P. GAULTIER.

INSTRUMENT FOR TOPOGRAPHICAL SURVEYING.

APPLICATION FILED SEPT. 14, 1909.

1,014,143.

Patented Jan. 9, 1912.

4 SHEETS—SHEET 1.

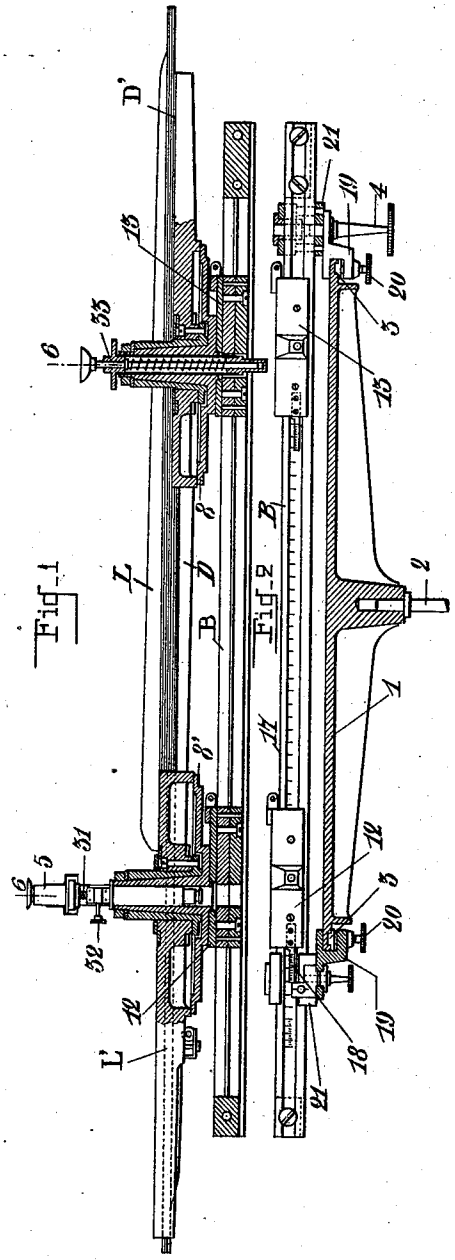


Fig. 1

Fig. 2

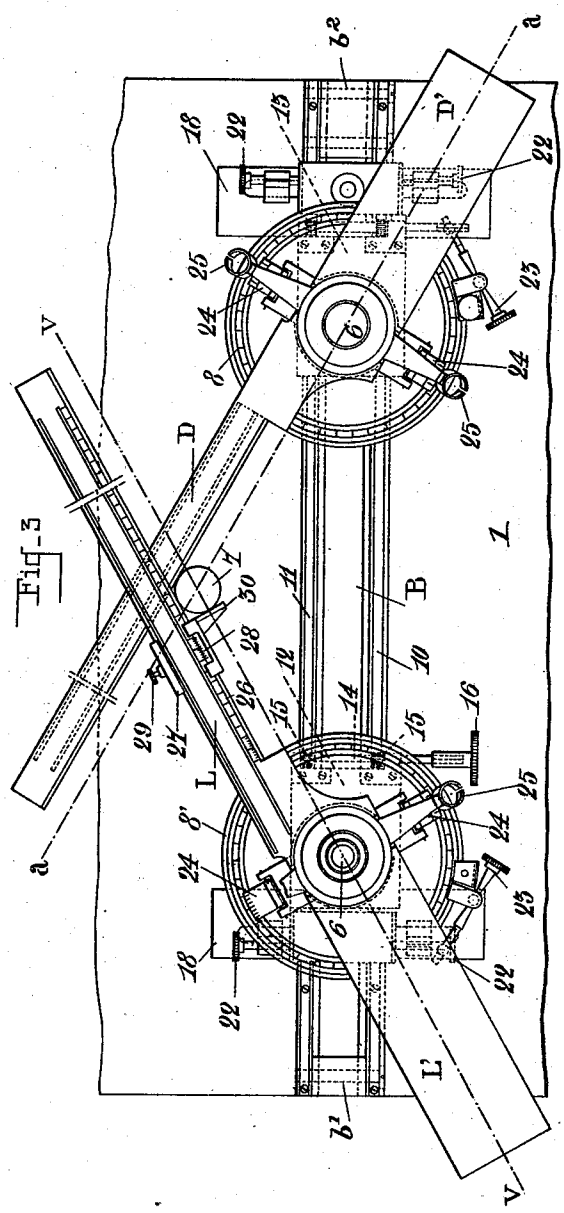


Fig. 3

WITNESSES.

