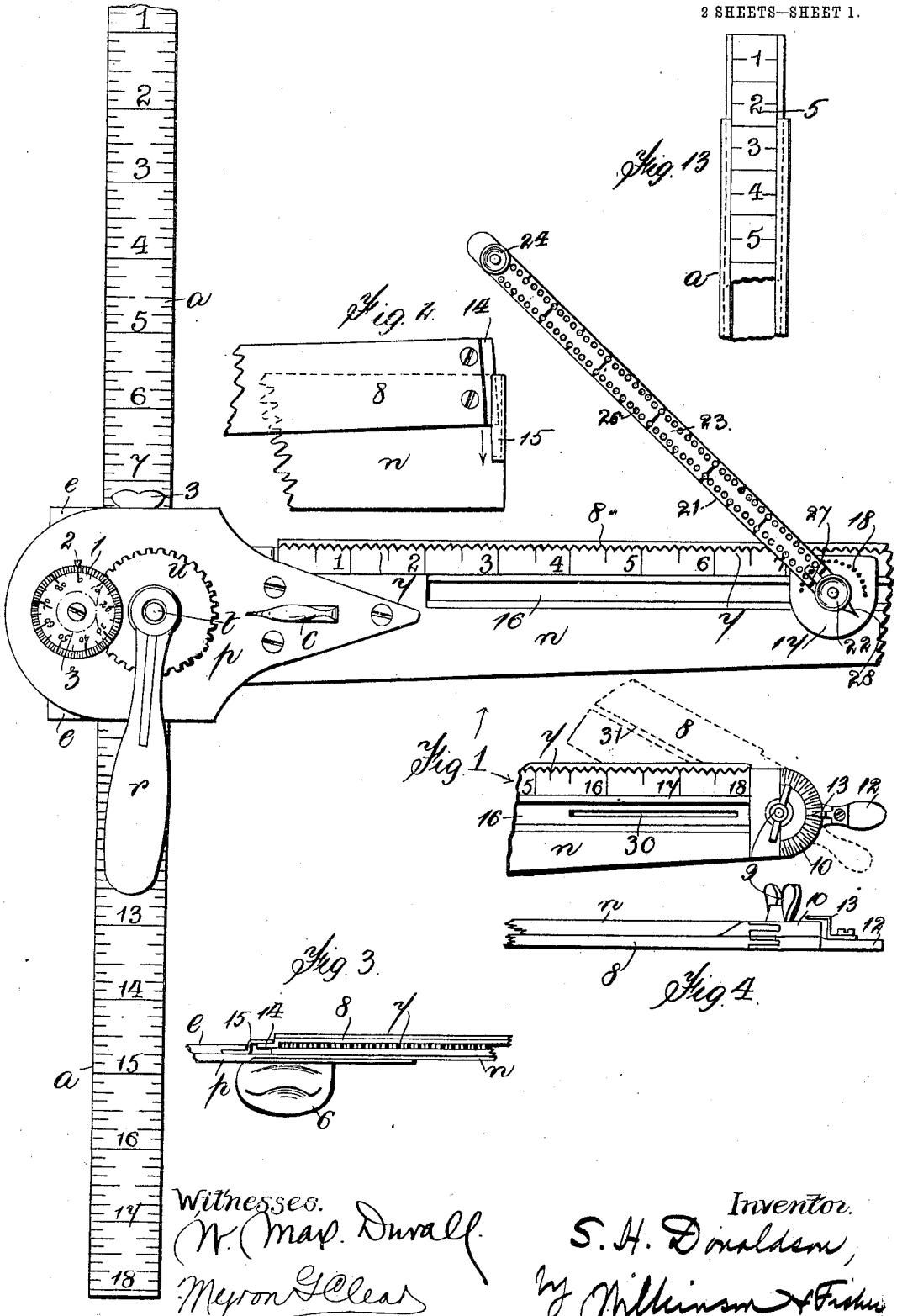
No. 828,721. PATENTED AUG. 14, 1906.

S. H. DONALDSON.

DRAWING APPARATUS.

