April 18, 1950 W. K. GROOME 2,504,832

INSTRUMENT FOR DRAWING ELLIPSES

Filed Nov. 13, 1945 2 Sheets-Sheet 1

Fig. 1

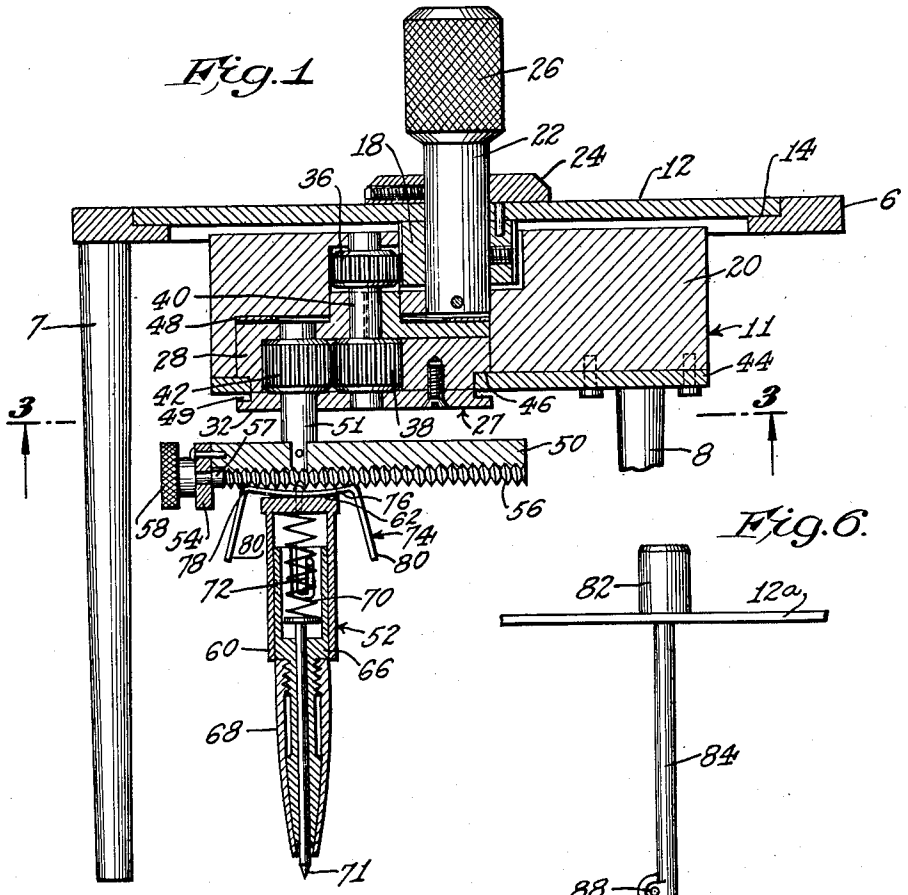


Fig. 6.

Fig. 5.

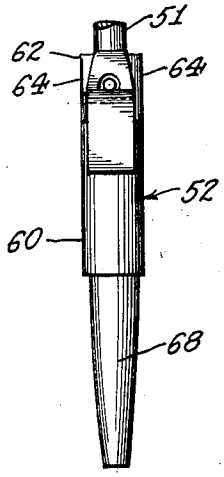
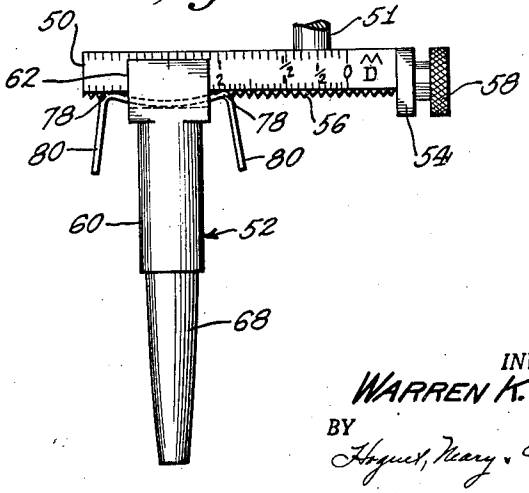


Fig. 4.



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Fig. 2.

