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No. 785,087. PATENTED MAR. 21, 1905.

R. CARLTON.

MACHINE FOR CUTTING ELLIPSES, OVALS, OR CIRCLES

APPLICATION FILED OCT. 20, 1903.

2 SHEETS—SHEET 1.

Fig. 1.

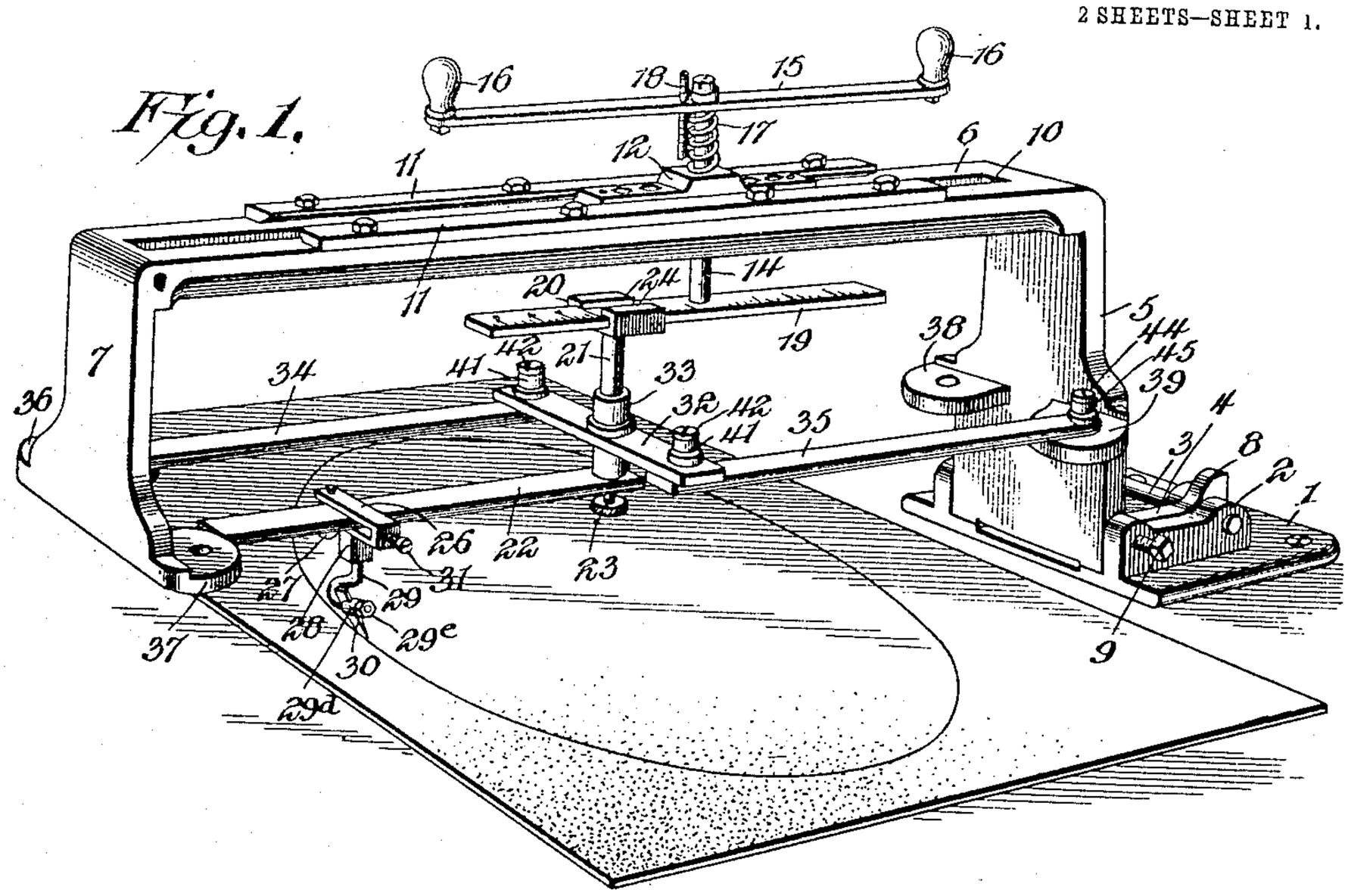
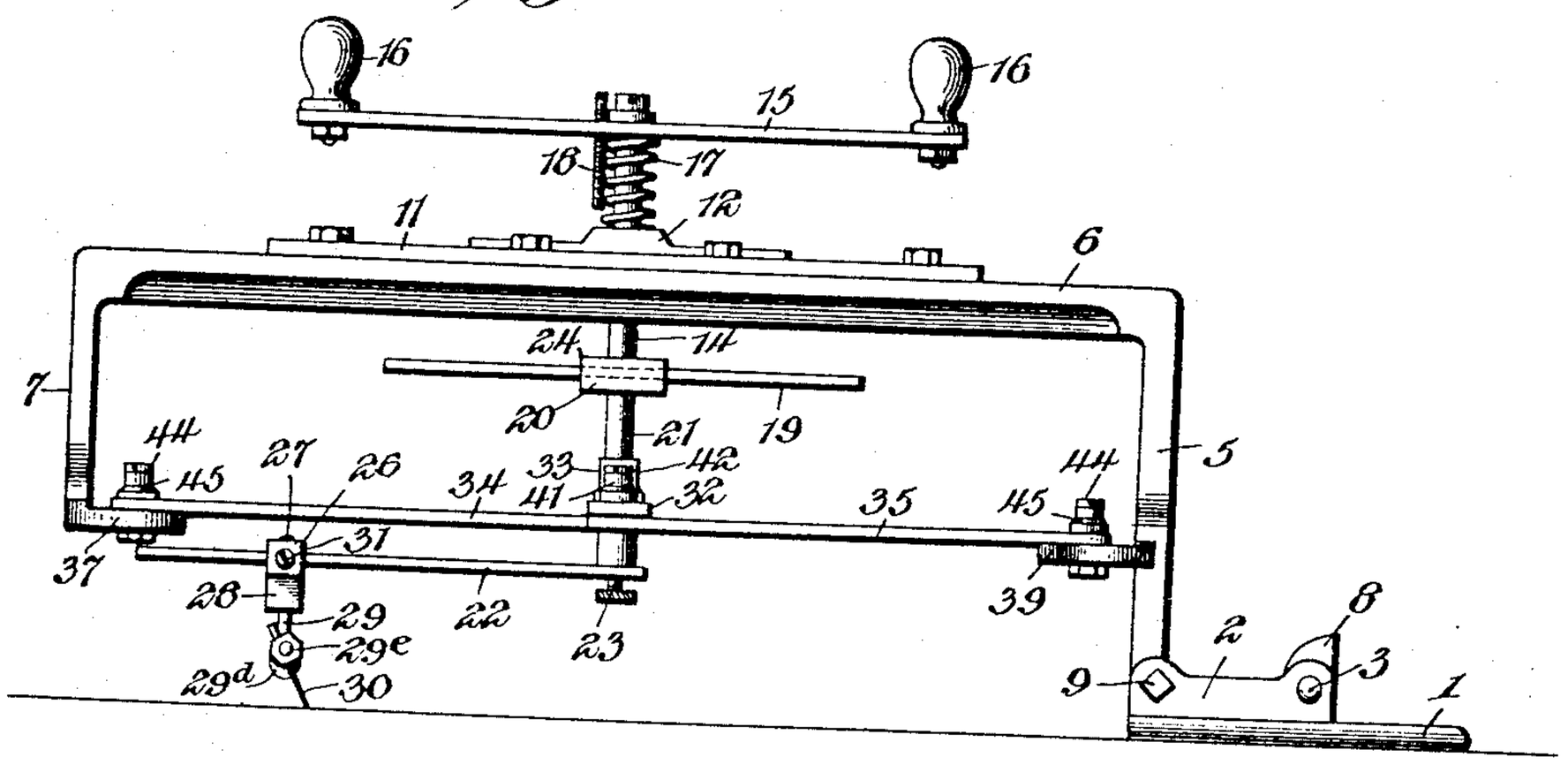


