(No Model.) 2 Sheets—Sheet 1.

E. MEYERS.

DIE MILLING MACHINE.

No. 453,018. Patented May 26, 1891.

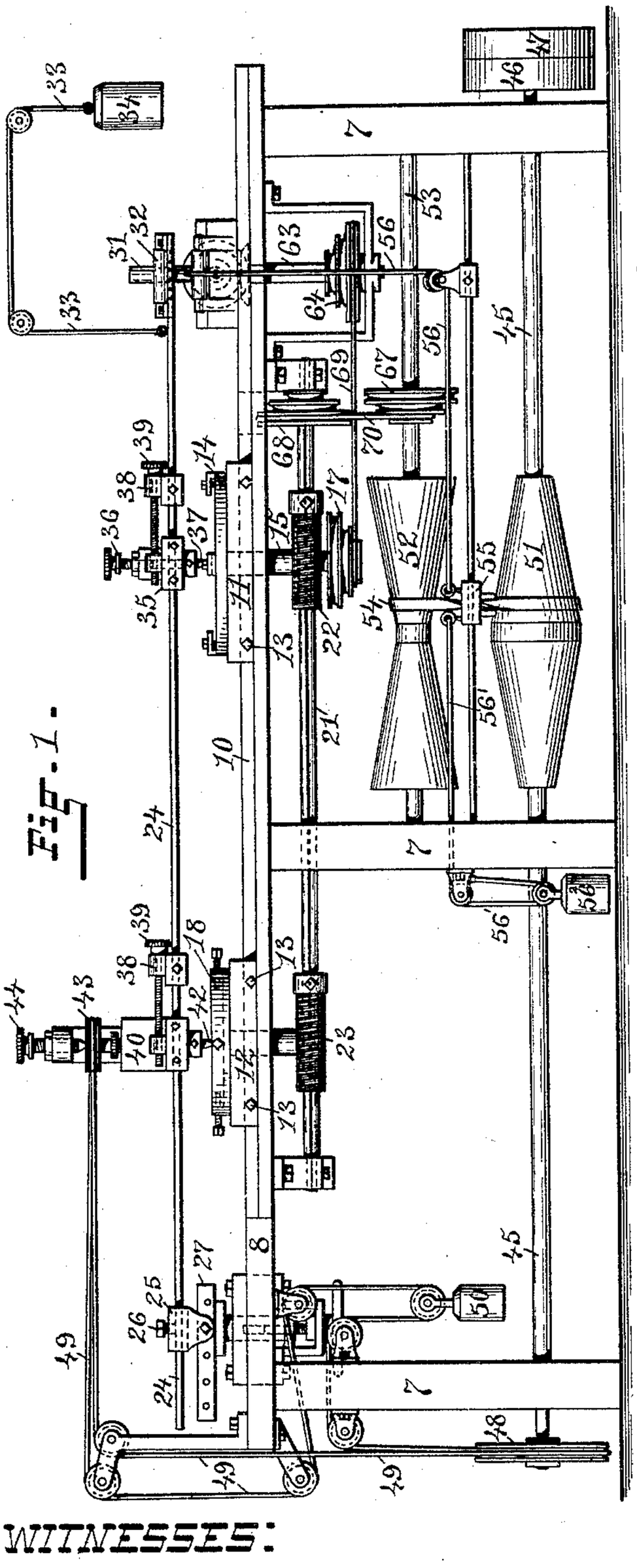

Fig. 1.

