

No. 735,497.

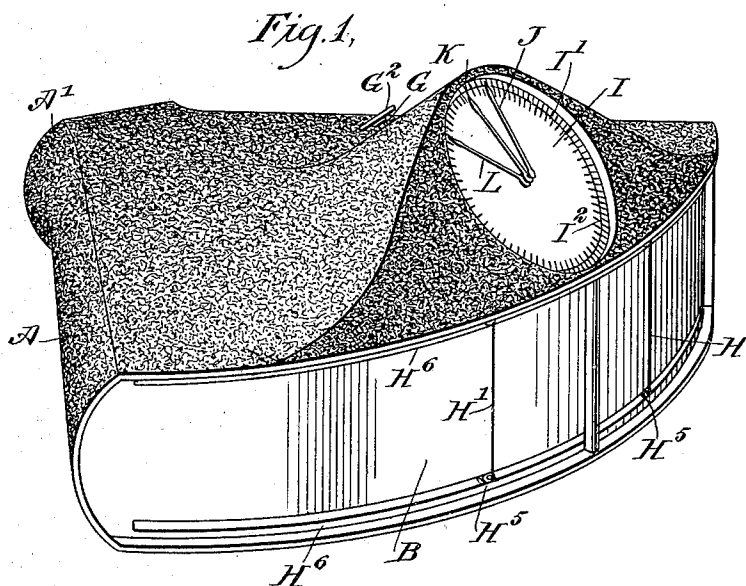
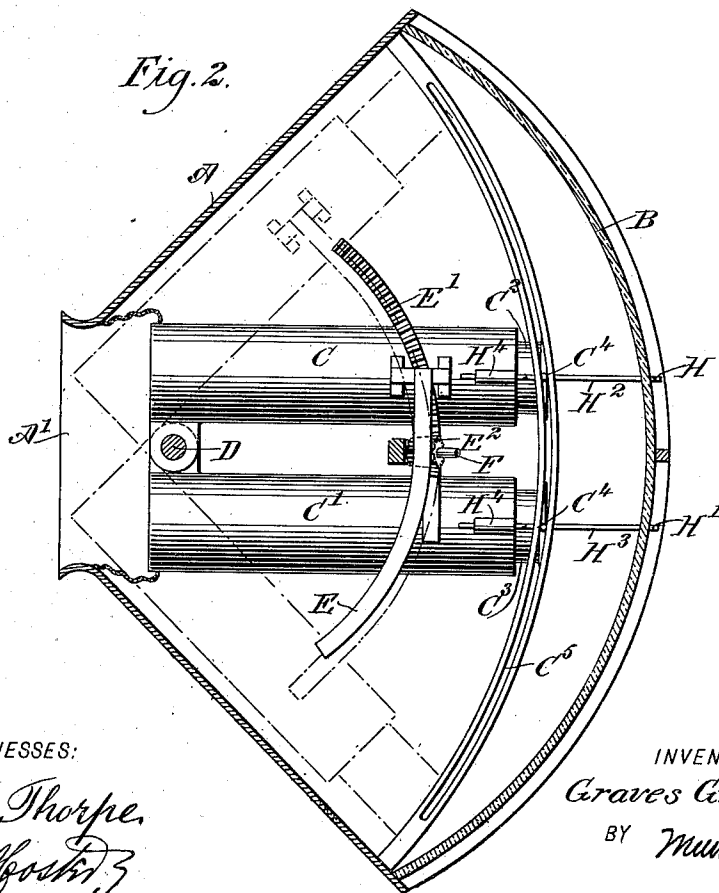
PATENTED AUG. 4, 1903.

G. GRIFFITH.
RANGE FINDER.

APPLICATION FILED MAR. 18, 1903.

NO MODEL.

2 SHEETS—SHEET 1.



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No. 785,497.

PATENTED AUG. 4, 1903.

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RANGE FINDER.