Fig. 2.



Witnesses
Howard D. Orr.
Louis G. Julihn

Robert Carlton, Inventor,
By C. G. Siggers
Attorney

164. CUTTI[redacted] & BARS,
Cutting, Machines.
Sweep Cutter, Elliptical Work.
Examiner.

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2 SHEETS—SHEET 2.

Fig. 3.

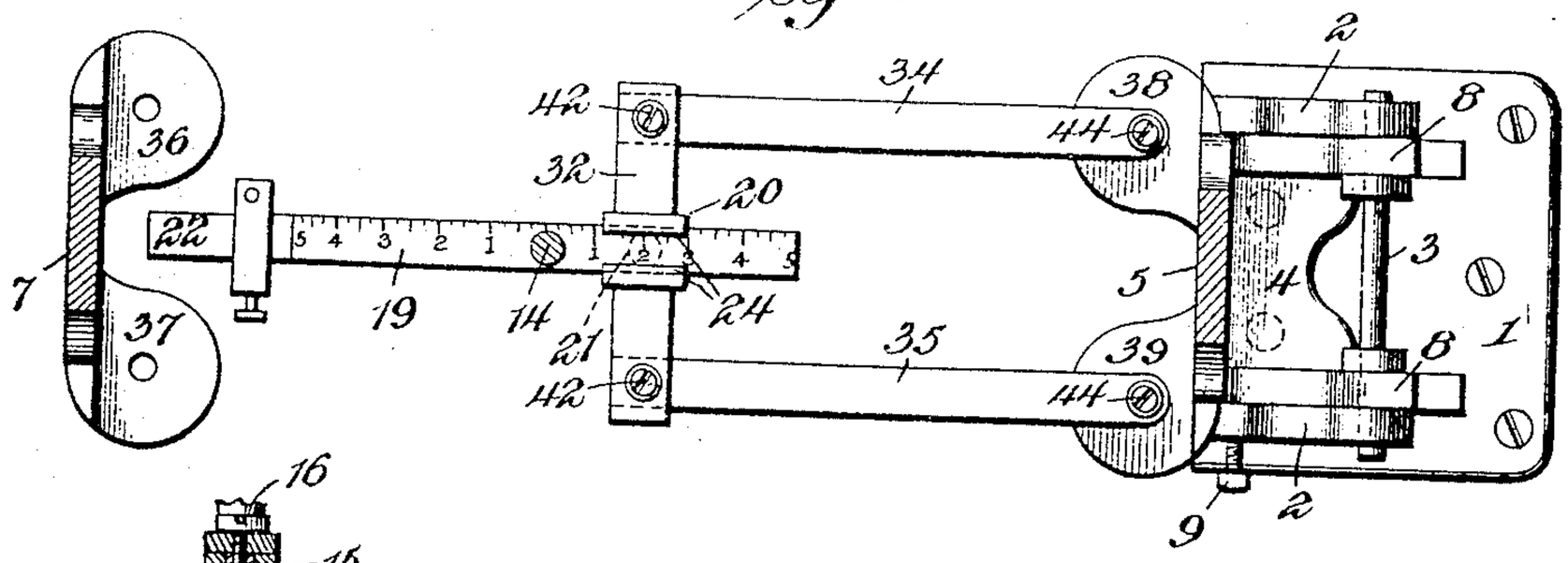


Fig. 4.

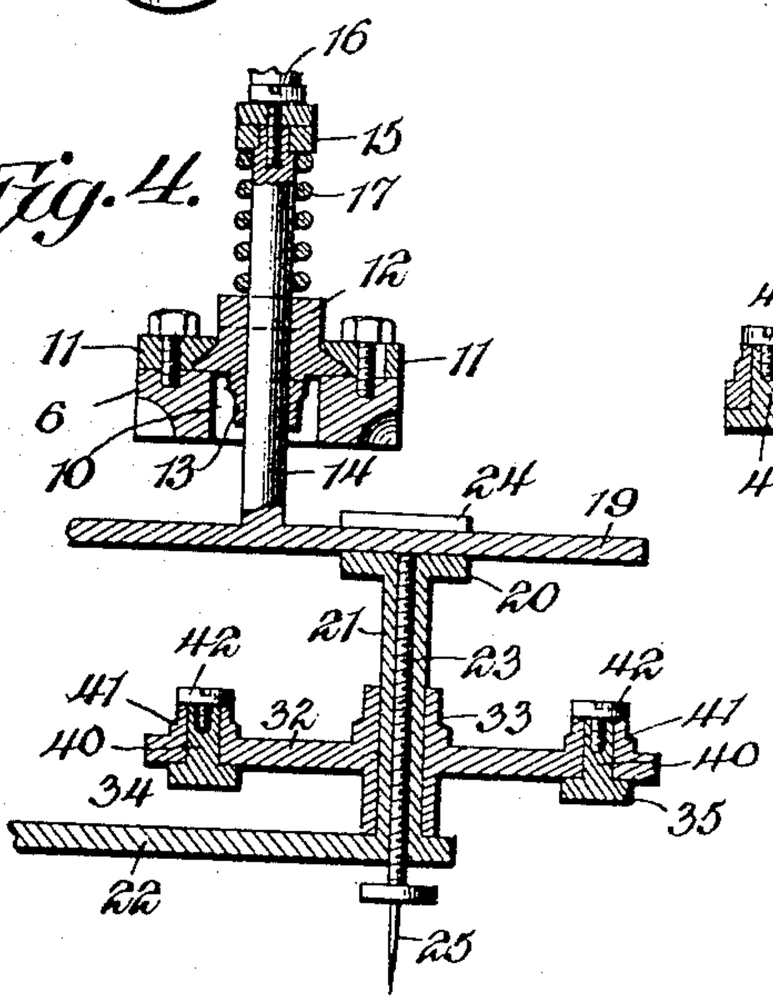


Fig. 5.

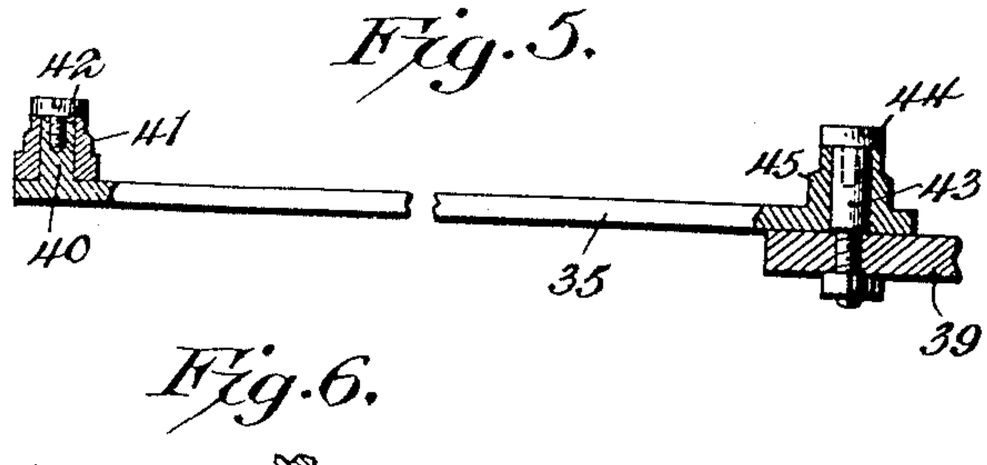


Fig. 6.

