F. KIRK & L. E. FRANCISCO.

ELLIPSOGRAPH.

APPLICATION FILED JUNE 4, 1915.

1,168,081.

Patented Jan. 11, 1916.

3 SHEETS—SHEET 1.

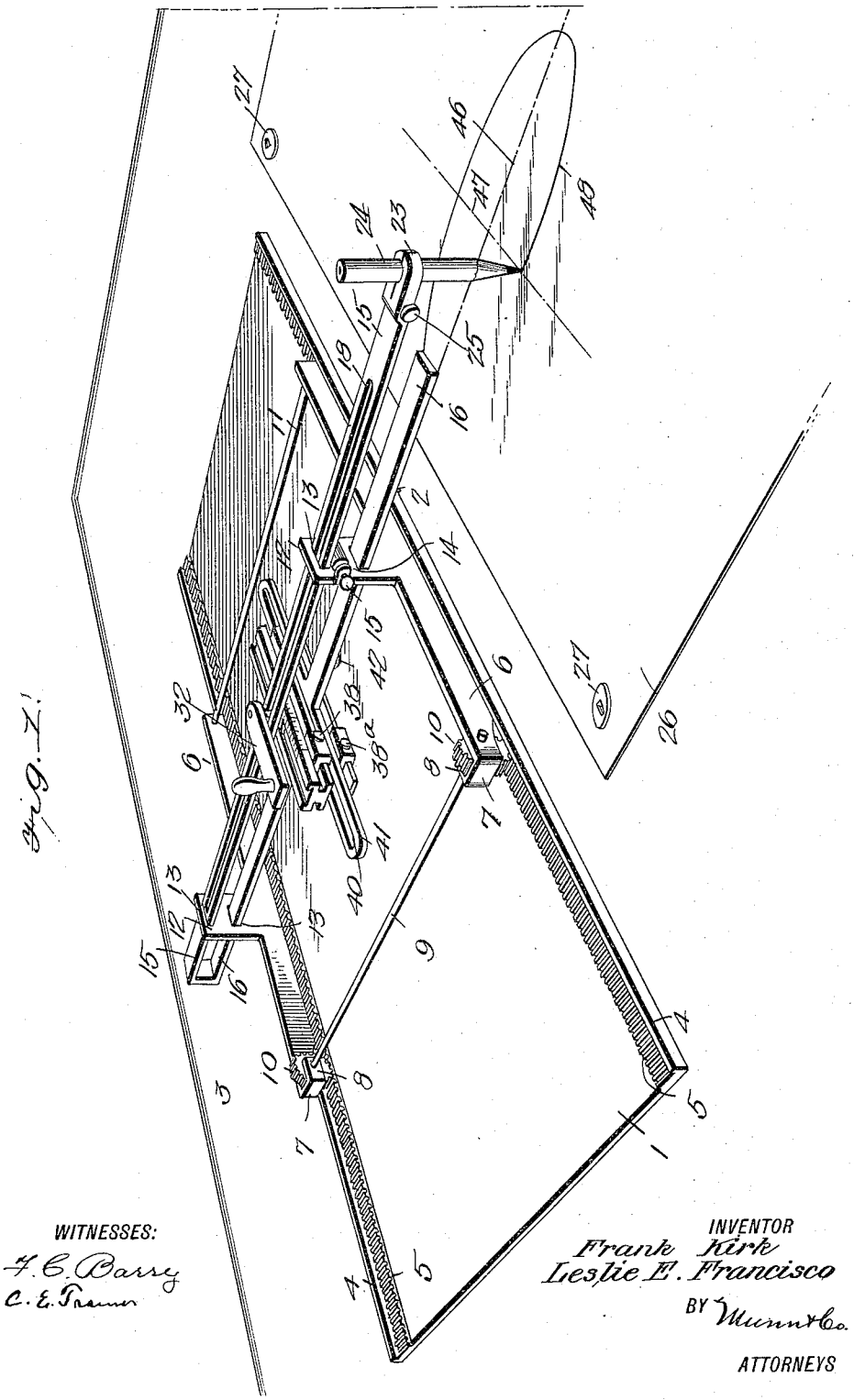


Fig. 1.

