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G. W. SHERMAN.
ELLIPSOGRAPH.

(Application filed Sept. 29, 1899.)

(No Model.)

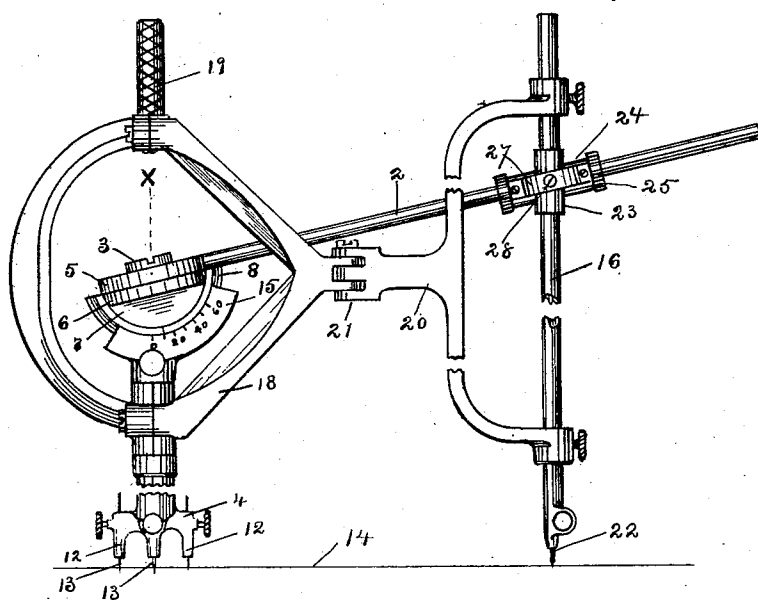


Fig. 1.

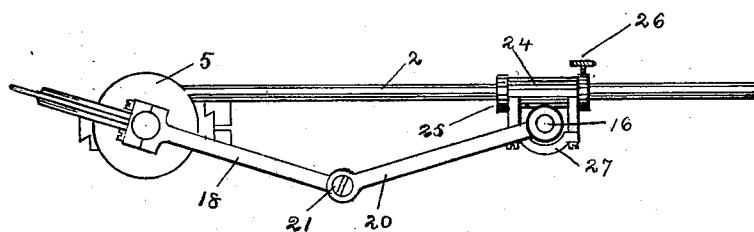


Fig. 2.

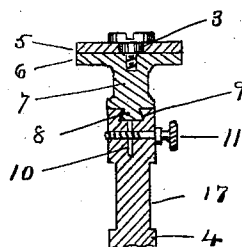


Fig. 3.

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ELLIPSOGRAPH.

SPECIFICATION forming part of Letters Patent No. 715,883, dated December 16, 1902.

Application filed September 29, 1899. Serial No. 732,040. (No model.)

To all whom it may concern:

Be it known that I, GEORGE W. SHERMAN, a citizen of the United States, residing at Fall River, in the county of Bristol and State of Massachusetts, have invented certain new and useful Improvements in Ellipsographs, of which the following is a specification.

My invention is intended to provide a simple and efficient device for generating ellipses of any desired size and eccentricity and may be described in a general way as consisting of means for describing a circle about an adjustable axis, combined with means for projecting said circle on the plane of the surface to be drawn on, which projection in accordance with a well-known geometrical proposition will be an ellipse whenever its plane lies at an angle to that of the circle projected, the size and eccentricity of the ellipse being dependent upon the radius of said circle and the angle between its plane and that of the surface to be drawn on.

An ellipsograph embodying a preferred form of my invention is illustrated in the accompanying drawings, in which—

Figure 1 is a side elevation of the complete device. Fig. 2 is a top plan view thereof, and Fig. 3 is a detail in section on the line x in Fig. 1.