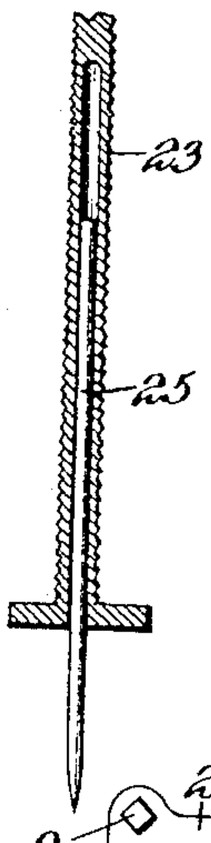


Fig. 9.

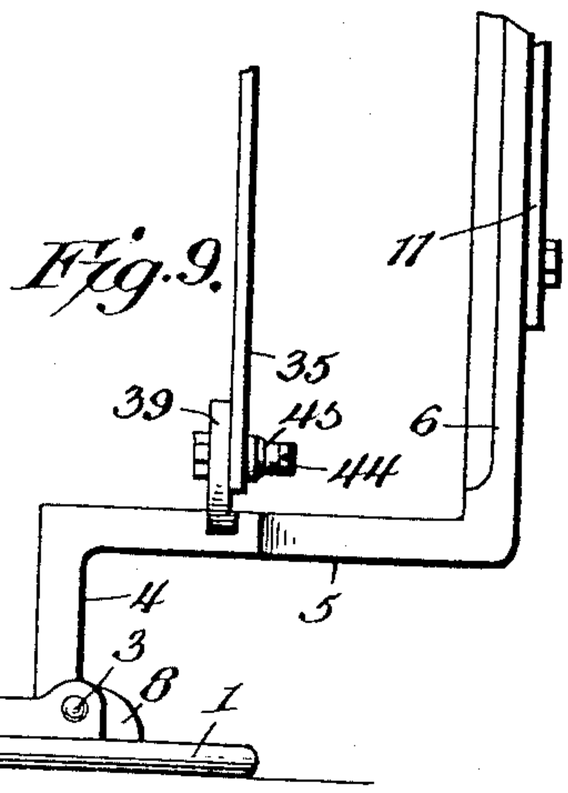


Fig. 7.

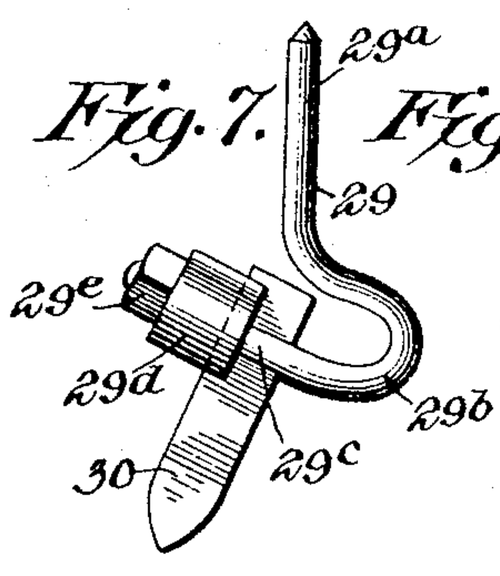
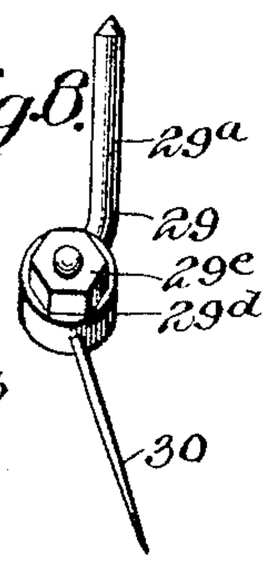


Fig. 8.



Witnesses
Howard P. Orr
Louis L. Julihn

Robert Carlton, Inventor,
By E. G. Siggers
Attorney

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No. 785,087. Patented March 21, 1905.

UNITED STATES PATENT OFFICE.

ROBERT CARLTON, OF SEARCY, ARKANSAS.

MACHINE FOR CUTTING ELLIPSES, OVALS, OR CIRCLES.

SPECIFICATION forming part of Letters Patent No. 785,087, dated March 21, 1905.

Application filed October 20, 1903. Serial No. 177,760.

To all whom it may concern:

Be it known that I, ROBERT CARLTON, a citizen of the United States, residing at Searcy, in the county of White and State of Arkansas, have invented a new and useful Machine for Cutting Ellipses, Ovals, or Circles, of which the following is a specification.

My present invention relates to a novel mat-cutting machine, the primary object being to provide in a machine of this character means whereby the connections between the cutter and the operating-handle may be set with convenience and precision for the cutting of circles, ellipses, and ovals of various sizes.

A further object of the invention is to economize space and to facilitate the manipulation of the mats by mounting the operating parts of the machine on a support in the form of an elevated arm, having hinged connection at one end only with a rigid base, the opposite end of the arm being spaced from the table or other mat-support and the entire structure being capable of swinging back to a vertical position over the base when the machine is not in use.

Subordinate to these recited objects are various others which will more fully appear during the course of the succeeding description of the illustrated machine.