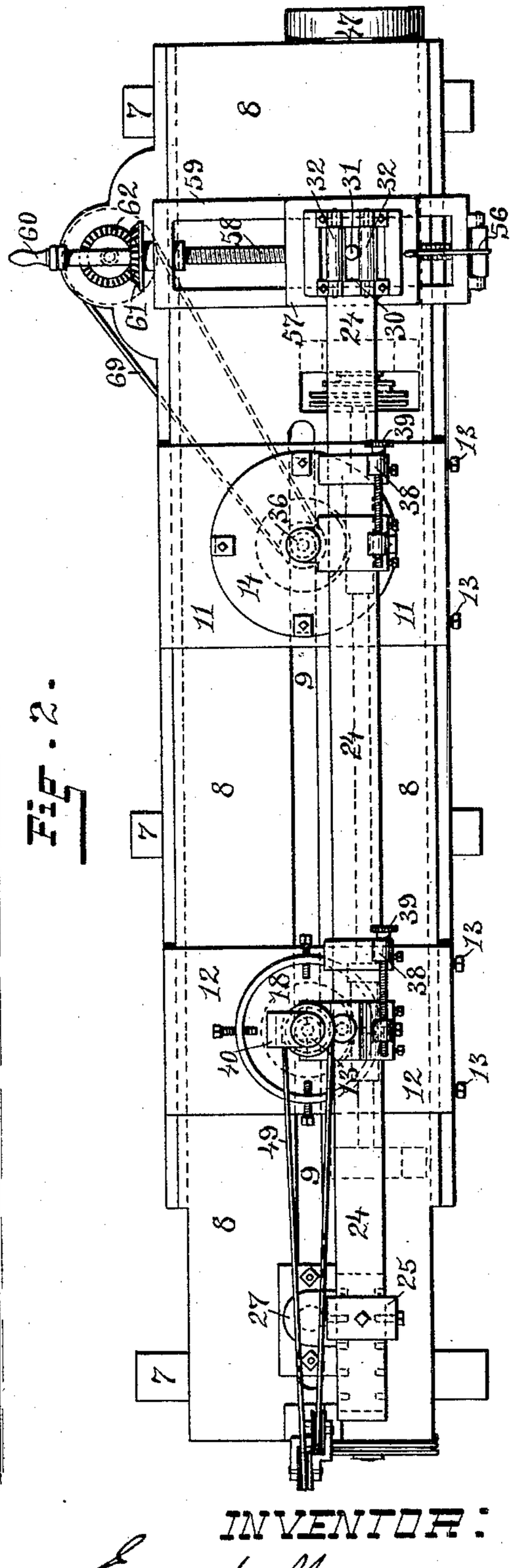

Fig. 2.

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(No Model.) 2 Sheets—Sheet 2.

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Fig. 3.

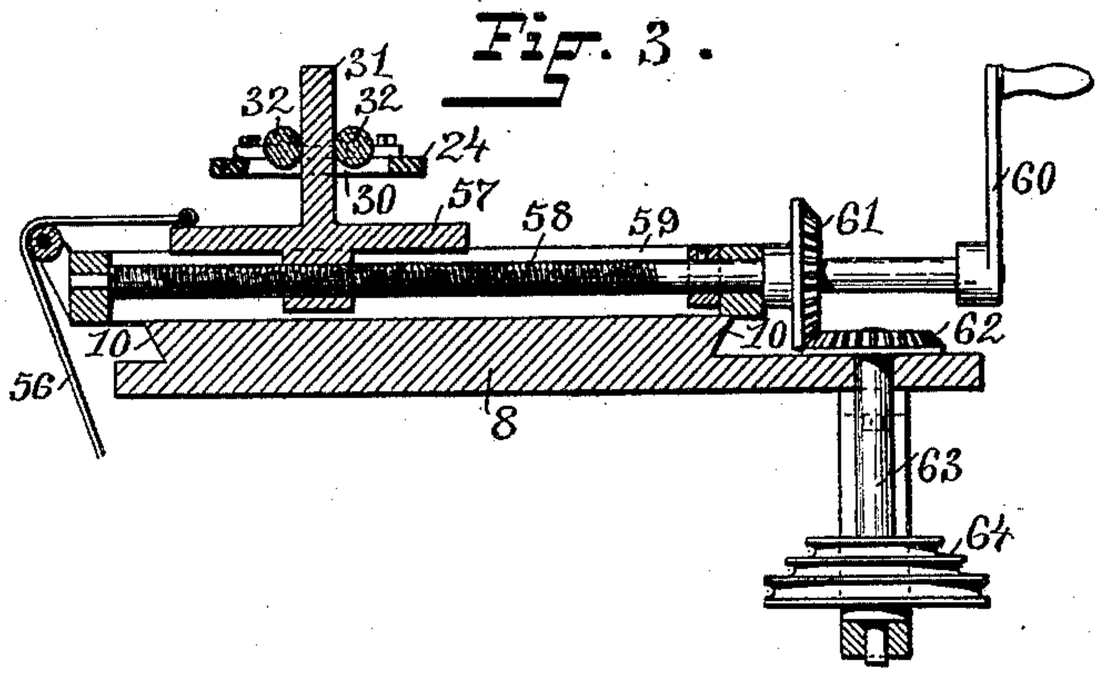


Fig. 4.