For describing the circle which is to be projected into the desired ellipse I provide an arm 2, journaled on an axis or pivot 3, which is supported by a fixed base 4 and is angularly adjustable with respect thereto. In order to confine the motion of the arm 2 with accuracy to the desired plane, I prefer to enlarge the pivoted end of said arm into a flat disk 5, adapted to bear against a corresponding flat head 6, carried by the base 4, into which head the axis 3, on which the arm 2 turns, may be screwed, as shown in Fig. 3. Thus the motion of the arm 2 will be accurately limited to the plane determined by the flat top face of the head 6, which head is made adjustable, preferably by being provided with a downwardly-projecting semicircular web 7, having a dovetailed tenon 8 formed thereon and fitted to slide in a corresponding dovetailed groove 9 formed in the upper end of the supporting-base 4. In order to clamp the head 6 in any desired position of adjustment,

the upper end of the base 4 may be split, as shown at 10 in Fig. 3, and provided with a clamping-screw 11, passed through the split portion thereof. I prefer to have the base 4 rest on three legs 12, lying in the same straight line, each leg being provided with an adjustable needle-point 13, adapted to enter slightly into the paper or other surface 14, on which the ellipse is to be drawn, thereby holding this portion of the instrument fixed while the rest of the device is being rotated, as hereinafter described. As thus constructed the adjustable head 6 may be so set and clamped as to provide for the accurate motion of the arm 2 in a complete circle and in a plane making any desired angle with the surface 14. The semicircular web 7 should be so constructed that the center from which it is struck will coincide with the center of the axis 3 where it passes through the disk 5, and the middle needle-point 13 may conveniently be located directly beneath said center, which in such case will always keep the same position, regardless of the position of adjustment of the head 6, and will be projected on the surface 14 by said middle needle-point. If desired, a graduated scale 15 may be formed on or attached to the top of the base 4 to indicate the angle to which the arm 2 has been adjusted with respect to the surface 14.

The aforesaid parts being constructed as described, it will be evident that if any given point in the arm 2 be projected in all positions of said arm on the surface 14 by any suitable device acting perpendicularly to said surface the circle described by said given point upon the complete rotation of the arm 2 will be projected on the surface 14 as an ellipse of which the middle needle-point 13 will be the center. To this end I provide a rod 16, so arranged that it may be moved bodily around the base 4 as a center and may approach thereto and recede therefrom, but will always be kept perpendicular to the surface on which said base rests, and I provide suitable connections between said rod and the arm 2, so constructed that said rod 16 will be maintained at a predetermined distance from the axis 3, but will be capable of the necessary pivotal movements with respect to the arm 2 when revolved around the base 4.

For this purpose I prefer to form a journal 17 on the upright portion of the base 4 and perpendicular to the surface 14, on which journal a frame 18 is mounted so that it may be rotated like a pair of compasses by means of a thumb-piece 19. Another frame 20 is hinged to the frame 18, as at 21, the pivot of said hinge being parallel to the journal 17, and the rod 16 is clamped in and carried by said frame 20, as shown, in such manner that it will be parallel with the hinge 21 and journal 17 in all positions of said parts. A considerable space is provided between the ends of the frame 20 to permit of the necessary motions of a sleeve 23, hereinafter described, and the frame 18 is similarly formed to provide room for the parts 5, 6, 7, and 8. A pencil, pen, or other suitable marking device 22 is carried by the lower end of the rod 16, and said rod and the needle-points 13 are to be so adjusted that said marking device 22 may be kept in proper contact with the surface 14 while the frames 18 and 20 are moved completely around the journal 17 as a central axis. During such motion the hinge 21 will obviously keep the rod 16 always perpendicular to the surface 14, but will permit of its motion toward and from the base 4 as a center.