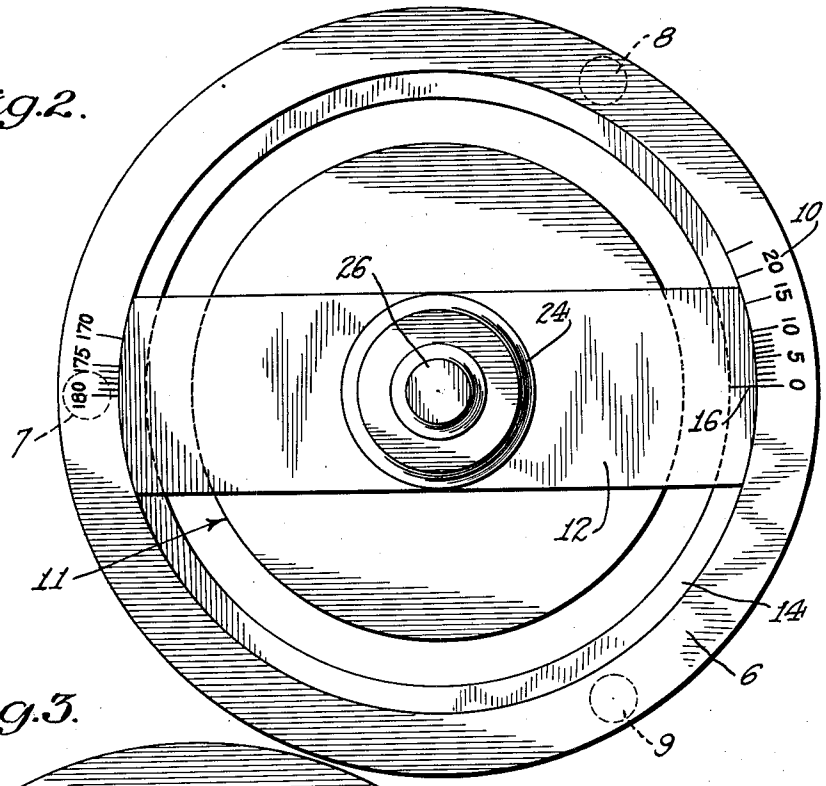
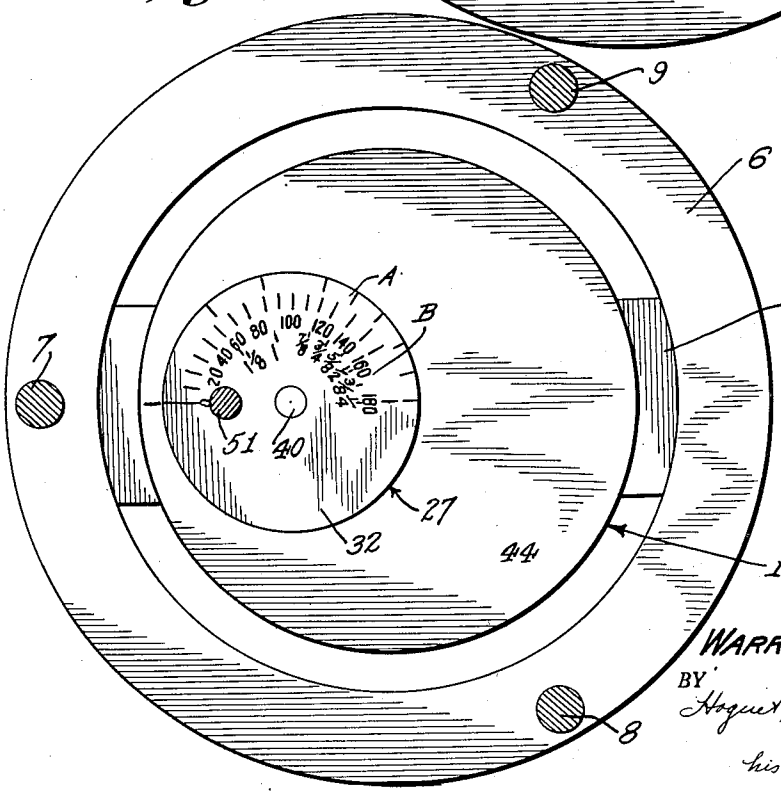


Fig. 3.



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INSTRUMENT FOR DRAWING ELLIPSES

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7 Claims. (Cl. 33—30)

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This invention relates to instruments for drawing ellipses.

