

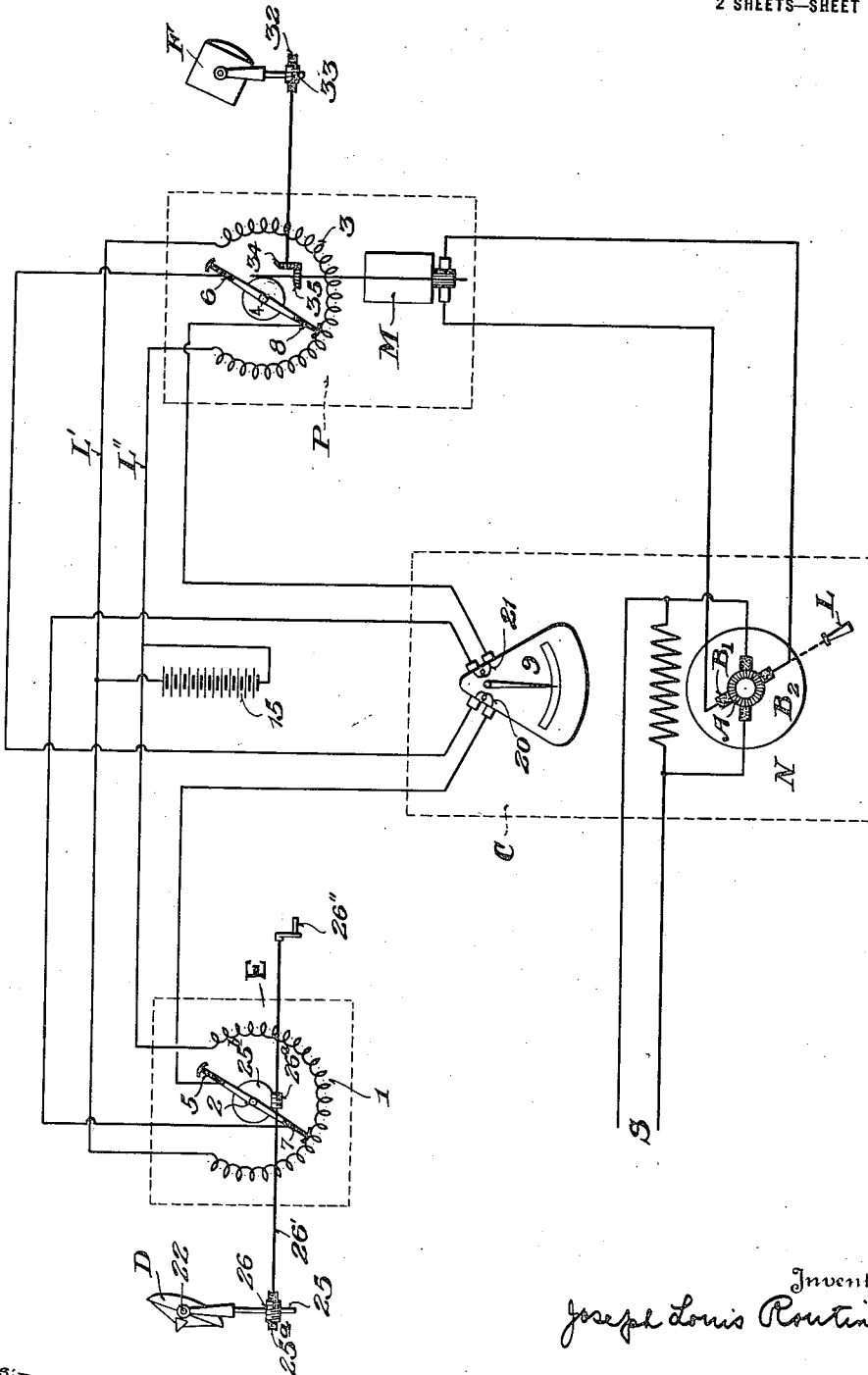
J. L. ROUTIN.
 APPARATUS FOR DIRECTING SEARCHLIGHTS BY THE SOUND OF AERIAL OBJECTIVES.
 APPLICATION FILED JUNE 24, 1919.

1,372,043.

Patented Mar. 22, 1921.

2 SHEETS—SHEET 1.

Fig. 1.



WITNESS:—

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2 SHEETS—SHEET 2.

Fig. 3.

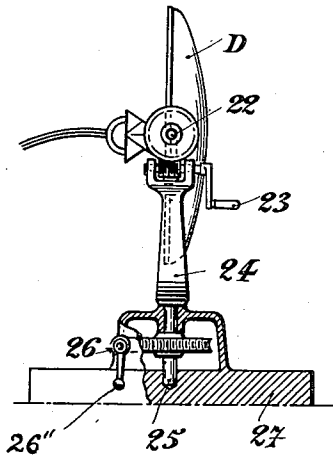


Fig. 2.

