No. 835,625. PATENTED NOV. 13, 1906.

A. KONIG.

TELESCOPIC SIGHT FOR ORDNANCE.

APPLICATION FILED MAR. 18, 1905.

2 SHEETS—SHEET 1.

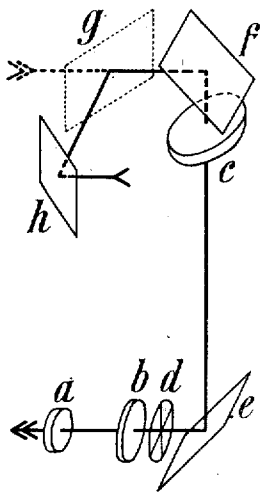

Fig. 1

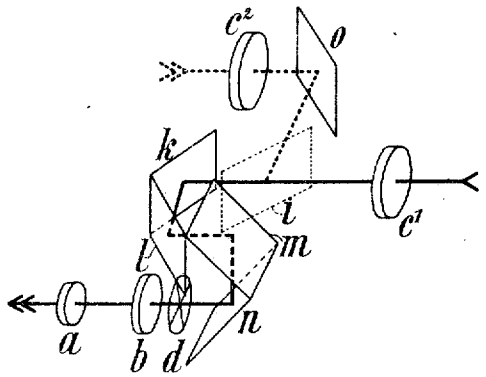

Fig. 2

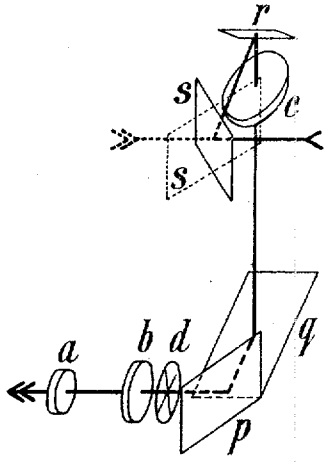

Fig. 3

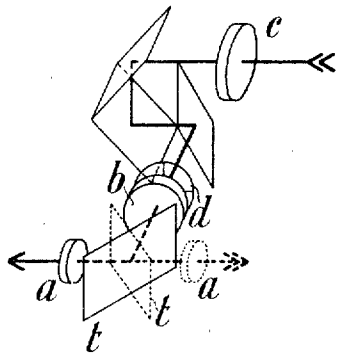

Fig. 4

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Inventor:

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2 SHEETS—SHEET 2

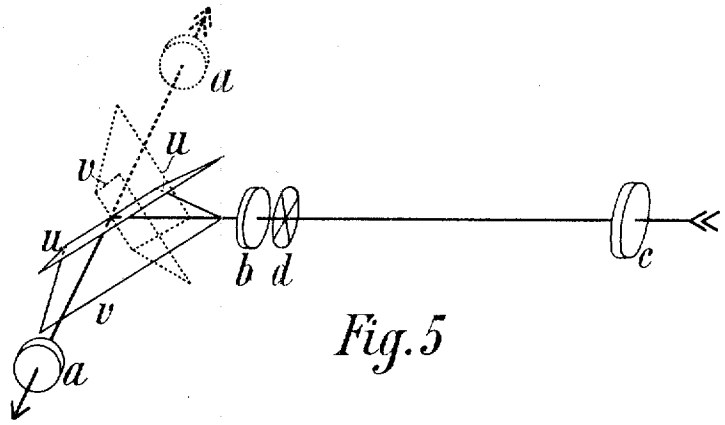


Fig. 5

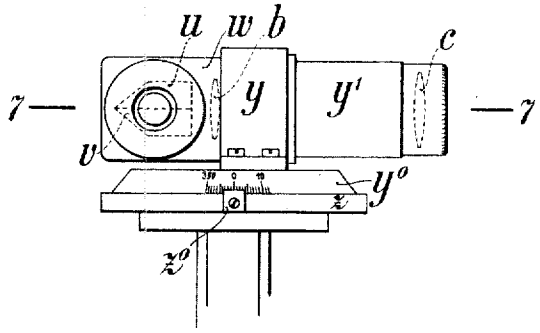
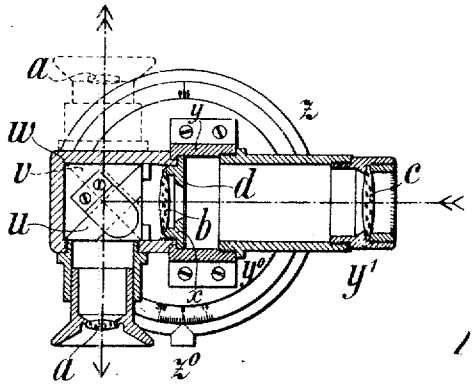


Fig. 6



Witnesses:
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Fig. 7

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UNITED STATES PATENT OFFICE.