APPLICATION FILED MAR. 10, 1906.

2 SHEETS—SHEET 1.



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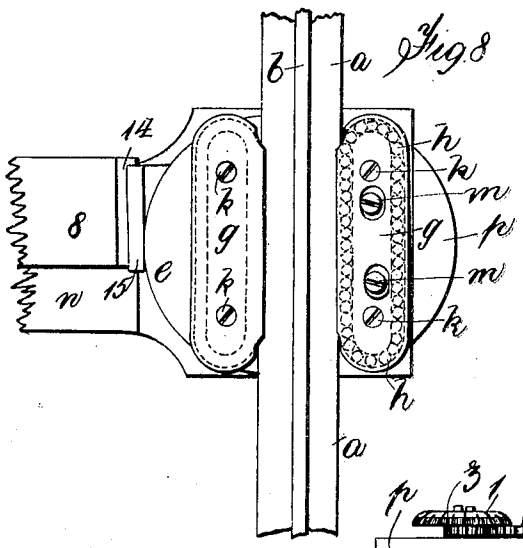
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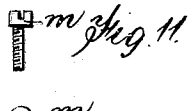
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2 SHEETS—SHEET 2.





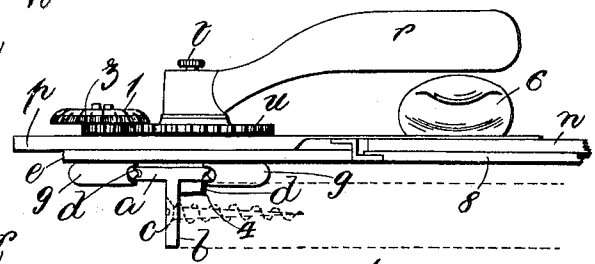
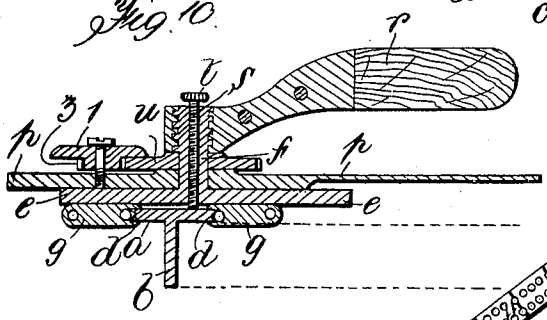
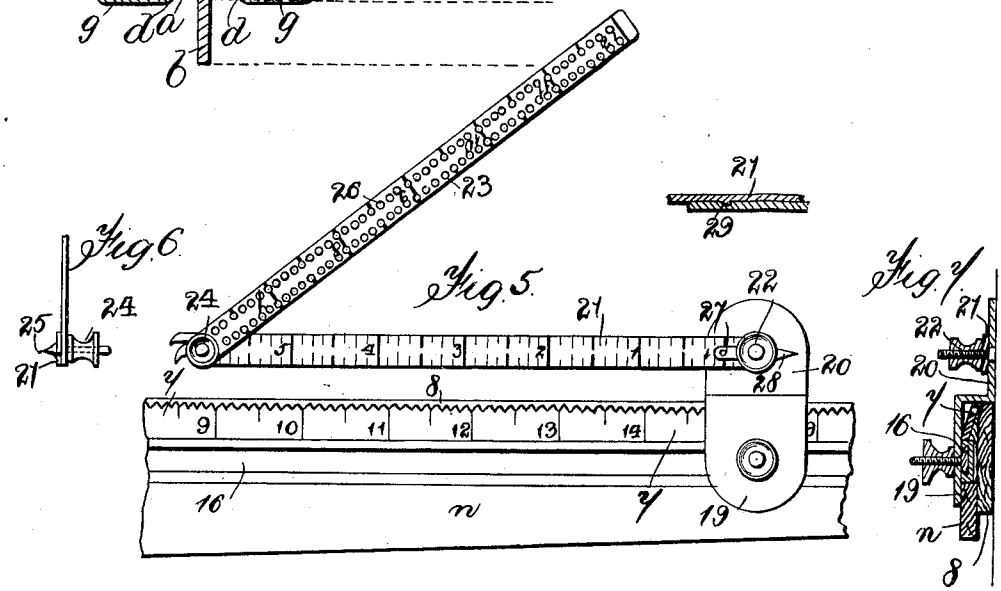


Fig. 9





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UNITED STATES PATENT OFFICE.

