Jan. 10, 1933. A. BARR 1,894,148

TOPOGRAPHICAL STEREOSCOPE

Filed June 2, 1930

FIG : 1.

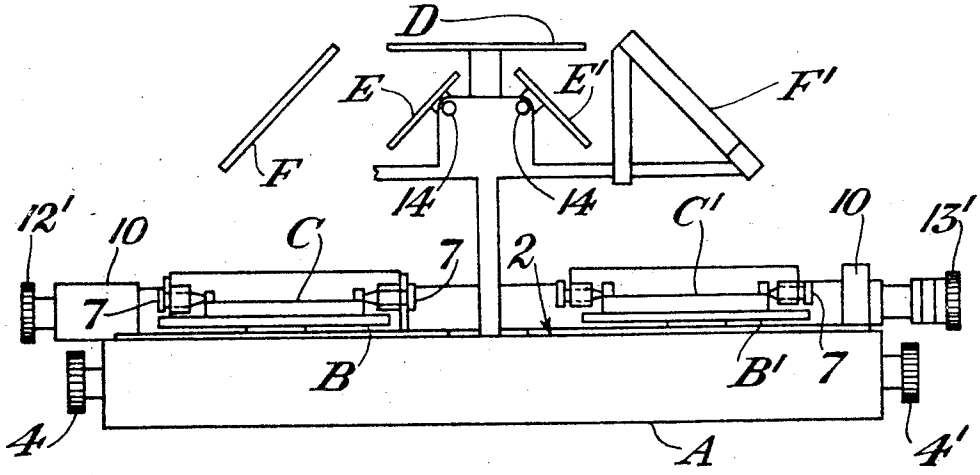


FIG : 2.

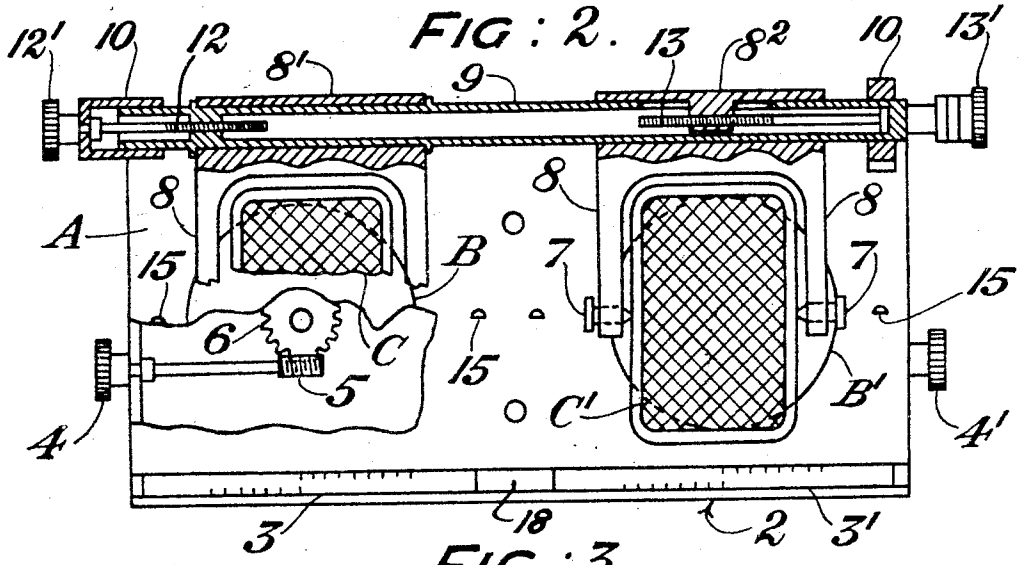
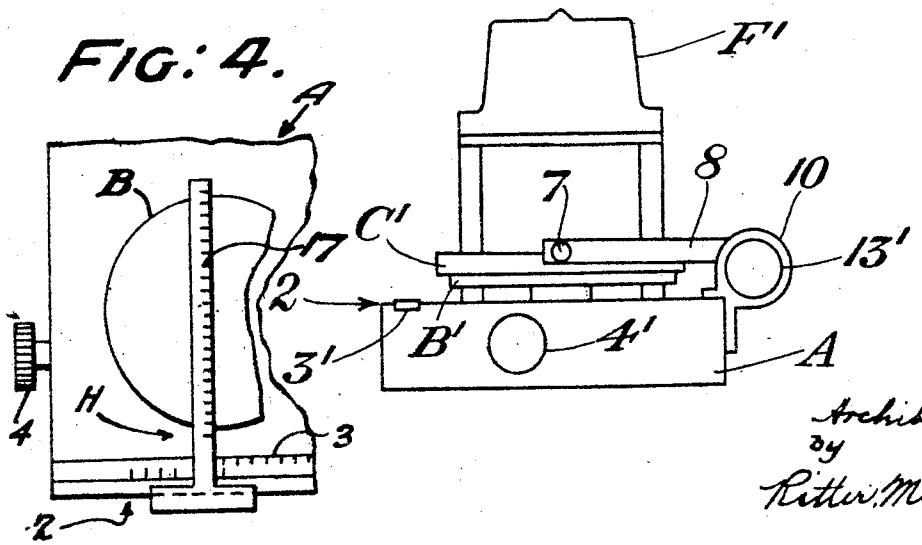


