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H. C. LOMB & E. G. SAILER.

ORIENTATION DEVICE.

APPLICATION FILED OCT. 29, 1906.

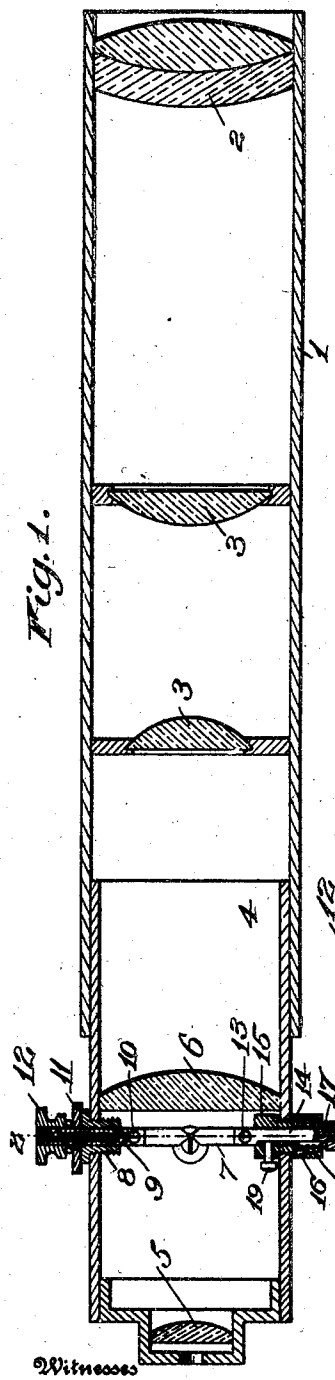

Fig. 1.

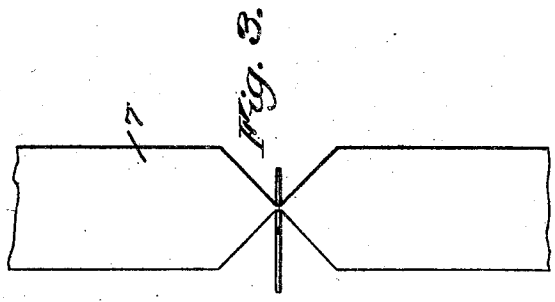

Fig. 3.

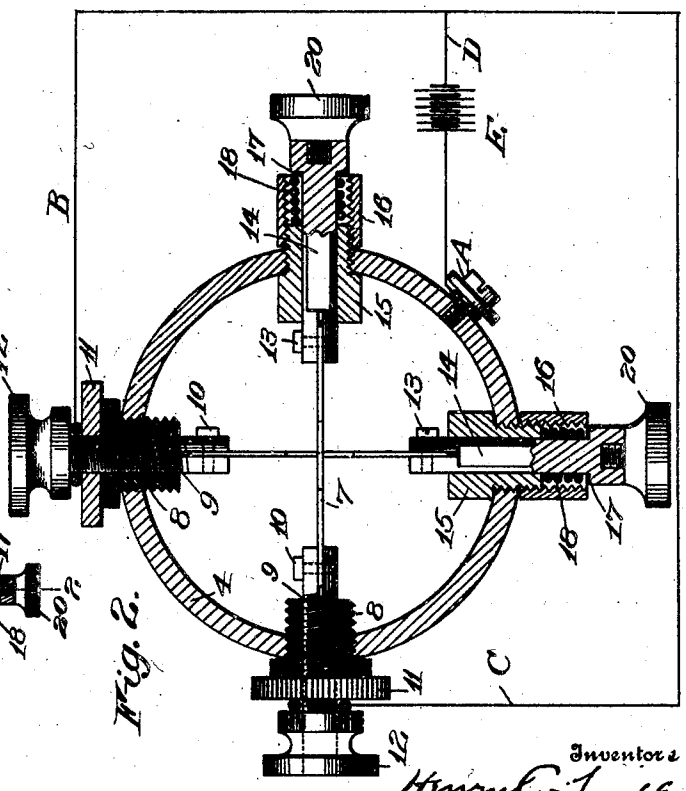

Fig. 2.

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UNITED STATES PATENT OFFICE.

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ORIENTATION DEVICE.

No. 848,757. Specification of Letters Patent. Patented April 2, 1907.

Application filed October 29, 1906. Serial No. 340,958.

To all whom it may concern:

Be it known that we, HENRY C. LOMB and ERNEST G. SAILER, both of Rochester, in the county of Monroe and State of New York, have invented certain new and useful Improvements in Orientation Devices; and we do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming a part of this specification, and to the reference-numerals marked thereon.