SIDNEY HERBERT DONALDSON, OF LONDON, ENGLAND.

DRAWING APPARATUS.

No. 828,721. Specification of Letters Patent. Patented Aug. 14, 1906.

Application filed March 10, 1906. Serial No. 305,333.

To all whom it may concern:

Be it known that I, SIDNEY HERBERT DONALDSON, a subject of the King of England, residing at 6 Boundary road, South Hampstead, in the county of London, England, have invented certain new and useful Improvements in Drawing Apparatus; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to a new and improved drawing appliance of the nature of a "T-square" for use on a drawing-board for architectural, mechanical, or such like drawing or work.

The invention refers to a drawing appliance of the type of T-square in which the arm or blade is pivoted on a suitable upright post and is allowed to swing in any position therefrom in or out of right angles to the upright edge of the drawing-board.

In the usual form of my invention I provide a longitudinal perpendicular guide-bar, having, by preference, a V-groove in each side of such bar or the like. Above the said bar and extending on each side of it is a platform or plate carrying a center upright post with side pieces fixed under the platform, with corresponding V-grooves running parallel with the grooves in the guide-bar. Into these grooves I place antifriction steel balls, which are allowed to occupy all the space between the grooves in the guide-bar and the grooves in metal side pieces on the under side of the platform before mentioned.

One of the side pieces, with its groove for the ball-race, is made adjustable by means of screws or the like to take up the wear on its groove and also on the grooves of the guide-bar. In order that the bolts may run freely, so as to enable the platform carrying the blade to run easily up and down the guide-bar, I make channels of V, tubular, or other sections all round the side pieces before mentioned, so that the balls may run continuously round, making a complete circuit outside the pieces, the balls coming in contact with the guide-bar in the inner side of the said side pieces and being kept in the grooves on the side pieces by means of the tubular or other section of casing or covering. The platform before mentioned has a longitudinal movement on the guide-bar by means of the ball-bearings, as before mentioned, and has pivoted upon the central upright post fixed on the platform a blade or arm somewhat of the shape and size usual in a T-square.

On the top edge or other suitable position I place a long strip of serrated metal, having the teeth on the upper edge overlapping the edge of the blade. The object of these teeth is that in drawing perpendicular lines down the sheet of paper the point of the pencil may be placed in the teeth and the platform and blade run easily and rapidly from top to bottom of the paper or to or from any other suitable position thereon. The serrated band or strip may be graduated to any desired scale, and there may be center-punched marks or other holes or indentations thereon to enable the point of a compass to describe an arc or portion of an arc from any point,

The center post is tapped inside and out. Screwing on the outside is a strong handle which upon a slight movement locks the blade upon the platform, while still allowing a perpendicular motion of the platform and blade up and down the guide-bar. The locking enables the operator to retain any desired angle.

There may be a flat scale or strip pivoted under the blade, extending beyond the serrations, thus enabling a straight line to be drawn by means of the straight edge of the flat strip. This strip is removable and is pivoted at the right hand or smaller end of the blade by means of a wing-nut or other device, which allows it to be set at any desired angle with regard to the top or bottom edge of the said blade. A pointer and scale may also indicate the angle between the bar and the blade by means of graduations marked on an extension of the small end of the said blade. This strip or bar gives a series of angles from points that would not be possible to obtain with the blade alone, and vanishing-points can be obtained above and below the blade.

The upright post on the platform, which forms the pivot on which the blade works, may be drilled and tapped through vertically, a milled screw engaging therein, so that when the said screw is turned the lower part of it presses down on the guide-bar, thus making the blade to be held at or pivoted on a fixed position upon the said guide-bar.