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TELESCOPIC SIGHT FOR ORDNANCE.

No. 835,625. Specification of Letters Patent. Patented Nov. 13, 1906.

Application filed March 18, 1905. Serial No. 250,865.

To all whom it may concern:

Be it known that I, ALBERT KÖNIG, doctor of philosophy, a citizen of the German Empire, residing at Carl-Zeissstrasse, Jena, in the Grand Duchy of Saxe-Weimar, German Empire, have invented a new and useful Telescopic Sight for Ordnance, of which the following is a specification.

The invention relates to telescopic sights into which the layer looks in the horizontal or in an inclined direction as the axis of the emerging rays may be situated and which can be rotated horizontally for indirect laying. It is a disadvantage of telescopic sights of this description that the layer has to quit his place behind the sight if he wish to lay indirectly by aiming at any auxiliary object in the rear. In the telescopic sight constructed according to the invention the said drawback is obviated. The optical system of this telescopic sight enables the layer to aim at objects situated in opposite directions without altering the direction of his vision. Thus while looking forward in such a direction that the object proper can be sighted through the optical system the layer is also able to sight through this system an auxiliary object lying in the opposite direction. Hence it follows that equal horizontal rotations of the sight, by means of which the layer is enabled to sweep both quadrants of the horizon to the right and left of the object, are likewise sufficient to sweep the remaining two quadrants in rear of the gun. As the layer easily follows with his head the axis of the emerging rays when it travels only through a quadrant both to the right and to the left he will be able to aim at any auxiliary object lateral or in the rear without leaving his place.

The telescopic system which allows the layer to sight in two opposite directions without change in the direction of his vision is transformable in such a way that two sighting-telescopes are successively available which differ in that the direction of the axis of the emerging rays or the horizontal projection of this direction relatively to that of the axis of the entering rays is not the same in both, but differs by one hundred and eighty degrees. The angle formed by the axes of the rays emerging from the two telescopes or by the horizontal projections of these axes is preferably either zero or one hundred and eighty degrees. In the former case the angle between the axes of the rays entering the two telescopes is one hundred and eighty degrees, and it would be advisable to extend the scales for both telescopes over the same semicircle of the base. In the latter case the angle between the axes of entrance is zero, and it is possible to employ a single scale of three hundred and sixty degrees fastened to the rotary sight, the pointer being attached to the fixed base.

The transformability of the telescopic system may in the first instance consist in that a part of the optical components of the system is common to both telescopes. This cannot, however, be done without making one or several of the optical components movable, unless the maximum brightness of the telescopic image is waived and one of the well-known optical combinations (transparent mirrors, &c.) for dividing into halves each pencil of rays is employed. The movability may be restricted to a reflecting-prism, which being a non-common component, adjoins a common component and can be interposed into and withdrawn from its operative position. If, on the other hand, the reflecting-prism be a common component and adjoins two non-common components, one of one telescope and the other of the other telescope, it is reversibly fitted so as to be put at will into coöperation with either one or the other of these two components, and thereby inserted into the composition of either one or the other of the two telescopes. A lens system common to both telescopes may also be made reversible.

It is feasible to use all optical components of the system for both telescopes. One telescope is then transformed into the other by reversing one of the components or a group of them, in a special case even their totality—*i. e.*, the entire telescopic system. As to the location of the movable components, it is advantageous to arrange them behind the reticule, so that the position of the image produced by the objective in relation to the reticule is not affected if those components should not be exactly adjusted after undergoing interposition or reversal. The direc-

tion finally of the axis of the entering rays as compared with that of the axis of the emerging rays or with its horizontal projection is quite optional for one of the telescopes. It is only necessary that the layer is able to sight the object in the middle position of his vision and that he is not placed in front of the sight with his back toward the object. By adopting the usual place of the layer behind the sight the middle position of his vision is determined. This position itself or its horizontal projection coincides with the direction to the object. One of the telescopes is thus the same as that commonly applied to rotary gun-sights, the axis of its emerging rays or the horizontal projection of this axis having the same direction as the axis of the entering rays. As set forth above, in the second telescope the direction of the axis of the entering rays and that of the axis of the emerging rays or its horizontal projection must then differ by one hundred and eighty degrees—*i. e.*, they must be contrary. It will be understood that in this retrospective telescope the axis of the entering rays and that of the emerging rays or of its horizontal projection must be parallel, with a sufficient interval between them to allow of the axis of the entering rays passing clear of the head of the layer, either above or at the side of it.