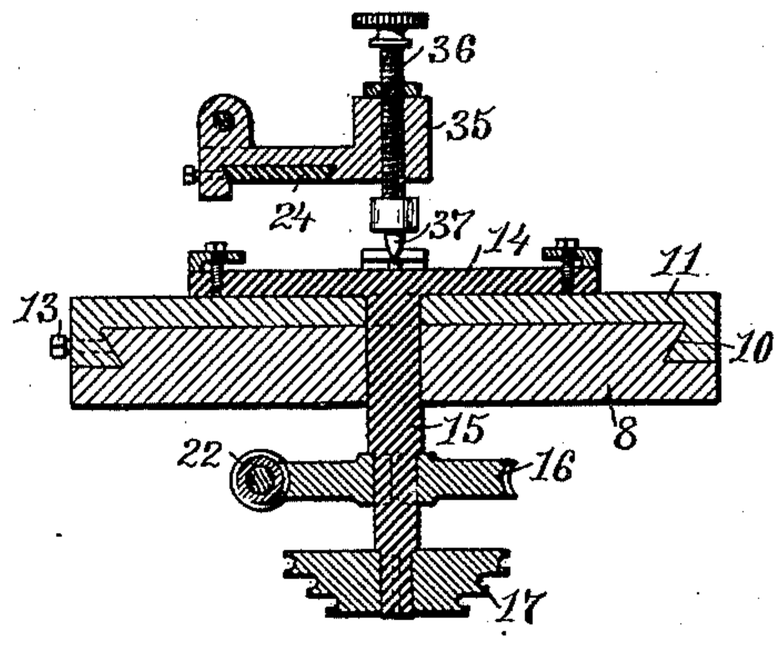


Fig. 5.

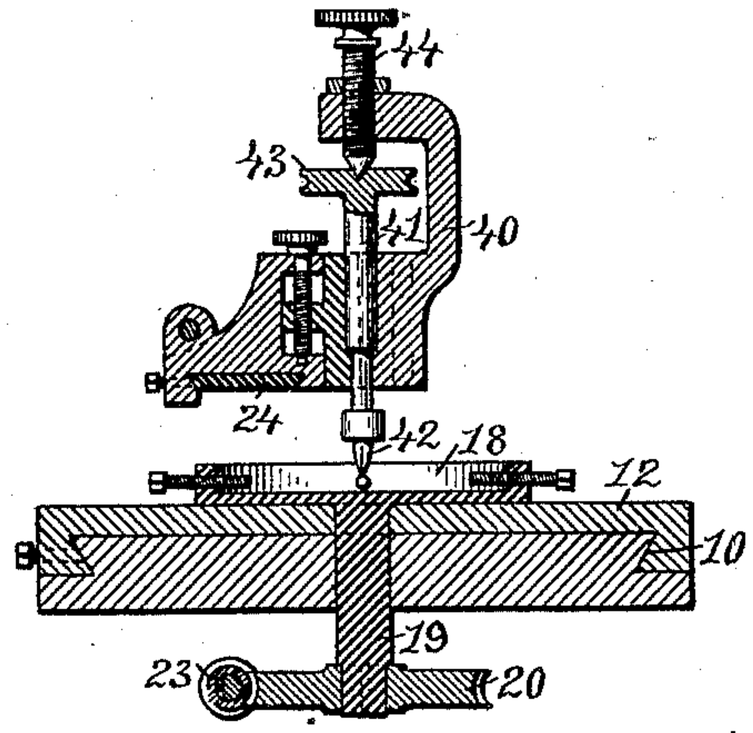
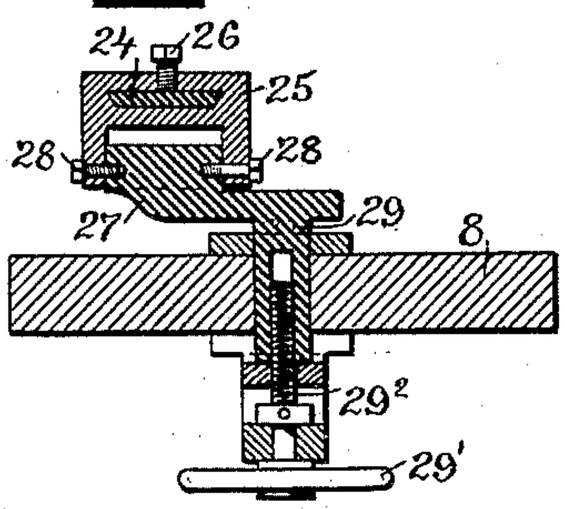