FIG : 3.

FIG : 4.



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UNITED STATES PATENT OFFICE

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TOPOGRAPHICAL STEREOSCOPE

Application filed June 2, 1930, Serial No. 458,956, and in Great Britain June 14, 1929.

This invention refers to topographical stereoscopes designed for work of the same general character as that for which the instrument described in specification of United States Patent No. 1,743,952, granted to Barr and Stroud, Limited, was devised, but it is not intended to be so portable as that instrument is, in that it refers to instruments having a rigid base on which two tables are mounted to carry two photographs, the tables being movable rotationally, and the invention relates to improvements in or connected with base components for such instruments, comprising the use of movable grid plates which are placeable over the photographs; the particular object of the invention being the provision of improved mechanical means for effecting the necessary adjustments and means for making measurements of the relative positions of details on the photographs, and generally for providing a topographical stereoscope of a simple kind available for accurate work.

According to this invention the two grid plates, one placed over each of the photographs, are movable longitudinally together and one is movable longitudinally relatively to the other.

An example of construction will now be described. The front edge of the base plate (which may be of cast metal) is formed to serve as a longitudinal guide. The reflector elements of the instrument may be similar to those described and illustrated in specification of the patent referred to, but in this case they need not be made foldable. These reflector elements are carried from standards extending upwards from the base plate preferably in the central part of the length. The tables for carrying the photographs are metal plates of disc formation and may be circular, rectangular, or polygonal in outline. They may carry surface insertions composed, say, of wood, into which drawing pins may be pressed for holding the photographs in position, or the photographs may be attached by means of adhesive material, or they may be held by clips provided on or in connection with the tables.

Each table has at its centre on the underside an axial projection about which it is rotatable. For rotation each table is provided with a toothed segment concentric with its axis and a shaft with a worm meshing with the segment is provided with a working head projecting from the end of the platform. The grid plates are carried from a tubular piece which extends along the base plate behind the photograph tables and above the level of the top of the base. Screws are provided for longitudinal motion of the grids, the gear being so designed that the screw which has its working head, say, at the left hand end of the tube moves the grid plates equally to right or left while another screw having its head at the other end of the tube moves one of the grids relatively to the other. The grid plates are carried from the tubular piece referred to by double hinging in such a manner that the grid plates may lie flat upon the photographs whether thick photographs or thin ones are placed on the tables.