APPLICATION FILED MAR. 16, 1903.

NO MODEL.

2 SHEETS—SHEET 2.

Fig. 3.

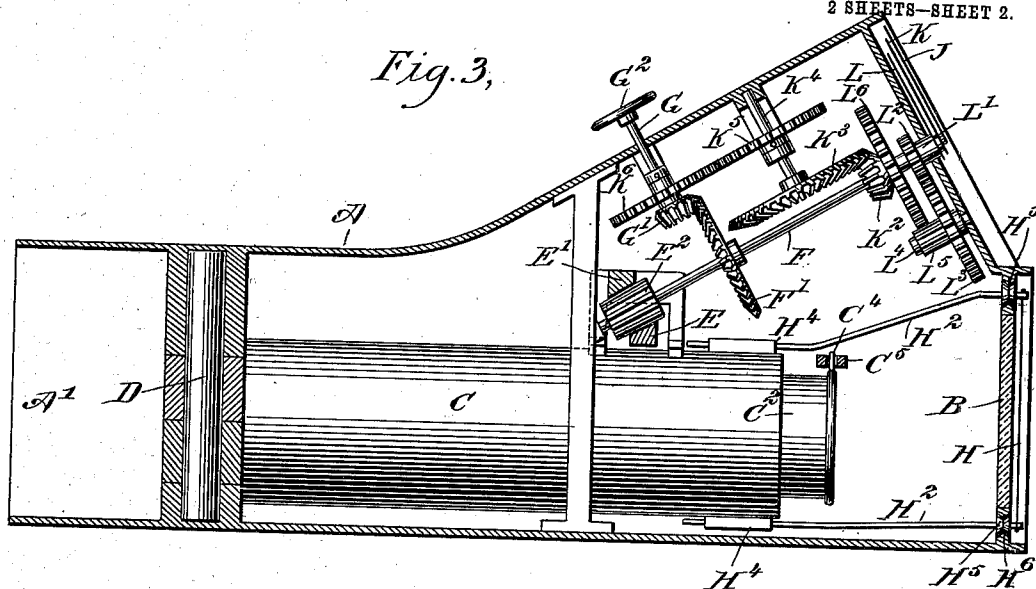
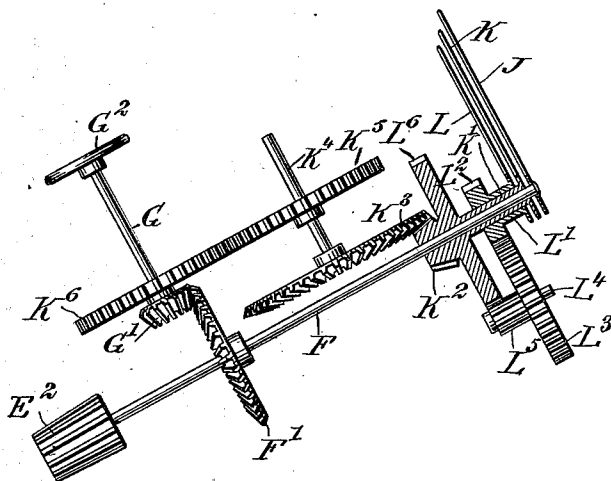


Fig. 4.



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UNITED STATES PATENT OFFICE.

GRAVES GRIFFITH, OF SAN FRANCISCO, CALIFORNIA.

RANGE-FINDER.

SPECIFICATION forming part of Letters Patent No. 735,497, dated August 4, 1903.

Application filed March 16, 1903. Serial No. 147,965. (No model.)

To all whom it may concern:

Be it known that I, GRAVES GRIFFITH, a citizen of the United States, and a resident of San Francisco, in the county of San Francisco and State of California, have invented a new and Improved Range-Finder, of which the following is a full, clear, and exact description.

The object of the invention is to provide a new and improved range-finder for the use of surveyors, marine officers, and other persons and arranged to indicate the distance of an object from the observer located on land or sea without requiring calculations.