W. A. Berrigan

Alfred R. Anderson

INVENTOR,

PAUL GAULTIER,

by Howard Edmunds

Attorney.

P. GAULTIER.

INSTRUMENT FOR TOPOGRAPHICAL SURVEYING.

APPLICATION FILED SEPT. 14, 1909.

1,014,143.

Patented Jan. 9, 1912.

4 SHEETS—SHEET 2.

Fig. 6

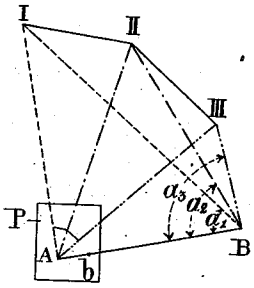


Fig. 4

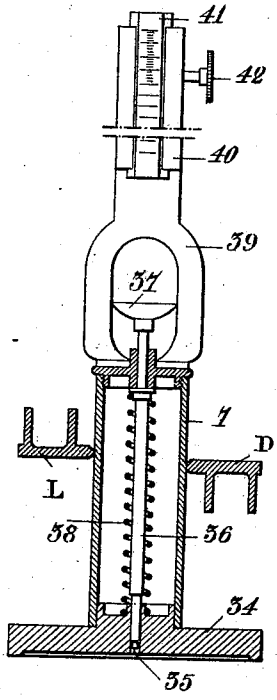
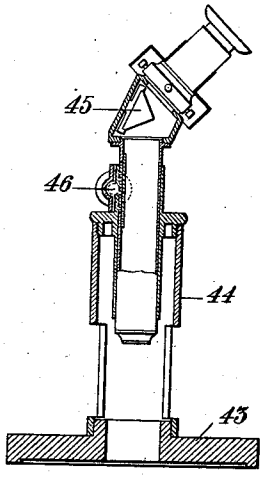


Fig. 5



WITNESSES:

H. H. Berrigan.

Alfred P. Anderson

INVENTOR,

PAUL GAULTIER,

by Howson & Howson

Attorney.

P. GAULTIER.

INSTRUMENT FOR TOPOGRAPHICAL SURVEYING.

APPLICATION FILED SEPT. 14, 1909.

1,014,143.

Patented Jan. 9, 1912.

