

O. H. BONNER.  
 ELLIPSOGRAPH AND ROUTING MACHINE.  
 APPLICATION FILED JUNE 14, 1909.

1,058,537.

Patented Apr. 8, 1913.

3 SHEETS-SHEET 1.

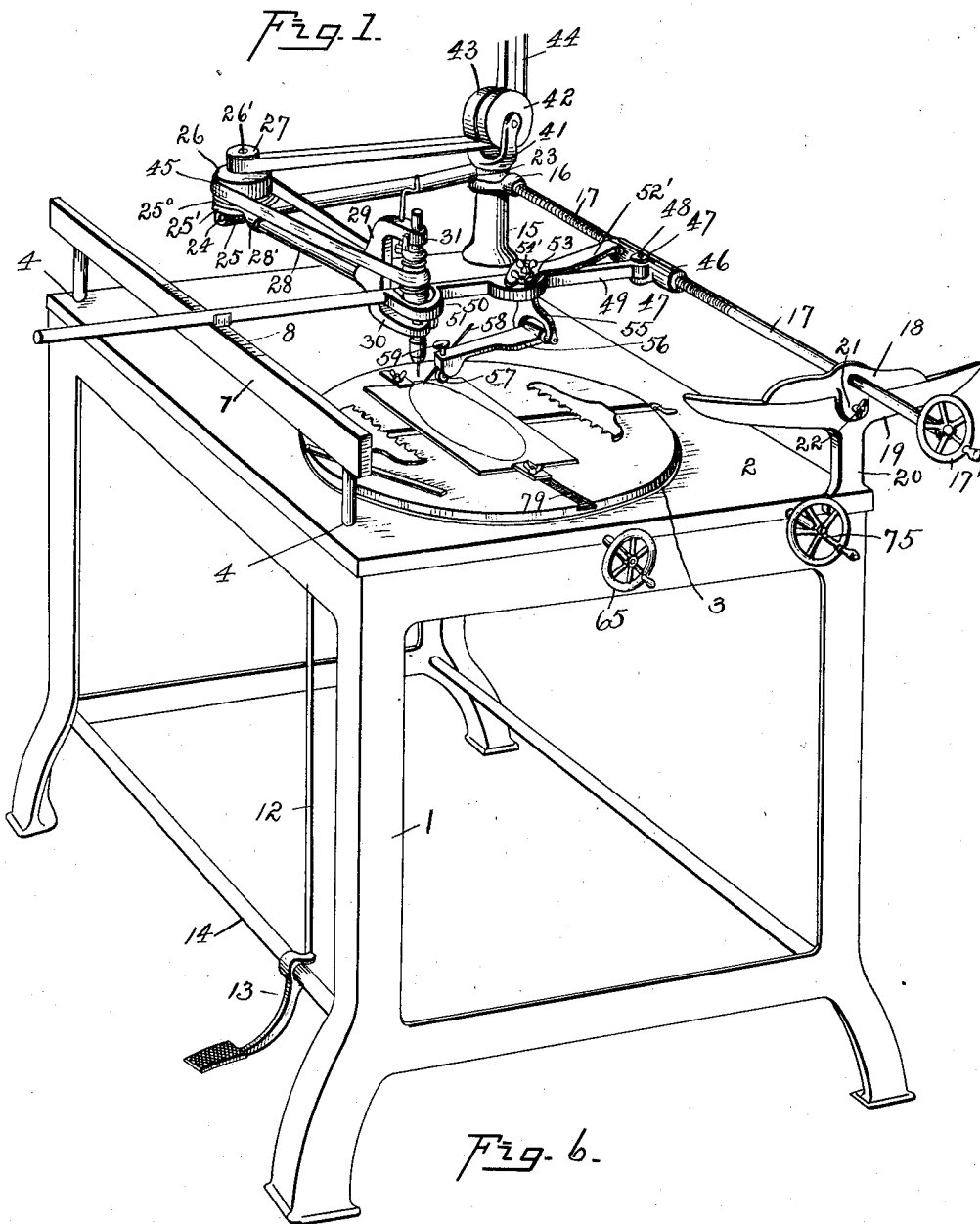
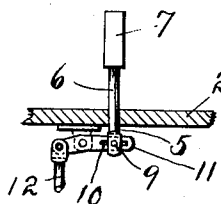


Fig. 6.



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3 SHEETS—SHEET 2.