The invention consists of novel features and parts and combinations of the same, as will be more fully described hereinafter and then pointed out in the claims.

A practical embodiment of the invention is represented in the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the views.

Figure 1 is a perspective view of the improvement. Fig. 2 is a sectional plan view of the same. Fig. 3 is an enlarged sectional side elevation of the same, and Fig. 4 is an enlarged sectional side elevation of the gearing for operating the pointers indicating the distance.

The range-finder is mounted in a suitably-constructed casing A, which may be mounted on a tripod or other support or may be held directly in the hands of the observer, and the front end of the said casing is provided with a mouth A', and the rear end of the casing is closed by a segmental ground glass B, as plainly shown in the drawings. On the ground glass B are thrown two images of a distant object by means of a pair of teleobjectives C C', arranged within the casing A and fulcrumed at their objective ends on a common pivot D, disposed vertically in the casing A. The teleobjectives C C' are swung in unison toward and from each other, according to the distance the object is from the apparatus, and in order to enable the operator to swing the teleobjectives C C' in proper position for both to throw images of the object onto the ground glass B the following device is provided: On the teleobjectives C C' are secured segmental racks E E' in mesh with opposite sides of a pinion E², secured on a shaft F, journaled in

suitable bearings in the rear upper portion of the casing A. On the shaft F is fastened a bevel gear-wheel F' in mesh with a pinion G', attached to the lower end of a shaft G, likewise journaled in suitable bearings in the casing A and extending through the top thereof to carry at its outer end a hand-wheel G², adapted to be taken hold of by the operator to turn the hand-wheel and shaft G, so as to rotate the shaft F and pinion E² to impart a traveling motion to the racks E and E' to swing the teleobjectives C and C' toward or from each other, according to the direction in which the hand-wheel G² is turned. Now by reference to Fig. 2 it will be seen that the teleobjectives C C' may be moved from a parallel position, as indicated in full lines in the said figure, to a right-angular position, as indicated in dotted lines in the said figure, to allow of bringing a distant object into the range of the apparatus no matter what distance the object is from the mouth A' of the apparatus. Now in order to enable the operator to bring the images reflected by the teleobjectives on the ground glass B equal distances from the middle thereof suitable cross-wires H and H' are provided, extending vertically on the outside of the ground glass and supported on rods H² and H³, slidable in bearings H⁴, arranged lengthwise on the teleobjectives C C', as plainly indicated in the drawings. The cross-wire rods H² H³ are provided with grooved friction-rollers H⁵, mounted to travel in suitable guideways formed in the rear end of the casing A, as plainly indicated in Fig. 1, and the rods H² and H³ are so arranged that the wires H and H' are in alignment with vertical planes extending through the axes of the teleobjectives C C'.

In order to move the teleobjectives C and C' into proper focusing position relative to the segmental ground glass B, the following device is provided: The teleobjectives C and C' have their slidable rear focusing portions C² and C³ provided with pins C⁴, projecting into a segmental guideway C⁵, fixed in the casing A and constructed to move the parts C² and C³ in and out in the hinged parts of the teleobjectives C C' whenever the latter are swung apart or toward each other on the operator turning the hand-wheel G². The segmental guideway C⁵ is so arranged rela-

tive to the ground glass B and the lenses of the teleobjectives C C' that no matter in what position the teleobjectives C C' are at the time they properly reflect the object on the ground glass B.