4 SHEETS—SHEET 3.

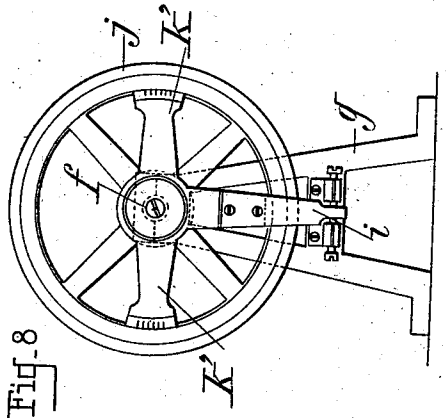


Fig-8

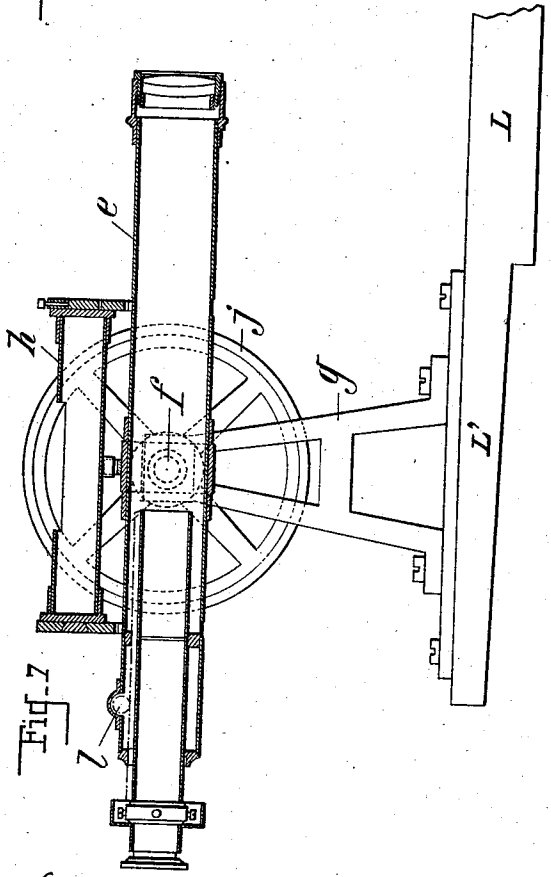


Fig-7

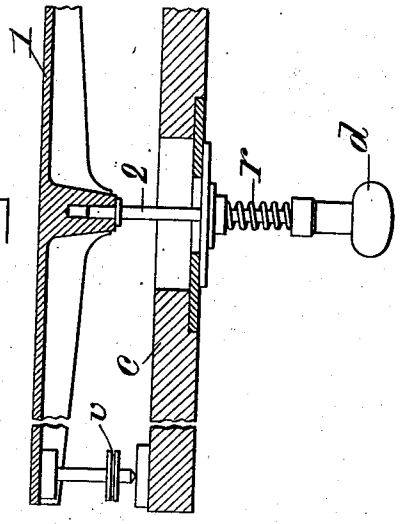


Fig-10

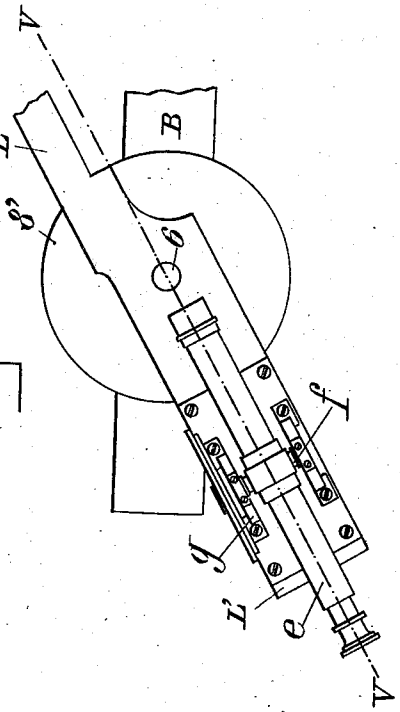


Fig-9

WITNESSES:

H. H. Berrigan.

John A. Hoving.

INVENTOR,

PAUL GAULTIER.

by Howard Edenwood

Attorney.

P. GAULTIER.

INSTRUMENT FOR TOPOGRAPHICAL SURVEYING.

APPLICATION FILED SEPT. 14, 1909.

1,014,143.

Patented Jan. 9, 1912.

4 SHEETS—SHEET 4.

Fig. 12.