The main objects of this invention are to provide an ellipsograph that is simple in construction, efficient in operation, easy to adjust and operate.

Other objects of this invention are to provide an instrument of this character which includes a supporting means, means facilitating positioning of the same to the center of the ellipse to be drawn and to a line of reference for the major axis of the ellipse, an operating or scriber unit with provision for adjusting the same in accordance with the difference between the lengths of the major and minor diameters and in accordance with the length of the major diameter and cooperating means on the operating or scriber unit and the supporting means for facilitating locating of the major diameter at a desired angle to the line of reference.

Other further objects of this invention will be apparent from the following description taken in connection with the drawings in which:

Figure 1 is a vertical transverse section through the instrument;

Figure 2 is a top plan view of the instrument;

Figure 3 is a transverse horizontal section on the line 3—3 of Figure 1;

Figure 4 is a rear elevational view of the generating arm and the pencil assembly;

Figure 5 is an end view of the generating arm and the pencil assembly shown in Figure 4; and

Figure 6 is a side elevational view of a centering pin equipped with a duplicate of the sun arm.

The instrument consists generally of a fixed sun wheel, a first planetary wheel cooperating with the sun wheel, a second planetary wheel cooperating with the first planetary wheel, and a generating arm fixed to the shaft of the second planetary wheel. The instrument is provided with means for adjusting the position of the second planetary wheel around the first planetary wheel and the position of the pencil or scriber on the generating arm.

The supporting ring assembly for the operating or scriber unit of the instrument consists of a supporting ring 6 supported on three legs 7, 8, and 9 spaced 120° from each other. This is the base of the operating or scriber unit. The upper face of the ring is marked in degrees from 0° to 180° as indicated at 10, Figure 2, to provide for predetermined angular positioning of the major axis of the ellipse to be drawn when the legs 8 and 9 are placed parallel to a line of reference. If desired, and for convenience, the ring 6 may be

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marked in degrees from 0 to 360 or additionally in degrees from 0 to 180 in a counter-clockwise direction to facilitate positioning of the major axis at angles inclined in an opposite direction with respect to the line of reference.

The operating or scriber unit 11 comprises a sun arm 12 which carries the weight of the operating or scriber unit to the supporting ring assembly, and this arm is fitted to rotate on a ledge 14 on the supporting ring 6. The sun arm has a reference mark on it as indicated at 16, Figure 2, which can be revised to a vernier, if necessary, to aid in positioning the unit to the desired angle on the supporting ring 6. Secured to the lower side of the sun arm 12 is a sun wheel 18. The sun arm and the sun wheel are adjustable on the supporting ring 6, but in the operation of the instrument, they are held fixedly in the adjusted position on the supporting ring.

The body 20 of the operating or scriber unit is rigidly connected to an operating shaft 22 which passes through and is rotatable in the sun wheel 18 and sun arm 12 and is supported on the sun arm 12 by a thrust washer 24 pinned to the operating shaft 22 and thus the sun arm carries the weight of all the moving parts of the unit. The shaft 22 is provided with a manipulating knob 26. The body 20 is constructed to receive the sun wheel and the capsule or housing 27 containing the planetary wheels later described.

The planetary capsule 27 comprises a capsule body 28 which is recessed to receive first and second planetary wheels and is provided with bearings for the shafts of the planetary wheels. A capsule indexing plate 32 is suitably secured to the capsule body and is provided with bearings for said shafts. The first planetary wheel may consist of two axially spaced planetary wheels 36 and 38 connected by a shaft 40 which has bearings in the capsule plate and in the capsule body and in the body 20 of the operating or scriber unit. The second planetary wheel 42 is provided with a shaft which has bearings in the capsule body and in the capsule plate 32 and which extends downwardly beyond the capsule plate 32. The capsule body 28 may be made in two pieces as shown to facilitate the mounting of the shaft 40.

As shown in Figure 3, the lower face of the capsule plate 32 is provided with concentric semicircular scales, the one designated A being in fractions, for example of inches, and is used to facilitate adjustment of the second planetary wheel 42 about the first planetary wheel 38 to set the operating or scriber unit for any desired

length of major axes (within the range of the instrument) of the ellipse to be drawn and the other shown at B to indicate the zero angle position for the sun arm 12 on the supporting ring 6 for locating the major axis of the ellipse parallel to a line of reference. The divisions on the scale A are so spaced that each division space represents an equal increment in the length of the major axis.