Fig. 2.

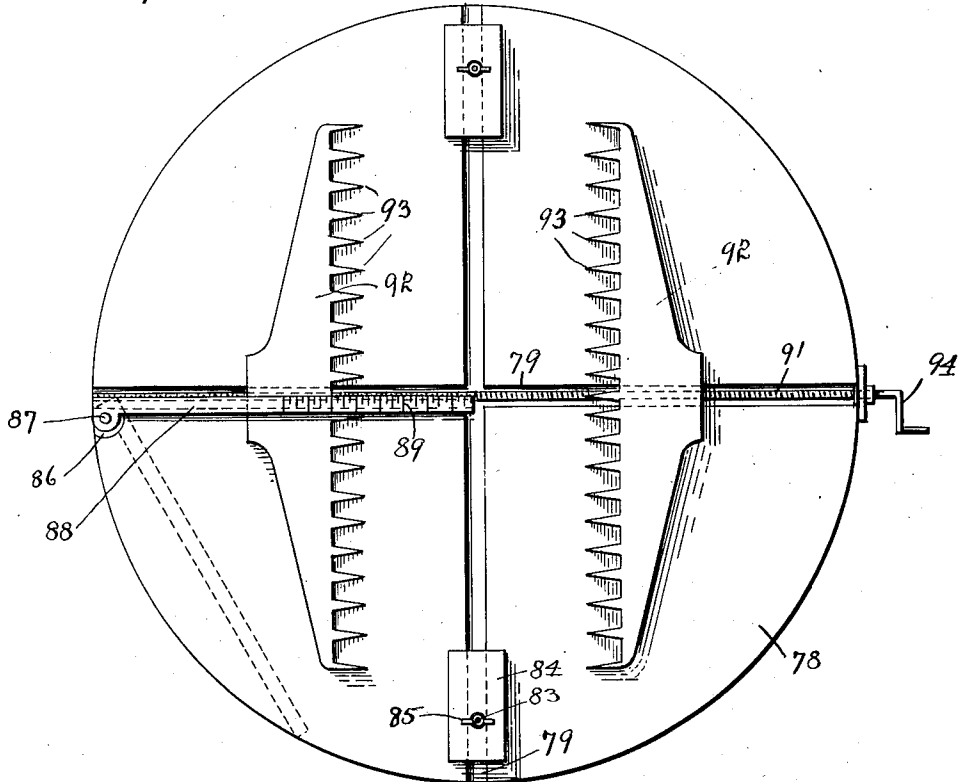


Fig. 3.

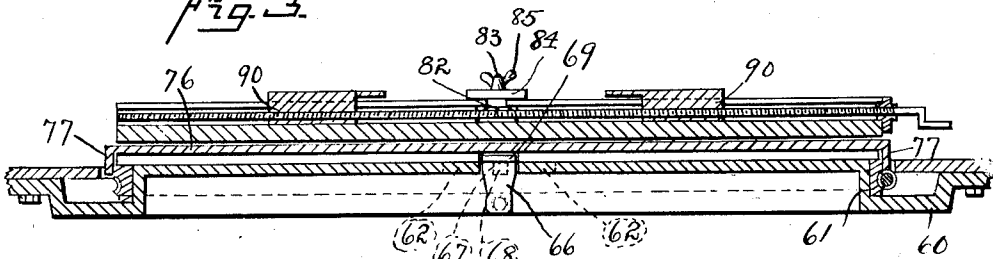
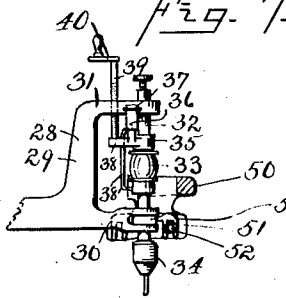


Fig. 7.



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# UNITED STATES PATENT OFFICE.

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ELLIPSOGRAPH AND ROUTING-MACHINE.

1,058,537.

Specification of Letters Patent.

Patented Apr. 8, 1913.

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*To all whom it may concern:*

Be it known that I, OTTO H. BONNER, a citizen of the United States, residing at Zanesville, in the county of Muskingum and  
5 State of Ohio, have invented certain new and useful Improvements in Ellipsographs and Routing-Machines, of which the following is a specification.

