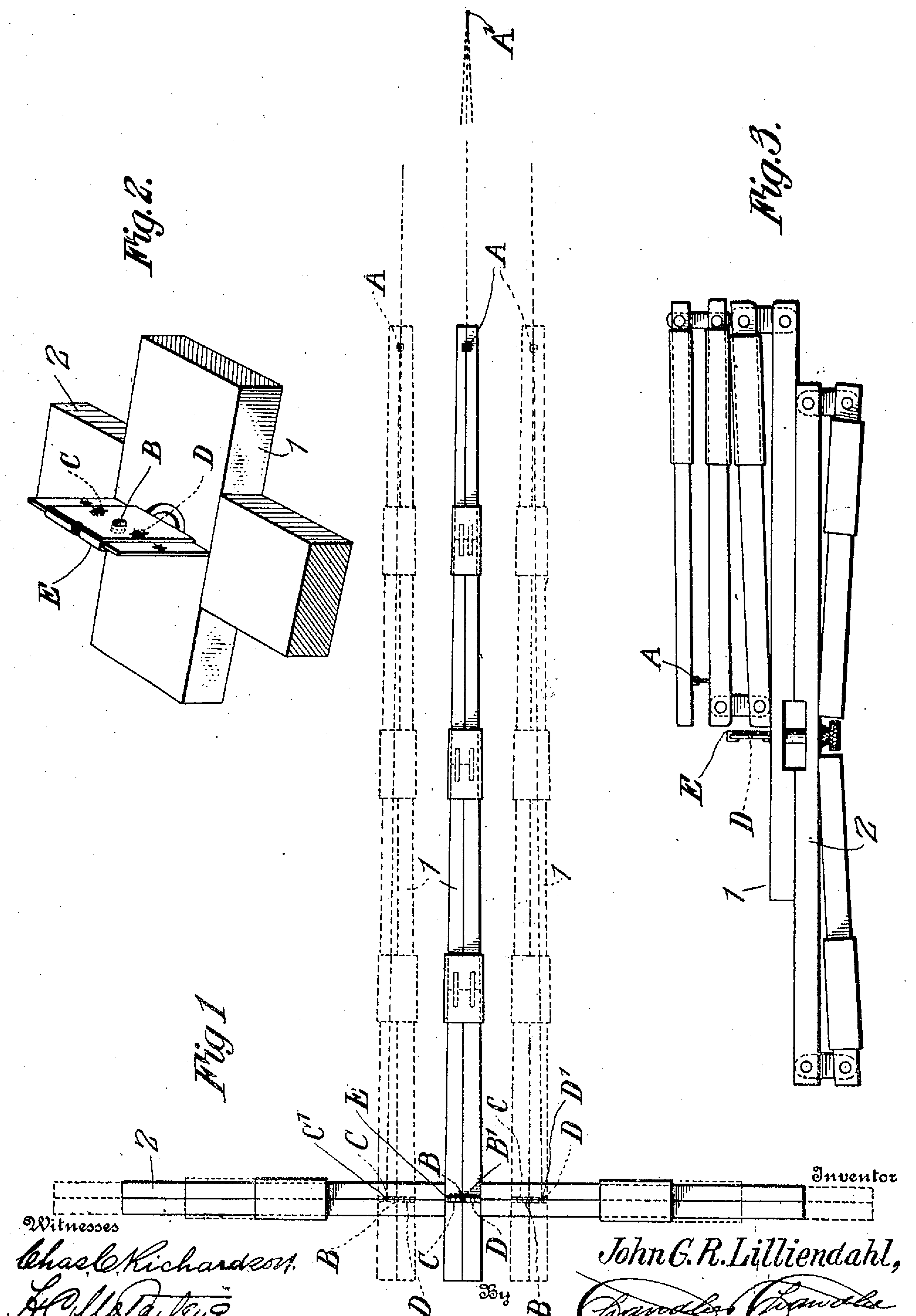
J. G. R. LILLIENDAHL.

DISTANCE FINDER.

APPLICATION FILED JULY 23, 1908.

913,526. Patented Feb. 23, 1909.



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DISTANCE-FINDER.

No. 913,526. Specification of Letters Patent. Patented Feb. 23, 1909.