The capsule body is held in the body of the unit by a holding plate 44 suitably secured to the lower face of the body of the unit and engaging under a shoulder 46 in the periphery of the lower end of the capsule body 28. The holding plate holds the capsule against a spring washer 48, the purpose of which is to provide enough thrust against the holding plate to hold the capsule in a locked position during the operation of the instrument. The capsule plate 32 is recessed at 49 to permit the capsule to be raised to free it for rotation for adjusting purposes.

The generating arm shown at 50, Figures 1 and 4, is fixed to the shaft 51 of the second planetary wheel 42 and carries the pencil holder assembly generally indicated at 52. Fixed to one end of the generating arm 50 is a thrust plate 54 which acts as a bearing for a shoulder 57 and a knob 58 on the adjusting screw 56. One side face of the generating arm 50 is provided with two scales, the one indicated at D to facilitate adjustment of the scriber unit for a given difference between the lengths of the major and minor axes of the ellipse to be drawn, and the other shown at M to aid in setting the unit by rotation of the capsule plate 32 for a given length of major axis of the ellipse to be drawn.

The pencil holder assembly 52 consists of the pencil body 60, the upper end of which is provided with a head 62 which is provided with flanges 64 having their opposed faces converging upwardly to cooperate with the upwardly converging side faces on the generating arm 50 to facilitate the movement and adjustment of the pencil assembly on the generating arm and to support and hold the pencil assembly normal to the generating arm.

Mounted in the pencil body 60 is a chucking section 66 on which is threaded a chuck thimble 68, and mounted within the pencil body and chucking section is a pressure spring 70 for advancing the lead or the like 71 of the pencil. The chucking section is connected to the pencil body by a bayonet slot connection 72 to provide not only for the removal of the chucking section but also for freedom of movement of the chucking section vertically as the scriber moves over irregularities in the drawing board.

Suported on the head 62 of the pencil body is a spring 74 which consists of an arcuate portion 76 resting on the head 62 and with rounded holding detent portions 78 which cooperate with the threads on the screw shaft 56 to move the pencil assembly as the knob 58 on the adjusting screw 56 is turned to effect final adjustment of the pencil assembly on the generating arm 50. The spring 74 is provided with downwardly projecting ends 80 which may be pressed toward each other to release the spring from the adjusting screw 56 when it is desired to make a quick approximate adjustment of the pencil holder assembly on the generating arm 50.

For the purpose of centering the instrument, a centering device shown in Figure 6 is provided. This includes a plate or arm 12a of the same dimensions as the sun arm 12. Secured to the arm

12a is an operating knob 82 and a centering pin shaft 84 which, at its lower end, receives a centering pin 86 which may be clamped on the shaft by any well-known means as shown at 88.

Operation of the instrument

In general in preparing the instrument for drawing an ellipse, the operating or scriber unit of the instrument is first set for the desired shape and size of the ellipse. The supporting ring is then positioned by using the centering pin. Then the sun arm is properly positioned on the supporting ring after which the operating knob 26 is rotated to generate the desired ellipse.

Specifically, the pencil holder assembly is set to the difference between the lengths of the major and minor axes by adjusting the pencil holder assembly along the generating arm and positioning it by means of the scale D. For example, for a one-half inch difference, the pencil holder is positioned at the one-half (½) mark on the D scale.

The pencil holder assembly is released for effecting this adjustment by pinching the spring 74 toward the body of the pencil holder and then sliding the assembly to the approximate setting. The spring 74 is then released, and the body of the pencil holder is set to the exact mark by means of the knob 58 on the adjusting screw 56. The setting on the scale M that is directly above the setting on the scale D is then read as one-quarter (¼) inch. This represents the portion of the major axes of the ellipse that the adjusted generating arm 50 will provide when the ellipse is drawn.

The operating or scriber unit is set for the size of the ellipse by turning the capsule plate so that the reading on its scale A plus the reading on the scale M equals the desired length of the major axis. The capsule plate has the two scales A and B marked on it. The basic scale A indicates the portion of the major diameter controlled by the angular position of the second planetary wheel 42 about the first planetary wheel 36, 38 and is calibrated in fractions of units of length such as inches, for example. The other scale B, which is superimposed on the scale A is calibrated in degrees. This second scale indicates the angle to which the sun arm 12 must be positioned on the supporting ring 6 to maintain the zero angle position with the line of reference, of the major diameter of the ellipse to be scribed.

