

UNITED STATES PATENT OFFICE.

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ENGRAVING AND DIE-SINKING MACHINE.

SPECIFICATION forming part of Letters Patent No. 659,461, dated October 9, 1900.

Application filed December 7, 1899. Serial No. 739,500. (No model.)

To all whom it may concern:

Be it known that I, FREDERICK D. VAN NORMAN, 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 Die-Sinking Machines, of which the following is a full, clear, and exact description.

This invention relates to improvements in machines for profiling or die-sinking various kinds of milling, although the machine is specially designed to be used in a manner to have the tool or cutter follow a course or contour which corresponds to a pattern, which is removably supported thereon, along the edge of which pattern a tracer adheres.

The object of the invention is to produce a machine having a comparatively-wide scope or capacity for a large variety of work which shall be simple, inexpensive, practical, and convenient in operation.

The invention consists in the combinations and arrangements of parts and the construction of certain of the parts, all substantially as hereinafter fully described, and set forth in the claims.

Reference is to be had to the accompanying drawings, in which—

Figure 1 is a side elevation of my improved die-sinking or profiling machine. Fig. 2 is a front view of the same. Fig. 3 is a side view of a fixture which may be used in substitution of the cutter-carrying head shown in Fig. 1. Fig. 4 is likewise a view of another fixture which may be used in substitution of either of the cutter-carrying heads shown in the other views.

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

In the drawings, A represents the standard or upright supporting frame or structure of the machine, having the overhanging portion A², provided on its under horizontal side with the wide dovetailed rib *a* and also provided thereunder, suitably near its bottom at its vertical front face, with the wide vertical dovetailed rib *b*.

B represents the bed or base, constructed with a dovetailed opening within its rear side, whereby it is adapted for a sliding fit vertically on the lower front portion of the stand-

ard. The bed B has engaged therewith the upper unthreaded and shouldered portion of the screw-shaft *d*, which screw engages in the threaded upstanding hub or stationary projection *e*, formed or affixed on the base of the standard. The screw-shaft has fixed upon its upper end the bevel gear-wheel *d*², with which meshes the bevel gear-wheel *d*³, which is carried at the inner end of the horizontal shaft *d*⁴, said shaft being provided with the hand-wheel *d*⁵, by means of which to conveniently turn the shaft, and thereby rotate the screw-shaft for effecting the raising and lowering of the work-supporting bed B.

C represents a slide which is capable of being moved forward and rearward horizontally on the bed B, and D represents a second slide having a dovetail engagement with the slide C, whereby it is movable horizontally relatively to the bed at right angles to the movement of the slide C. The upper sliding part D receives directly thereupon the work or article to be operated upon by the mill, cutter, or tool used in the machine. Said part D is shown as having T-grooves *e* formed within and below its top surface for the reception of the headed clamping-bolts *e*², upon which the nuts *e*³ are applied to confine the clamping member *e*⁴, which hold the piece *y* to be worked upon.

E represents a table or support sustained by the bracket E², on which is movably confined the pattern *w*, having the contour desired to be reproduced in or on the piece *y*. The pattern may be either depressed or in relief.

F represents a slide having a dovetail engagement horizontally for a movement forward and back along the aforementioned wide dovetailed rib *a* at the under side of the overhanging head or part *a*² of the standard. G represents a second slide having a dovetail engagement with and at the under side of the sliding part F for a transverse movement in a horizontal plane—that is, a movement in a line at right angles to the movement which the sliding part F is permitted to have. These slides F and G are constructed and lubricated that the one slide F may have its movement most freely upon or relatively to the overhanging part of the standard in the one direction, and the other slide G may have

most freely its movement right angularly to the direction of movement of said slide F. The lower or secondary slide G has the bracket-arm G^2 , constructed with the vertical axially-bored hub f for the reception adjustably therein of the tracer J, the position of which is over and in proximity to the pattern. The confining-screw f^2 permits the tracer to be held immovably in any suitable vertically-adjusted position.