In various industries, and particularly in  
10 the art of engraving and the making of half tones and zinc etchings, it is necessary to scribe ellipses and ovals. This is particularly true in making up half tone cuts  
15 wherein it is necessary to cut into the surface of the copper or other metal plate and form an ellipse or oval, and the present machines for performing this duty are more or less ineffective and operate with only  
20 reasonable efficiency and accuracy in view of the crude facilities for setting them and manipulating them. It is further true of this particular art that after an ellipse has been scribed upon a plate or other surface  
25 for the first time and has gone through certain stages or processes it is necessary to reset the plate in the ellipsograph, or machine for scribing or cutting ellipses, and to find or so locate, so to speak, the original ellipse that the original line or curve may  
30 be again produced for additional cutting or for routing. This has been practically impossible except by a vast amount of manipulation of the plate and of the parts of the machine to determine the exact spot or the  
35 exact position which the scribed ellipse will assume relative to the cutting member or scribing member. It is also a fact that users of machines of this type would appreciate greatly a machine wherein a router is  
40 combined with the ellipsograph in one machine so that after the ellipse has been scribed the plate may be routed around the ellipse and the ellipsograph sections can be  
45 thrown out of operation, so that the entire plate may be routed, thus eliminating the two machines and producing at once a combined ellipsograph and router.

The object of the present invention, therefore, is to provide a combined router and  
50 ellipsograph both features of which are highly efficient and accurate for their separate uses and are arranged so that they will cooperate to produce a tool which is highly useful for the purposes for which it is intended.  
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A further object is to produce a positive and complete control for the ellipsograph; to produce a finder so that an ellipse already scribed or cut may be properly adjusted and  
60 located upon the ellipsograph; to arrange in conjunction with the ellipsograph mechanism a suitable router which may cooperate therewith to rout a plate around the ellipse and may then be used for general routing  
65 purposes after being disconnected from the ellipsograph mechanism.

More specifically the invention relates to a suitable frame supporting a table in which the ellipsograph bed and its operating  
70 mechanism are mounted, and this mechanism comprises a supporting ring provided with a radially disposed guide way for a member carrying a pivoted block, and a ring carrying a strip, the former engaging  
75 in a slot in the underside of the bed plate, and the latter engaging in another slot at right-angles to the former slot, and also arranged in the bed plate, together with suitable  
80 mechanism for rotating the ring, which operation will cause the bed plate to gyrate about the pivoted block and scribe an ellipse with respect to a fixed point.

Further it relates to an adjustable fixed tool which is mounted upon and driven by a  
85 rotatable threaded shaft supported on one side of the bed plate and held in the proper relationship to the work by means of a rail on the opposite side of the bed plate.

Still further the invention relates to suitable  
90 mechanism for rotating the ellipsograph bed and to certain details relative to the arrangement of a routing arm and router head which may be connected to the member carrying the scribing tool so that  
95 the routing tool may rout out around the ellipse which has been previously scribed by the scribing tool.

Still further the invention relates to an ellipse finder arranged in conjunction with  
100 the ellipsograph bed whereby a plate, which has been previously scribed with an ellipse, may be shifted so that the ellipse scribed thereon may be positively located on the bed  
105 plates and may be clamped down in place whereby after the major and minor axes of the ellipse have been located by the parts of the machine determining these factors, then the original curve may be gone over with either the scribing tool or the routing  
110 tool.

Still more specifically the invention relates to a center finder located on the ellipsograph bed and adapted to positively determine the center for manipulating the device in determining one of the axes of the ellipse.

The invention may be further briefly summarized as consisting in the construction and combinations of parts hereinafter set forth in the following description, drawings and claims.

Referring to the drawings, Figure 1 is a perspective view of a machine embodying the features of my invention; Fig. 2 is a top plan view of the bed plate showing the finder plates mounted thereon and also showing the center finder; Fig. 3 is a sectional view; Fig. 4 is a top plan view of the mechanism below the bed plate with the latter removed; Fig. 5 is a bottom plan view of the bed plate; Fig. 6 is a detail view of the guide rail mounting; and Fig. 7 is a detail view of the router head.