If the advantage conferred by the place of the layer being, as usual, behind the sight—viz., that the middle position of his vision in sighting or its horizontal projection is also the direction in which the layer can see the object with the naked eye—be waived and the layer placed at the side of the gun-sight, some compensatory advantages can be gained. For this purpose the middle position of vision, which enables the layer to sight the object through one of the telescopes, must form a right angle to the direction in which the object is situated—that is to say, the first telescope becomes right-angled. The second telescope must also be a rectangular one, (and can be identical to the first,) because the angle between the axis of the emerging rays and the axis of the entering rays being ninety degrees in one instance must be two hundred and seventy degrees in the other. Moreover, the telescopic system becomes simple in optical composition, because it is unnecessary in either case to avoid the head of the layer. It is here that the special case already mentioned can be realized in which a single telescope is reversibly fitted so as to serve in one position as one and in the other position as the other telescope of the system.

In the construction of the new telescopic system for rotatable gun-sights it will generally be desirable not to miss the well-known advantages of the prismatic systems for reërecting the image as compared with the lens systems. The reflecting-prisms composing the reërecting systems will at the same time, as far as possible, be utilized, so as to supply also the deflections of the axis of the rays, which are required by the chosen middle position of vision in relation to the direction of the object, as illustrated by the constructional examples of the invention shown in the annexed drawings.

In these drawings, Figures 1 to 5 are diagrams of five telescopic systems for gun-sights constructed according to the invention. Instead of the prisms only their reflecting-surfaces are shown for the sake of clearness. Fig. 6 is an elevation of a telescopic gun-sight constructed in accordance with the optical diagram shown in Fig. 5. Fig. 7 is a section on line 7 7 in Fig. 6.

In the telescopic system shown in Fig. 1 a fixed ocular consisting of an eye-lens *a* and the field-lens *b* is used for sighting in opposite directions, the angle formed by the axes of the rays emerging from the two telescopes being zero. Between the objective *c* and the reticule *d* a reflecting-prism *e* is placed. This prism, together with another *f*, placed before the objective *c*, renders the telescope retrospective, the entering rays passing above the head of the layer. There are still two supplemental reflecting-prisms—a withdrawable one, *g*, and a fixed one, *h*. When the prism *g* is interposed, the vision becomes parallel.

Fig. 2 represents a telescopic system in which the axis of the rays which enter the retrospective telescope passes by the side of the head of the layer. In both telescopes the axis of the emerging rays has the same direction, and a single ocular is employed for both telescopes. If the reflecting-prism *i*, which pertains to the retrospective telescope, be withdrawn, the objective *c'* is operative, which in combination with the common optical parts—the prism system *k l m n* well-known from the prismatic field-glasses and the ocular *a b*—forms a parallel-vision telescope. By interposing the prism *i* the objective *c'* becomes inoperative, while the prism *o* and the objective c^2 of the retrospective telescope are combined with the common optical parts.

In the arrangement of the telescopic system shown in Fig. 3 the axis of the rays entering the retrospective telescope lies above the head of the layer, the same as shown in Fig. 1. The angle between the two axes of the emerging rays is again zero, one ocular serving for both telescopes. All optical parts are common to both telescopes, the fixed prisms *p*, *q*, and *r* coöperating with a reversible one, *s*, so that a change from one telescope to the other is effected not by interposition and withdrawal, but by reversal. If the entrance reflecting-prism *s* be in the posi-

tion indicated by unbroken lines, the parallel-vision telescope is available; but if this prism occupy the position shown in dotted lines the retrospective telescope is operative.

The telescopic system, according to Fig. 4, also belongs to the class in which all optical parts remain active when the direction of sight is reversed. The angle between the axes of the rays emerging from one telescope and the other is designed to be one hundred and eighty degrees. For this purpose an angular ocular is provided, the eye-lens *a* and the prism *t* of which are reversed in the manner indicated by dotted lines, when the parallel-vision telescope (shown in full lines) is to be converted into a retrospective one. The axis of the rays entering the retrospective telescope again passes by the side of the head of the layer. It should be observed that only such parts are movable which are situated behind the reticule.