Fig. 6.



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UNITED STATES PATENT OFFICE.

ERNEST MEYERS, OF TAUNTON, MASSACHUSETTS.

DIE-MILLING MACHINE.

SPECIFICATION forming part of Letters Patent No. 453,018, dated May 26, 1891.

Application filed November 28, 1890. Serial No. 372,826. (No model.)

To all whom it may concern:

Be it known that I, ERNEST MEYERS, of Taunton, in the county of Bristol and State of Massachusetts, have invented a new and useful Improvement in Die-Milling Machines; and I hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming part of this specification.

This invention has reference to an improved machine for cutting dies; and it consists in the peculiar and novel construction by which a cameo die may be automatically cut by a milling-tool from an intaglio die, or vice versa, and an enlarged or reduced die may be automatically cut from another die, as will be more fully set forth hereinafter.

Figure 1 is a front view of my improved die-milling machine. Fig. 2 is a horizontal top view of the same. Fig. 3 is an enlarged vertical view of the traversing screw and mechanism for operating the same. Fig. 4 is a vertical section of the revolving die-holder and the stylus, shown partly in section. Fig. 5 is a sectional view of the die-holder and the milling-tool. Fig. 6 is a sectional view of the adjustable fulcrum.

Similar numbers of reference designate corresponding parts throughout.

In the drawings, the numbers 7 indicate the cross-frames forming the support of the machine. The bed-plate 8 is rigidly secured to the cross-frames 7, forming a horizontal table provided with the slot 9, extending lengthwise through or nearly through the center of the bed-plate 8. The two sides of the bed-plate have the undercut ways 10. The slide-rests 11 and 12 bear on the surface of the bed-plate 8 and fit the ways 10, so that the slide-rests may be moved longitudinally on the bed-plate. When adjusted to the desired position, the slide-rests are secured firmly to the bed plate 8 by the clamp-screws 13. The slide-rest 11 forms the support for the die-holder 14, which is provided with the spindle 15, turning in a bearing formed in the slide-rest 11. The spindle 15 extends through the slot 9 in the bed-plate 8, and has the worm-gear 16 secured to it below the bed-plate and at its lower end the cone band-pulley 17, as is shown in Fig. 4. The slide-rest 12 supports the die-holder 18, provided with the spindle 19, on which the worm-gear 20 is secured, as shown in Fig. 5. Both the die-holders 14 and 18 are provided with suitable clamping devices for securing the dies. The shaft 21, supported in suitable bearings, is provided with a longitudinal groove. The worms 22 and 23 are secured to the shaft 21 by means of a clamp-screw and may be adjusted along the shaft 21. The worm 22 meshes with the worm-gear 16 and the worm 23 with the worm-gear 20, so that by rotating the shaft 21 the die-holders 14 and 18, and with them the dies secured in the die-holders, are simultaneously rotated in the same direction, and as the worms, as well as the worm-gears, are of the same size and pitch both dies are rotated at the same speed. By reversing the worm 23 the die-holder 18 will turn in the opposite direction, but will turn at the same speed as the die-holder 14.