Application filed July 23, 1908. Serial No. 444,989.

To all whom it may concern:

Be it known that I, JOHN G. R. LILLIENDAHL, a citizen of the United States, residing at New York, in the county of New York, State of New York, have invented certain new and useful Improvements in Distance-Finders; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

The present invention relates to improvements in distance-finders, and it has for its principal object the production of an instrument of that type which shall not only be capable of being readily and quickly operated and of giving accurate results, but which also, by reason of its extreme simplicity of construction, may be manufactured at an exceedingly low cost, which latter object is accomplished by the reduction of the number of parts of which the instrument is composed to a minimum, and by the avoidance of the employment of such expensive devices as telescopes, graduated scales and dials, and the like.

A further object is to provide a distance-finder in which the two main members or limbs are each composed of a plurality of hinged sections, which are designed to be folded one upon another, so as to permit the instrument to be carried in the pocket when not in use.

With the above and other ends in view, the instrument, briefly described, comprises in its entirety, a pair of sectional limbs arranged normally, or when the instrument is in use, at right angles to each other, one of said arms being provided at its opposite ends with front and rear sights, and with a pair of additional sights located at opposite sides of the last-mentioned sight, one or the other of the additional sights being employed, according toward which end of the imaginary base-line (which latter is determined by the other arm of the instrument), the instrument is moved by the surveyor.

The preferred embodiment of the invention is illustrated in the accompanying drawings, in which corresponding parts, or features, as the case may be, are designated by the same reference numerals throughout the several views.

Of the said drawings, Figure 1 is a plan view of the instrument, illustrating the positions thereof for taking the first and second observations, the second position being indicated in dotted lines. Fig. 2 is an enlarged detail view of the rear and additional sights. Fig. 3 is a side elevation of the instrument in its folded position.

Before entering upon the detailed description of the instrument, it may be stated that its operation is based upon that law of triangulation which relates to similar triangles, and the direct proportion of the corresponding sides thereof, the first triangle being formed by the instrument itself, and the second triangle by the first and second lines of sight and the line which connects the rear ends of the sight lines.

Referring more particularly to the drawings, the instrument is shown as comprising a pair of members or legs 1 and 2 arranged at right angles to each other, the smaller leg 2, which determines the position of the base of the second or imaginary triangle, being bisected by the longer leg 1, the length of said leg 2 being exactly 18 inches. The leg 1 is provided with front and rear sights A and B, respectively, and with a pair of additional sights C and D located upon opposite sides of the rear sight, the line formed by the three sights B, C and D, which are preferably constructed of a single piece of metal, being disposed at right angles to the longitudinal edges of the leg 1. The distance between the sights A and B is exactly 22 inches, and that between each of the sights C and D and the sight B is exactly 22 inches. It will be apparent, therefore, that the sights C A B and D A B form, respectively, two triangles, the angles C A B and D A B each being by accurate measurement 34′, 22.5″, the cotangent of which angle is 100. The length of the sides B A of either triangle thus equals this cotangent multiplied by the length of the base C B, (or D B, as the case may be), or, in other words, the altitudes of the two triangles are exactly 100 times as great as the bases thereof. This proportion is made use of in computing the distance of the object to be sighted. The metal strip in which the sights B, C and D are formed, is provided with a slide E which is designed to cover one or the other of the sights C, D, so as to prevent the second observation hereinafter described, from being taken through the wrong sight.

In the operation of the instrument, the distant object A′ is first sighted through the sights B A. The instrument is moved along