In order to automatically indicate the distance the object is from the apparatus, the following device is provided: On the rear upper portion of the casing A is arranged a dial I, containing annular graduations I¹ and I², of which the graduation I¹ indicates ninety degrees and the graduation I² indicates minutes and seconds, and on the graduation I¹ a pointer J indicates, and pointers K and L indicate on the graduation I². The pointer J is secured on the outer end of the shaft F, previously mentioned, and turned by the operator turning the hand-wheel G², it being understood that when the teleobjectives C C' are in the parallel position shown in Fig. 2 then the pointer J indicates zero degrees and when the hand-wheel G² is turned and the teleobjectives assume the right-angular position indicated in dotted lines in the said Fig. 2 then the pointer J makes one complete revolution on the graduation I¹. The pointer K, which indicates the minutes on the graduation I², is secured on a sleeve K', mounted to turn loosely on the shaft F, and on the said sleeve is secured or formed a bevel-pinion K² in mesh with a bevel gear-wheel K³, secured on a shaft K⁴, journaled in suitable bearings arranged in the casing A. On the shaft K⁴ is fastened a spur-wheel K⁵ in mesh with a spur-wheel K⁶ on the shaft G, so that when the latter is rotated rotary motion is transmitted by the gear-wheels K⁶ K⁵ to the shaft K⁴, which by the bevel gear-wheel K³, pinion K², and sleeve K' turns the pointer K to indicate minutes on the graduation I². The pointer L, which indicates seconds on the graduation I², is secured on a sleeve L', mounted to rotate loosely on the sleeve K', and on the said sleeve L' is secured a pinion L² in mesh with a spur-wheel L³, mounted to turn on a stud L⁴, attached to the casing K. On the spur-wheel L³ is secured or formed a pinion L⁵ in mesh with a gear-wheel L⁶, secured on the sleeve K', so that when the latter is rotated, as previously explained, a rotary motion is transmitted by the gear-wheel L⁶, pinion L⁵, gear-wheel L³, pinion L², and sleeve L' to the pointer L to indicate seconds on the graduation I². Now it is understood that the gearing described and shown in detail in Figs. 3 and 4 is so proportioned that when the pointer J advances one degree the pointer K makes one complete revolution, and when the pointer K advances one minute the pointer L makes a complete revolution.

The operation is as follows: The casing A is adjusted on the tripod or in the hand of the observer so that the mouth A' is toward the object, and then the observer turns the hand-wheel G², so as to bring the teleobjectives C and C' from their parallel positions (shown in Fig. 2) into an angular position rela-

tive to each other until the images of the object appear well defined on the ground glass B and centrally relative to the cross-wires H and H'. In order to enable the operator, to obtain a clear view of the reflected images, it is desirable for the operator to make use of a covering-hood the same as is used in photographing. Now when the operator turns the hand-wheel G² the pointers J, K, and L are caused to move, as previously explained, and when the images are well reflected on the ground glass, as described, then the operator reads the degrees, minutes, and seconds indicated by the pointers J, K, and L on the graduations I¹ and I² of the dial I. The reading thus obtained is readily translated by the use of tables indicating distances in miles and subdivisions or other suitable linear measure. It is understood that as the object approaches the instrument the angular intersection of the teleobjectives increases until the angle measures ninety degrees, and the object is then immediately in front of the mouth A'. As the object recedes, the angle of the teleobjectives decreases, and when the object moves out of range of the instrument the teleobjectives stand approximately parallel to each other, and the distance the observer is from the object is then infinite.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. A range-finder comprising teleobjectives mounted to swing, and means, substantially as described, for simultaneously imparting a uniform swinging motion to each of the teleobjectives to swing them toward or from each other, as set forth.

2. A range-finder comprising similar teleobjectives, having their object ends mounted to swing, means for imparting a simultaneous uniform swinging motion to the said teleobjectives, and means for automatically bringing the teleobjectives into proper focus during their swinging motion, as set forth.

3. A range-finder comprising a casing having a ground glass, and teleobjectives mounted to swing in the casing and arranged to throw images of the object onto the ground glass, as set forth.

4. A range-finder comprising a casing having a segmental ground glass, teleobjectives mounted to swing in the casing and arranged to throw spaced images of a distant object onto the ground glass, and cross-wires moving with the teleobjectives over the ground glass, as set forth.