The number 24 indicates a rigid bar supported over the bed-plate 8 above the die-holders, and on one side of the longitudinal slot 9, near one end of the machine, the left-hand end of Figs. 1 and 2, the bar 24 is adjustably secured in the yoke 25 by the clamp-screw 26. The yoke 25 is pivotally secured to the arm 27 by the screws 28, so as to allow the yoke to rock on the screws 28. The arm 27 is provided with a series of holes, as is shown in Fig. 1, so that the yoke 25 may be secured at different points on the arm 27, the screws 28 forming the vertical fulcrum of the bar 24. The arm 24 is provided with the spindle 29, journaled in the bed-plate or table 8. The spindle 29 forms the horizontal fulcrum of the bar 24, which is vertically adjusted by raising or lowering the spindle 29 by means of the hand-wheel 29′, secured to the screw-spindle 29^2, by which the nut forming the support of the fulcrum-spindle 29 is raised and lowered. The opposite end of the bar 24 on the right-hand side of Figs. 1 and 2 is provided with the slot 30, into which the post 31 enters. On each side of the slot 30 a roll 32, journaled in bearings secured to the bar 24, is placed, by which the friction on the post 31 is diminished and positive contact on the post 31 secured to guide-bar 24 as it is raised and lowered. The strap or chain 33 is secured to the bar 24 near the end of the bar. The strap extends over two sheaves, and the other end

is secured to the weight 34, by which the weight of the bar 24 is partly counterbalanced.

Over the die-holder 14 the arm 35 is adjustably secured to the bar 24. The spindle 36 is screw-threaded in the projecting end of the arm 35. The lower end of the spindle 36 forms the tracer or stylus 37. The clamp-piece 38 is connected with the arm 35 by the screw 39. By moving the arm on the bar 24 until the tracer or stylus 37 is near the center of the die-holder 14 and securing the clamp-piece 38 the arm 35 and stylus 37 can be accurately adjusted by the screw 39 and then secured by the clamp-screws.

The bracket 40 is secured to the bar 24 over the die-holder 18. The bracket 40 forms the bearing for the milling-spindle 41, having the milling tool or cutter 42 secured to its lower end and the band-pulley 43 to its upper end. The screw 44 forms the upper bearing for the spindle 41 and serves to adjust the spindle and the cutter. A clamp-piece 38 and a screw 39 serve to adjust the bracket 40 in the same manner as they are used in connection with the arm 35, as heretofore described.

The vertical axes of the stylus 37 and the spindle 15 of the die-holder 14, the milling-spindle 41, and the spindle 19 of the die-holder 18, and the fulcrum-spindle 29 are all on a line when in the position shown in Fig. 2. The stylus and the milling-spindle are secured to and move with the bar 24, which is pivoted in the fulcrum-spindle 29. As the die-holder 18 and the milling-tool 42 are nearer the fulcrum than the die-holder 14 and the stylus 37, every motion of the stylus vertical or horizontal is reproduced by the milling-tool on a smaller scale, and the die in the die-holder 18 will be an exact reproduction of the die in the die-holder 14, but on a smaller scale. If the die is to be cut so as to form the reverse to the original die, the fulcrum is placed between the two die-holders, so that the axes of the screws 28, on which the yoke 25 is pivoted, and the axis of the spindle 29 are exactly equidistant from both the centers of the two die-holders 14 and 18. The longitudinal adjustment of the yoke 25 on the arm 27 is for the purpose af varying the vertical traverse of the milling-tool.

In the position as shown in Figs 1 and 2, if the yoke 25 is secured on the arm 27 farther toward the end of the machine the vertical traverse of the milling-tool is increased, and if the yoke is secured farther from the end and nearer the milling-tool the vertical traverse of the milling-tool is reduced. When the fulcrum-support of the bar 24 is placed between the two die-holders, the same effect is produced on the milling when the yoke 25 is secured on the arm 27 nearer to or farther from the milling-tool than the center of the fulcrum-spindle 29.