In order to indicate the exact angle of the blade in regard to the guide-bar or edge of the drawing-board, I key upon the upright center post a fine-toothed wheel and engage therewith a pinion pivoted upon the top plate which forms the extension of the blade,

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with a dial or its equivalent fixed upon the pinion and an indicating-pointer upon the back extension of the blade. The smallest movement of the said blade is thus indicated by the rotation of the dial by means of the engagement of the pinion with the toothed wheel before mentioned, thus enabling very fine measurements to be registered. The blade has at or near its smaller end a slot or series of slots, so as to enable the operator to arrive at a vanishing-point with great facility simply by putting a pin through the slot into the board where required, lowering the left-hand or sliding platform of the apparatus while drawing the lines. A pointer attached to the platform enables the vertical position of the blade to be accurately defined by means of the graduations on the guide-bar. I may also provide a dovetailed slot in the said guide-bar and have a series of movable scales which can be readily slid into the aforesaid dovetailed slot in the said guide-bar, and thus the scales can be varied according to the class of measurement or work required. Provision may be made, if necessary, for the addition of scales of various graduation to be attached to or form part of the bar, which is attached to the under surface of the blade, as before indicated.

One or more snap-springs are provided under the upper blade to retain the lower strip or bar in its closed position when in use. When desired, an additional small scale can be pivoted upon the top bar or any other convenient position, so that when the bar is raised or lowered at an angle to the blade and it is wished to draw a series of lines of varying angles, but at given distances between such lines, these distances may be easily regulated by means of the graduations upon this small pivoted bar, which may be brought down at right or any other angle to the bar and the indications read from the line of contact with the top edge of the blade proportionately, and in order that this invention may be understood I will proceed to describe the same with reference to the drawings accompanying this specification, in which—

Figure 1 is a top plan of the apparatus. Figs. 2, 3, and 4 are details hereinafter referredto. Fig. 5 shows alternative construction of portion of the apparatus. Figs. 6 and 7 show details of such alternative construction. Figs. 8 to 13 show further details of construction hereinafter referred to.

The same letters and numerals of reference are employed to denote the same parts in all the views.

a shows a guide-bar, which in the instrument shown is T-shaped in cross-section, the portion *b* being provided with screw-holes *c*, which serve the purpose of screwing the bar onto the side of a drawing-board or the like. The portion *a* has V-grooves *d* in each edge thereof.

e is a platform or plate carrying a center upright post *f*. This plate or platform *e* has attached to its under surface two pieces *g*, coming on each side of the V-grooves of the guide-bar *a*. This may be suitably shaped to take into the said V-grooves *d*, or, as in the case of the instrument shown in the drawings, they may constitute chambers provided with balls *h*, such balls projecting through grooves in the sides of the chambers, so that two ball-races are formed, one on each side of the guide-bar *a*, which is therefore enabled to slide longitudinally with great facility. The construction of this part will be clearly understood from Figs. 8, 9, and 10, and it will be observed that in the case of the instrument therein represented the balls *h* are placed in a channel forming a continuous ball-race in the chambers forming the side pieces *g*. The side pieces of chambers *g* are secured to the under side of the platform *e* by means of screws *k*. One of the chambers *g* is provided with other screws *m*. The heads of these screws *m* are mounted eccentrically, so that by rotating the screws the piece *g* is brought nearer to or farther from the edge of the guide-bar *a* in order to enable the piece *g* to be adjusted in order to allow for wear. These screws *m* are shown in Figs. 11 and 12. *n* is a blade somewhat resembling the blade of an ordinary T-square. This blade *n* in the case of the instrument shown is attached to a plate *p*, which turns upon the upright or post *f*, attached to the platform *e*. The upright *f* is provided with a screw-hole and with a screw-thread on the outside. I prefer to have the screw-thread on the outside left-handed. *r* is a handle screwing on the outer thread of the upright post *f*. When this handle is screwed down, the blade *n* is locked in any required position, owing to the plate *p* being forced down upon the plate or platform *e*.