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3 SHEETS—SHEET 2.

Fig. 2.

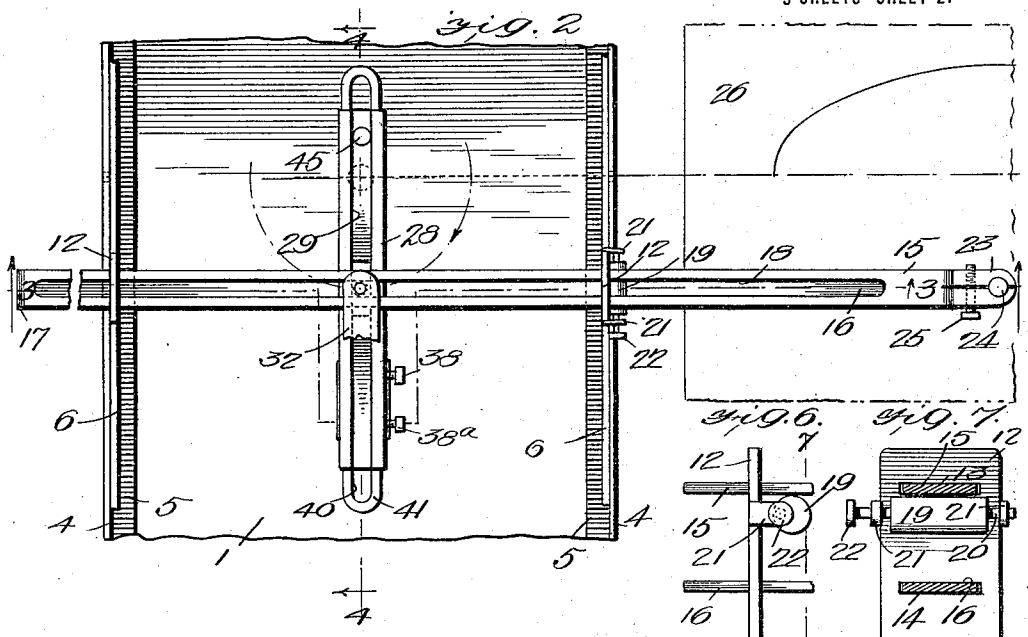


Fig. 6.

Fig. 7.

Fig. 3.

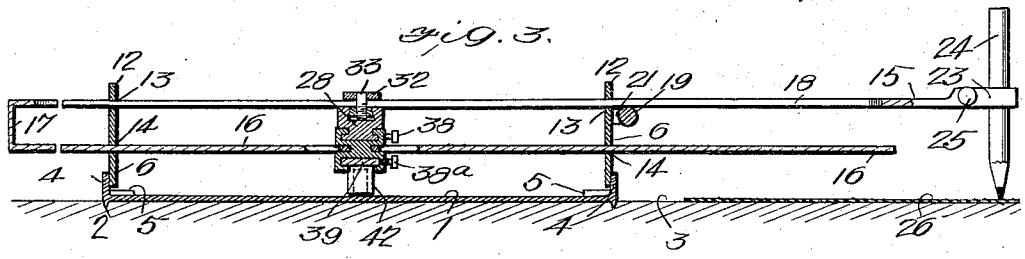


Fig. 4.

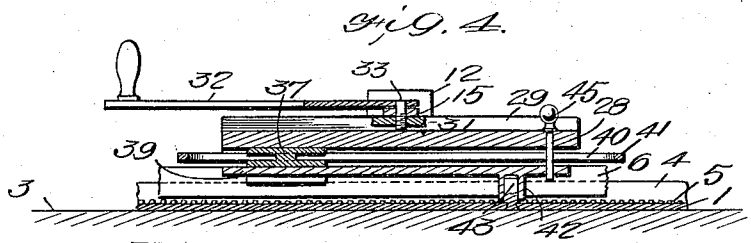
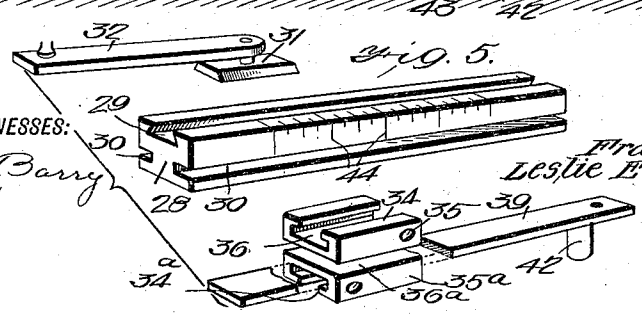


Fig. 5.



