May 9, 1967 I. A. PIROGOW 3,318,003

PERSPECTIVE DRAWING DEVICE AND COMBINATION OF PERSPECTIVE AND PARALLEL DRAWING DEVICE

Filed Sept. 9, 1965 2 Sheets-Sheet 1

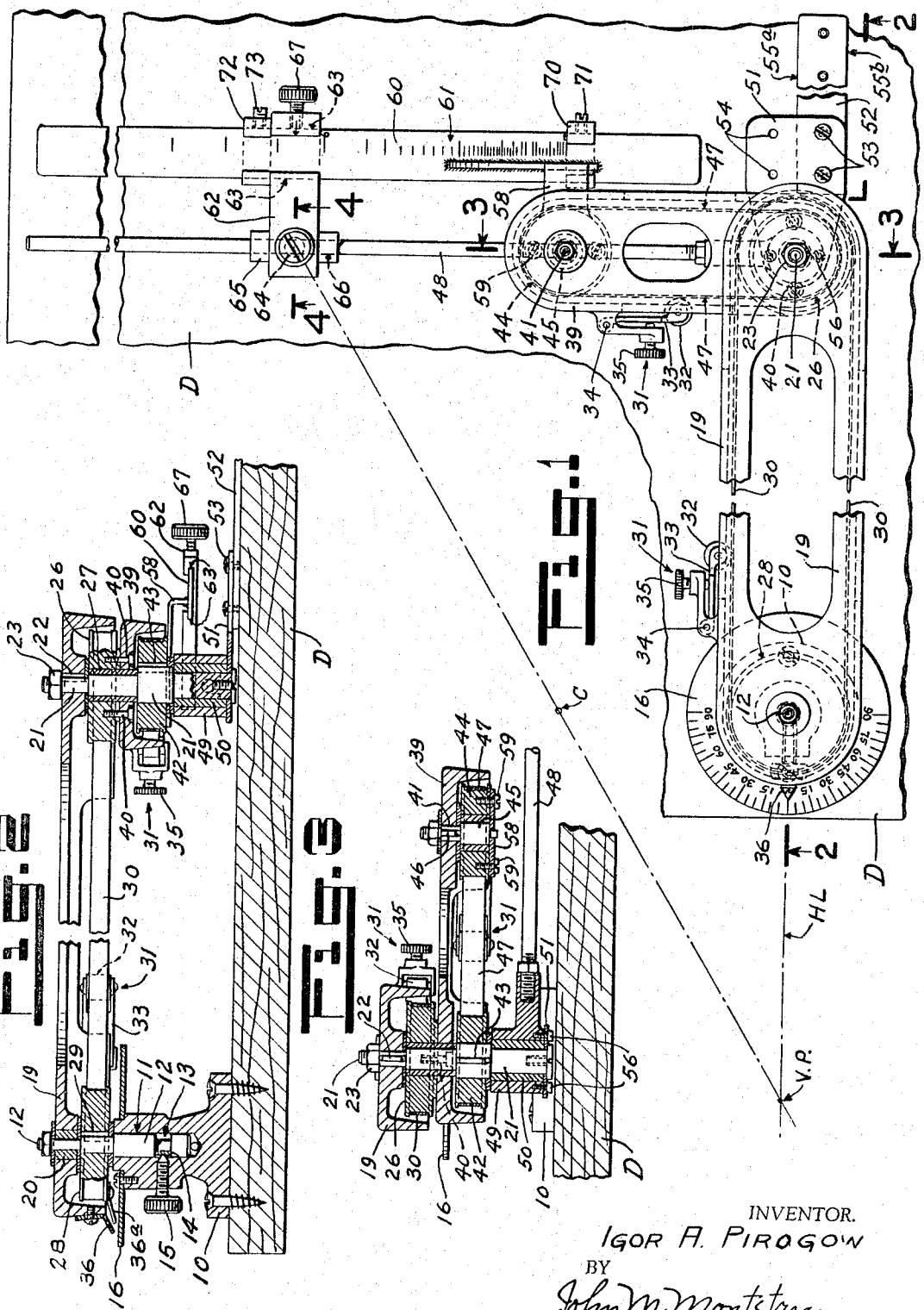


FIG. 1

FIG. 2

FIG. 3

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FIG. 7

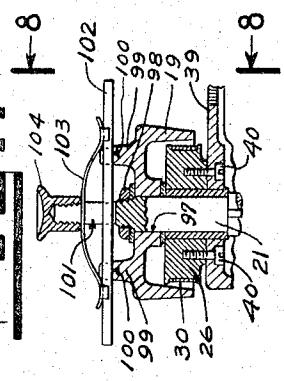


FIG. 8

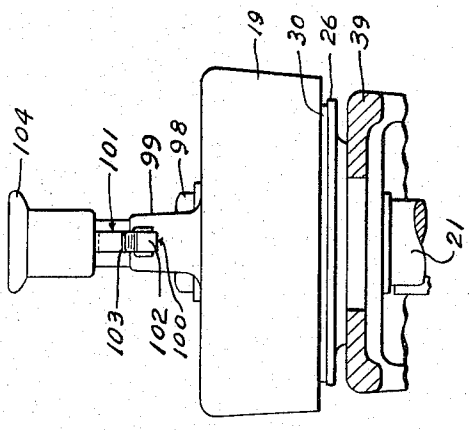


FIG. 5

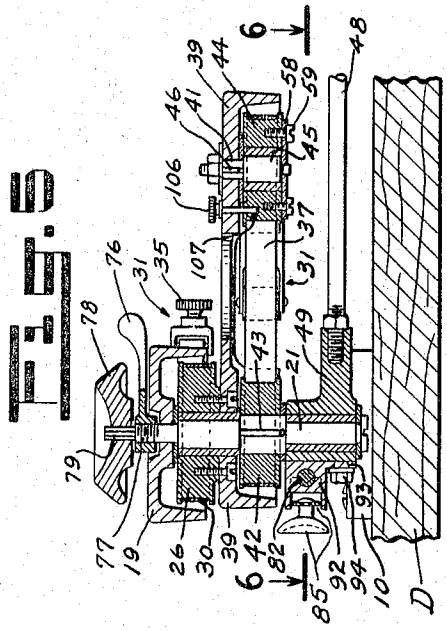


FIG. 6

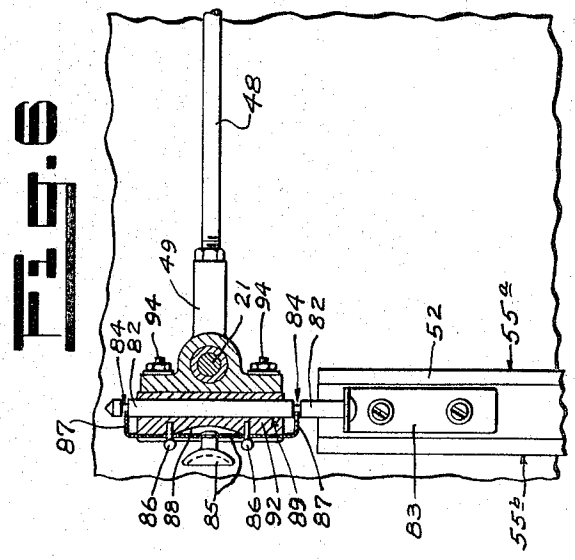
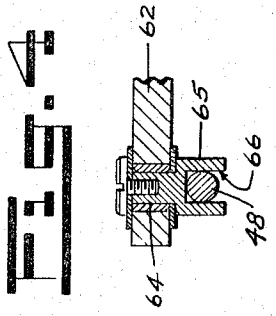


FIG. 5a



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3,318,003

Patented May 9, 1967

3,318,003

PERSPECTIVE DRAWING DEVICE AND COMBINATION OF PERSPECTIVE AND PARALLEL DRAWING DEVICE

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Filed Sept. 9, 1965, Ser. No. 486,158
15 Claims. (Cl. 33—77)

The invention relates to a perspective and parallel drawing device of another form from that of my prior device which can be adjusted to fix the vanishing point at any point on or off of the drawing board. It can also be adjusted such that the horizon line which is a horizontal line through the vanishing point, may be below or above the center of the instrument mounting as desired: The construction herein differs from my patented structure in using a single arm and differs from my prior single arm construction in that the ruling edge member pivots on a pivot at the end of the pivotal arm of the instrument and the control pivot means is pivotally mounted at the end of the lever. The construction herein also avoids interference between parts when used.