s is a screw provided with a milled head *t*. This screw *s* screws into the screw-hole inside the post or upright *f* and on account of its pressure upon the guide-bar *a* locks the plate *e* at any required position along the said guide-bar *a*.

u is a toothed disk fixed to the upright *f*. This disk *u* gears with a pinion *z*, mounted in the plate *p*. This pinion *z* carries a disk 1. In the case of the instrument shown in the drawings the gear is so constructed that the disk 1 makes a complete revolution when the toothed disk *u*, and consequently the blade *n*, makes a quarter of a revolution. A suitable scale from "0" to "90" is marked upon the surface of the disk 1, and a pointer 2 is attached to the plate *p* to enable the angle to be read. The surface of the guide-bar *a* is provided with suitable graduations, and 3 is a double pointer attached to the plate *e* for enabling such plate to be accurately adjusted in any position on the guide-bar *a*.

4 is a stop, of which there are two, one on

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each end of the guide-bar *a* at the back, into contact with which the ends of the side piece *g* come, thus preventing the plate *e* from sliding entirely off the guide-bar *a*.

The guide-bar *a* may in some cases be provided with a long dovetailed slot extending, if desired, the entire length of the said bar. Into this slot scales variously graduated may be slid, and the graduations on such scales may be read with facility by means of the pointer 3. In Fig. 13 is shown a scale 5 being inserted into the guide-bar *a* for this purpose.

6 is a thumb-piece attached to the face of the plate *p* to facilitate manipulation.

7 is a long strip of serrated metal attached to the upper edge of the blade *n*. This strip may be suitably graduated to determine the position of the teeth along the serrated edge. Under the blade *n* is a strip 8. This strip 8 is pivoted at 9 to a plate 10 at the end of the blade *n* by means of a screw-pivot provided with a fly-nut 11. The plate 10 may be provided with graduations for determining angles.

12 is a handle by means of which the strip 8 may be conveniently turned into any required position.

13 is a pointer carried on the handle 12 for indicating the position of the strip 8. The other end of the strip 8 from the pivot 10 is provided with a metal strip 14, which takes under a catch 15 to hold the strip 8 in position when beneath the blade *n*. This catch 15 is closed toward the inner side to prevent the strip 8 passing right through. These details may be seen in Figs. 2 and 3, Fig. 3 being inverted to more clearly show the details.

It will be observed that the strip 8 when in position under the blade *n* projects slightly beyond the teeth upon the edge of the serrated strip 7 in order to enable lines to be drawn. The edge of the strip 8 may, if desired, be provided with a scale.

16 is a dovetail groove along the surface of the blade *n*, in which slides a piece carrying a plate 17. This plate 17 is provided with markings for determining angles and with indentations 18 for the purpose hereinafter mentioned. Instead of the flat plate 17, as shown at Fig. 1, I may have a plate 19. (Shown clearly at Figs. 6 and 7.) This plate is bent at right angles, so as to bring the portion 20 onto the level of the paper or the like on which the drawing is being done, and in this case the markings for determining the angles are provided on the portion 20.

21 is a steel strip attached to the plate 17 or 20 by means of a screw-pin attached to the plate 17 or 20, furnished with a nut 22 and provided on its upper surface with a suitable scale. 23 is another steel strip, likewise provided with graduations and attached to the strip 21 by means of a screw-pin and nut 24. At the bottom of this screw-pin 24 or on the strip under same is a point 25 for use when it is required to strike circles by means of the piece 23. The piece 23 may be provided with any suitable number of holes 26, through which the point of a pencil may be placed when it is required to draw circles.

27 is a catch for taking over the piece 23 when it is turned back over the piece 21. The piece 21 is provided with a suitable pointer 28 to enable the angles to be easily read.

29 is a projection on the under surface of the strip 21 for taking into any of the indentations 18 on the plate 17 or 20 for arresting the strip 21 at intervals—say ten degrees apart.

30 is a slot through the blade *n*, and 31 is a similar slot through the strip 8. The slot 31 comes exactly beneath the slot 30 when the strip 8 is in position beneath the blade *n*.