Fig. 5, finally, exemplifies the case already mentioned, in which the layer is placed at the side. The example shown realizes that of the two practically important variations in which the direction of the axis of the emerging rays in one telescope differs from that in the other by one hundred and eighty degrees. An Amici prism comprising a pair of optical square surfaces *u v* is fitted at an inclination of forty-five degrees between the eye-lens *a* and the field-lens *b* of the ocular, so as to produce, in addition to the reërection of the image, an inclination of ninety degrees of the axis of the emerging rays to that of the entering rays. By rotating the entire telescopic system, or at least the optical square surfaces *u v* and the eye-lens *a*, about the axis of the entering rays into the position shown in dotted lines the axis of the emerging rays is reversed into the opposite direction.

The optical arrangement of Fig. 5 is employed in the gun-sight shown in Figs. 6 and 7. The second position of the reversible part of the telescopic system, consisting of the eye-lens *a* and the prism *u v*, is again indicated by dotted lines in Fig. 6. To allow the rotation of this part from one position into the other about the axis of the objective *c*, the prism-casing *w* is screwed together with the mount *x* of the field-lens *b* in such a way that the totality of both parts is rotatably secured in the eye of the standard *y*, which, together with the disk *y''*, constitutes the carrier of the telescopic system. The objective-tube *y'* is not fixed to the prism-casing *w*, but to the standard *y*, so that in the construction shown by the reversal of the reversible part of the telescopic system the non-reversible part is only influenced in that the field-lens *b* undergoes a rotation about its axis, such rotation of a lens about its axis having, of course, no effect at all. The carrier-disk *y''* is provided with a complete scale of three hundred and sixty degrees, the pointer *z''* being fixed to the base *z*, on which the carrier is rotatably mounted.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In a telescopic gun-sight for ordnance a carrier, a telescopic system mounted on it, the position of parts of the system relatively to the carrier being alterable in such a way as to present to the layer two successively-available telescopes, in one of which the angle between the horizontal axis of the entering rays and the horizontal projection of the axis of the emerging rays differs by one hundred and eighty degrees from the corresponding angle in the other telescope, a base on which the carrier is mounted so as to be rotatable in a horizontal plane, and means for indicating the angular position of the axis of the entering rays relatively to the base.

2. In a telescopic gun-sight for ordnance a telescopic system including movable parts for successively combining from out of the said system two telescopes, in one of which the angle between the horizontal axis of the entering rays and the horizontal projection of the axis of the emerging rays differs by one hundred and eighty degrees from the corresponding angle in the other telescope, a carrier of the telescopic system, a base on which the carrier is mounted so as to be rotatable in a horizontal plane, and means for indicating the angular position of the axis of the entering rays relatively to the base.

3. In a telescopic gun-sight for ordnance a telescope, a part of which is rotatable for transforming the telescope into another, in which the angle between the horizontal axis of the entering rays and the horizontal projection of the axis of the emerging rays differs by one hundred and eighty degrees from the corresponding angle in the first telescope, a carrier of the telescope, a base on which the carrier is mounted so as to be rotatable in a horizontal plane, and means for indicating the angular position of the axis of the entering rays relatively to the base.

4. In a telescopic gun-sight for ordnance a telescope including behind the reticule rotatable parts for transforming it into another telescope, in which the angle between the horizontal axis of the entering rays and the horizontal projection of the axis of the emerging rays differs by one hundred and eighty degrees from the corresponding angle in the first telescope, a carrier of the telescope, a base on which the carrier is mounted so as to be rotatable in a horizontal plane, and means for indicating the angular position of the axis of the entering rays relatively to the base.

5. In a telescopic gun-sight for ordnance a telescope in which the horizontal angle between the axis of the entering rays and the axis of the emerging rays is ninety degrees and which includes behind the reticule rotatable parts for transforming it into another

telescope, in which the said angle is two hundred and seventy degrees, a carrier of the telescope, a base on which the carrier is mounted so as to be rotatable in a horizontal plane, and means for indicating the angular position of the axis of the entering rays relatively to the base.

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

ALBERT KÖNIG.

Witnesses:
PAUL KRÜGER,
FRITZ SANDER.