A. KÖNIG.

BINOCULAR TELESCOPE.

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920,756.

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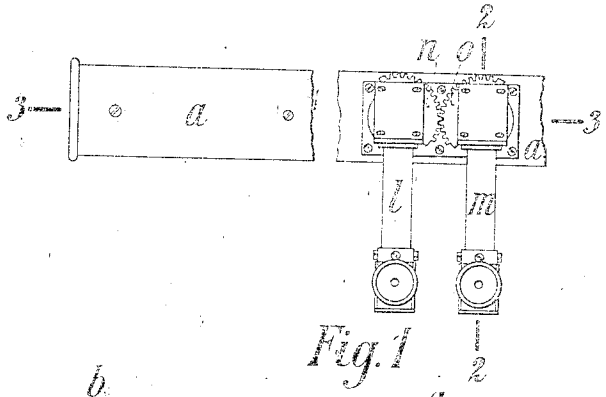


Fig. 1

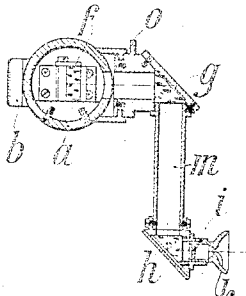


Fig. 2

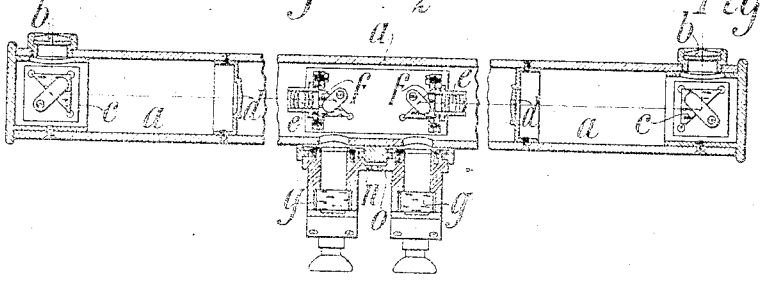


Fig. 3

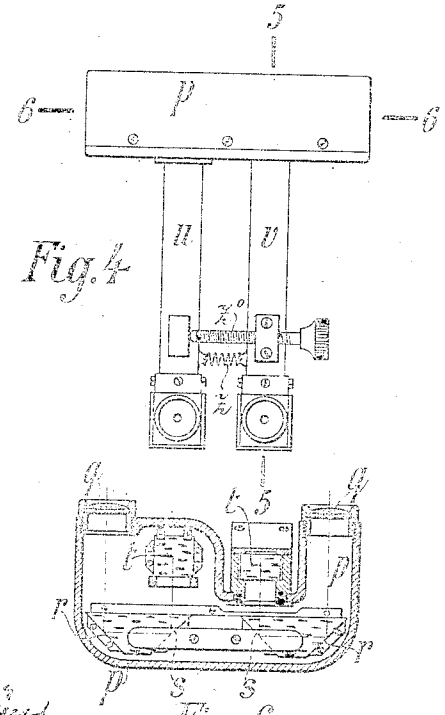


Fig. 4

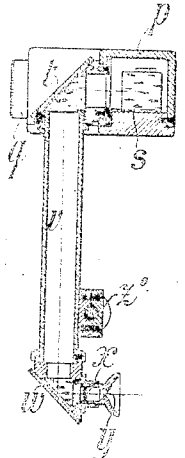


Fig. 5

Fig. 6

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UNITED STATES PATENT OFFICE.

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BINOCULAR TELESCOPE.

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To all whom it may concern:

Be it known that I, ALBERT KÖNIG, a citizen of the German Empire, and residing at Carl-Zeiss strasse, Jena, in the Grand Duchy of Saxe-Weimar, Germany, have invented a new and useful Binocular Telescope, of which the following is a specification.

The invention consists in an improvement in double telescopes, in which the adjustability of the distance between the oculars is attained by adapting each of the two ocular casings so as to be rotatable with a small eccentricity on a rigid main casing. By the present improvement an advantage is conferred upon these double telescopes without the necessity of having to multiply the elements of construction, which advantage was first realized by the hinged double telescopes: namely, binocular observation over some obstacle sheltering the observer. This end is attained with dropped ocular casings by increasing their eccentricity, until the level of the two exit axes lies at least 15 cm. below the bottom points of the entrance apertures. Since these casings are now relatively long, the adjustability of the distance between the oculars is not prejudiced, even if one of the dropped casings be rigidly connected with the main casing.