M represents the cutter or tool-carrying head, the same being mounted upon the under side of the slide G, and it is provided with journals g g for the tool-carrying spindle h , which has the pulley h^2 thereon, by means of which, through the belt h^3 , suitably driven, the tool-spindle is rotated. As illustrated in Fig. 3, the tool-carrying head is so mounted that the tool-spindle ever remains with its axial line perpendicular to the plane of movement of the slides F and G; but in order to give the machine increased scope I prefer to construct the head for the tool or cutter in two parts or members, the one, m , adapted for a swiveling movement relative to and in the plane of movement of the slide G—that is, as shown, in a horizontal plane—and the other, m^2 , for a swiveling movement for adjustment relatively to said part m at right angles thereto. n represents a swivel-pin, pivoted to said portion m of the head, engaging in a socket therefor in the underside of the lower horizontal elevated slide G, and the said slide G has the T-groove n^2 , concentrically arranged relatively to the swivel-pin for the reception of the head of the bolt n^3 , on which is provided the confining-nut, all as will be manifest from an inspection of Fig. 1. The primary member m of the tool-carrying head is constructed as a knee—that is, it has, in addition to the horizontal upper portion, which is swiveled on the under side of the slide G to move bodily therewith, the depending front portion 10, constructed with the arc-slot 12, which is concentrically formed relatively to the swivel pin or bolt 13, which forms the connection between the secondary member m^2 of the head and the primary member thereof. The said secondary member has the pin or bolt 14, projecting through the aforementioned arc-slot 12, the nut on the front end of the said bolt adjustably confining the one part in its given set position relatively to the other. It will therefore be manifest that the tool-carrying spindle and the tool or cutter may be carried axially vertical or it may have an inclination in any direction desired to the normal vertical line. For instance, the secondary member m^2 of the head may be adjusted on the primary member m , so that the tool will stand with its axis at seventy-five degrees of inclination to the horizontal plane of movement of the tool, the spindle, nevertheless, being as to all parts of its length in a vertical plane coincident or parallel with the movement of the slide G. Now by adjusting the member m of the head more or less, as

desired, the spindle may be brought into a plane angular to the line of movement of the slide G. Of course it is understood that however the spindle for the tool or cutter may be adjustably confined it always retains its inclination throughout the entire course or circuit of its bodily movement until it shall have been readjusted.

Projecting forwardly from the front side of the overhanging upper part of the frame-standard is the horizontal swiveling-pin o , adapted to turn in its engagement in the socket o^2 therefor, which is formed in the aforementioned overhanging part of the standard.

o^3 represents the restraining collar or shoulder for the swivel-pin.

The forward end of the swivel-pin is constructed bifurcated or with the separated earpieces o^4 o^4 .

Forwardly projecting from the front side of the slide G is the short bar or stud t , the forward end of which has the ball-and-socket engagement, as indicated at t^2 , with an intermediate portion of the operating handle-lever P, the upper end of which lever is constructed with the slot u , engaging through which is the pin u^2 , which is supported by and penetrates through both of the aforementioned earpieces of the swivel-stud o .

It being understood that the tracer or guiding-pin is adjusted down to working proximity to the pattern and the bed has been adjusted to bring the work to be operated upon within the range of action of the tool or cutter, the operator may by proper manipulations of the handle-lever P, both fore and aft and transversely, as permitted by the swiveling, ball-and-socket, and pin-and-slot connections or engagements pointed out, impart the pantagraphic movement to the cutter as constrained by the motions of the slides F and G in parallel planes at right angles to each other and as governed by the tracer, care of course being exercised that the tracer adheres to and is kept in contact on the margin of the pattern at all times.

As indicated in Fig. 1, the part m of the tool-carrying head has on the semicircular portions thereof, which are right-angular to each other, the graduations, as indicated at 16, by means of which the degrees of inclination of the axis of the cutter to two planes which are perpendicular to each other may be determined.

The bottom portion of the standard A near its front face is provided with the vertical rod or bar r , rigidly held by and between the bracket-lugs r^2 , and on this vertical rod is adjustably confined the stop r^3 .

r^4 represents a dog or abutment affixed on the vertically-movable bed B. The adjusted position of the stop r^3 determines the height to which the bed and the work thereon may be elevated.