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3 SHEETS—SHEET 3.

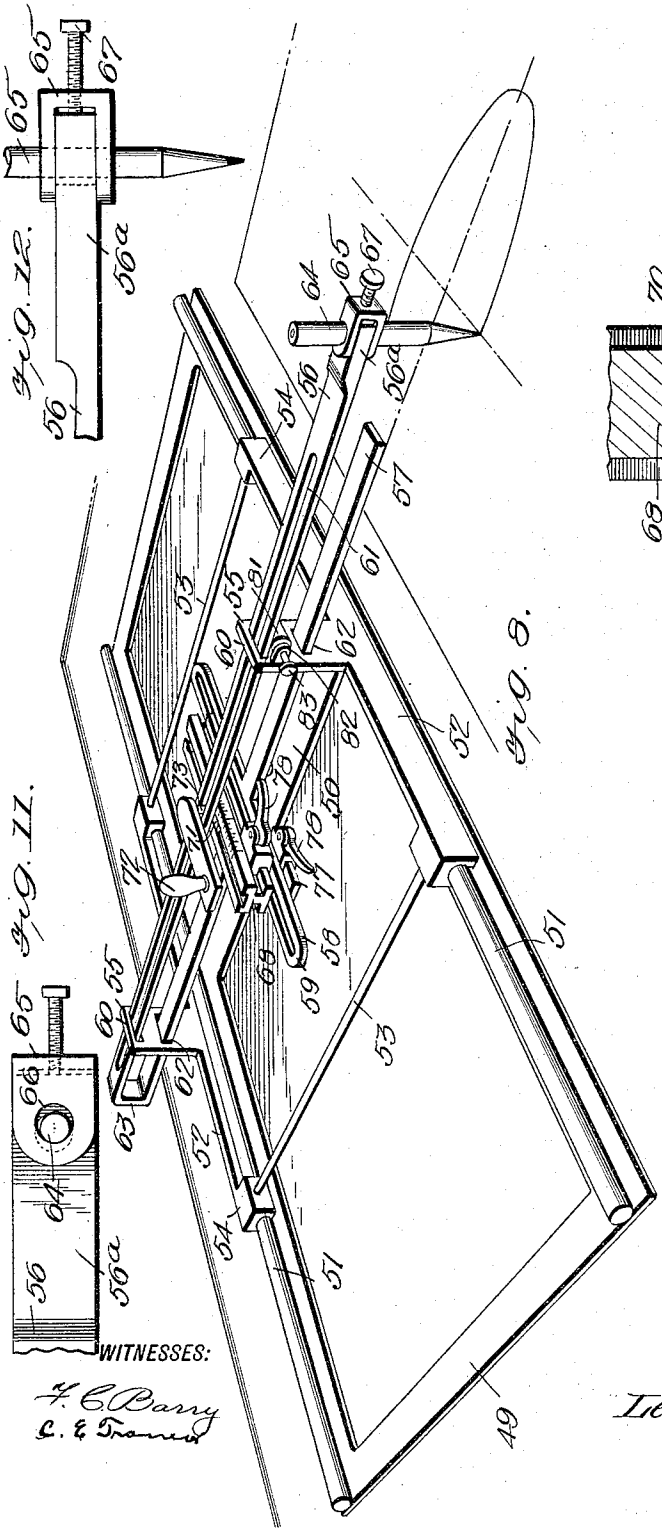


Fig. 12.

Fig. 11.