The mechanism for operating the machine is designed to secure a uniform feed to the milling tool or cutter. The revolutions of the die-holders increase in speed as the cutter moves toward the center of the die and diminish as the cutter moves toward the periphery of the die. The shaft 45 extends longitudinally and is journaled in suitable bearings. At one end it is provided with the pulleys 46 and 47. One of these is a pulley loose on the shaft and the other a pulley secured to the shaft. A belt extends from these pulleys to a counter-shaft, and thus power is supplied to the machine. On the other end of the shaft the band-pulley 48 is secured, from which power is transmitted through the belt 49, extending over a series of guide-pulleys and around the pulley 43 on the milling-tool spindle 41. The belt 49 returns over a series of guide-pulleys and a pulley on the weight 50 to the band-pulley 48. By this arrangement of the belt 49 and the weight 50 the milling-tool spindle has a considerable range of lateral motion and the strain on the belt is uniformly maintained. On the shaft 45 is also secured the double cone-pulley 51, having the bases of the cones in the center of the pulley, and above the same is the double cone-pulley 52, having the apexes of the cones in the center. The double cone-pulley 52 is secured to the shaft 53. The belt 54 connects the two cone-pulleys 51 and 52 and transmits motion from the cone-pulley 51 to the cone-pulley 52. The belt 54 is controlled by the shipper 55, connected by the band or cord 56 to the carriage 57, from which the post 31 extends through the slot 30 in the bar 24 and between the rolls 32. To the opposite side of the shipper 55 the cord or band 56′ is secured, the opposite end of the cord or band being secured to the counterbalance-weight 56^2, or passed around a pulley on the counterbalance-weight, and has the end secured to a fixed part of the machine, as is shown in Fig. 1. The carriage 57 is moved transversely to the bed-plate or table 8 by the screw 58, journaled in the frame 59, the carriage being provided with a nut in which the screw turns. The screw 58 is provided at one end with the hand-crank 60 and with the bevel-gear 61, which meshes with the bevel-gear 62 on the shaft 63, the lower portion of which shaft has the cone band-pulley 64 secured to it. On the shaft 53 the cone band-pulley 67 is secured, and this is connected by means of a belt with the cone band-pulley 68 on the shaft 21, and thereby motion is imparted to worms 22 and 23 and through them to the die-holders 14 and 18. The cone band-pulleys 17 and 64 are connected by the belt 69.

By the cone band-pulleys 67 and 68, each of which consists of three band-pulleys of different diameters placed so that the smallest pulley of one cone is opposite the largest pulley of the other, the speed of the worms, and through them the revolutions of the die-holders and dies, can be regulated to suit the nature of the die, the depth of the cut, and the material by moving the belt 70 from one set of pulleys to another. In the same manner the transverse feed can be regulated by

changing the belt 69 on the cone band-pulleys 17 and 64, and thus increasing the speed of the screw 58, and consequently the transverse motion of the free end of the bar 24, and with the same the stylus and the milling-spindle. As shown in the drawings, the belts on the cone band-pulleys 17 and 64 and 67 and 68 are on the smallest pulley of the driving-cone and the largest pulley of the driven cone, thus transmitting the slowest speed. The stylus and the milling-tool are at the center of the respective dies, and the belt 54, controlled by the shipper 55, is at the center of the double cone-pulleys, where the greatest speed is transmitted to the die-holder. If now the machine is started, the screw 58 will draw the bar 24, and with it the stylus and cutter, across the face of the die rearward by moving the carriage 57 with the post 31 toward the rear of the machine. The shipper 55 will lead the belt toward the right, where the cone-pulley 52 increases and the cone-pulley 51 decreases in diameter, so that as the diameter of the die operated on or the distance of the milling-tool from the center of the die increases the revolutions of the dies decrease and the feed of the material to the milling-tool is practically uniform. As the dies revolve while the cutter and stylus traverse the same, the whole die is passed over by both the cutter and the stylus by traversing one-half of the diameter. The machine may therefore be adjusted by turning the crank 60 by hand until the stylus and the milling-cutter are on the extreme outer edge of the dies and run until the stylus and milling-cutter have reached the center of the die, when the milling-cutter will have made one cut over the whole die. The milling-cutter may now be adjusted by the screw 44 for the next cut and the traverse continued until the stylus and milling-cutter have reached the edge of the die opposite the side from which they started. As shown in the drawings, the automatic traverse of the bar 24, the stylus, and the milling-cutter is from the front to the rear of the machine, where the hand-crank 60 is secured to the screw 58, by which the whole may be returned to the front by turning the screw 58 so as to slide the carriage 57 toward the front.

