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COMPLETE SPECIFICATION.

Improvement in Hertzian-wave Projecting and Receiving Apparatus for Locating the Position of Distant Metal Objects.—

I, CHRISTIAN HÜLSMEYER, of 3 Grabenstrasse, Düsseldorf, Germany, Engineer, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement;—

5 This invention has reference to an improved Hertzian-wave projecting and receiving apparatus for locating the position of distant metal objects such for example as ships, wrecks or submarine boats.

10 In the Specification of the British Patent No. 13170, 1904, an apparatus is described which is intended to be used for indicating the presence of a metal body such as a ship, but such an apparatus only indicates the direction in which the metal body or object is situated. It would without doubt be most useful if it were possible to also ascertain at what distance from the point of observation the metal body is located, and the object of my invention is to enable such a result to be attained.

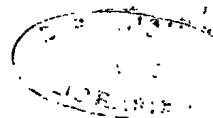
15 For this purpose I employ a projector which throws the electric waves in the form of a powerful cylindrical bundle & it is sufficient to move the projector up or down in a vertical plane (said projector having been first turned in the direction of the metal body) until the particular angle is found at which the action of the waves reflected from the metal body to the receiver is strongest. The angle
20 which the projector at that time makes with the horizon is read off & by its aid the distance of the metal body can be easily calculated or ascertained from a prepared table. The movements of the various parts as well as the ascertaining of the correct angle may be accomplished in various ways of which I hereinafter describe two. In one of these the projector, containing the reflector *etc.*, whereby
25 the electric rays are concentrated, is provided with an adjustable weight whereby the projector, which is appropriately mounted, is inclined. In the other form, I project parallel rays by means of a pair of lenses, which latter are adapted to be moved relatively to the projector casing, whereby the angle of inclination of the wave beams to the horizontal can be varied.

30 In the accompanying drawings the two methods of altering or adjusting the angle of the rays are shown diagrammatically.

Fig. 1 showing the first and Fig. 2 the second method, both views being in vertical section.

35 Referring to Fig. 1, 1 is the projector which serves to throw the electric waves and which is supported by the parts *a*, *b* and *c* similarly to a ship's compass. The hollow semisphere *c* contains the necessary induction coil *d* and the required current is supplied from any suitable source—not shown—either accumulators, batteries, a continuous current dynamo (in which latter case an interruptor is provided) or a direct alternating current. The secondary current from the

[Price 8d.]



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inductor passes up a hollow column *e* and thence to two rings *f* and *f'*. Around the column *e* is a hollow axle *g* which is formed or provided with the projector *l* which latter serves to collect and throw the electric waves from an oscillator *h* in a definite direction. The high tension current is taken from off the rings *f*, *f'*, by brushes *i*, *k*, and from these conducted to the oscillator. The electric rays, given off by the oscillator and also by wires which I provide within the projector for the purpose, are thrown or projected by the projector *l* and a curved or concave mirror *m* in a definite direction according to the angle with the horizon that the projector makes. To prevent inductive transmission of the rays, I provide a metal shield or cover-plate *t*.

Over the shield *t*, I provide a rod *Q* which is arranged in the axis of the projector, on which rod a weight *G* is suspended and adapted to be moved along said rod and accordingly as said weight is moved or adjusted either to the right or to the left of said axis so will the angle of the projector with the horizontal be altered. The rod *Q* may have a scale marked on it, obtained empirically by preference, so that the adjustment of the weight will enable the angle of inclination of the projector to be at once read off. If desired the rod *Q* may be arranged under the shield *t*.

Referring to Fig. 2 the projector *l* is provided with two lenses *R* and *S* which are provided with frames and are hingedly suspended from slides *T* and *U*. These slides pass through a longitudinal slot in the projector and are carried by a screwed spindle *V* which is fixed over the slot and is parallel to it. The spindle *V* may be rotated, through the instrumentality of suitable gear wheels, by turning a handle *W*. The lower part of the lense frames are connected by a link *X* to about the centre of which an adjusting rod *Z* which passes through a slot in the projector and is guided by a bearing *Y*, is connected. The length of the link *X* is equal to the distance the slides *T*, *U* are apart. By operating the handle *W* and the rod *Z* the angle of inclination of the lenses—which by their connection are always parallel to each other—may be altered relatively to the projector, the angle or direction in which the rays are projected being thereby also altered. This angle may if desired be read of from a suitable scale (not shown) which may be provided for example in combination with the handle *W*.

If the lenses *R*, *S*, are not required to be used, they may be moved into the position indicated by dotted lines, against the upper inner face of the projector.

In order to prevent the apparatus, which would usually be fixed on the fore deck of a ship, being injured by heavy seas or waves, said apparatus may be protected by a wooden or other suitable non-metallic housing which will permit the electric waves to pass through its walls.