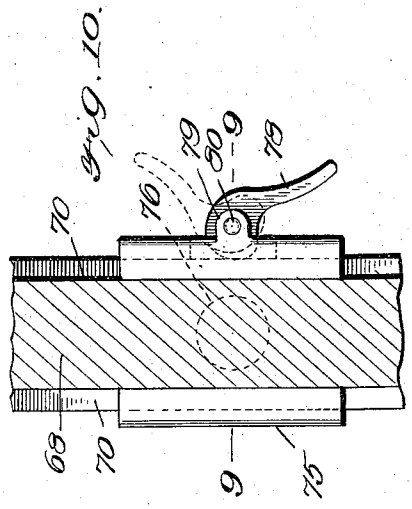


Fig. 10.

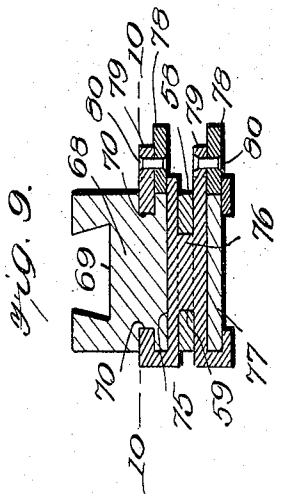


Fig. 9.

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UNITED STATES PATENT OFFICE.

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ELLIPSOGRAPH.

1,168,081. Specification of Letters Patent. Patented Jan. 11, 1916.

Application filed June 4, 1915. Serial No. 32,089.

To all whom it may concern:

Be it known that we, FRANK KIRK and LESLIE E. FRANCISCO, citizens of the United States, and residents of Canon City, in the county of Fremont and State of Colorado, have invented a new and useful Improvement in Ellipsographs, of which the following is a specification.

Our invention is an improvement in ellipsographs, and the invention has for its object to provide a device of the character specified, designed for use by draftsmen and others, for drawing perfect ellipses, wherein a table is provided and a carriage having guided movement on the table, together with an arm movable transversely of the table and provided with marking means, and connected to the table in such manner that the combined movement of the arm and the table will permit the drawing of a perfect ellipse.

In the drawings: Figure 1 is a perspective view of the ellipsograph with the parts in one position, Fig. 2 is a partial plan view, Figs. 3 and 4 are sections on the lines 3—3 and 4—4, respectively, of Fig. 2, looking in the direction of the arrows adjacent to the line, Fig. 5 is a perspective view of the mounting of the arm with the parts separated, Fig. 6 is a side view of one of the drawing arm supporting standards detached, Fig. 7 is a section on the line 7—7 of Fig. 6, Fig. 8 is a perspective view of a modified construction, Fig. 9 is a section on the line 9—9 of Fig. 10, Fig. 10 is a section on the line 10—10 of Fig. 9, Fig. 11 is a partial top plan view of the drafting arm, and Fig. 12 is a side view of Fig. 11.

In the embodiment of the invention shown in Figs. 1 to 7 inclusive, the ellipsograph comprises a table in the form of a plate 1 of suitable material, the said plate having depending pointed spurs or lugs 2, on its under face for engaging a supporting surface 3, as for instance, a table, to prevent movement of the plate with respect to the table. The plate 1 is also provided at each side edge with an upstanding flange or rib 4, the said flanges or ribs extending longitudinally of the plate, and just inside each rib the plate is provided with a series of rack teeth 5, the teeth extending the full length of the plate and the teeth of the series registering.

A carriage is mounted to travel longitudinally of the table, the said carriage comprising spaced side plates 6, each plate having at one end an angular web 7, extending inwardly, and provided at its inner end with a lug 8, extending parallel with the body of the plate but inwardly offset from the body. The lugs 8 and the plates 6 have registering openings for receiving a rod or shaft 9, the said rod or shaft being held by the plates and the lugs in a position transverse to the table 1, and pinions 10 are mounted on the shaft between the plates and their respective lugs, and each pinion is adapted to engage the adjacent series of rack teeth. The plates 6 are connected at their opposite ends by a rod 11, and the rods 9 and 11 space the side plates so that they will move just inside of the ribs 4 of the plate or table 1. Each plate 6 is provided at approximately its center with an upright or standard 12, the said standards being in register transversely of the table, and the standards have registering slots 13 and 14, the slots 13 being near the tops of the standards, while the slots 14 are near the bottom.