In considering the action of an instrument of the class described it will be sufficient to explain some of the less obvious functions of the apparatus, since its uses are so various that it would be impossible to give an exhaustive account of them. By loosening the handle *r* the blade *n* may be turned about the post *f* into any position with regard to the perpendicular—*i. e.*, with the guide-bar *a*—and locked in any required angle, as determined by the graduations on the disk 1, indicated by means of the pointer 2, and it may be locked in the position thus determined by again tightening the handle *r*. By loosening the screw *s* the plate *e* may be slid up and down the guide-bar *a*, and the blade *n* can be brought to any required position without altering the angle formed by the blade with the said guide-bar *a*. By again tightening the screw *s* the plate *e* is secured in any required position on the said guide-bar. A series of vertical parallel lines may be drawn by loosening the screw *s*, placing the pencil in any one of the serrations at the edge of the strip 7, and sliding the plate *e* up and down the guide-bar *a*. By means of the slot 30 the operator is enabled to arrive at a vanishing-point with great facility. To do this, the screw *s* and the handle *r* are loosened, so that the plate *e* can slide up and down the guide-bar *a*. A pin is passed through the slot 30 into the drawing-board, and by means of the left hand the plate *e* is slid up and down. The lines then drawn can be made to converge to the required point.

What I claim, and desire to secure by Letters Patent of the United States of America, is—

1. In a device of the character described, the combination with a drawing-board, of a guide-bar attached to said board, a traveler mounted on said bar, an arm attached to said traveler and extending at right angles to said guide-bar, said arm having a longitudinal slot therein, a second traveler mounted in said slot, and arms pivotally connected to

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said second traveler, substantially as described.

2. In a device of the character described, the combination with a guide-bar, of a traveler attached to said bar, an arm attached to said traveler and provided with a longitudinal slot, a plate slidably mounted in said slot and one or more arms pivotally mounted on said plate and coöperating with said first-named arm, substantially as described.

3. In a device of the character described, a guide-bar, a traveler slidably mounted on said bar, an arm connected to said traveler, means whereby said arm may be fixed at any desired angle, means for registering the angle, and an arm pivotally mounted on the under side of said first-named arm and normally held in place by a clip, substantially as described.

4. In a device of the character described, a guide-bar, a traveler mounted on said guide-bar, an arm carried by said traveler, a second arm pivotally mounted on the under side of said first-named arm and normally held by a clip carried by said arm, and means carried by said first-named arm for registering the angle of said second-named arm, substantially as described.

5. In a device of the character described, a guide-bar, a traveler slidably mounted on said guide-bar, comprising a base-plate, frames attached to the under side of said base-plate and provided with antifriction-rollers embracing said guide-bar, a pivot-plate, an arm attached to said pivot-plate, and an upwardly-extending shank integral with said base-plate and extending through said pivot-plate whereby said arm may be fixed at any desired angle, substantially as described.

6. In a device of the character described, a guide-bar, a traveler slidably mounted on said guide-bar comprising a base-plate, a pivot-plate, an upwardly-extending hollow shank integral with said base-plate and extending through said pivot-plate, said shank being internally threaded and having screw-threads formed on its outer face adjacent its upper end, a handle having an internally-threaded portion adapted to screw upon said shank to lock said pivot-plate, and a thumb-screw having a milled head, said thumb-screw being adapted to engage within the threaded bore of said shank and lock said traveler upon said guide-bar, substantially as described.

7. In a device of the character described, a guide-bar, a traveler slidably mounted on said guide-bar, comprising a base-plate, a pivot-plate, an upwardly-extending shank integral with said base-plate and extending through said pivot-plate, a gear-wheel mounted on said shank and a registering disk carrying a pinion loosely mounted on said pivot-plate, said pinion being meshed with said gear-wheel whereby when said pivot-plate is moved to a desired angle the degree of said angle may be read, substantially as described.

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

SIDNEY HERBERT DONALDSON.

Witnesses:
H. D. JAMESON,
A. NUTTING.