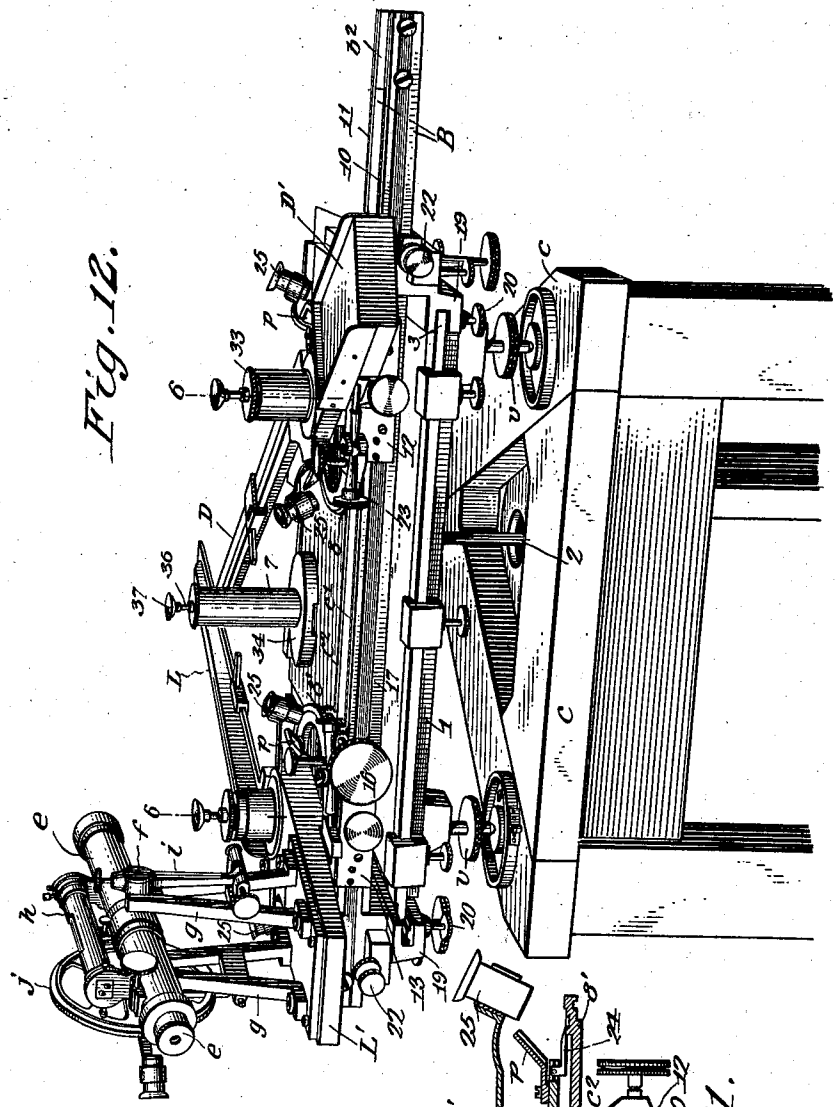
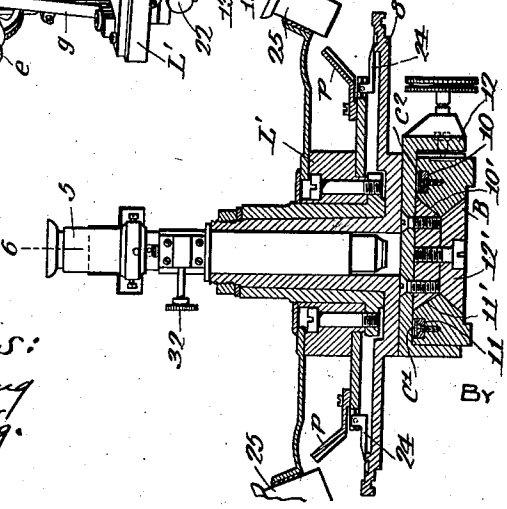


Fig. 11.



Witnesses:
John N. Hoving
Cornelius Hoving.

Inventor
Paul Gaultier
By Hvan Deserved
Attorney

COLUMBIA PLANOGRAPH CO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

PAUL GAULTIER, OF VERSAILLES, FRANCE.

INSTRUMENT FOR TOPOGRAPHICAL SURVEYING.

1,014,143. Specification of Letters Patent. Patented Jan. 9, 1912.

Application filed September 14, 1909. Serial No. 517,687.

To all whom it may concern:

Be it known that I, PAUL GAULTIER, a citizen of France, residing at Versailles, in the said Republic, have invented new and useful Improvements in Instruments for Topographical Surveying, (for which I obtained a patent of addition in France, No. 9,966, of October 20, 1908, and a patent in Turkey, No. 1,504, of April 22, 1909,) of which the following is a specification.