The drawing arm is mounted to move in the slots, and the said arm comprises connected upper and lower bars or portions 15 and 16, the said portions being connected at one end by an integral web. The said bars 15 and 16 are parallel or approximately so, and the bar 15 is longitudinally slotted as shown at 18. The bar 15 engages the slots 13 of the standards 12, while the portion or bar 16 engages the slots 14 of the standards 12.

A roller 19 is journaled just below the slot 13 of the front standard, the said roller having a shaft 20, which is journaled in bearing lugs 21 at opposite sides of the standard, and outside of one of the lugs the shaft is provided with a head or button 22, for permitting the roller to be turned when desired. This roller has its upper surface in position to engage the under surface of the bar 15, and the said bar is provided at its outer end with a split bearing 23, for receiving a pencil 24 or the like. The bearing may be clamped upon the pencil by means of a set screw 25, the said set screw being journaled in one of the sides of the bearing as shown in Fig. 2, and having a threaded engagement with the other side. It will be evident that when the set screw is turned in the proper direction, the bearing will be clamped upon the pencil, and by loosening the said screw the pencil may be adjusted to the proper po-

sition with respect to the sheet 26, upon which the drawing is to be placed. This sheet as shown, is arranged in proper position on the table 3 or other support for the ellipsograph, and the sheet may be held to the table by means of thumb tacks 27.

The bar 16 of the drafting arm is provided with a transversely extending guideway, to be later described, at approximately its center, the said guideway extending longitudinally of the table, and the mechanism shown more particularly in Figs. 4 and 5, is supported by the guideway. The said mechanism comprises a guide bar 28, having in its upper face an undercut longitudinally extending groove 29 and having in each side a longitudinally extending groove 30, and the grooves 30 are in register, and together with the groove 29 extend the full length of the bar 28 opening at the ends of the said bar.

The groove 29 of the bar 28 forms a guideway for receiving a slide block 31, the said block as shown in Fig. 5, being shaped to fit the groove, and a crank arm 32 is connected with the block by means of a threaded stem 33, secured to the arm at one end thereof and passing through the bar 15 into threaded engagement with the slide block. It will be evident that by turning the crank arm in the proper direction the bar 15 may be clamped to the bar 28 or released therefrom. When the crank arm 32 is turned in the proper direction the nut or slide block 31 is forced upwardly into close contact with the undercut walls of the groove.

The grooves 30 are engaged by inwardly extending ribs 34 on the side walls 35 of one of the channel shaped sections of a connector consisting of the section 36 and a section 36^a integrally connected as shown more particularly in Fig. 4 by web 37, which is at the centers of the bodies of the connector. The section 36^a has side walls 35^a, each of which is provided at its outer edge with an inwardly extending rib 34^a, corresponding in arrangement to the ribs 34.

The section 36 of the connector is precisely the same as the connection 36^a, but the said sections are reversed or oppositely arranged with respect to each other, the channel of the section 36 facing upward, while the channel of the section 36^a faces downward. The ribs 34 of the section 36 engage the grooves 30 of the bar 28 with the body portion 36 of the section below the bar.

A set screw 38 is passed through one of the sides 35 of the upper section 36 into engagement with the bar 28, to hold the connector in adjusted position with respect to the bar, and a similar screw 38^a is passed through the side wall of the section 36^a into engagement with the side edge of a strap or plate 39, mounted to slide in the channel of the section 36^a. By means of the set screw 38^a the strap or bar 39 may be held in adjusted position with respect to the connector and with respect to the bar 28.