It is an object of the invention to construct a perspective and parallel drawing device in which the ruling edge is pivotally mounted on the arm which is pivotally mounted on base means.

Another object of the invention is as in the preceding paragraph and which also may make use of the advantages of pulleys on spaced pivots and operatively connected together by band means.

Other objects of the invention will be more apparent from the following description when taken in connection with the accompanying drawing illustrating a preferred embodiment thereof in which:

FIG. 1 is a top view of the device.

FIG. 2 is a section taken on line 2—2 of FIG. 1 and

FIG. 3 is a section taken on line 3—3 of FIG. 1.

FIG. 4 is a section of the control pivot means.

FIG. 5 is a vertical section through lever pivot means which is a modification of that of FIGS. 1 and 3.

FIG. 6 is a section taken on line 6—6 of FIG. 5.

FIG. 7 is a partial view of another form for conversion of the device for right hand mounting.

FIG. 8 is a side view of FIG. 7.

The perspective drawing device includes a base means, that illustrated being a simple form of base, however, it is understood that the base means may be that shown in my prior application S.N. 455,421 filed May 13, 1965 in which the base means includes a base having a base member pivot means, a base member pivotally mounted on the base and the base member carrying the arm on its arm pivot means spaced from base member pivot. The advantage of the more complex base means is that the perspective device becomes more effective as a parallel drawing device in addition to its capabilities as a perspective drawing device.

The base means particularly shown includes a base **10** which is adapted to be secured to a drawing board D. The base carries a vertical bearing **11** shown as a hole therein which bearing receives an arm pivot means including an arm pivot or pivot pin **12** and bearings receiving the pivot. The arm pivot is preferably adjustably fixed within the base bearing in any suitable manner that illustrated being a circular groove **13** in the pivot in which is received a circular clamp plate **14**. The clamp plate is clamped into contact with the pivot by a clamp screw **15** to lock the pivot in adjusted position. In order to aid in the adjustment of the arm with respect to the base means, a disk **16** is secured to the base which carries angular indicia in degrees and fractions of degrees.

An arm **19** is suitably mounted for pivotal movement on the arm pivot means or pivot **12** such as by a bearing **20**. The arm carries a lever pivot means including a pivot or pivot pin **21** at a point spaced from the arm pivot and which lever pivot is fixed to the arm **19** in a suitable manner such as by a key **22** and a nut **23** received on threads on the end of the pivot pin.

An operating connection is provided between the base means and the lever to maintain the lever in the same relative angular position with respect to the base means throughout the pivotal movement of the arm. In the adjustment or position of the device as illustrated, the lever remains vertical for all pivotal positions of the arm. The operating connection shown includes a first fixed member **26** rotatably mounted on the lever pivot **21** in any suitable manner such as by a bearing **27**. A second fixed member **28** is fixed to the arm pivot pin **12** such as by a suitable key **29**. A connecting linkage is provided between the fixed members and that shown is a band **30** so that with this type of connection, the fixed members **26** and **28** are pulleys. The connection is such that the first fixed member or pulley **26** remains in the same position angularly as the second fixed member **28** irrespective of the pivotal movement of the arm **19** on the arm pivot means. The adjustable arm pivot **12** constitutes adjustable means for the second fixed member **28**.