The supporting ring assembly is positioned by holding the two legs 8 and 9 which span the zero point against the T square or drafting machine scale. The zero angle of the major diameter will then be parallel to the edge of the T square or scale. The centering pin, Figure 6, is then placed on the supporting ring, and the supporting ring is moved bodily so that the pin is directly on the center of the ellipse to be drawn; or the point of the centering pin while supported on the supporting ring may be engaged with a desired point on the paper and then the legs 8 and 9 may be lined up against the T square. The centering pin is then removed and the adjusted operating or scriber unit is placed on the supporting ring with the reference mark on the sun arm in registration with the degree mark representing the angle indicated on the capsule plate directly radially of the mark at which scale A is set. When the parts are so positioned, the direction of the major diameter will be parallel to the edge of the T square or scale. If it is desired that the position of the major axis be at

an acute angle to the line of reference, the sun arm can be rotated with respect to the indicated "zero angle" by an amount equal to said angle in either direction, depending upon the direction of inclination of the major axis to the line of reference.

Thus, it is seen that the only requirements for the use of the instrument are the differences of the major and minor axes, the length of the major axis, a known center and the direction of the major axis and that it is not necessary to draw axes. This is particularly helpful in making isometric drawings.

When the instrument has been thus positioned, the sun arm is held stationary on the supporting ring assembly with one hand, and the operating knob 26 is turned with the other hand to generate the desired ellipse.

While the invention has been described with reference to a preferred embodiment illustrated, it is to be understood that I reserve the right to all such changes as fall within the principles of this invention and the scope of the appended claims.

I claim:

1. An ellipsograph comprising a supporting ring, a sun arm rotatable on said ring, cooperating degree scale means on said ring and said sun arm, an operating shaft supported on and extending rotatably through said sun arm, a sun wheel secured to said sun arm, a planetary wheel supporting body secured to said shaft, a capsule frame unit rotatably mounted in said body, a planetary wheel in said frame unit engaging said sun wheel, a second planetary wheel cooperating with said first planetary wheel, a shaft supporting said second planetary wheel journalled in said frame unit parallel to said operating shaft and projecting below said frame unit, said frame unit comprising upper and lower sections defining an external groove between them, said lower section having a bottom face, and said body comprising two sections, one of which is narrower than and extends into said groove, concentric fractional length unit and degree scales on the bottom face of the lower section of said frame unit, a scriber supporting arm secured to the lower end of the shaft of said second planetary wheel, a scriber adjustable longitudinally along said supporting arm, said supporting arm being provided with a lower scale to aid in positioning said scriber in accordance with the difference between major and minor diameters of an ellipse to be drawn, and with an upper scale readable in fractions of ellipse major diameter for indicating the setting to be given to said lower section of said frame unit by means of its fraction scale to add a length to the portion of the major diameter contributed by said scriber to produce the total length of major diameter desired, and said degree scale on said lower section of said frame unit indicating the setting to be given to said sun arm to position the major diameter parallel to a line of reference.

2. An instrument of the character described comprising a supporting table, a sun arm rotatably mounted on said table, a capsule body, a shaft rotatable in said sun arm and connected to said body, a sun wheel surrounding said shaft and connected to said sun arm, a capsule mounted rotatably within said body on an axis parallel to said shaft, first planetary means rotatably mounted in said capsule on an axis coinciding with the axis of rotation of said capsule,

second planetary means rotatably mounted in said capsule on an axis eccentric to the axis of rotation of said capsule and cooperating with said first planetary means, a scriber supporting arm rigidly connected to said second planetary means, and a scriber supported for movement along the length of said scriber arm, said scriber arm being provided with a scale for facilitating the adjustment of said scriber in accordance with the difference between the major and minor diameters of the ellipse to be drawn and with a cooperating scale to indicate the portion of the length of the major diameter contributed by the adjustment of the scriber, said capsule being provided with a scale for facilitating adjustment of the second planetary means around the first planetary means to provide for the remainder of the length of the major diameter of the ellipse, and said capsule being also provided with a degree scale to indicate the position at which the sun arm should be located to bring the major diameter parallel to a line of reference for any given adjustment of the second planetary means around the first planetary means.