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

1. In a die-milling machine, the combination, with two die-holders and mechanism for rotating the same, of a bar secured to a support having capacity to permit the bar to move vertically and horizontally, a stylus or tracer adjustably secured to the bar, a milling-tool supported by the bar, and mechanism for rotating the milling-tool and traversing the bar horizontally across the die, as described.

2. In a die-milling machine, the combination, with a milling-tool secured to the end of a vertical spindle and having capacity to traverse across the face of the die, a table or bed-plate having a slot, and slide-rests adjustably secured to the bed-plate, of die-holders provided with spindles extending through the slot in the bed-plate, and mechanism for rotating the die-holders and milling-tool and moving the same across the face of the die, as described.

3. In a die-milling machine, the combination, with a table or bed-plate having a slot and slide-rests adjustably secured to the bed-plate, of die-holders provided with spindles journaled in the slide-rests and extending through the slot in the bed-plate, worm-gears secured to the spindles of the die-holders, a driving-shaft provided with detachable worms, and a milling-tool secured to the end of a vertical spindle and a stylus or tracer, both supported on a pivoted arm, the whole constructed to turn the die-holders simultaneously at the same speed in the same or opposite directions and the milling-tool across the face of the die, as described.

4. In a die-milling machine, the combination, with die-holders and mechanism for turning the same, of a bar secured to a support pivoted vertically and horizontally, a stylus adjustably secured to the bar over one of the die-holders, a milling-tool adjustably secured to the bar over another die-holder, and a leading-screw operating a carriage connected with one end of the bar, by which the bar is moved and the stylus and the milling-tool are moved across part of the whole of the faces of the dies, as described.

5. In a die-milling machine, the combination, with the die-holders, the bar provided with the stylus and the milling-tool, and mechanism for turning the die-holders, of the support for the bar, consisting in the spindle 29, the arm 27; the yoke 25, and the screws 28, as described.

6. In a die-milling machine constructed substantially as herein described, the adjustable fulcrum consisting in the spindle 29, the arm 27, provided with a series of holes, the yoke 25, the screws 28, adapted to secure the yoke pivotally to the bracket, the hand-wheel 29′, and screw 29^2, forming a vertically-adjustable support for the spindle 29, as described.

7. In a die-milling machine, the combination, with the die-holders, the milling-tool, and stylus, of the shaft 45, provided with the double cone-pulley 51, the shaft 53, provided with the double cone-pulley 52, the cone band-pulley 67 on the shaft 53, the cone band-pulley 68, and belts connecting the cone-pulleys, the shaft 21, the worms 22 and 23, and the worm-gears 16 and 20, secured to the spindles of the die-holders.

8. In a die-milling machine, the combination, with the die-holders, the milling-tool, and stylus, of the driving-shaft 45, provided with the pulleys 46 and 47, the double cone-pulley 51 and the band-pulley 48, the shaft 53, having the double cone-pulley 52 and the cone band-pulley 67 secured to it, the cone band-

pulley 68 and belts connecting the cone-pulleys, the shaft 21, provided with the adjustable worms 22 and 23, the worm-gears 16 and 20, secured to the spindles of the die-holders, and the belt 49 for driving the milling-spindle and provided with the tension-weight, as described.

9. In a die-milling machine, the combination, with the die-holders, mechanism for rotating the same, a bar pivotally supported above the die-holders, a stylus adjustably secured to the bar, a milling-spindle supported by the said bar mechanism, substantially as described, for rotating the milling-spindle, and mechanism for moving the stylus and milling-tool across the face of the dies, of the double cone-pulleys 51 and 52, the belt 54, and the shipper 55, connected with the traversing mechanism by the band 56 and with the counterbalance-weight 56^2 by the band 56′, as described.

10. In a die-milling machine, substantially as herein described, the combination, with the pivotally-supported bar 24, of the weight 34, connected with the bar by the strap or chain 33, and mechanism for moving the free end of the bar horizontally, as and for the purpose described.

In witness whereof I have hereunto set my hand.

ERNEST MEYERS.

Witnesses:
HENRY J. MILLER,
JOSEPH A. MILLER, Jr.