With a band connecting linkage, it may be desirable to have a tightening means that shown includes a roll **32** pivotally mounted on a roll lever **33** which is pivotally mounted on a pivot **34** carried by the arm **19**. A screw **35** presses against the roll lever **33** to press the roll **32** against the band **30** to keep the band taut for a non-slip driving connection between the pulleys **26** and **28**. The tightening means illustrated is applied to one span only of the band **30**, however, it is obvious to provide a similar tightening means for the other span if it is deemed desirable. Constructions have been devised which assure a positive band driving connection between pulleys which do not require any tightening means. The arm **19** carries a pointer **36** which is secured to the arm and cooperates with the dial disk **16** as will appear more fully hereinafter.

A lever **39** is secured to the first fixed member **26** such as by a screw **40** so that it rotates with this member. A ruling edge control mechanism is carried by the lever and includes a control frame pivot means having a pivot **41** at a point spaced from the lever pivot **21**. Preferably, the pivot **41** is secured to the lever by a key **46**. An operating connection is provided between the fixed pivot **21** and a control frame **58**, that shown being a connecting member or pulley **42** which is suitably secured to the pivot such as by a key **43**. The connecting member **42** actually is fixed with respect to the arm, however, with its location below the pulley **26**, the convenient way of fixing its position with respect to the arm is through the pivot **21**. The pivot **41** has a second connecting member shown as a pulley **44** rotatably mounted thereon such as by bearing **45**. A connecting linkage is provided between the connecting members **42** and **44** that shown being a band **47** so that the connecting members **42** and **44**, for a belt type of connecting linkage, are pulleys. This connection assures that the pulley **44** has the same angular position as the pulley **42** irrespective of the movement of the arm **19** and lever **39**. The band connection between pulleys may have the same tightening means as that described for the band **30**. Gears without backlash constitutes an equivalent connecting linkage in place of the bands **30** and **47**, in which event the fixed members and the connecting members are gears.

Control rod means is pivotally mounted on the pivot **21** which means includes a control rod **48** having a hub **49** which is pivotally mounted on the lever pivot **21** such

as by a bearing 50. This hub carries ruling edge means which includes a ruling edge bracket 51 secured thereto, such as by screws 56. A ruling edge member 52 is secured to the bracket such as by screws 53. The ruling edge member carries a ruling edge 55*a*, which is in line with the axis of the lever pivot 21. The ruling edge bracket 51 is wide enough to carry screw holes 54 on its opposite side so that the ruling edge member may be attached thereto with the ruling edge 55*b* in line with the axis of pivot 21 which converts the drawing device into a right hand mounting of the device on the drawing board as compared to the left hand mounting particularly illustrated herein. It is clear that holes for screws 53 may be provided at the other end of the ruling edge member and this member reversed and the screws inserted in the holes 54 to convert to a right hand mounting. The same ruling edge 55*a* then serves for both mountings and it is not necessary that edge 55*b* be precisely straight. The hub 49 is in fact a hub for the ruling edge member and the control rod is connected therewith.

The second connecting member or pulley 44 has the control frame 58 secured thereto such as by screws 59. The control pivot frame preferably includes a scale 60 having scale markings 61 thereon. The scale 60 has a control pivot bracket 62 suitably mounted on the scale for longitudinal adjustment thereon which adjusts the location of the vanishing point. The construction shown provides slots 63 carried by the bracket 62 to engage the longitudinal edges of the scale 60. The bracket is held in adjusted position by a lock screw 67. For a fixed vanishing point, the control bracket would be fixed to the control frame or its scale. A control pivot 64 is pivotally mounted on the bracket on a vertical axis which control pivot carries a control rod slide or guide means 65 which guide means conveniently is a slot 66. This guide means is in alignment with the axis of the control pivot 64 and extends perpendicular thereto. The adjustable bracket 62 constitutes adjustable means for the control pivot means.

With a horizontal horizon line passing through the center of the pivot means 12, the lever 39 is vertical or at right angles to the axis of the arm 19 determined by a line through the axes of the pivots 12 and 21. For this setting and position of the arm and lever, the axis of the control pivot 64 is on a vertical line which is in alignment with the axes of the pivots 21 and 41 and hence on a line which is vertical to the arm axes and extends vertically from the axis of pivot 21.