This invention has for its object to provide an instrument for topographical surveying.

In order to enable this invention to be more clearly understood, reference is to be had by way of example to the accompanying drawings in which:

Figures 1 and 2 are front elevations partly in section, of the table of the apparatus and the straight edges carried by it. Fig. 3 is a plan of the aforesaid general arrangement. Fig. 4 is an elevation partly in section, of the pricking cylinder provided with its millimetric scale. Fig. 5 is a sectional elevation of the angled microscope. Fig. 6 is a diagrammatic view illustrating the method of practical use of the apparatus herein referred to. Fig. 7 is a detail view showing in elevation the arrangement of the telescope on its support-bar. Fig. 8 is a detail view showing the vertical divided circle, in front of which the telescope is movable. Fig. 9 is a detail showing in plan the disposition of the telescope on its support-bar. Fig. 10 is a detail view, showing the device designed to center the table of the apparatus on its support. Fig. 11 is a detail sectional view taken through the axes 6. Fig. 12 is a general perspective view of the whole arrangement.

The same references are employed to indicate the same parts in all the figures of the drawings.

The apparatus is based on the following principle of geometry: A triangle is known, when one side and two adjacent angles of the triangle are known. The practical application of this principle is illustrated by Fig. 6 of the accompanying drawings.

Let I, II, III be points of the land of which it is desired to plot the plan to a given scale. A base A B is measured on the land, and is plotted on the desired scale at A b on the drawing sheet. The instrument carrying the drawing sheet P is set up at A. Now if this instrument allows of: 1—Bringing the point A of the land in coincidence with the point A on the drawing; 2—Bringing the three points A, b and B into alinement; 3—Determining directly the lines of direction A—I, A—II, A—III, &c., (lines such as v—v in Fig. 3); and 4—Plotting at b, the angles a^1, a^2, a^3, &c., determined at the point B by any suitable means (lines such as a—a in Fig. 3); then it will be clear that the intersection of the various lines v—v and a—a respectively in pairs will produce on the drawing P a polygon similar to the polygon I, II, III, and on the desired scale.

The apparatus comprises a stand, adapted to be fixed on the ground; this stand consists of a tripod carrying a platform c (Fig. 10) supporting the table 1 and the bearing for the rod 2, which insures the centering of the table 1 on its support. The said rod is fixed on a button d, and a spring r, fixed on the one hand, to the platform c, and, on the other hand, to the button d, is coiled around the said rod.

The table 1, capable of being placed horizontal by means of adjusting screws such as v (Fig. 10), carries a base bar B, corresponding in direction to the base line of the plan, which bar can slide and be fixed in position on the table 1. Two other movable straight bars D and L which are capable of pivoting on axes 6, and of being fixed in any desired positions are carried by the bar B.

The base bar B is composed of two pieces 10 and 11 on which are mounted the slides 12 and 13 that carry respectively the bars L and D. Each of these slides comprises a central block such as 12′ (Fig. 11) grooved laterally so as to fit exactly upon the edges 10′ and 11′ of the two pieces which constitute the rule of the base B, which pieces are moreover braced at their extremities by the pieces b', b^2, (Fig. 3) is provided with a horizontal shaft 14 carrying two pinions 15 that engage respectively with sunk racks shown as at c' and c^2 of Fig. 11 of the drawings fixed in the pieces 10 and 11 of the bar B. The horizontal shaft 14 is provided at one end with an operating knob 16. This system of operating the slides enables the said slides to be moved rapidly and to be adjusted in position accurately and very easily to 1/20th of a millimeter.

The base bar B is divided in millimeters along its outer edge at 17, and one of the verniers carried by the slides 12 and 13, for

instance the vernier 18 carried by the slide 12, is adjustable. This arrangement enables the exact distance between the two axes 6 of the bars D and L to be determined with strict accuracy without it being necessary for the zero of the divisions 17 to coincide exactly with the station point A which is exceedingly difficult to be effected.