In carrying out the invention any preferred form and construction of parts may be employed, but a very effective construction is set forth in the drawings and in such embodiment 1 represents a suitable frame supporting a table 2 which is of any suitable size and arrangement, but provided with a circular opening 3 for a purpose to be described. Near one edge the table 2 is provided with openings 4 which receive reduced ends 5 of rods 6 which support a rail 7 having on the upper edge thereof graduations 8 preferably in inches, shown in Fig. 1 and for a purpose to be later disclosed. The reduced end 5 of each of these rods 6 is provided with a pin 9 engaging in a slot 10 carried by a bell crank lever 11 fulcrumed to the under side of the bed and connected by a link 12 of a foot treadle 13 which is mounted upon a cross rod 14 carried by the frame. The arrangement of this mechanism is such that the weight of the rail 7 and the spring 11' holds the treadle 13 elevated and the rail in its upper position, but upon engaging the treadle and shifting it about the rod 14, this rail is lowered and the object of this operation is to lower the tool to the work.

Secured to the corner of the opposite side of the table is a post 15 having swiveled thereon a member 16 carrying a threaded shaft 17 which is arranged to rotate in the member 16 and carries a sliding block 18 which is of arc shape and is arranged to travel upon the upper edge of a guide 19 mounted on a bracket 20 secured to the corner of the table. A hand wheel 17' is mounted on the end of the shaft 17. The sliding block 18 is provided with an ear 21 having an opening therein for receiving a bolt 22 which is arranged to screw into the guide 19 and hold the block in central position such that the shaft 17 is parallel with the rail 7.

Swiveled upon the post 15 above the member 16 is an arm 23 which has at its other end a reduced portion 24 receiving a sleeve 25. This sleeve has a circular flat plate 25' integral therewith and receiving another plate 25° having a socket 28' and a short shaft 26' for supporting a pair of pulleys 26 and 27. This socket 28' carries an arm 28 which has upon the end thereof a bifurcated support 29 for the router head mechanism. The bifurcated support 29 has its arms 30 and 31 extended beyond the end of the arm 28 and has loosely mounted therein the router shaft 32 provided with a driving pulley 33 and a tool holder 34. The shaft is further provided with a block 35 which is secured to the shaft in a manner such that the latter is free to rotate therein but is held against endwise movement. This member 35 has an arm 36 slidably mounted in a bracket 37 secured to the arm 31, and also has an arm 38 which is adapted to be swiveled to the lower end of a threaded shaft 39 operating in a threaded opening in the arm 31, and having a crank 40 thereon. By this crank and threaded shaft the router may be raised and lowered in the support. The post 15 further supports a pulley bracket 41 which is rigid with the arm 23 and carries suitable pulleys 42 and 43. A belt 44 passes around these pulleys and around the pulley 27. Another belt 45 passes around the pulley 26 and the pulley 33 of the router shaft.

The threaded shaft 17 is provided with a nut 46 having upon one side a pair of ears 47 which, by means of a pin 48, support an arm 49 extending across the table and resting upon the upper surface of the rail 7. This arm is provided, at about the center of the machine, with a curved portion 50 having upon one side thereof a face plate 51 carrying bolts 52 which receive a cooperating supporting plate 54 swiveled to the bifurcated frame 29 so that when the face plate 50 and the cooperating plate 51 are secured together, the end of the router arm and the router head will be supported and may be shifted back and forth by grasping the arm 49.

The description up to this point has been confined to the mechanism which constitutes the routing mechanism, but a portion of this mechanism is also employed in conjunction with ellipsograph mechanism, which will now be described.

In utilizing the mechanism already described in scribing or routing an ellipse the arm 49 is fixed at right angles to the threaded shaft 17 and the rail 7 and this is accomplished by an arm 52' swiveled to the nut 46 and having a bifurcated end 53 which receives a suitable screw 54 secured in the arm 49 some distance from its connection to the nut 46. This screw holds this arm 49 firmly in the position indicated, and by this

arrangement on rotating the shaft 16 the nut 46 will be caused to travel carrying with it the arm 49, and the graduations upon the top of the edge rail 7 will indicate the distance from the center and should be set at one-half of one of the axes of the ellipse or oval which is to be scribed. A scribing device is secured to the arm 49 and consists of a bracket 55 secured in the arm 49 and carrying at its lower end a tool holder 56 provided at its forward end with a roller 57 and a scribing tool 58 held in place by a suitable set screw 59. In utilizing the mechanism already described in scribing or routing ellipses, the only step to be performed by this part is to adjust the position of the transverse arm 49 a distance away from the center corresponding to a half of the major axis. The other adjustment and the operating mechanism for cutting ellipses is carried by the table.