3. In an instrument of the character described, the combination of a supporting table provided with a plurality of supporting legs for positioning the table with respect to a line of reference, an ellipsograph supported rotatably on said table and provided with an index mark, said table being provided with degree marks for cooperation with said index mark, said ellipsograph including a sun wheel, a first planetary wheel cooperating with said sun wheel and a second planetary wheel cooperating with said first planetary wheel, a scriber arm rotatable with said second planetary wheel, and a scriber adjustable along the length of said arm, means for adjusting said second planetary wheel around said first planetary wheel and indicating means carried by said first-mentioned means for indicating, for different positions of said adjusting means, the angular position to which said ellipsograph should be set on said table to insure that the major diameter of the ellipse will be drawn parallel to said line of reference.

4. In an instrument of the character described, the combination of a supporting table, an ellipsograph rotatably supported on said table and provided with an index mark, said table being provided with degree marks for cooperation with said index mark, said ellipsograph comprising a sun arm rotatably supported on said table, a sun wheel rigid with said sun arm, a shaft rotatable in and extending through said sun arm and sun wheel and supported on said sun arm, a first rotatable planetary wheel supported by said shaft and cooperating with said sun wheel, a second rotatable planetary wheel supported by said shaft and cooperating with said first planetary wheel, said second planetary wheel being revolvable about said first planetary wheel, a scriber supported by said second planetary wheel, means for facilitating rotation of said shaft relatively to said sun arm and sun wheel, and indicating means associated with said second planetary wheel for indicating, for different positions of said second planetary wheel, the angular position to which said ellipsograph should be set on said table to insure that the major diameter of the ellipse will be drawn parallel to a line of reference.

5. In an instrument of the character described, the combination of a supporting table, an ellipsograph rotatably supported on said table and pro-

vided with an index mark, said ellipsograph comprising a sun arm rotatably supported on said table, a sun wheel rigid with said sun arm, a shaft rotatable in and extending through said sun arm and sun wheel and supported on said sun arm, a first rotatable planetary wheel supported by said shaft and cooperating with said sun wheel, a second rotatable planetary wheel supported by said shaft and cooperating with said first planetary wheel, said second planetary wheel being revolvable about said first planetary wheel, means for adjusting said second planetary wheel around said first planetary wheel and for maintaining said adjustment, a scriber supported by said second planetary wheel, means for facilitating rotation of said shaft relatively to said sun arm and sun wheel, and indicating means carried by said adjusting means for indicating, for different positions of said adjusting means, the angular position to which said ellipsograph should be set on said table to insure that the major diameter of the ellipse will be drawn parallel to a line of reference.

6. In an instrument of the character described, the combination of a supporting table, an ellipsograph rotatably supported on said table, and provided with an index mark, said table being provided with degree marks for cooperation with said index mark, said ellipsograph comprising a sun arm rotatably and adjustably supported on said table, a sun wheel rigid with said sun arm, a shaft rotatable in and extending through said sun arm and sun wheel and supported on said sun arm, a first rotatable planetary wheel supported by said shaft and cooperating with said sun wheel, a second rotatable planetary wheel supported by said shaft and cooperating with said first planetary wheel, said second planetary wheel being revolvable about said first planetary wheel, means for adjusting said second planetary wheel around said first planetary wheel and for maintaining said adjustment, a scriber arm supported by said second planetary wheel and carrying a scriber, means for adjusting said scriber on said scriber arm, means for facilitating rotation of said shaft relatively to said sun arm and sun wheel, and indicating means carried by said adjusting means for indicating, for different positions of said adjusting means, the angular position to which said ellipsograph should be set on said table to insure that the major diameter of the ellipse will be drawn parallel to a line of reference.

7. An ellipsograph comprising a support, a sun arm rotatable thereon, a sun wheel secured to said sun arm, a first planetary wheel cooperating with said sun wheel, a second planetary wheel cooperating with said first planetary wheel, means supporting said second planetary wheel for movement around said first planetary wheel, a scriber arm rigidly connected to said second planetary wheel, and a scriber adjustable along the length of said scriber arm, said scriber arm and said supporting means being provided with scales facilitating adjustment for the difference between the lengths of major and minor diameters and the length of the major diameter of the ellipses to be drawn, and said supporting means and said support being provided with degree scales to facilitate locating the major diameter in any desired angular relation to a line of reference.

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