5. A range-finder comprising a casing, a pair of teleobjectives mounted to swing in the casing from a common center, manually-controlled means for imparting a simultaneous uniform swinging motion to the teleobjectives toward or from each other, and image-receiving mediums in the casing, for receiving spaced images from the said teleobjectives, as set forth.

6. A range-finder comprising a casing, a

pair of teleobjectives mounted to swing in the casing from a common center, manually-controlled means for imparting a simultaneous uniform swinging motion to the teleobjectives toward or from each other, image-receiving mediums in the casing, for receiving spaced images from the said teleobjectives, and means for indicating the distance of an object from the casing, as set forth.

7. A range-finder comprising a casing having a ground glass, a pair of teleobjectives mounted to swing in the casing simultaneously and uniformly toward and from each other and arranged to throw spaced images on the said ground glass, and an automatic focusing device for the said teleobjectives, to focus the latter relative to the distant object and the ground glass, as set forth.

8. A range-finder comprising a casing having a ground glass, a pair of teleobjectives mounted to swing in the casing from a common center, and adapted to throw images onto the said ground glass, segmental racks secured on the said teleobjectives, and a manually-controlled pinion, in mesh with the said racks, as set forth.

9. A range-finder comprising a casing having a segmental ground glass, a pair of teleobjectives mounted to swing in the casing from a common center and arranged to throw images on the said ground glass, means for imparting a swinging motion to the said teleobjectives, and segmental guideways fixed in the casing and engaged by movable parts of the teleobjectives, to automatically focus the same, as set forth.

10. A range-finder comprising a casing having a segmental ground glass, a pair of teleobjectives mounted to swing in the casing from a common center and arranged to throw images on the said ground glass, means for imparting a swinging motion to the said teleobjectives, segmental guideways fixed in the casing and engaged by movable parts of the teleobjectives, to automatically focus the same, and cross-wires carried centrally by the said teleobjectives and extending over the ground glass, as set forth.

11. A range-finder comprising a casing having a ground glass, teleobjectives mounted to swing in the casing and arranged to throw images of the object onto the ground glass,

manually-controlled means for imparting a swinging motion to the said teleobjectives, an indicator having trains of gear-wheels, actuated from the said means, and pointers actuated from the trains of gear-wheels and indicating on a dial, as set forth.

12. A range-finder comprising a casing having a ground glass, teleobjectives mounted to swing in the casing and arranged to throw images of an object onto the ground glass, manually-controlled means for imparting a swinging motion to the said teleobjectives, an indicator having trains of gear-wheels, actuated from the said means, and pointers actuated from the trains of gear-wheels and indicating on a dial having graduations indicating degrees and subdivisions, as set forth.

13. In a range-finder, the combination with swinging teleobjectives, a shaft, means for operating the teleobjectives from said shaft, and means for operating the shaft, of a dial, a pointer on the end of the said shaft, a sleeve on the shaft, a pointer carried by the sleeve, a second sleeve on the first sleeve, a pointer on the second sleeve, and means for operating the sleeves from the shaft-operating means, as set forth.

14. In a range-finder, the combination with swinging teleobjectives, racks carried by the teleobjectives, a shaft provided with a pinion engaging the racks, a hand-operated shaft, and gearing for operating the shaft from the hand-operated shaft, of a dial, a pointer on the end of the shaft, a sleeve on the shaft, gearing between the sleeve and the hand-operated shaft, a pointer on the sleeve, a second sleeve on the first sleeve, gearing between the sleeves, and a pointer on the said second sleeve, as set forth.

15. In a range-finder, the combination with swinging teleobjectives, of a segmental guideway engaged by the movable parts of the teleobjectives to move the said parts in and out when the teleobjectives are swung apart or toward each other, as set forth.

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

GRAVES GRIFFITH.

Witnesses:

GEO. T. KNOX,
ABRAHAM WOLF.