The bar B is attached to the slide ways 3 of the table 1 through the medium of parts such as 19 provided with slots for the passage of the set screws 4, these pieces being in turn attached to the slide ways 3 of the table 1 by means of clamping screws such as 20. The bar B is raised relatively to the table 1, by means of sliding parts such as 21, through which clamping screws 4 pass. The adjustment of the bar B, in the exact line of direction A—B is effected by means of adjusting screws such as 22.

The slides 12 and 13 carry, respectively, two graduated circles 8′ and 8 having their respective centers on the pivot of the bar L and on the pivot of the bar D; these two circles are entire and full. The verniers 24—24 of these circles are adapted to be readily adjustable, are illuminated by a clear glass piece *p*—*p* (Fig. 11), and are read by means of lenses such as 25—25.

The bars L and D have, in cross section, the form shown in Fig. 4 of the drawings; they are counterbalanced by masses L′ and D′ situated respectively on the farther side of the pivot of each bar. The said cross-sectional forms, render the bars very stiff, while allowing the bars to be arranged very close to each other, and to the paper on which it is desired to plot the plan.

The bar L carries a telescope *e*, for sighting the point on the land, and along the divisions of the bar there can be moved a small slide block 27 carrying a vernier 28 and a clamping screw 29. This slide block has a projecting part 30 at right angles to the axis of the bar L. The disposition of the telescope *e* on the bar L is indicated on Figs. 7, 8 and 9. It is pivoted at *f* on a suitable support *g*, and it is provided with a level *h* permitting to insure its horizotal position. Any suitable device *i* for adjusting the inclination of the telescope, is provided, and acts on the pivoting support *f*. A fixed graduated circle *j* is secured on the support *g*, and a vernier *k*, *k*′ is movable along the graduations of said circle, according to the rotation of the pivot *f*.

Microscopes such as 5, are situated in the axis 6 of the slides 12 and 13. These microscopes can be brought exactly over the trigonometrical points of the plan, and they can be adjusted vertically by means of a rack such as 31 actuated by a pinion operated by means of a knob 32. This arrangement greatly facilitates the centering of the spider's webs; in fact if one of the slides, the slide 13 for instance, be clamped on the bar B, it will be sufficient to insert in the axis 6 of the said slide in the place of the microscope, a pricking cylinder such as 33 having the same external diameter, to prick the drawing at that point to replace the pricking cylinder by the microscope, and then to adjust the spider's webs so that they shall aline with the point marked by the pricking.

The pricking cylinder 7, illustrated in detail in Fig. 4 of the drawings, is intended to be placed at the intersection of the bars D and L. It is supported by a faced base plate 34, and its point 35 is mounted on the end of a rod 36 operated by a push 37 and a returning spring 38. The upper part is extended in the form of a frame 39 carrying slide ways 40 in which is a movable millimeter scale 41 operated by means of a knob 42 through the medium of rack and pinion gear. This scale enables the altitude of the point that has been sighted and marked by pricking, to be ascertained directly by reading the scale a first time when a sight of the said point is taken with the telescope *e* on the bar L, and a second time when the telescope is placed horizontally, which position is controlled by means of the level *h*. The angle which corresponds to the said altitude may, further, be read on the circle *j*.

For the purpose of determining by synthesis the given points of the land on the plan, there is likewise provided an angled microscope cylinder mounted on a faced base plate 43, and comprising a cylinder 44 equal in diameter to the pricking cylinder 7. This microscope contains a prism 45 between the eye-piece and the objective, and it is focused by means of the operating knob 46. In using it, it is sufficient to focus it to a pricked point, and then to set the bars L and D tangentially to the cylinder 44.