The integral connection 37 between the sections of the connector moves in a slot 40, extending longitudinally of the guideway 41, before mentioned, which is interposed in the length of the bar 16. The strap or bar 39 is provided near one end with a depending socket 42, which is adapted to fit over a post 43, secured to the table 1. This post as shown in Fig. 4, extends upwardly into engagement with the opening of the socket, and the post is rigid with the table. A pin 45 is passed downwardly through the registering openings in the bar and in the strap or bar 39, the pin passing through the slot 40 of the guideway 41, and the pin has a head as shown, for convenience in manipulating the same. This pin 45 and the connector or connecting sections 36—36^a hold the bars 28—39 in rigid register or parallelism with each other. It will be noticed from an inspection of Figs. 1 and 5 that the bar 28 is provided with graduations 44 on its upper face at one side of the groove 29 and on one side face above the groove 30.

In operation, should for instance the operator desire to draw an ellipse having a long axis of six inches and a short axis of four inches, he will proceed as follows:— The handle 32 is first turned to loosen the nut or slide block 31 in the groove 29, and this block is set in the groove 29 to the proper graduation of the scale 44, after which the block is tightened in the slot. The block 31 is set at that graduation denoting half the short axis of the ellipse to be drawn, in the present instance, the graduation designated by the numeral 2. The set screw 38^a is then loosened and the connector 36—36^a is moved to that graduation bearing the numeral 3, that is, the numeral corresponding to half the length of the desired ellipse. The set screw 38^a is then tightened and the instrument is ready for use. The operator now places the table 1 on the table 3 in such position that the lugs 2, which are in alinement transversely of the plate 1, will be in the extension of the long axis of the ellipses. These lugs 2 are at the exact center of the bar 15, and in alinement with the point of the pen or pencil 28. The lugs 2 are then pressed into the material of the table top 3, thus anchoring the plate in proper position with respect to the sheet 26. The plate 1 is anchored at such position with respect to the sheet that when the pencil point is at the end of the long axis adjacent to the plate 1 the handle 32 will be directly above the drafting bar 15 and parallel therewith, and extending in the opposite direction from the pencil or pen. The handle 32 is now turned to the right, and since the arm 32, the bars 28, 15 and 16, are locked rigidly to the strap

or plate 39, it will be evident that when the handle is turned this entire construction will revolve about the post 43. The bars 15 and 16 slide smoothly through the slots 13 and 14, and the carriage, as a whole, rolls smoothly on the tracks constituted by the rack bars 15. The pinions 10 constrain the carriage to hold a certain predetermined and definite position with respect to the table during this movement. As the arm 32 is turned to the right the stem 33 will move the sliding block or nut 31 upward, gradually clamping the crank arm to the bar, and further movement of the arm will be transmitted to the carrier, constituted by the bars 28—39 and connected parts. Since the crank arm 32 is in register with the bar 15 at the commencement of its movement, this continued movement will move the drafting arm 15 outward or away from the table 1. At the same time the clip 36—36ª is moving longitudinally of the guideway 41 to cause the pen or pencil to move laterally. This combined lateral and outward movement forms the outline 48 of the ellipse and a quarter turn of the arm 32, will cause the pencil to outline a quarter of the ellipse moving from the inner end of the long axis 46 to one end of the short axis 47. Continued movement will draw the second quarter, and as the arm 32 completes the circle, the third and fourth quarters will be drawn. It will be understood that the operation of drawing is continuous.

In the embodiment of the invention shown in Figs. 8 to 12, a frame 49 of substantially rectangular form is provided, the said frame being open as shown for the sake of lightness, and having a cross bar 50 at approximately its center. Guide rails 51 of circular cross section are mounted on the table at the opposite sides thereof, and parallel with each other, and a carriage comprising side members 52 and connecting cross rods 53, is mounted to slide on the rails 51. Each of the side members 52 is provided with bearings 54 at its ends for engaging the rails, and the cross rods 53 connect the bearings. Each side member is provided with a standard or upright 55 at approximately its center, the standards corresponding to the standards 12 of Fig. 1.

