-bar, revoluble pattern and work holders mounted thereon, a swinging tool-bar, a stylus and cutting-tool mounted on said tool-bar, and having the movements of said work and tool bars effected in planes at right angles to each other.

2. In an engraving-machine of the character described, a swinging non-revoluble work-bar, means for imparting angular movement to said bar, and revoluble pattern and work holders mounted thereon, in combination with a suitably guided and supported swinging tool-bar, a stylus and a revoluble cutter adjustably mounted on said tool-bar.

3. In an engraving-machine of the character described, the combination of a pivotally-mounted swinging work-bar, pattern and work holders mounted on and carried by the bar, mechanism connected to and swinging in unison with said bar for rotating said holders, and a swinging cutter-carrying bar mounted to move perpendicular to the plane of movement of the said work-bar.

4. In an engraving-machine of the character described, a mechanically-operated swinging work-bar adapted to move in one plane, and revoluble pattern and work holders mounted on said bar, in combination with a swinging tool-bar mounted to move perpendicular to the plane of movement of the said work-bar, a stylus and a revoluble cutter adjustably mounted on said tool-bar and arranged to coact with said pattern and work holders, respectively, substantially as described.

5. In an engraving-machine of the character described, the combination with a swinging work-bar fulcrumed at one end and revoluble pattern and work holders mounted thereon, of a revoluble shaft for imparting a corresponding movement to said holders, said bar and shaft members being arranged to move or swing in unison with each other, means for rotating said shaft, and mechanism connected with and supporting the free end of the work-bar for swinging the latter in a circular arc, substantially as described.

6. In an engraving-machine of the character

described, the combination of a work-bar pivoted at one end, pattern and work holders mounted thereon, and a movable carriage or cross-head supporting the other end of said bar, whereby the latter is adapted to swing through a circular arc.

7. In an engraving-machine of the character described, the combination of a pivoted work-bar, a suitably-mounted revoluble shaft parallel therewith, means for simultaneously moving said bar and shaft in a circular arc, and a pivoted tool-bar arranged to swing perpendicular to the plane of movement of the said work-bar.

8. In an engraving-machine of the character described, the combination of a pivotally-mounted work-bar, a vertically-movable cross-head supporting the outer or free end of the bar for imparting a swinging movement to the latter, a pivoted tool-bar mounted to move perpendicular to the plane of movement of the work-bar, and rigidly-fixed members for supporting and guiding the free end of the tool-bar, substantially as described.

9. In an engraving-machine of the character described, the combination of a work-bar pivotally mounted at one end, a revoluble pattern-holder non-adjustably mounted in the opposite or free end portion of the bar, a revoluble work-holder adjustably mounted on the bar, mechanism for rotating said holders in unison, and means for slowly swinging the bar and its revoluble holders through a short circular arc.

10. In an engraving-machine of the character described, the combination of a pivoted work-bar, means for swinging said bar through a circular arc, pattern and work holders mounted on and movable with said bar, means operatively connected with said holders for revolving the latter while the bar is in any working position, a pivoted tool-bar mounted to move perpendicular to the plane of movement of the said work-bar, and stylus and cutting-tool members mounted on said tool-bar.

Signed at Providence, Rhode Island, this 18th day of April, 1905.

ALBERT J. LOEPSINGER.

Witnesses:

GEO. H. REMINGTON,  
CALVIN H. BROWN.