If the apparatus on the fore deck is only capable of being rotated through an angle of 180°, I provide a second apparatus on the after deck so as to enable a metal object to be located also from the stern of the ship.

Said transmitting apparatus may have separate receivers with common antennae, the receivers being tuned so that it can readily be detected from which transmitter the message has been sent.

Having now particularly described and ascertained the nature of my said invention, and in what manner the same is to be performed, I declare that what I claim is:

1. A process for locating the position of distant metal objects (vessels *etc.*) the presence of which has been detected by the process described in the British Patent No. 13170/1904, this process consisting in varying in the vertical plane the angle of the cylindrical wave bundle sent by the transmitting apparatus, until the action of the reflected waves on the receiver is at its maximum, and in calculating then with the aid of this angle the distance of the object reflecting the waves from the transmitter.

2. An apparatus for the execution of the process claimed in Claim 1, comprising a projector carried so as to be moveable in any desired direction and whose

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adjustment in a vertical plane is attained by a weight adjustably carried on a rod having a scale of the relative angles marked on it all substantially as set forth.

3. An apparatus for executing the process claimed in Claim 1, comprising a system of lenses (R, S) the angle of which may be altered whereby the angle at
5 which the electric rays are projected may be altered in a vertical plane, said lenses being contained in a projector and serving to concentrate the electric rays all for the purposes and substantially as set forth.

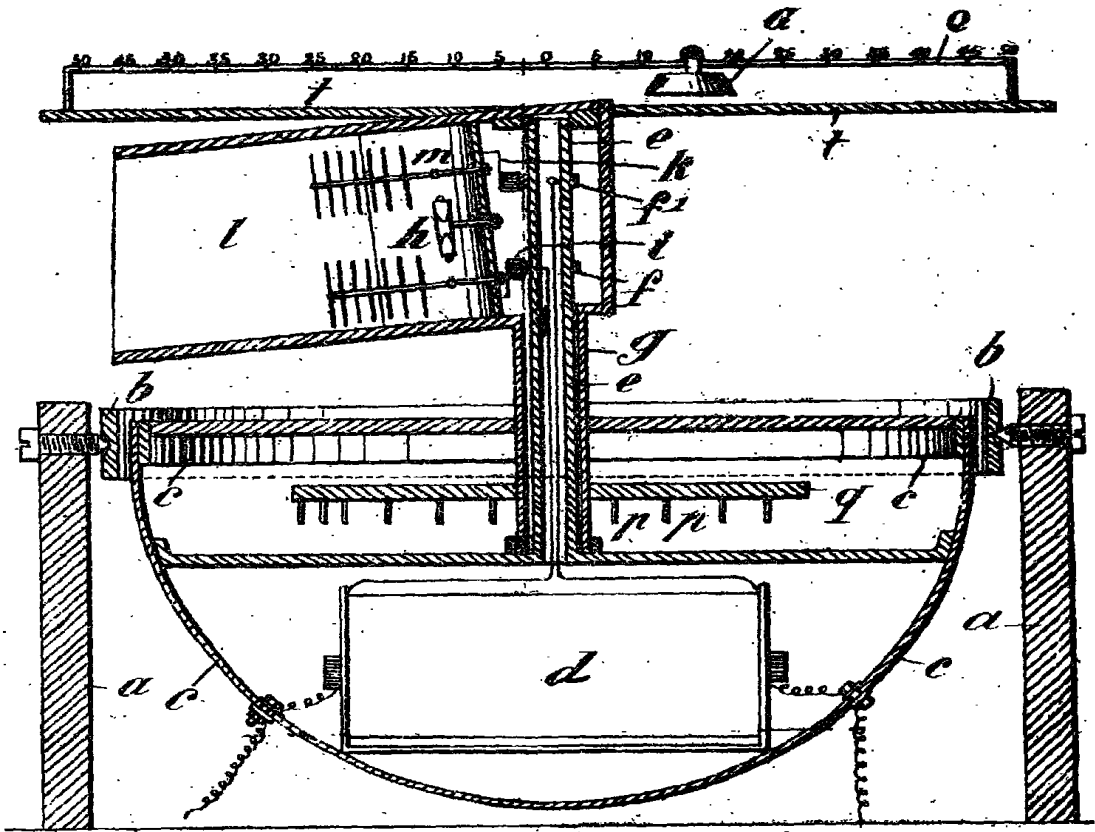
4. The combination with an apparatus for projecting electric rays, of a fixed or rotatable housing made of wood or other suitable non-metallic material which
10 will permit the electric waves or rays to pass through its walls and which serves to protect said apparatus against injury by heavy sea and the like.

Dated this 24th day of Novr. 1904.

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Fig. 1.



[This Drawing is a reproduction of the Original on a reduced scale.]

Fig. 2.