The drafting arm comprises the upper bar 56 and a lower bar 57 having the transverse guideway 58, at approximately its center, the guideway having the slot 59 corresponding to the slot 40 of the guideway 41 of Fig. 1. The bar 56 moves in registering slots 60, near the upper ends of the standards, and the bar is longitudinally slotted, as shown at 61. The bar 57 of the drafting arm moves in slots 62 in the standards, the said slots being just below the slots 60, and the bars 56 and 57 are connected at one end by the integral web 63. The bar 56 is provided at the end remote from the web with a vertical opening for receiving the pen or pencil 64, and this pen or pencil is held in place by a substantially U-shaped clip 65. The arms of the clip engage above and below the outer end of the bar 56, the said end being enlarged as shown at 56ª to fit the arms, and the openings 66 in the arms of the clip through which the pen or pencil 64 extends are of greater diameter than the pencil, as shown more particularly in Fig. 11. A set screw 67 is threaded through the body of the clip into engagement with the end of the portion 56ª of the bar, and it will be evident that when the set screw is turned in the proper direction, the pencil will be clamped in the openings 66 of the clip, and in the opening of the bar 56. A block 68 is arranged between the bars 56 and 57, the said block having an under-cut groove 69 in its upper face, and having inwardly extending registering grooves 70 in its opposite side faces. A crank arm 71 is arranged above the bar 56, the said arm having a threaded stem 73, engaging a slide block or nut 74 in the groove 69 of the block 68. The connecting clip 75 corresponds to the clip 36—36ª, in that it is composed of two oppositely arranged channel shaped members, having their body portions connected by the integral connecting pin 76, and this pin extends through the slot 59 of the guideway 58. The lower portion of the clip embraces a strap or plate 77, corresponding to the strap or plate 39 of Fig. 1, and the clip is arranged to be clamped to the bar 68 and the strap 77, by means of cam levers 78, each of which is pivoted to a bearing lug 79, connected with the adjacent section of the clip, by means of a pivot pin or rivet 80. The strap 77 is pivotally connected to the table 1 or frame 49 in the same manner as the strap 39 before mentioned, and the bar 57 of the drafting arm is supported by a roller 81, journaled in bearing lugs 82 on the front standard 55, and the shaft of the roller has a button 83, for convenience in manipulating the roller.

The operation of the construction just described, is precisely the same as that of the construction shown in Figs. 1 to 7, and the bar 68 is provided with graduations as shown in Fig. 8, to permit the adjustment of the parts for the ellipse desired. In this construction the carriage moves on the guide rails 51, instead of having the rack and pinion connection. The table or frame 49 is provided with the pointed spurs or lugs, not shown, corresponding to the lugs 2, of Figs. 1 to 7, for permitting the frame or table to be anchored at the proper position with respect to the sheet upon which the ellipse is to be drawn.

The improved ellipsograph is capable of drawing an ellipse so broad as to be prac-

tically a circle or so flat as to be practically a straight line, and but a single complete rotation of the handle is necessary in the formation of an ellipse. The machine may be made of sheet metal as for instance, German silver, aluminum, steel, or the like, and may be of any desired size, depending upon the use to which it is to be put.

To pack the machine for transportation the handle should be set in a position lengthwise of the machine. The socket 42 is then released from the pin 43 by lifting the carriage upward, after which the drafting arm 15—16 is turned lengthwise of the machine, and the carriage is replaced between the ribs 4. The said plates 6 of the carriage are of a length to fit between the ribs 4 when the drafting arm extends longitudinally of the table. When the carriage is replaced after turning it transverse to the table the socket 42 is again engaged with the pin 43 to hold the carriage in place.

It will be understood also that the ellipsograph will draw a circle or an oval of any size within the capacity of the particular instrument. The roller 81 is for use in making dotted or broken lines. The roller is eccentrically arranged so that by turning the button or head 83 the drawing arm may be lifted to bring the pencil out of contact with the paper or to permit it to contact with the paper.