In order to transmit to the arm 2 the rotatory motion to be given to the frames 18 and 20 through the thumb-piece 19, the arm 2 may be connected to the rod 16; but during such rotatory motion the arm 2 will have a vertical motion along the rod 16 and also two angular movements with respect thereto—one about its own length as an axis and the other about an axis perpendicular to its intersection with the rod 16—and to provide for such relative movements and at the same time keep the rod 16 at a predetermined distance from the axis 3, measured along the arm 2, I prefer to mount a sleeve 23 to slide easily but accurately upon the rod 16, which sleeve is pivoted to another sleeve 24, mounted to turn easily on a collar 25 on the arm 2, which collar may be slid along said arm and clamped by a set-screw 26 at any desired point thereon. The sleeve 24 may be kept in place on the collar 25 by confining it between flanges or collars secured to the ends of the latter, as shown in Figs. 1 and 2, and it will be understood that the sleeves 23 and 24 are pivoted together in such manner as not to interfere with the sliding of the sleeve 23 up and down the rod 16 or the rotation of the sleeve 24 on the collar 25 or the movement of said collar when desired along the arm 2. This may conveniently be done by passing a strap 27 around the sleeve 23 and securing said strap to the sleeve 24, the pivot 28 being screwed into the sleeve 23 and arranged to turn in said strap.

To draw a given ellipse with the device above described, the base 4 is placed on the surface 14 with the central needle-point 13 co-

inciding with the center of the desired ellipse and with the semicircular web 7 lying in that vertical plane which contains the minor axis of the ellipse, and the marking device 22 is so adjusted that it will make proper contact with the surface 14. The instrument is then turned on the journal 17 until the arm 2 is parallel with the surface 14, and the collar 25, carrying the rod 16 with it, is then moved along said arm until the marking device 22 is at one extremity of the major axis of the desired ellipse, at which point said collar 25 is clamped firmly to the arm 2. The instrument is next turned on the journal 17 through an angle of ninety degrees, and the head 6, carrying with it the arm 2, is then adjusted to such an angle as will cause the marking device 22 to coincide with one extremity of the minor axis of the ellipse, and thereupon said head 6 is clamped by the screw 11. If now the frame 18 be rotated by means of the thumb-piece 19 after the manner of a pair of compasses, the frame 20 and rod 16 will be carried along therewith and will in turn cause the arm 2 to move through a circle in the plane to which it is adjusted, the head 6 of course remaining stationary, so that the collar 25, being held at a fixed distance from the center on which the arm 2 turns, will cause the rod 16 and marking device 22 to approach and recede from the base 4, according to the inclination of the arm 2 to the surface 14, the sleeve 23 at the same time sliding up and down on the rod 16. The result will be that the circle described by the point at which the collar 25 is clamped will be projected on the surface 14 as the ellipse desired and will be described thereon by the marking device 22, as will be apparent without further description.

I claim as my invention—

1. In an ellipsograph, the combination of a head having a downwardly-extending, semicircular web, a fixed base having its upper end formed on an arc described from the same center as that of said web and adapted to guide the latter, means for clamping said web and base together, an arm journaled on said head, at the center of the arc on which said web is formed, a rod pivotally connected with said arm and carrying a marking device, and means for maintaining said rod perpendicular to the plane of the desired ellipse and for moving the same about said fixed base as a center.

2. An ellipsograph comprising in combination a fixed base, an arm adjustably pivoted thereon, a collar adjustable on said arm and carrying a rotatable sleeve, a rod provided with a marking device and with a second sleeve adapted to slide thereon, said two sleeves being pivoted together, and means for maintaining said rod perpendicular to the plane of the desired ellipse, and for causing it to revolve about said fixed base, substantially as described.

3. An ellipsograph comprising in combina-

tion a fixed base carrying an adjustable head,
an arm pivoted on said head and provided
with an adjustable collar, a sleeve adapted to
turn on said collar and pivoted to a second
5 sleeve, a rod on which said second sleeve is
adapted to slide and carrying a marking de-
vice at its lower end, and a hinged frame, one
portion of which carries said rod and the other
portion of which is journaled on said fixed

base and provided with a thumb-piece, all as
substantially as described.

In testimony whereof I have hereunto sub-
scribed my name this 28th day of September,
1899.

GEO. W. SHERMAN.

Witnesses:

FRANCIS W. CLOUGH,
E. D. CHADWICK.