In the said drawings, Figure 1 is a perspective view of the machine organized as an ellipsograph. Fig. 2 is a front elevation of the machine organized for cutting circles. Fig. 3 is a sectional plan view of the machine organized for cutting ovals. Fig. 4 is a detail sectional view showing the positions of the parts when the machine is adjusted for the purpose of subtracting a given amount from a known major axis in order to secure an oval or ellipse of the desired dimensions. Fig. 5 is a detail sectional view illustrating the connections at the opposite ends of a swinging bar. Fig. 6 is a detail view of the centering-pin and its mounting. Figs. 7 and 8 are detail views of the cutter, and Fig. 9 is a fragramentary view showing the mechanism swung back to its vertical position.

Like numerals of reference designate corresponding parts in the several figures of the drawings.

Upon a suitable support—as, for instance, a table—is screwed a comparatively small metal base-plate 1, provided with parallel upstanding bearing-flanges 2, between which is pivotally mounted, as by means of a shaft or pintle 3, a horizontal foot 4, extending outwardly from one end plate 5 of a horizontal bar 6, constituting the main support of the machine, and provided at its opposite extremity with a pendent end plate 7, the lower edge of which is separated from the table by a considerable interval to facilitate the displacement and replacement of the mat or other material to be cut or inscribed upon. The foot 4 is preferably in the form of two horizontal arms or extensions of the plate 5, as shown in Fig. 1; but this is immaterial, since the foot may be cast in a single solid piece or formed in any other suitable manner to insure the proper rigidity of the support in either its normal or elevated positions. When the arm is swung down to a horizontal position, the under side of the foot 4 rests flat upon the base-plate 1; but when the machine is not in use the arm 6 is swung back on its hinge to a vertical position, with the extremity 8 of the foot 4 resting upon the base in an obvious manner. (See Fig. 9.)

In order to take up any lateral vibration which may be caused by wear between the support and its mounting, an adjusting-screw 9 is passed through one of the bearing-flanges 2 and bears against the adjacent side edge of the plate 5. The arm 6 is formed with a longitudinal slot 10, along the opposite sides of which are mounted adjustable guides 11, between which is disposed a reciprocatory slide 12, designed to travel longitudinally of the arm. Midway of its ends the slide 12 is apertured and is provided with a suitable bushing 13 for the reception of a vertical shaft 14, which for convenient designation I shall term the "handle-shaft," since at the upper end thereof is fixed in any suitable manner a horizontal handle-bar 15, provided at its opposite ends with handles or grips 16,

164. CUTTING & PUNCHING SHEETS & BARS,
Cutting Machine
Sweep Cutter, Elliptical Work.
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which are grasped by the operator to rotate the handle-shaft 14 in the manner and for the purpose to be presently explained.

The shaft 14 is capable of more or less vertical movement and is urged upwardly by a lifting device, preferably in the form of a spiral spring 17, encircling the upper portion of the shaft and interposed between the handle-bar 15 and the slide 12. The longitudinal movement of the handle-shaft 14 is designed to effect the presentation of the cutter to the work and its withdrawal therefrom, and in order that the cutter may be prevented from cutting deeper than is desired a stop pin or screw 18 is screwed through the handle-bar 15 adjacent to the shaft 14 and is arranged to bear upon the upper surface of the slide 12 for the purpose of limiting the depression of said shaft. To the lower end of the shaft 14 is fixed a horizontal graduated bar 19, extending in opposite directions from the shaft and accommodating the slide 20, fixed to the upper end of the cutter-bar shaft 21, from the lower extremity of which extends a horizontal cutter-bar 22, designed to swing from the shaft 21 as an axis. The slide 20 is designed to be adjusted along the graduated bar 19 for the purpose of varying the relative location of the shafts 14 and 21 and is secured in its adjusted positions by a long binding-screw 23, passed upwardly through the cutter-bar shaft 21 and the lower wall of the slide 20 and bearing against the under side of the bar 19. The adjustment of the screw 23 is facilitated by a knurled head on the lower end thereof and when screwed up produces the necessary friction between the bar 19 and the flanges 24 of the slide 20, it being observed in this connection that the flanges 24 overhang the opposite edges of the bar 19 and are separated by a sufficient interval to permit the slide to move freely past the shaft 14 in order that the axis of the cutter-bar may be located out of alinement with the shaft 14 at either side thereof or in direct alinement therewith, as desired.

For the purpose of aiding the operator to accurately position the mat a centering-pin 25 has its upper end extended into an axial opening in the lower end of the binding-screw 23.

Adjustably mounted on the cutter-bar 22 is a cutter-holder 26, in the form of an open-ended clip, provided with a clamping-screw 27, by means of which the clip or holder may be caused to clamp the cutter-bar after it has been adjusted to its proper position on the latter. By loosening the screw 27 the cutter-bar holder may be shifted both longitudinally and transversely of the bar to locate the cutter at the exact point desired. At the under side of the holder, midway of the ends thereof, is formed a socket 28 for the reception of the swiveled shank 29 of a cutter 30. The upper portion 29^a of the shank 29 is disposed vertically and constitutes a pivot and is connected by a crooked or deflected portion 29^b, with the opposite end 29^c disposed at an angle to the vertical end 29^a (see Fig. 7) and located in a plane to one side thereof by the lateral deflection of the crook 29^b, as shown in Fig. 8. The end portion 29^c of the shank is provided with a slot for the reception of the cutter-blade 30, designed to be retained therein by a block 29^d, fitted over the end 29^c and having a kerf into which one edge of the knife-blade fits. The block 29^d is retained in place to rigidly secure the blade by any suitable means—as, for instance, a nut 29^e, screwed upon the extremity of the shank and bearing against the block. The cutter 30 is designed to have more or less swinging movement, with the vertical portion 29^a of the shank as an axis, and is arranged to trail as the cutter-bar is swung in a manner to cause the cutter to describe a circle, ellipse, or oval, according to the particular manner in which the machine is organized.