The well-known double telescopes above referred to are alike in that the axes of rotation of the ocular casings coincide with the objective axes or other sections of the optical axes. This is no necessary property of the new double telescope. If it be desired to invest it with this property and at the same time give the objectives a greater distance apart than the oculars, the simplest arrangements for each of the two optical axes are those in which two rectangular deflections in the horizontal plane are followed by two similar ones in the vertical plane. That section of the axis between the second and third deflections serves as axis of rotation for the ocular casing. If the first and second deflection have the like sign and the same holds for the third and fourth, the four reflecting prisms then form the more usual one of the two Porro prism systems, consequently special means for erecting the images are unnecessary. In average distance between the exit pupils, that is to say, in parallel directed ocular casings, two perfectly erected images are presented to the observer. If, however, the double telescope be adapted to a large or small distance between the eyes, there arises an inclination between the two images in their common plane, which is double as great as the angle, which the ocular casings form. Since on the one hand this angle—for a definite deviation of the distance between the exit pupils from the average one—is approximately inversely proportional to the length of the ocular casing, and on the other hand the images having a considerable rotation to one another are no longer capable of being conveniently combined into a stereoscopic image, the special arrangement explained is only available in relatively long ocular casings. It may further be remarked, that in the one or the other half of the Porro system or in both the simple reflecting prisms can be substituted by optical square prisms, without prejudicing the image-erecting effect.

In the annexed drawing: Figure 1 is a front view of a double telescope constructed according to the invention. Fig. 2 is a transverse vertical section through the same double telescope along the line 2—2 of Fig. 1. Fig. 3 is a horizontal section through the same double telescope along the line 3—3 of Fig. 1. Fig. 4 is a front view of another double telescope constructed according to the invention. Fig. 5 is a transverse vertical section through the same double telescope along the line 5—5 of Fig. 4. Fig. 6 is a horizontal section through the same double telescope along the line 6—6 of Fig. 4.

In the arrangement shown in Figs. 1 to 3, the main casing *a* contains on the side of each single telescope an objective *b*, a reflecting prism *c*, a collective lens *d* at the place where the image is projected by the objective, an inverting lens system *e* and a reflecting prism *f*. Each ocular casing contains the prisms *g* and *h* and the two lenses of a Ramsden ocular, viz., the field-lens *i* and the eye-lens *k*. The image field of the inverting lens system *e* lies in the surface of the prism *h* facing the field-lens *i*. Both ocular casings *l* and *m* are mounted for rotation on the main casing and, to insure an equally large but opposite rotation, coupled together by the toothed sectors *n* and *o*. In such rotation the erect position of the image does not alter, since neither the pair of prisms *c f* nor the pair *g h* turns the image, both displacing it only laterally. Should this double telescope be made use of to form

a stereoscopic telemeter, the physical components of the stereoscopic measuring marks are expediently adapted in the image fields of the objectives *b*, that is on the collective lenses *d*.

In the arrangement according to Figs. 4 to 6, the main casing *p* includes two objectives *q*, two double prisms *r s* and one of the prisms *t*. Of the ocular casings *u* and *v*, *u* is fixed to the main casing *p* and includes a prism *w* and the field-lens *x* as well as the eye-lens *y* of a Ramsden ocular. The ocular casing *v* is mounted for rotation on the main casing *p*. It contains the same optical parts as *u*, and moreover the other prism *t*. For adjusting the distance btween the oculars the two ocular casings are connected by a spring *z* and a set-screw z^0. The image fields of the objectives *q* lie in the hinder surfaces of the prisms *w*.

I claim:

1. In a binocular telescope the combination, with a rigid main casing having two apertures for the entrance of the rays, of two dropped ocular casings having each an exit aperture at the dropped end, one at least of the latter casings being rotatable on the main casing and both being extended vertically downward so that the bevel of their exit axes lies at least 15 cm. below the bottom points of the entrance apertures.

2. In a binocular telescope the combination, with a rigid main casing having two entrance apertures, of two dropped ocular casings having each an exit aperture at the dropped end, two objectives fixed in the main casing, two ocular lens systems and two erecting prism systems, the front portions of which are fixed in the main casing and each hinder portion of which is fixed in an ocular casing, the level of the axes of exit lying at least 15 cm. below the bottom points of the entrance apertures, each prism system deflecting the optical axis successively in two planes perpendicular to each other, in each by 180°, and one at least of the ocular casings being rotatable on the main casing about that section of the optical axis which is common to both planes of deflection.

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