Our present invention relates to devices for defining a fixed point or points of reference in the fields of optical instruments, by the aid of which the relative positions of objects appearing therein may be determined; and it has for its object to provide a device of this nature which is capable of offering such a point in luminous contrast to a clouded or darkened field, whereby the instrument to which it is attached or with which it is used is rendered serviceable with equal efficiency by night or by day.

A further object of our invention is to furnish a point of this character of such minuteness as will not disturb the line of vision, yet of variable intensity, by means of which adjustments thereof may be made to suit particular conditions.

The construction through which we attain these ends also provides means for bringing the line of observation to coincide with the optical axis.

To these and other ends the invention consists of certain improvements and combinations of parts, all as will be hereinafter more fully explained, the novel features being pointed out in the claims at the end of the specification.

While for various optical experiments in many lines, such as astronomical measurements, range-finding, and many kindred pursuits, it is of great importance to obtain a point of reference for the purposes above described, and our improvements are equally applicable to all, we have illustrated the present form of our device as applied to a telescope of conventional design, and referring to the drawings—

Figure 1 is a central longitudinal section of such an instrument embodying our improvements. Fig. 2 is a transverse section thereof on the line 2 2 of Fig. 1, and Fig. 3 is an enlarged view of our preferred form of cross-hair.

Similar reference-numerals in the several figures indicate similar parts.

To command a point of reference in the field of a telescope, it is usual to extend two very fine lines transversely of the field-lens and at right angles to each other, their intersection being in the optical axis thereof and forming the fixed location of the point sought. This is accomplished in many instances either by scratching or drawing faint lines upon the surface of the glass or by stretching filaments of spider-web or fine wire across its face. Such devices of course answer their purpose admirably by day or in viewing bright objects at any time, and at night it is the custom to illumine them by light admitted from an extraneous source and properly reflected in the plane in which they lie; but therein lies the objection, as it is manifestly difficult to direct the rays only upon the point or points of intersection of the lines, and when the object is very faint, either because of its distance or because of lack of illumination, or both—as, for instance, at twilight or at night—it is essential that when looking through the telescope the field appear as dark as possible in order that the faint object may be visible at all. To overcome these defects, we construct the filaments of a material which is an electrical conductor, reducing the area of their cross-sections at the points of intersection and connecting each with a source of current-supply, whereby the greater resistance offered by said reduced portion causes that portion of its extent alone to glow, the radiations emitted being directly governable by the intensity of the current.

Referring now to the drawings, 1 indicates the main section of a telescope in which are suitably mounted the objective 2 and the erecting-lenses 3. Fitted within the open end thereof is the sliding adjusting-section 4, provided, preferably, with an adjustably-mounted eyepiece 5 and the intermediate field-lens 6. Immediately adjacent the latter are arranged the cross-hairs 7, which are preferably formed of exceedingly-thin ribbons of a comparatively indestructible material, such as platinum, their greatest width lying in a direction longitudinally of the instrument. At their point of intersection each is reduced in the manner shown in Fig. 3 to the minimum cross-sectional area, which is yet sufficient to withstand the slight tensile

strain imposed by the supporting devices hereinafter described, and though closely approaching each other at this point they are held apart and out of contact. As each ribbon and its supporting connections is herein shown to be identical in construction, a description of one will suffice for both.

Threaded into an aperture in the tube 4 in front of the lens 6 is a plug 8, preferably of hard rubber or of other material, properly insulated from the barrel of the telescope and having a longitudinally-adjustable threaded core 9, the inner end of which projects within the tube. This inner end is split to receive one end of the platinum ribbon or cross-hair, which is clamped therein by means of a set-screw 10, while the outer end projects above the plug on the exterior and is provided with a lock-nut 11 and a thumb-nut 12, forming a binding-post for one of the electrical connections. The opposite end of the ribbon is similarly secured, by means of a set-screw 13, in the split inner end of a longitudinally-movable pin or plunger 14, freely movable centrally of a plug 15, threaded in an aperture in the tube 4 diametrically opposite the plug 8. The plug 15 is seated from the interior and of such a length as to project a threaded portion exteriorly of the tube, upon which is screwed a collar 16. The outer end of the plunger 14 is expanded to the approximate internal diameter of the collar or otherwise provided with a shoulder or projection 17, forming an abutment for a light helical spring 18, the other end of which bears against the end of the plug, normally forcing the plunger outward, and thereby keeping the cross-hair at a tension, and hence absolutely straight, in which position it may be retained fixed by means of a set-screw 19. In this manner compensation is made for any slight expansion or stretching that may take place in the ribbon through the effects of heat or from other causes of disarrangement without danger of breakage, as the power of the spring is slight and uniform. The other cross-hair is supported in the same manner and at right angles thereto, as above described, the reduced portions being opposite, or, in other words, at the point of intersection. A single electrical contact A, arranged at any point upon the barrel of the telescope, suffices for supplying current to both of the non-insulated cross-hair supports, whereat the current divides, traversing each and producing the minute radiations of the desired intensity at the reduced portions, the wider portions offering less resistance, and hence remaining unaffected with the proper voltage. The current is thence led from the insulated plugs by means of wires B and C and to the return-wire D and back to the battery or other source of supply E.