Secured to the table 2 upon the under side thereof is a bed 60 which has an upwardly extending ring 61 and a pair of parallel guide members 62 arranged on either side of the center and supported by suitable webbing in the ring 61. These guide members form a guide-way which extends radially from the periphery beyond the center of the ring. These guide members 62 are connected by a cross piece 63 and just beyond the center, as shown. Rotatably mounted in the ring is a threaded shaft 64 which extends below but in parallel alinement with the guide members 62 to the opposite side of the ring where it is provided with a suitable crank 65. Mounted on this threaded shaft 64 is a nut 66 which is guided between the guide members 62 and is provided with a socket 67 shown in dotted lines in Fig. 3 for receiving a pin 68 carried by a block 69 which extends above the plane of the upper surface of the ring 61. Rotatably mounted upon this ring 61 is a worm ring 70 having on the periphery thereof worm teeth 71 adapted to mesh with a worm 72 mounted in brackets 73 secured to the bed and having a shaft 74 projecting out upon the front edge of the frame, as shown in Fig. 1, where it is provided with a hand wheel 75. This worm ring rotates freely about the ring 61 and supports a diametrically disposed strip 76 which is provided with downwardly extending portions 77 secured to the ring. Resting upon the ring 61 is the bed plate 78 of the form shown in Figs. 1 and 2 in top plan and having diametrically disposed slots 79 at right angles to each other and of dove tail cross section, as shown in Fig. 1, for a purpose to be later disclosed. This bed plate is of the construction shown in Fig. 5 in bottom plan with diametrically disposed slots 80 and 81 directly below the slots 79 and crossing each other at right angles. The slot 80 is deeper, when looking at the bot-

tom of the plate, than the slot 81 and is for the purpose of receiving the strip 76 which as already stated, is in a plane above the plane of the block 69. The other slot 81 receives the block 69.

The slots 79 receive blocks 82 provided with bolts 83 which receive clamping plates 84 and clamping screws 85. These clamping blocks are for holding the work upon the bed plate.

Mounted upon a boss 86 secured to the bed and preferably adjacent to one of the slots 79, as shown in Fig. 2, is a pin 87 upon which is pivoted a center finder arm 88 which may be swung in parallel alinement with the adjacent slot 79 or may be swung around out of position, as shown in dotted lines in Fig. 2. This arm has suitable graduations 89 preferably in inches, and the end of it extends to the center of the bed plate, as well as to the center of the ring 61 when the former is in normal position.

The normal or initial position of the several parts of the machine, when it is to be used as an ellipsograph, is with the transverse arm 49 located so that the end thereof is at the point marked center on the rail 7 so that the tool is positioned directly above the center of the supporting ring 61, and with the transverse arm held at right angles to the threaded driving shaft 17 by having the arm 52' rigidly clamped against this transverse arm 49, and further with the bed plate arranged so that the strip 76 is at right angles to the threaded driving shaft 17 and to the radial guide way formed by the guide members 62.

In operating the device as an ellipsograph, the operator places the plate upon the bed plate and clamps it down with the clamps in any suitable position. He then, by rotating the shaft 17, shifts the arm 49, which has been previously secured at right angles to the shaft 17, in the manner described, until it indicates upon the rail 7, one-half of one of the axes of the ellipse preferably the major axis. The bed plate is then rotated through a quarter turn, or until the strip 76 is parallel with the guide way formed by the guide members 62 and rotates the hand wheel 65 until one-half of the other axis of the ellipse, preferably the minor axis, is indicated upon the center finder 88, this member having been previously thrown into operative position with its corner coinciding with the center of the bed plate. The next operation is to lower the tool upon the plate. Then upon the rotation of the shaft 74 by the hand wheel 75, the worm ring 70 will be rotated, and through the strip 76, will rotate the bed plate 78 causing it to turn or gyrate about the pivot 68 of the block 69 in a well known manner and, as already understood, from the popular Trammel mechanism. This op-

eration causes the plate or the work to move under the tool in a manner to cause it to cut an ellipse into the plate. If the router is to be used, the scriber is thrown out of operative position and the router is set in motion after having first been secured to the arm 49.