I have found by experiment that the most satisfactory position of the holder and cutter presents the middle of the cutter-bar in a vertical plane midway of the planes occupied by the axis of the rotary shank and the extremity of the cutter-blade, respectively. While, as heretofore stated, the loosening of the screw 27 will permit the cutter-holder to be adjusted in any desired degree both longitudinally and transversely of the cutter-bar, I prefer, nevertheless, to provide an adjusting-screw 31, which is passed through the closed end of the holder and bears at its inner end against the adjacent edge of the cutter-bar. This screw is employed for the purpose of securing a very fine adjustment of the holder laterally of the bar. I wish it to be understood, however, that the present invention is not limited to any specific form of holder or cutter, nor, in fact, is it essential that a cutting-tool be employed, since the essential characteristic of the machine is that peculiar arrangement whereby a tool, whether it be an indicator, a marking device, or a cutter, is caused to indicate, inscribe, or cut a circular, oval, or elliptical figure.

We have now seen that the handle-shaft is connected with the cutter-bar shaft in a manner to compel the cutter-bar to swing when the handle-bar is rotated; but it will be obvious that some means must be provided for preventing longitudinal movement of the slide 12 when it is desired that the handle-shaft shall constitute the axis of movement of the cutter-bar—as, for instance, in describing a circle—and it is equally important that provision be made for compelling a predetermined lateral movement of the cutter-bar shaft to differentiate the minor and major axes of ovals and ellipses. To effect this control of the cutter-bar shaft, I provide what may be termed

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a "shifter" 32, having a compound movement the general direction of which is transverse to the arm 6. This shifter is provided midway of its ends with a comparatively long brass bushing 33, affording a bearing for the shaft 21. The shifter 32 is in the form of a link pivotally connected at its opposite extremities to the proximate ends of a pair of swinging arms 34 and 35, pivotally connected at their outer ends to the machine-support. The disposition of these arms 34 and 35 is susceptible of variation, the purpose of which is to modify the movement of the link or shifter 32 in a manner to cause the cutter or other tool to describe an ellipse or oval, as desired.

Projecting inwardly from the plate 7 in a plane below the bar 6 are a pair of bearing-lugs 36 and 37, and a similar pair of lugs 38 and 39 project inwardly in the same horizontal plane from the plate 5 at the opposite end of the supporting-arm. When the machine is organized for the cutting of elliptical figures, as shown in Fig. 1, the swinging arms 34 and 35, which are of exactly the same length, are disposed in the initial position of the parts in parallel relation, but extend in opposite directions from the shifter 32, the arm 34 being pivotally connected to the lug 36 at the rear side of the left-hand end of the machine-support, and the arm 35 being likewise connected to the lug 39 at the front side of the opposite end of the supporting structure. In this organization of the machine the arms 34 and 35 correspond to diagonally opposite side bars of a double parallelogram, it being observed that these arms are compelled to swing in unison and that the link or shifter necessarily has a compound movement due to the fact that its opposite ends must move in the oppositely-disposed arcuate paths described by the inner ends of the arms 34 and 35 when the latter are swung in one direction or the other. The general direction of this compound movement of the shifter, as heretofore stated, is transverse to the bar 6 and includes a slight pivotal movement of the shifter with the shaft 21 as an axis, the ratio of this latter movement increasing as the shifter nears the extreme limits of its longitudinal movement. It will therefore appear that the axis of the cutter-bar will shift in almost a straight line at right angles to the bar 6, there being very slight lateral deflection in opposite directions as this axis approaches the extreme limits of such movement.

The manner of effecting the connection between the swinging arms 34 and 35 and the shifter and bearing-lugs, respectively, is not material, since various bearing devices affording proper pivotal movement without lost motion may be employed in lieu of the construction shown. By preference, however, the inner ends of the arms are provided with bearing-posts 40, received within cylindrical bushings 41 at the opposite ends of the shifter 32 and retained by cap-screws 42. A similar connection is provided for the outer ends of the arms, the elements of the bearing, however, being reversed—that is to say, the bearing-lugs are provided with posts 43, carrying cap-screws 44, which serve to retain cylindrical bearing-surfaces or bushings 45, formed at the outer ends of the arms and fitted over the posts. (See Fig. 5).