The photographs should be placed on the tables with the principal point of each photograph lying exactly over the centre of rotation of its table. This point may be indicated when the photograph is lying on the table, by any suitable means. For example, a strip of transparent celluloid may be arranged to lie over the photograph and to be held in a definite position relatively to the table and have marked upon it the centre of rotation of the table, so that the principal point of the photograph may be brought under the point so indicated; or a jig may be provided consisting of a triangular frame, provided at two of its corners with feet adapted to fit respectively into a conical recess and an angled groove near the edge of the table surface, while the third corner is provided with a projecting needle; the disposition of the parts being such that, when the feet are in the recesses, the needle fits into a small hole drilled at the centre of the table. If the needle be put through the photograph at its principal point and the feet are then placed in the hole and slot, the needle point will enter the hole in the centre of the table; the photograph may then be rotated about the needle point approximately into the re-

quired orientation and fixed to the table. The jig may then be removed and the orientation finally adjusted by rotation of the table in accordance with observations made when the two photographs have thus been approximately adjusted.

For measurement of the "X" and "Y" co-ordinates of any points on the photographs, that is, the co-ordinates parallel to the plane of the photographs, say with the principal point as zero of co-ordinates, a device of somewhat T-square form may be used. The head of the T-square is adapted to slide longitudinally on the base plate and is provided with an index or a vernier to read on a scale carried on the base plate. One such scale is provided for each photograph and it may be adjustable longitudinally on the base plate. After the photographs have been adjusted rotationally relatively to each other and comfortable fusion obtained by the particular observer using the instrument by such means as are provided the T-square may be placed over the photograph on which measurements are to be made and adjusted so that the edge of the blade of the T-square lies over the principal point of the photograph; the scale is then adjusted if necessary on the base plate so that it reads zero at the index or vernier provided on the head of the T-square. The blade of the T-square is graduated in each direction from a central point which coincides with the principal point. If, now, the T-square is moved along the base till its edge intersects a point whose co-ordinates are required, the "X" co-ordinate may be read from the scale carried on the base, and the "Y" co-ordinate read on the scale of the blade of the T-square.

After the photographs have been correctly adjusted for orientation and otherwise, the air base line may be accurately drawn on the photographs by aid of a straight edge laid over the photographs and brought into contact with two stops fixed to the base plate.

An example of construction will now be described with reference to the accompanying drawing, in which:—

Figure 1 is a front elevation, Figure 2 is a broken plan partly in section, Figure 3 is an end view, and Figure 4 is a plan showing a T-square.

The construction illustrated comprises a base A, two tables B B^1, two grid plates C C^1, a face piece D, two eye mirrors E E^1, and two object mirrors F F^1.

The base A is formed with a straight front edge 2, and near the edge 2 it is formed to receive two scales 3 3^1 each of which, for adjustment may be movable longitudinally, that is movable parallel to the front edge 2, the scales being, for example, slidable in a channel 18 parallel to the edge 2 and being frictionally maintained in the positions to which they are set. The tables B B^1, which are shown circular, are mounted on the base A and are rotatable each about its vertical axis. The table B is rotatable by means of a head 4 which operates a worm 5 meshing with a toothed segment 6 movable with the table, and the table B^1 is rotatable similarly by means of a head 4^1. Each of the grid plates C C^1 is adapted to lie upon a photograph placed upon its associated table. The grid plates, which are of glass, have on their under surfaces a set of lines forming a grid or some other set of marks, those on the two glass plates corresponding to each other. The two grid plates are connected with the base A by a system of double hinging to permit each plate to lie flat upon the photograph on its table, irrespective of the thickness of the photograph. In the example shown each grid plate is mounted in a frame which is pivoted at 7 to arms 8, the axis of the pivot at 7 is parallel with the front edge 2 of the base A, and the arms 8 are movable angularly about a sleeve 9 the axis of which is also parallel with the front edge 2. The grid plates C C^1 are movable together longitudinally and provision is made for moving longitudinally one of the grid plates relatively to the other. For this purpose, the arms 8 for the grid plates C C^1, extend from two yokes, a yoke 8^1 for the arms of plate C, and a yoke 8^2 for the arms of plate C^1, and each yoke is bored to fit onto the cylindrical sleeve 9 which extends longitudinally at the back of the table. The sleeve 9 is rotatable in bearings 10 which extend from the base A, and the sleeve 9 and with it the yokes 8^1, 8^2, are movable longitudinally by means of a screwed spindle 12 which is rotatable by a head 12^1. Endwise movement of the yoke 8^1 relatively to the sleeve 9 is prevented by collar engagement, and endwise movement of the yoke 8^2 relatively to the sleeve 9 is normally prevented by a spindle 13 which is threaded to screw into a part of the yoke 8^2 and relatively to the sleeve 9 the spindle 13 is prevented by collar engagement from movement endwise. Spindle 13 is rotatable by a head 13^1. Thus, by rotating head 13^1 the grid plate C^1 is moved longitudinally relatively to the grid plate C, and by rotating head 12^1 the two grid plates C C^1 are moved similarly longitudinally. The face plate D is formed with two apertures for the eyes of the observer to look through, and, since in the example illustrated the tables are not movable longitudinally nearer to or further apart, the eye mirrors E E^1 are movable angularly about transverse axes at 14 to obtain fusion stereoscopically. The straight front edge 2 serves as a guide for the head of a device of substantially T-square formation designated H, referred to in the general description of the invention, and having graduations 17 on its blade.