the imaginary line formed by the prolongation of the leg 2 in the corresponding direction, until the object is sighted through the sights C A, or D A, as the case may be. This point is indicated by the reference character C′ in one instance, and D′ in the other instance, according as the surveyor moves to the left or to the right of the point of the first observation, which point is designated by the character B′, it being understood that throughout the movement of the instrument, the leg 2 travels along the imaginary line formed by the prolongation above referred to. There will thus be formed an imaginary triangle C′ A′ B′, (or D′ A′ B′) the length of whose side A′ B′ is equal to the cotangent of the angle A′ multiplied by the distance between the points C′ and B′, (or D′ and B′). But since the length of the sides of these two imaginary triangles is proportional to that of the sides of the first-mentioned triangles C A B and D A B, the length of the side A′ B′ is equal to the distance between the points C′ and B′ (or D′ and B′) multiplied by 100. In other words, the distance of the sighted object from the point at which the first observation was taken is exactly one hundred times the distance between the points of the first and second observations. It will thus be apparent that the necessity for any complicated computation is unnecessary, since the required distance may be determined merely by mental calculation. Likewise, the employment of expensive devices, such as telescopes and minutely graduated scales and dials is obviated. The instrument can therefore be manufactured at an extremely low cost, since with the exception of the sights, it consists solely of two members. Moreover, the sights are of the ordinary type and are comparatively inexpensive. It is, of course, of vital importance to keep the instrument oriented during its movements, and this can be effected by means of a tape line, the ring at the end of which is placed over the end of a rod or stake driven into the ground at the point where the first observation is taken, the line being then stretched in the direction of one or the other of the arms of the member 2 according to whether the instrument is to be moved to the right or to the left for the second observation. It is only necessary, therefore, to move the instrument along the line formed by the tape line, the graduations upon the tape line indicating the exact distance between the points of the first and second observations, and thus obviating the necessity for a separate measurement of such distance. Owing to the definite proportion between the lines A B and C B or D B, a relatively small base-line is required, 52.8 feet to the mile. Furthermore, the necessity for the use of a compass for the purpose of orientation, and the possible inaccuracy dependent upon any local attraction for the needle, are avoided. In order to permit the instrument to be carried about in the pocket when not in use, both of the members thereof are formed in sections, the mutually-adjacent inner ends of which are hinged together. The front member or leg 1 which bisects the leg 2 is preferably connected with the latter member by a pivot pin, owing to which construction, the sections of both members or legs can be folded one upon another, and the sections of one member folded over upon those of the other member.

What is claimed, is:—

1. A distance-finder consisting in its entirety of a base-member, and a member arranged at right angles thereto, the latter member being provided with front and rear sights and with a pair of additional sights located at opposite sides of and in alinement with the rear sight, the distance between either of said additional sights and said rear sight bearing a definite relation to the distance between the front and rear sights.

2. A distance-finder consisting in its entirety of a base-member, and a member arranged at right angles thereto, the latter member being provided with front and rear sights and with a pair of additional sights located at opposite sides of and in alinement with the rear sight, the distance between either of said additional sights and said rear sight bearing a definite relation to the distance between the front and rear sights, and means for covering either of said additional sights.

3. A distance-finder consisting in its entirety of a base-member, and a member arranged at right angles thereto, the latter member being provided with front and rear sights and with a pair of additional sights located at opposite sides of and in alinement with the rear sight, the distance between either of said additional sights and said rear sight bearing a definite relation to the distance between the front and rear sights, and a slide for covering either of said additional sights.

4. A distance-finder consisting in its entirety of a base-member, and a member arranged at right angles thereto, the latter member being provided with front and rear sights and with a pair of additional sights located at opposite sides of and in alinement with the rear sight, the rear sight and the additional sights being formed in a single strip of metal, the distance between either of said additional sights and said rear sight bearing a definite relation to the distance between the front and rear sights, and a member slidable upon the strip of metal in which said rear and additional sights are formed.

5. A distance-finder consisting in its entirety of a base-member and a member arranged at right angles thereto, the latter member being provided with front and rear

sights, and with a pair of additional sights located at opposite sides of and in alinement with the rear sight, the distance between either of said additional sights and said rear sight bearing a definite relation to the distance between said front and rear sights, each of said members being formed of a plurality of sections hinged together and arranged to be folded one upon another.

6. A range finder consisting in its entirety of a base-member and a member arranged at right angles to and pivotally connected with the base-member, to permit said members to be folded into alinement with each other when the instrument is not in use, the last-mentioned member being provided with front and rear sights, and with a pair of additional sights located at opposite sides of and in alinement with the rear sight, the distance between either of said additional sights and said rear sight bearing a definite relation to the distance between said front and rear sights.

In testimony whereof, I affix my signature, in presence of two witnesses.

JOHN G. R. LILLIENDAHL.

Witnesses:
FRANK W. AMES,
PHILIP C. GRUSSY.