With the control pivot bracket 62 adjusted to the infinity mark on the scale 60, the device will draw parallel lines, that is, the ruling edge 55 will be horizontal in all positions of the arm 19. The lever 39 will also be vertical with respect to a horizontal line in all positions of the arm 19. The location of the vanishing point on the horizon line H.L. is adjusted by moving the control pivot bracket 62 along the scale 60. Because of the angles involved, the scale markings are progressively further apart upwardly for equally spaced positions of the vanishing point along the horizon line H.L. Movement of the control pivot upwardly moves the position of the vanishing point in a direction towards the pivot 12. The location of the vanishing point V.P. is found by drawing a line through the axis of the control pivot 64 and the corner C of a rectangle having corners determined by the axes of pivots 12, 21, and 41 when the lever 39 is perpendicular to the axis of the arm 19. Adjusting the control pivot bracket below the infinity mark positions the vanishing point on the right.

The length of the arm 19 between axes of pivots 12 and 21, as well as the length of the lever 39 between axes of the pivots 21 and 41 may be any dimensions selected but for practical reasons they should not be of excessive length compared to the drawing board on which they will be used. Should the base 10 not be secured to the drawing board with the arm pivot means over the board as shown, but located to the left of the left edge of the board such as by a suitable bracket practical considerations again would determine the length of the arm and lever and their relative length. The indicia 61 on the scale would be different for different lengths of the arm or lever. The spacing of the indicia on the scale is easily calculated (see S.N. 455,421).

In order to locate the vanishing point on a horizontal horizon line below a horizontal line through the axis of pivot 12, the clamp screw 15 is turned to release the clamping plate 14. The arm 19 and the pulley 28 are turned while maintaining the lever 39 vertical to the arm. The horizon line or vanishing point is brought lower, the greater the angular adjustment in the lower quadrant of the disk 16. The clamp screw is then tightened to secure the arm pivot and the second fixed member in adjusted position with respect to the base means. The adjustment may be made also by turning the fixed member 28 with the arm held in which event the pointer 36, numbered as 36*a*, would be carried by this part. The location of the vanishing point is then at the intersection of a line extending from the ruling edge in that position where the lever 39 is at right angles to the arm 19 and of a line through the axis of the control pivot 64 and the equivalent position of point C. In other words, it would be the same as with FIG. 1 turned angularly contra-clockwise. To place the vanishing point above the horizontal line H.L. the adjustment is made into the upper quadrant of disk 16. The axis of the control pivot 64 moves on the arc of a circle having its center at point C.

The device is used by pivoting the arm 19 on its arm pivot means or pivot 21 and the ruling edge 55*a*, or 55*b* for a right hand mounting, will be in alignment with the vanishing point in all positions of the arm. A simpler construction may provide solely the angular adjustment at the pivot 12 in which event the vanishing point is always at a fixed point from the axis of this pivot but is adjustable to positions above and below the horizontal line H.L. Similarly, the device may be constructed solely with the adjustment of the control pivot 64 in which construction the location of the vanishing point is adjustable along the horizon line H.L. If no adjustment is provided, the device will have a fixed vanishing point on line H.L. The device has maximum utility with both of these adjustments.

As to the adjusting means for the arm pivot means, it is immaterial whether the disk 16 is carried by one of the parts including the base means 10 or the second fixed member 28 and the pointer 36*a* is carried by the other part. The adjusting means for adjusting the angular position of the fixed member 28 with respect to the base means may take other forms, that shown being a simple form for accomplishing the adjustment.

Scale stop means 70 with a lock screw 71 may be provided to aid in returning the control pivot means to parallel drawing or infinity position. A second stop means 72 having a lock screw 73 is shown at a selected vanishing point position for the control pivot means or its bracket 62. It is clear that the stop means 70 may be adjusted upwardly upon the scale 60 in the event that the control pivot means is to be used at two settings each for a different location of a vanishing point.