Pins 15, see Figure 2, may be provided pro-

jecting upwards from the base A, against which a straight edge may be placed to guide a pencil or the like in marking the air base on each of the photographs.

The marks, say grid lines on the under sides of the two grid plates being alike, when seen stereoscopically, appear as a flat level net stretched over the field of view. When the grid plates C, C^1 are moved towards or from each other, by rotation of the head 13^1, the net appears to move towards or from the observer, that is, to rise or to fall, and its apparent distance may thus be made to correspond to the apparent height of any point on the landscape viewed. Thus, by relative longitudinal movement of the grid plates, the relative heights of various objects in the landscape may be judged and the form and position of contour lines on the ground may be observed. When the direction and the position of a contour line at any part of the landscape have been seen, one of the grid plates, say C, may be hinged up so that a pencil may be used to mark on the photograph the contour line referred to. The position of the grid plates C, C^1 in any setting relative to the photographs, can be determined by reference to the scales 3, 3^1. Longitudinal movement of the grid plates together, by rotation of the head 12^1, causes the net to be displaced longitudinally relatively to the landscape.

I claim:—

1. A topographical stereoscope comprising a base plate, two tables on the base plate each rotatable in its own plane, two grid plates, one for each table, means for connecting the grid plates to the base plate, means for moving said grid plates longitudinally equally and simultaneously and longitudinally relative to one another, and reflector elements for viewing stereoscopically photographs on the tables.

2. A topographical stereoscope comprising a base plate having a straight front edge, two tables on the base plate each rotatable in its own plane, two members hinged to the base plate, two grid plates, one for each table, hinged to the two members, one to each member, the axes of hinging of the two members and of the two grid plates being parallel with the front edge of the base plate, and parallel with the surfaces of the tables, means for moving said grid plates longitudinally equally and simultaneously and longitudinally relative to one another, and reflector elements for viewing stereoscopically photographs on the tables.

3. A topographical stereoscope comprising a base plate, two tables on the base plate each rotatable in its own plane, two grid plates, one for each table, means for connecting the grid plates to the base plate, mechanical means for moving said grid plates longitudinally equally and simultaneously and longitudinally relative to one another, and reflector elements for viewing stereoscopically photographs on the tables.

4. A topographical stereoscope comprising a base plate, two tables on the base plate each rotatable in its own plane, two members, hinged to the base plate, two grid plates, one for each table, hinged to the two members, one to each member, the axes of hinging of each member to the base plate and of its grid plate to its member being parallel and parallel to the surface of its table, screw means for moving said members and the grid plates longitudinally equally and simultaneously and longitudinally relative to one another, and reflector elements for viewing steroscopically photographs on the tables.

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