The width of the cross-hairs used gives rise to another feature of our invention, as when adjusted to lie in planes common with the axes of the lens by proper tests they form a guide to the eye by means of which the line of vision is directed in the line of the optical axis. This position is reached when the edges of the cross-hairs appear of a minimum thickness, as any deviation in a perpendicular or lateral direction would make itself apparent by exposing the wide surfaces of the ribbons converging in non-parallelism to the direction of the light. For accomplishing the adjustments here spoken of the plunger 14 is fitted upon its exterior end with a thumb-nut 20, by means of which it is rotated to exert a torsional influence upon the ribbons.

It will be understood that many forms of cross-hairs may be used to accomplish the results described without departing from the spirit of our invention, or the charging of only one of the two intersecting hairs may be found sufficient for many purposes in any or all of the various uses to which our improvements are applicable, or, in like manner, several pairs or couples may be used when it is desired, for instance, to arrange a number of points for establishing a definite field of astronomical observation.

An instrument of the class described while equally efficient by day in respect to the ordinary devices is of the greatest service at night or under the usually adverse circumstances mentioned, furnishing a point of exceeding minuteness and of adjustable intensity without in any way interfering with the clearness of the vision.

We claim as our invention—

1. In a device for establishing a luminous point of reference in an optical field, the combination with an optical instrument, of a cross-hair arranged to appear in the field thereof embodying an electrical conducting filament provided at a point intermediate its ends with a section offering greater resistance to the passage of a current than the adjoining portions and an electrical circuit including said filament.

2. In a device for establishing a luminous point of reference in an optical field, the combination with an optical instrument, of a cross-hair arranged to appear in the field thereof embodying an electrical conducting-filament reduced in the area of its cross-section at a point intermediate its ends and an electrical circuit including said filament.

3. The combination with an optical instrument, of cross-hairs arranged therein composed of electrical conducting material and adapted to be rendered luminous at their point of intersection alone, by the passage of an electric current through them.

4. In a device for establishing a point of reference in an optical field, the combination with an optical instrument, of a cross-hair arranged to appear in the field thereof embody-

ing a flat ribbon of suitable conducting material reduced in the area of its cross-section at a point intermediate its ends and an electrical circuit including said filament.

5. In an optical instrument, the combination with a cross-hair adapted to be rendered incandescent by means of an electric current, of means for imposing a yielding tensile strain on said cross-hair.

6. The combination with an optical instrument, of cross-hairs arranged therein composed of ribbons of conducting material reduced in width at their point of intersection to enable the said intersecting-points alone to be raised to incandescence by the passage of suitable electrical currents.

7. In an appliance for establishing a point of reference in an optical field, the combination with a support and a cross-hair connected thereto at one end, of a plug in the support, a plunger operating therein and connected to the opposite end of the cross-hair, a shoulder on the plunger and a spring arranged on the support and engaging the shoulder on the plunger to hold the cross-hair under tension.

8. In an electrically-illuminated cross-hair for optical instruments, the combination with a tubular support of electrical conducting material inclosing a filament in contact therewith at one end, of an insulated plug arranged in said support having a metallic core connected to the filament at one end and projecting beyond the plug at the other to form a binding-post.

9. A cross-hair for telescopes comprising a flat strip of material arranged transversely of the tube with its greatest transverse dimension extending in the direction of the optical axes of the lenses.

10. The combination with an optical instrument embodying a lens, of two cross-hairs composed of ribbons of suitable material arranged transversely at right angles to the optical axis and to each other with their greatest transverse dimension extending in the direction of said axis, whereby the observing organ may be alined with reference to the latter.

11. The combination with an optical instrument embodying a lens, of two cross-hairs composed of ribbons of suitable material arranged transversely at right angles to the optical axis and to each other with their greatest transverse dimension extending in the direction of said axis, and means for effecting a torsional adjustment of the cross-hairs.

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