FIGS. 5 and 6 show a modification with respect to the lever pivot means and its pivot 21 whereby the device can be converted to a right hand mounting with the lever 39 extending upwardly in which position there is less interference with the lever when drawing than when the lever and its associated control mechanism extends downwardly. Similar parts are similarly numbered and the difference in the construction is primarily that the pivot 21 instead of being fixed to the arm 19, such as by a key 22, is instead adjustably mounted on the arm. The adjustment is such that the lever pivot and hence the parts secured thereto can be turned through 180 degrees. This

lever adjustment or reversal can be accomplished in several ways that shown being a pivot clamping means. The clamping means particularly shown includes a clamping lever **76** threadedly received on threads **77** on the end of the pivot. A hand wheel **78** is fixed to the pivot such as by a key **79**. In order to turn the lever and the associated parts, the arm pivot clamping screw **15** is loosened. With the clamping lever loosened, turning of the hand wheel and lever **39** will turn the pivot **21**, the lever **39** and its associated parts including the control pivot means and control rod **48**. All of these parts are turned through an angle of 180 degrees after which the clamping lever is tightened as well as screw **15**. When the base is now mounted on the right hand side of the drawing board, the lever **39** and the control mechanism projects upwardly. Suitable aligning marks may be provided on the hand wheel and the arm to assure a conversion rotation of 180 degrees. The ruling edge member is finally reversed on the hub **49**.

FIG. 5 also shows a modification of the ruling edge means whereby a ruling edge member may be easily removed from the hub and reinserted in the opposite direction for the conversion of the device for a right hand mounting. This means includes a shaft **82** carried by the ruling edge member and shown as being secured to the ruling edge member by a ruling edge member bracket **83**. The shaft carries at least one groove **84** therein, there being two particularly shown, a spring key **85** is loosely secured to the hub such as by screws **86** and the spring key has an engaging flange **87** fitting into each groove. A central depression **88** is provided in the hub so that depression of the center of the spring key raises the two flanged ends and releases the shaft for reverse insertion of the same into the socket **89** carried by the hub. Preferably, the shaft socket is well above the ruling edge member so that the latter can pivot easily into a flat position in contact with the drawing board.

FIGS. 5 and 6 also show adjustment means for adjusting the relative vertical position of the ruling edge member **52** on the hub. This adjustment is secured by the hub with a ruling edge mounting member **92** which is adjustable vertically on the hub such as by vertical slots **93** therein which receive a bolt **94** carried by the hub.

FIGS. 7 and 8 illustrate another form of construction of conversion means for converting the device to a right hand mounting and assuring a rotation of 180 degrees. The lever pivot **21** is rotatably mounted on the arm **19** by a bearing **97** and nut **98**. The arm carries a pair of pedestals **99**, one on each side of the pivot in which there is a notch **100**. The end of the pivot has a slot **101** in which is received a lock bar **102** which may be pressed downwardly by suitable spring means such as a leaf spring **103** retained in the slot **101**.

Raising the lock bar **102** in the slot and above the pedestals permits the pivot **21** to be rotated through 180 degrees whereupon the bar is allowed to engage the notches **100**. The pedestal notches being on the center line of the lever pivot **21** assures rotation of the pivot through 180 degrees. The lock screw **15** is then tightened to clamp the arm pivot **12**.

In order to assure that the lever **39** rotates through 180 degrees as well it is desirable that it be locked with the pivot **21** which can be accomplished such as by a lever lock pin **106** carried on the lever and insertable in a pin socket **107** in the second connecting member **44**. This locks the lever with the pivot through the pulleys **44** and **42** and the connecting linkage or belt **47**.

This invention is presented a fill a need for improvements in perspective drawing device and combination of perspective and parallel drawing device. It is understood that various modifications in structure, as well as changes in mode of operation, assembly, and manner of use, may and often do occur to those skilled in the art, especially after benefiting from the teachings of an invention. This disclosure illustrates the preferred means of embodying the invention in useful form.