The manner of plotting the plan with the herein described apparatus, is as follows: The tripod stand is first set up on the land so that the station point A marked on the plan will coincide approximately with the station point on the land. The table 1 of the instrument is then placed on the stand, and the pivot 2 engaged in the table 1. The drawing sheet on which the base A *b* (Fig. 6) has been drawn to scale is fixed on the drawing board which is then placed on the table 1 so as to be held by the edges of the bars 3. The board is fixed in position by means of clamping screws 4. The station point A on the drawing sheet is brought as closely as possible over the point A of the land base line A—B. The table 1 of the instrument is then adjusted so as to bring the point A of the drawing into absolute coincidence with the point A of the land. This may be done by means of a line and plummet. Then the table 1 is fixed to the fixed

platform *c* of the stand. When this has been done, the bars B, D and L are placed on the table 1. These three bars constitute an entirety which can be placed as a whole upon the slideways 19 attached to the table. The bar B is arranged so that the spider's webs of the microscopes such as 5, situated on the axis 6 of the pivots of the bars D and L; are brought exactly over the points that correspond to the end points A and *b*, of the base line. The stand pivot is then operated in such a manner as to bring the bar B in alinement with the point B (Fig. 6); this being done by means of the telescope *e* carried by the bar L. For this purpose the bar L is brought and fixed in position along the base bar B; this is easily done because the radius of the cylinder (acting as a stop) of the microscope situated on the axis 6 of the bar D is exactly equal to the radius of the cylinder 7 of the pricker. The instrument is then locked in position. Then without disturbing this alinement which must remain exact, the upper table 1 is leveled with the aid of the adjusting and fixing screws. The plotting of the plan is then carried out, as follows: An instrument for measuring angles is then set up at the second station B, and an assistant carries to each of the points to be plotted, such as the points I, II, III, a staff which is held vertical by means of a line and plummet. A reading is taken upon the staff at each point, simultaneously, by the two observers at the chosen stations A and B. The observer at station A takes a sight at the point I with the telescope *e* on the bar L, and the line such as *v*—*v* (Fig. 3) gives the line of direction A—I. The operator at station B notes the angle *a'* made by the base A—B with the line BI, and this angle is reproduced by the observer at station A by means of the circle 8 and bar D. Then the line such as *a*—*a* (Fig. 3) gives the line of direction B—I. The adjusting screws 23, 23 permit the exact positioning of the bars L and D. Then by fixing the bars L and D, and moving the cylinder 7 over their point of intersection, he can mark the point I accurately on his drawing sheet. The operation is the same for the points II and III.

Having now fully described and illustrated my invention, what I claim, is:

1. A stand; a table adjustable into a horizontal position; grooves on the under surfaces of the said table; a bar, called 'base line bar,' supported by means movable in the said grooves and fixable in a predetermined direction, on the table; two other movable bars pivoted and fixable in position as desired, on the base line bar; slides movable on the base line bar and supporting the pivots of the pivoted bars; a telescope mounted on one of the pivoted bars and designed for sighting points on the land; millimetric scale and vernier on the said bar; divided circles fixed on the movable slides on the base line bar and having their centers of the pivots on the pivoted bars; microscopes disposed on the pivots of the pivoted bars; pricking cylinders for replacing eventually said microscopes; adjusting screws for enabling the bars to be brought quickly into their exact positions; plunger prickers to be brought over the intersection of the two pivoted bars; and an angled microscope for replacing eventually the said pricker.

2. An instrument for topographical surveying comprising; a table adapted to be adjusted into a horizontal position and provided with grooves on its lower face; a base line bar; means movable in said groove and adapted to support said bar; a pair of slides movable on the base line bar; pivots carried thereon; additional bars pivotally supported on said slides and adapted to cross each other; a telescope mounted on one of the pivoted bars; a scale and vernier on said last named bar; divided circles fixed on said slides and having their centers on the pivots coincident of the pivoted bars; microscopes disposed on said pivots and adapted to be replaced by pricking cylinders; adjusting screws for enabling the bars to be brought quickly to the desired positions; plunger prickers adapted to be brought over the intersection of the pivoted bars and an angled microscope adapted to replace the plunger prickers.

In testimony whereof, I have signed my name to this specification in the presence of two subscribing witnesses.

PAUL GAULTIER.

Witnesses:
ANDRÉ BORDILLON,
EUGÉNE PICHON.