We claim:—

1. An ellipsograph, comprising a table having longitudinally extending guides at its opposite side edges, a carriage mounted to move on the guides, said carriage comprising connected side plates, each plate having a standard intermediate its ends and the standards being in register and having registering slots, a drafting arm mounted to slide in the standards and comprising upper and lower bars spaced apart vertically and approximately parallel and movable in the slots, said bars being connected at one end, and the upper bar having a longitudinally extending slot and extending beyond the lower bar at the opposite end, said bar having at the extended ends means for clamping a pencil to the bar, and the table having depending spurs or lugs in alinement with the point of a pencil supported by the drafting arm for engaging the supporting surface for the table to anchor the table to the said surface, the lower bar of the drafting arm having a transverse guideway provided with a longitudinal slot, a bar arranged above the guideway and beneath the upper bar, a strap arranged below the guideway, a clip connecting the bar and the strap and having a pin extending through the slot of the guideway, said clip being slidable with respect to the bar and the strap, and means for rigidly connecting the clip to the bar and to the strap, a detachable pivotal connection between the strap and the table at the end remote from the clip, said bar having in its upper face an undercut longitudinally extending groove, a slide block fitting the grooves and having a threaded opening, and a crank arm having a threaded stem passing through the slot of the upper bar and engaging the threaded opening of the slide block, said bar having graduations with which the clip and block coöperate as indicators.

2. An ellipsograph, comprising a table having guides at its opposite sides, a carriage mounted to move on the guides, a drafting arm comprising upper and lower portions connected at one end and mounted to slide transversely of the table, the table having means for guiding the arm, and the upper portion of the arm having means at the end remote from the connection for clamping a pencil to the said portion, the lower portion of the arm having a slotted guideway intermediate its ends and extending transversely of the portion of the arm, a strap arranged below the lower portion of the arm and having a detachable pivotal connection with the table at one end, a bar arranged between the portions of the arm and having a scale and connected to the strap at the end adjacent to the pivotal connection of the strap, a connector connecting the bar to the strap at the opposite end from the pivotal connection and slidable with respect to the bar and the strap and having means for securing the connector to the bar and to the strap, said connector moving in the slot of the guideway and a common means adjustable with respect to the bar for clamping the upper portion of the arm to the bar and for swinging the bar and strap on the pivotal connection of the strap, said means and the connector coöperating with the scale as indicators.

3. An ellipsograph, comprising a table, a carriage movable longitudinally of the table and having guided movement on the table, a drafting arm mounted to slide transversely of the carriage and provided at one end with means for clamping a pencil to the arm, a strap having a detachable pivotal connection with the table at one side of the arm, a bar arranged above the strap and connected with the strap at the end adjacent to the pivotal connection of the strap, a guideway in connection with the drafting arm and extending transversely thereof and rigid with the arm, a connection between the bar and the strap at the opposite end from the pivotal connection of the strap and extending through the guideway and adjustable with respect to the bar and the strap toward and from the pivotal connection, and a common means for clamping

the arm to the bar and for swinging the strap on its pivotal connection and adjustable with respect to the bar.

4. An ellipsograph, comprising a table, a carriage movable longitudinally of the table and having guided movement on the table, a drafting arm mounted to slide transversely of the carriage and provided at one end with means for clamping a pencil to the arm, a strap having a detachable pivotal connection with the table at one side of the arm, a guideway extending transversely of the arm at the strap, a bar adjustable transversely of the arm at the strap and connected to the strap at the end adjacent to the pivotal connection, means adjustable with respect to the strap and the bar for connecting the strap and the bar to constrain them to move together, said means passing through the guideway, and means for swinging the strap and the bar on the pivotal connection of the strap, said means being adjustably connected with the bar and detachably connected with the arm.

5. An ellipsograph, comprising a table, a drafting arm arranged transversely of the table, a carriage movable longitudinally of the table and having guides for the arm, said arm having a transverse guideway, a strap pivoted to the table at one end of the strap and at one side of the arm, a bar arranged above the guideway and connected to the strap at the end adjacent to the pivotal connection thereof, means adjustable with respect to the strap and the bar and passing through the guideway for rigidly connecting the bar and the strap, and a common means for swinging the bar and the strap and for clamping the arm to the bar.

6. An ellipsograph, comprising a support, a carriage having guided movement longitudinally of the support, a drafting arm movable transversely of the carriage, a swinging connection between the arm and the support for constraining the free end of the arm to describe an ellipse, said connection being adjustable with respect to the arm for varying the extent of the swinging movement of the free end of the arm, and means for swinging the arm.

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."