We are now prepared to consider the operation of the machine when organized as an ellipsograph. (Illustrated in Fig. 1). In the initial position of the machine (shown in Fig. 1) the various bars and arms are disposed parallel with each other and at right angles to the shifter. If now it is desired to inscribe or cut an ellipse, the cutter-holder 26 is adjusted along the cutter-bar (which, if desired, may be provided with graduations) until the distance from the cutter to the center of the ellipse, found by means of the centering-pin 25, is one-half of the minor axis of the desired figure. The difference between the minor and major axes being known, the slide 12 is now moved back to the right sufficiently to separate the axes of the two shafts 14 and 21 by an interval equal to one-half of the difference between the major and minor axes, this adjustment being facilitated by the graduations on the scale. It may be explained at this point, however, that the necessity for calculation is eliminated by reducing the subdivisions on the graduated bar 19, so that if it is desired to make an ellipse having a major axis three inches longer than the minor axis thereof it is simply necessary to shift the slide 12 until the edge of the slide 24 is opposite "3" on the bar 19, in which position the interval between the axes of the two shafts will be one and one-half inches—to wit, one-half of the difference between the major and minor axes. If now the handle-shaft 14 is rotated, corresponding rotary movement of the cutter-bar shaft will be effected, and the cutter-bar will likewise swing to describe a curve, of which the center of the cutter-bar shaft will constitute the axis. This curve, however, will not be in the form of a segment, because the eccentric relation of the two shafts 14 and 21 and the limitation on the movement of the shaft 21 by the shifter and the arms 34 and 35 will compel the simultaneous lateral movement of the shaft 21 in a direction substantially transverse to the arm 6 and of the shaft 14 in the direction of the arm. It follows, therefore, that since the cutter swings from the cutter-bar shaft as an axis and since said axis shifts in a direction transverse to the supporting-arm during the movement of the cutter the latter will necessarily describe an ellipse.

In the arrangement of the parts just described it will be noted that the cutter-bar

164. CUTTIN[redacted] BARS,
Sweep Cutter, Elliptical Work.
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shaft 21 is located in a plane intermediate of the shaft 14 and the cutter. It is by reason of this relation that the major axis exceeds the minor axis of the ellipse by twice the distance between the axis and the two shafts and that the minor axis is equal to twice the distance between the axis of the shaft 21 and the cutter. It is obvious, therefore, that a minor axis may be ascertained and delimited with reference to a major axis equal to twice the distance between the axis of the shaft 21 and the cutter by so adjusting the parts that the handle-bar shaft 14 will be located in a plane between the cutter and the shaft 21. Thus suppose the slide 20 instead of being located at the third graduation to the left of the shaft 14, as shown in Fig. 1, is located a similar distance beyond the opposite side of the shaft. In this event the major axis of the ellipse will be parallel with the supporting-bar, while the minor axis will be transverse thereto, said minor axis being decreased by reason of the fact that as the cutter swings beyond one side of the support the link or shifter instead of moving the axis of the cutter-bar in the direction of movement thereof, as in the case first described, will move the axis in the opposite direction, thus subtracting from the throw of the cutter-bar instead of adding thereto. It will be noted, therefore, that the described relation of parts and the capabilities of adjustment thereof makes it possible to quickly set the machine to cut an ellipse disposed parallel with or at right angles to the support and that such adjustment may be effected with reference to a given increase over the minor axis to form the major axis or with reference to a given reduction of a major axis to delimit the minor axis of the figure.

If it is desired to cut an oval instead of an ellipse, it is simply necessary to remove the outer end of the arm 34 from the lug 36 and to attach it to the lug 38 instead. This relation of the parts is shown in Fig. 3, wherein it is noted that the arms 34 and 35, connected at one end by the shifter or link 32 and at the opposite end by the plate 5 of the machine, constitute a parallelogram. The machine is set to secure the desired major and minor dimensions of the oval in the precise manner heretofore described in connection with the ellipse, but with the arms 34 and 35 swinging from adjacent bearing-lugs instead of from lugs diagonally related, and the cutter will describe a figure of oval or egg shape instead of an ellipse as before.

If instead of an oval or an ellipse it is desired to cut or inscribe a circle, it is simply necessary to shift the slide 12 until the handle-bar shaft 14 is in exact alinement with the cutter-bar shaft 21. With the parts thus adjusted the two shafts are substantially continuous and the axis of rotation will be fixed, inasmuch as its lateral movement is prevented in one direction by the slide 12 and in the other direction by the shifter 32, the slide being incapable of movement in a direction transverse to the supporting-arm 6 and the shifter 32 being likewise incapable of movement longitudinally of the arm, whether the arms 34 and 35 are arranged as shown in Fig 1 or are connected to the same end of the support, as in Fig. 3.

If desired, the machine frame or support may be provided with suitable retaining devices for the paper or mat, and a leveling device may be attached to the elevated end of the arm. The employment of these features, however, is a mere matter of choice, and since they constitute no essential part of the present invention are neither illustrated nor described in detail. Ordinarily the mat will be held upon the table by suitable clamps attached to the latter, and if the bar 6 is not exactly level it may be readily trued up by inserting one or more sheets of paper between the foot 4 and the base 1.

It is thought that from the foregoing the construction and operation of my mat-cutting machine will be clearly understood; but while the present embodiment of the invention is thought at this time to be preferable I do not limit myself to the structural details defined. On the contrary, I reserve the right to effect such changes, modifications, and variations of the illustrated structure as may fall fairly within the scope of the protection prayed.

What I claim as new is—

1. The combination with a base, of a normally horizontal supporting-arm having a vertical terminal part hinged to the base and unsupported at its opposite end, means for sustaining said arm in a vertical position when swung up, and figure-describing mechanism carried wholly by said arm.