In many instances it is necessary to reset the plate upon the bed plate for further operation either by the scriber or by the router, and in doing this, it becomes necessary to find, as it were, the original ellipse, and to accomplish this purpose the bed plate 78 is provided with blocks 90 slidably mounted in the groove 79, which is always parallel to the strip 76. One of these blocks is arranged on each side of the center. These blocks are threaded onto a shaft 91 which is provided on either side of the center of the bed plate with oppositely pitched threads, for example, the portion on the right is a right-hand thread and the one to the left is a left-hand thread, whereby the blocks 90 upon the rotation of the shaft 91 move simultaneously either toward or from each other. Mounted upon each of these blocks 90 is a finder plate 92 which has upon its inner edge sharp teeth 93 and they are arranged and constructed in a manner such that when brought together, the points of opposed teeth abut. These plates 92 are arranged above the plane of the bed sufficiently to permit the work plate to pass under them. In using this finder, the operator places the work plate upon the bed plate and by manipulating the shaft 91 through the instrumentality of the crank 94 finally brings two pairs of opposed points into a position such that they touch, as it were, the curve of the ellipse. The work plate is then clamped upon the bed plate, and it has been properly located so that the operator need only set his scribing or routing tool upon the curve for the two axes and then rotate the bed plate in the manner described, when the scribing or routing tool will then follow the path of the original ellipse.

Having described my invention, I claim:—

1. In a routing and scribing machine, in combination, a frame, a bed, means for shifting said bed in a manner such that it will scribe an ellipse with respect to any fixed point, a scribing and routing device, means for supporting and adjusting said scribing and routing device, and means whereby the parts may be adjusted for any predetermined major and minor axes.

2. In a routing machine, in combination, a frame, a suitable bed plate for holding the work, a routing tool suitably mounted, means whereby the work and the routing tool may be moved relatively so that an ellipse is cut upon the work and means whereby the parts may be adjusted for any predetermined major and minor axes.

3. In a routing machine, in combination, a frame, a bed plate mounted upon said frame, means whereby said bed plate is caused to move in a manner to scribe an ellipse with respect to a fixed point, a routing tool mounted on the frame and adapted to operate upon the work, and means whereby the parts may be adjusted for any predetermined major and minor axes.

4. In a routing machine, in combination, a frame, a bed plate mounted therein for carrying the work, mechanism for operating said bed plate and causing it to move in a manner to scribe an ellipse relative to a fixed point, a routing device mounted on the frame, means for adjusting said routing device to determine one of the axes of the ellipse, and means for adjusting the bed for the other axis of the ellipse.

5. The combination with a tool, of a bed plate, comprising a supporting ring, a driving ring mounted upon said supporting ring, a strip carried by the driving ring, a sliding block adapted to move to and from the center of the supporting ring, means for shifting this block, and suitable gearing for rotating the driving ring, and a bed plate provided with grooves at right-angles to each other, one of said grooves being adapted to receive the strip and the other the sliding block, all of said parts being arranged in a manner to cause the bed to scribe an ellipse with respect to a fixed point.

6. In an ellipsograph, in combination, a frame, a tool supported thereon, means for adjusting said tool from a fixed point to determine one of the axes of the ellipse, a supporting ring mounted in the frame, a driving ring mounted about said supporting ring, suitable gearing for driving said ring, a diametrically disposed strip carried by said driving ring, a sliding member adapted to move radially with respect to the supporting ring, a guide block carried by said sliding member, a bed plate having diametrically disposed slots cutting each other at right-angles, one of said slots being adapted to receive the strip and the other the block, means for adjusting the sliding member for one of the axes of the ellipse, and means for adjusting the tool for the other axis.

7. In an ellipsograph, in combination, a frame, a bed plate for receiving the work, means for shifting said bed plate to cause an ellipse to be scribed relative to a fixed point, a support mounted upon the frame and on either side of the bed plate, an arm extending from one support to the other, means for moving said arm along said supports and maintaining it at all times at right-angles to the supports, and a tool carried by said arm.

8. In an ellipsograph, in combination, a frame, a bed plate mounted in said frame, means for moving said bed plate in a man-

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ner such that an ellipse may be scribed relative to a fixed point, a supporting member mounted upon one side of the bed plate and carried by the frame, a shaft upon the opposite side of the bed plate, an arm mounted upon said shaft and adapted to be moved along said shaft and by it and to normally assume a position at right-angles to it, said arm resting on the other support, and a tool carried by said arm.