The upper slide F is provided with the abutment or dog s , which projects horizontally

outwardly from its side. The part A^2 of the standard is constructed with the horizontal T-groove s^2 parallel with the length of the dovetailed slide a . s^3 s^3 are adjustably confined lugs having the screws or bolts s^4 threading through said lugs and both located in a common line at the level of the abutment s . The lugs s^3 are held in their adjustments by T-bolts and nuts s^5 . The slide member F has similarly a T-groove s^* , in which are adjustably engaged the lugs 17 17 by T-bolts and nuts, which lugs have the screw-stops 18 in line with the abutment q , affixed on the slide G . The traverses of the slides F and G may be limited by the adjustments of the stop devices, or the stops may be set up hard against the abutments s and q , whereby the tool can have no bodily movement in any direction in a line across its axis, or the stop for one slide may be left open and the other locked, whereupon there may be a traverse of the cutter in one direction with no possibility of motion in a direction angularly thereto.

The bracket E^2 is shown as adapted to be swung and locked by the nut 20, so that it may have its position under the tracer J , or it may be swung away from under the tracer and around against the side of the standard.

The parts o and t by being removably affixed at the head of the standard and on the tool-carrying slide G permit their detachment and the detachment of the operating-lever handle, which may be desirable when the machine is to be utilized for work other than pattern-controlled work—as, for instance, when it is desired to use the machine as a plain vertical miller. In such a case the tool-carrying head may be set in any given position over the bed or work-table and fixed or locked by setting up the stops on each side of the abutments for the two slides.

As an example of the capability of the present improved machine for certain kinds of work wherein the axis of the cutter is inclined to the vertical while the tracer remains in a vertical position, it will be mentioned that in making and reproducing certain forms of cutter-knives the pattern need have but a square face or edge, against which the tracer would have guiding contact, as usual, while the cutter could be set at any required degree of inclination. Again, in undercutting or backing out for clearance an internal wall of a die opening the susceptibilities for use of the improved machine are found.

In the new arrangement and organization of the parts and appliances comprised in and constituting the present improvements in machines for die-sinking and other analogous kinds of work in which a controlling-lever for imparting all the compounds or resultants of reciprocatory movements to the tool and tracer in directions at right angles to each other is provided which is independent of the tracer advantageous results and conveniences are acquired, and in this connection it will be stated

that with the bracket or otherwise suitably-supported pattern and the adjacent tracer and independent operating-lever the guide-pin or tracer may remain in contact at the proper depth at the edge of the pattern, while the work-holding table may be set to a cut of any depth, as variably from one one-hundredth to one-half an inch, without reference to the guide-pin, which may remain at the same depth of overlap at the edge of the pattern, and the lever may be of any length desired for the power as may be necessary to easily impart the motions to the movable parts.

When the machine is constructed with the tool-carrying head M so mounted or affixed on the lower slide G as to be without capability of swiveling movement thereon, (although it may have an adjusting slide movement horizontally relatively thereto,) the profile-governing stud or tracer, which may be carried directly supported from the tool-carrying head, may operate in relation to the pattern, which is mounted on the bed, as well as the work y , instead of working in relation to a pattern to which an independent bracket is provided for the support thereof.

As a fixture to be carried on the slide G in substitution of the swiveling-knee m , on which the tool-carrying head is mounted to be turned adjustably thereon, I may provide the part m^* , (shown in Fig. 4,) which resembles the knee-shaped part m , but which, instead of being swiveled to the slide G , is otherwise connected thereto—as for instance, by having a dovetailed-slide engagement therewith, as indicated at m^4 . The tool-carrying head is mounted to turn on the said part m^* at the center of movement 13, as before described, the concentric slot 12 being provided also. This construction permits the vertical cutter-spindle being set at an angle without reference to being bodily swung into a plane other than one coincident with its normal axis.

The appliances illustrated in Figs. 3 and 4, to which reference has been made, as above, for substitution in the improved machine of the form of tool-carrying head shown in Figs. 1 and 2 are useful and available where the scope and range and variability of the work to be performed are not so great as required of the machine equipped as shown in Figs. 1 and 2 and in conjunction with which full descriptions and explanations have been given.