2. The combination with a base and a normally horizontal supporting-arm having a vertical terminal part provided with an angular foot hinged to the base and having its opposite end unsupported, of figure-describing mechanism carried wholly by said arm.

3. The combination with a base and a normally horizontal supporting-arm terminally hinged to the base and otherwise unsupported, of adjustable means for preventing lateral vibration of the arm, and figure-describing mechanism carried by said arm.

4. The combination with a base provided with parallel bearing-flanges, of a normally horizontal supporting-arm having a vertical terminal part provided with a horizontal foot located between the flanges and hinged thereto, said foot having angularly-related faces designed to rest upon the base in the horizontal and vertical positions of the arm to sustain the same, and figure-describing mechanism carried by said arm.

5. The combination with a base provided with parallel bearing-flanges, of a normally

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horizontal supporting-arm having a vertical terminal part provided with a horizontal foot located between the flanges and hinged thereto, said foot having angularly-related faces designed to rest upon the base in the horizontal and vertical positions of the arm to sustain the same, a screw carried by one of the flanges and bearing against one side of the hinged structure to prevent lateral vibration thereof, and figure-describing mechanism carried by said arm.

6. The combination with a support, of a rotary and laterally-movable handle-shaft, a second shaft constituting an eccentric continuation thereof, an arm extending laterally from the second shaft, and means for confining the lateral movement of said second shaft to a given path, said means including a shifter and swinging arms connected thereto.

7. The combination with a support, of a rotary and laterally-movable handle-shaft, a second shaft constituting an eccentric continuation thereof, a tool-carrying bar extending laterally from the second shaft, and means for confining the lateral movement of the second shaft to a given path, said means including arms swinging from independent centers and connected by a shifter operatively related to said second shaft.

8. The combination with a support, of a rotary and laterally-movable handle-shaft, a second shaft constituting an eccentric continuation thereof, a tool-carrying bar extending laterally from the second shaft, a shifter rotatably receiving said second shaft, and swinging arms pivotally connected at their inner ends to the shifter at opposite sides of the last-named shaft.

9. The combination with a support, of a rotary and laterally-movable handle-shaft, a second shaft constituting an eccentric continuation thereof, a tool-carrying bar extending laterally from the second shaft, a shifter rotatably receiving said second shaft, swinging arms pivotally connected at their inner ends to the shifter at opposite sides of the last-named shaft, and means for mounting said arms in directly or diagonally opposed relation as desired.

10. The combination with a support, of a rotary and laterally-movable handle-shaft, a second shaft constituting an eccentric continuation thereof, a tool-carrying bar extending laterally from the second shaft, means for confining the lateral movement of the second shaft to a given path, said means including arms swung from independent centers and connected by a shifter operatively related to said second shaft, paired bearing members at opposite ends of the support, and means for swinging the last-named arms from either pair of members or from a bearing member of each pair respectively.

11. The combination with a support, of a rotary and laterally-movable handle-shaft and a second shaft constituting a continuation thereof, said shafts being relatively adjustable laterally, a tool-carrying bar extending from the second shaft, and means including independently-mounted swinging arms for limiting the lateral movement of the second shaft to a given path.

12. The combination with a support, of a slide movable thereon, a handle-shaft rotatably mounted in the slide and having a bar at its lower end, a cutter-bar shaft having adjustable connection with said bar to present the shafts in concentric or eccentric relation, a cutter-bar extending laterally from the cutter-bar shaft, and means for preventing or controlling the lateral movement of the last-named shaft, said means including a pair of arms having operative connection with the cutter-bar shaft.

13. The combination with a support, of a slide longitudinally movable thereon, a handle-shaft rotatably mounted in the slide and having a graduated bar at its lower end, a cutter-bar shaft having at its upper end a slide adjustable along the graduated bar to dispose the shafts in concentric or eccentric relation as desired, a cutter-bar at the lower end of the cutter-bar shaft, a pair of arms swung from the support, and a link connecting said arms and having a bearing for the cutter-bar shaft.

14. The combination with a support, of a laterally-movable handle-shaft provided with a graduated bar and a slide shiftable along said bar, a cutter-bar shaft rigidly connected to said slide, an adjusting-screw for retaining the slide in its adjusted positions and having a socket, and a centering-pin extending into the socket in the screw.

15. In an instrument of the character described, the combination with a base, of a horizontal supporting-arm connected at one end only to the base, and having its opposite end unsupported and elevated above the plane of the base to permit the material to be cut to be slipped under the elevated end of the arm and thus quickly positioned, a slide movable upon the supporting-arm, a handle-shaft rotatably mounted in the slide and having a graduated bar at its lower end, a cutter-bar shaft adjustable along the graduated bar, a cutter-bar at the lower end of the cutter-bar shaft, and means for confining the lateral movement of the cutter-bar shaft to a given path.

16. The combination with a support, a cutter-bar, and means for operating the latter, of a cutter-holder, a cutter, and a shank for said cutter formed with a vertically-disposed upper end received by the holder, a knife-bearing end having acute-angular relation to

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the vertical end, and a crook connecting the end portions of the shank and having a lateral deflection, substantially as described, the cutter being disposed in right-angular relation to the knife-bearing end of the shank and detachably secured thereto.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

ROBERT CARLTON.

Witnesses:
JAMES J. GILDEA,
C. J. SAENGER.