9. In an ellipsograph, in combination, a frame, a bed plate mounted in said frame, means for conveying a movement to said bed plate whereby it may scribe an ellipse relative to a fixed point, a support carried by the frame on one side of the bed plate, a shaft rotatably mounted on the frame on the opposite side of the bed plate and in substantially parallel alinement with the support, a nut threaded upon said shaft, an arm carried by said nut and resting upon the opposite support, and a tool carried by said arm.

10. In an ellipsograph, in combination, a bed plate for holding the work, a fixed tool, means for imparting a relative movement between the fixed tool and the bed plate whereby the former may scribe an ellipse upon the work carried by the bed plate, and means for properly locating a previously scribed ellipse upon the bed plate.

11. In an ellipsograph, in combination, a bed plate for holding the work, a fixed tool, means for imparting a relative movement between the fixed tool and the bed plate whereby the former may scribe an ellipse upon the work carried by the bed plate, and means carried by the bed plate for locating a previously scribed ellipse thereon.

12. In an ellipsograph, in combination, a bed plate for holding the work, a fixed tool, means for imparting a relative movement between the fixed tool and the bed plate whereby the former may scribe an ellipse upon the work carried by the bed plate, and means adapted when adjusted to cause its parts to touch the curve of a previously formed ellipse in a manner to locate such ellipse upon the bed plate.

13. In an ellipsograph, in combination, a bed plate for holding the work, a fixed tool, means for imparting a relative movement between the fixed tool and the bed plate whereby the former may scribe an ellipse upon the work carried by the bed plate, suitable plates mounted upon the bed plate and having opposed indicating elements which, when caused to touch the curve of a previously scribed ellipse, will locate the latter relative to the bed, and means for manipulating said plates.

14. In an ellipsograph, in combination, a bed plate for holding the work, a fixed tool, means for imparting a relative movement between the fixed tool and the bed plate

whereby the former may scribe an ellipse upon the work carried by the bed plate, a pair of sliding plates mounted on the bed and each is provided with projections, the projections of one plate being opposed to the projections of the other and pointing toward each other, and means for simultaneously shifting said plates to and from each other.

15. In an ellipsograph, in combination, a bed plate for holding the work, a fixed tool, means for imparting a relative movement between the fixed tool and the bed plate whereby the former may scribe an ellipse upon the work carried by the bed plate, a pair of sliding plates mounted on the bed and each is provided with projections, the projections of one plate being opposed to the projections of the other and pointing toward each other, and a shaft provided with right and left-hand threads for shifting said plates simultaneously to and from each other.

16. In an ellipsograph, in combination, a bed plate for holding the work and provided with a transverse slot, a fixed tool, means for imparting a relative movement between the fixed tool and the bed plate whereby the former may scribe an ellipse upon the work carried by the bed plate, guide blocks carried in said slot one on each side of the center, a shaft threaded in each block, the threads on one side of the center being oppositely arranged to those on the other whereby the blocks will move toward and from each other simultaneously, a finder plate secured to each block, and teeth projecting from the inner edge of each plate, the teeth of one plate being opposed to the teeth of the other so that when the two plates are brought together the points of the teeth of one plate abut against the teeth of the other.

17. In a routing machine, in combination, a frame, a bed plate mounted therein for carrying the work, a jointed router arm supported on said frame, a router head carried by said arm, a supporting plate carried by said head, a supporting shaft mounted on said frame, a member adapted to be moved by said shaft, a face plate carried by said member, and means for securing the face plate carried by the router head to the face plate carried by said member.

18. In an ellipsograph, in combination, a frame, a bed, a jointed router arm mounted on said frame, a rotatable shaft mounted on said frame, a member adapted to be moved by said shaft and constituting a part of the ellipsograph mechanism, means carried by said member for supporting the router head, and means for operating said bed plate relative to the router head whereby the latter may scribe an ellipse upon the work.

19. In an ellipsograph, in combination, a frame, a jointed router arm mounted on

said frame, a shaft swiveled upon said frame, suitable members for guiding said shaft as it moves bodily over the frame, an arm mounted on said shaft and having a hinge, a  
5 router head mounted on the jointed router arm, suitable connections between said head and the arm supported by said shaft, a bed plate, and suitable mechanism causing the

bed plate to gyrate and scribe an ellipse with respect to the router head. 10'

In testimony whereof I affix my signature in presence of two witnesses.

OTTO H. BONNER.

Witnesses:

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EDWD. R. MEYER.