What is claimed is:

1. A drawing device at least for perspective drawing comprising base means, a single pivotal arm, arm pivot means having a vertical axis and pivotally mounting the arm on the base means, a lever, lever pivot means having a vertical axis and pivotally mounting the lever on the arm at a point spaced from the arm pivot means including a lever pivot mounted on the arm, an operating connection between the base means and the lever to maintain the lever in the same relative angular position with respect to the base means throughout the pivotal movement of the arm including a first fixed member secured to the lever and a second fixed member secured to the base means, and a connecting linkage between the fixed members; ruling edge means including a ruling edge member having a ruling edge, the ruling edge means being pivotally mounted on the lever pivot, and the ruling edge being in alignment with the axis of the lever pivot; and ruling edge control mechanism including a control pivot frame, control frame pivot means pivotally mounting the control frame on the lever at a point spaced from the lever pivot means and having a control frame pivot with a vertical axis, a first connecting member fixed to the arm at the lever pivot, a second connecting member secured to the control frame, a connecting linkage between the connecting members, a control pivot means having a vertical axis and carried by the control frame, the control pivot means including a control pivot having a vertical axis located on a line extending from the axis of the lever pivot means and vertical to a line between the axes of the arm pivot means and the lever pivot means when the lever is vertical to a line between the axes of the arm pivot and the lever pivot, guide means carried by the control pivot having its axis at right angles to the axis of the control pivot, and control rod means secured to the ruling edge means and extending at right angles to the ruling edge and slidably received by the guide means carried by the control pivot means.

2. A drawing device as in claim **1** in which the control pivot frame includes a scale secured thereto, and an adjustable bracket carrying the control pivot means and adjustably mounted on the scale.

3. A drawing device as in claim **2** including at least one scale stop means adjustably mounted on the scale and engageable by the adjustable bracket for the control pivot means.

4. A drawing device as in claim **1** including adjustable means adjustably mounting the second fixed member angularly with respect to the base means.

5. A drawing device as in claim **4** in which the control pivot frame includes a scale carried thereby, and an adjustable bracket carrying the control pivot means and adjustably mounted on the scale.

6. A drawing device as in claim **5** in which the scale has parallel edges, the adjustable means for the control pivot means including a control pivot bracket carrying the control pivot means, and the control pivot bracket having a slot engaging the longitudinal edges of the scale.

7. A drawing device as in claim **4** in which the adjustable means for the second fixed member includes the arm pivot rotatably mounted in the base means, and clamping means carried by the base means and engaging the arm pivot.

8. A drawing device as in claim **1** in which the first connecting member is below the first fixed member, means fixing the lever pivot to the arm against rotation, and means non-rotatably fixing the first connecting member to the lever pivot.

9. A drawing device as in claim **1** in which the ruling edge means includes a ruling edge bracket having a width greater than the width of the ruling edge member and a center line, and securing means on both sides of the

center line of the ruling edge bracket to selectively receive the ruling edge member.

10. A drawing device as in claim **1** including clamping mechanism releasably securing the lever pivot to the arm for rotation of the pivot and lever and control mechanism with respect to the arm.

11. A drawing device as in claim **1** including a hub member carried by the hub, means mounting the hub member on the hub for vertical adjustment thereon, and in which the ruling edge means is mounted on the hub member.

12. A drawing device as in claim **1** in which the ruling edge means includes a ruling edge shaft carried by the ruling edge member, socket means carried by the hub on opposite sides thereof and spaced from the axis of the lever pivot, to receive the ruling edge shaft from either side, the ruling edge member having a second ruling edge on the opposite side thereof and equidistant from the shaft, and means releasably securing the ruling edge shaft in the socket means.

13. A drawing device as in claim **4** in which the lever pivot is turnably mounted on the arm, and including interengaging locking means carried by the arm and the lever pivot retaining the lever pivot in either of two angular positions spaced 180 degrees apart.

14. A drawing device as in claim **13** in which the interengaging locking means includes at least one pedestal carried by the arm spaced from the lever pivot, and a vertically movable lock bar carried by one of the parts including the lever pivot and a pedestal and interengaging with the other part to retain the lever pivot in its selected position.

15. A drawing device as in claim **14** in which the interengaging locking means comprises two pedestals spaced on each side of the lever pivot, each pedestal having a slot, the lever pivot having a slot, and a locking bar passing through lever pivot slot and slidable vertically therein and engaging in each pedestal slot.

No references cited.

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