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

1. In a machine of the character described in combination, a supporting standard or head, a slide adapted for horizontal movement thereon, and a second slide movable on the first slide right-angularly thereto, and carrying a cutter-head, a rigid depending arm carried by the second slide and provided with a tracer, a bracket for a pattern in conjunction with which the tracer coacts, the operating-lever arm P additional to and independ-

ent of the tracer, adapted for swinging movements in two directions at right angles to each other, and adapted to be manually operated, and having an engagement with the
 5 second slide, a work-support under said head, and relatively to which the said tool courses, which support is additional to and independent of the pattern-bracket, and which is vertically movable, and means for feeding the
 10 work-support vertically and for confining the same in any given adjustment to which it is fed, substantially as described and for the purposes set forth.

2. In a machine of the character described,
 15 the combination with a suitable work-support, of the two slides F and G, the one movable horizontally on a supporting part of the frame therefor, and the second movable horizontally on the first slide right-angularly to
 20 the line of movement of such slide, and having a cutter-head supported thereby which is adjustable rotatably in a plane perpendicular to the plane of movement of the cutter-head-supporting slide, and which is furthermore
 25 rotatably adjustable in a plane angular to the plane of said first adjustment, means for confining the head in its stated adjustments, a tracer supported by, and movable in unison
 30 with said slide G, a support for the pattern thereto an operating-lever handle pivotally connected to a fixed part of the machine to swing in one direction, and having a jointed connection with the said slide G relatively to
 35 which the lever may have swinging movements in a second right-angular direction, for the purposes set forth.

3. In a machine of the character described the combination with a vertically-adjustable
 40 work-support or bed and a pattern-support, of the two slides the one F movable horizontally above the bed on the elevated or overhanging supporting part of the frame therefor, and the second G, movable horizontally
 45 on the first slide right-angularly to the line of movement of such slide, and in a plane parallel therewith, and having a tool or cutter-head supported thereby which is adjustable about an axis perpendicular to the plane
 50 of movement of said slide G, and which is also adjustable about an axis that is parallel with the plane of movement of said slide G, the tracer bodily movable in unison with the cutter-head and having its location in operative
 55 proximity to the pattern, and in addition thereto the controlling handle-lever pivotally connected to a fixed part of the machine and having a jointed connection with the head G substantially as described.

60 4. In a machine of the character described,

the combination with the supporting frame or structure, and a work-support, of the slide F movable horizontally in one direction relatively to the supporting part of the frame therefor, and adjustable stop devices for limiting the movements of said slide relatively
 65 to the supporting-frame, the second slide G movable across the first slide angularly to the line of movement thereof and stop devices for limiting the movements of the second slide
 70 relatively to the first, the cutter-head comprising the two parts m and m^2 , the one formed with a portion which is swiveled to the said slide G and having an angular member on
 75 which the part m^2 is swivel-connected for an adjustable movement in a plane angular to the movement of the part m , means for confining said parts in their adjusted positions, the spindle for the tool or cutter journaled in
 80 said part m^2 , a tracer carried by the slide G, a pattern with which the tracer coacts, and a supporting-fixture therefor and in addition thereto, a lever-handle movable in two directions right-angular to each other for imparting the movements to the cutter-head and
 85 means for causing the approaching movements of the work-supporting bed and the cutter, the one relatively to the other.

5. In a machine of the character described, the combination with the supporting frame
 90 or structure A having the overhanging elevated portion A^2 , and the bed B vertically adjustable thereunder, and means for elevating it, the slide F movable horizontally in its sliding connection under said part A^2 , the slide
 95 G movable horizontally in its connection with the said slide F at right angles to the line of movement thereof, the angular part m swiveled under the slide G, and having means for confining it in its swivel adjustments, the part
 100 m^2 swiveled on the vertical member of said part m^2 , in a plane right-angular to the plane of swiveling movement of part m and means for confining it in its swivel-adjusted position, the cutter-spindle mounted on said part
 105 m^2 , and means for rotating it, a tracer-support bodily movable in unison with the cutter-head, provided with a tracing pin or stud, a pattern-support adjacent which the tracer has its location, the lever-arm P detachably
 110 connected and engaged with one of the slides and with the frame, and articulated for movements in two directions right-angular to each other, all substantially as described, and for the purposes set forth.

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Witnesses:

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