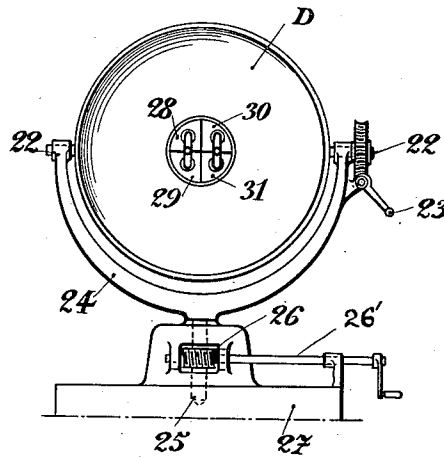


Fig. 4.

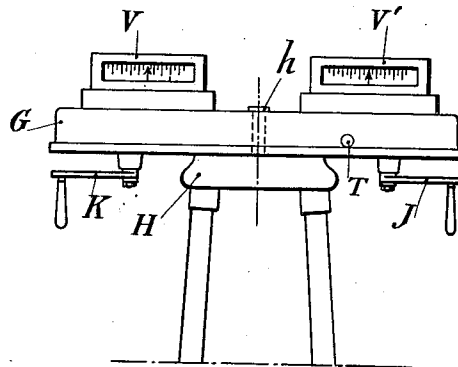
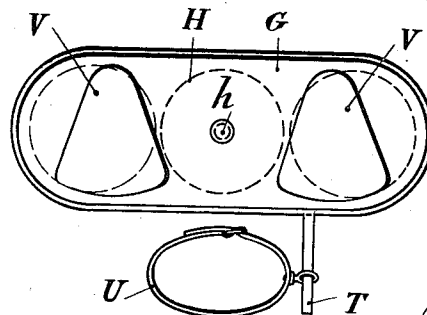


Fig. 5.



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UNITED STATES PATENT OFFICE.

JOSEPH LOUIS ROUTIN, OF PARIS, FRANCE.

APPARATUS FOR DIRECTING SEARCHLIGHTS BY THE SOUND OF AERIAL OBJECTIVES.

1,372,043.

Specification of Letters Patent.

Patented Mar. 22, 1921.

Application filed June 24, 1919. Serial No. 306,477.

To all whom it may concern:

Be it known that I, JOSEPH LOUIS ROUTIN, a citizen of the Republic of France, a resident of Paris, in the Republic of France, have invented a new and useful Apparatus for Directing Searchlights by the Sound of Aerial Objectives, which invention is fully set forth in the following specification.

This invention comprises, in combination, the following appliances:

1. A sound-detector enabling the direction of the object sought to be approximately ascertained.

2. A projector or searchlight which, during the period of search, is directed by special means to be described hereafter, according to the direction given by the sound detector.

3. A control post, located about 50 meters from the searchlight, with means for keeping the latter directed upon the object.

In order that the invention may be more readily understood, reference is had to the accompanying drawings, in which—

Figure 1 is a diagrammatic view showing one constructional form of my invention;

Fig. 2 is a front elevational view of a sound-detector suitable for use in connection with my invention;

Fig. 3 is a side elevational view of Fig. 2, with parts broken away;

Figs. 4 and 5 are views in elevation and plan, respectively, showing details of the mounting of the apparatus.

The sound detector, which may be of any suitable known type, or may consist of a pair of acoustic receivers arranged to receive the sound-waves emanating from an aircraft engine, and to indicate the direction thereof, is mounted for horizontal adjustment or training, on a vertical axle, vertical angular adjustment or tipping being effected by rotation upon a second axle which is perpendicular to the former and takes part in the movement imparted for horizontal movement or training.

In Figs. 2 and 3 is shown a sound-detector for use in my invention in which D designates a sound-detector comprising, for example, a parabolic disk of three meters diameter, provided with axles 22. A crank 23 permits manipulation of the disk for pointing in elevation, that is to say, inclining it more or less to the vertical. Axles 22 are carried by a forked support 24, the vertical portion 25 of which is supported in a base

27 and is adapted to receive a movement of rotation by aid of a manually-operated spindle 26' through gearing 26. Near the focus of the parabolic disk are disposed receiving horns 28, 29, 30, 31, indicated diagrammatically. These horns are coupled together as follows:—

For pointing in direction, the operator receives in his right ear, by aid of a rubber tube terminated in a fork, the noises received by horns 28 and 29, and in his left ear the noises received by horns 30 and 31.

For pointing in elevation, a second operator receives in one ear the noises received by horns 28 and 30 and in the other ear the noises received by horns 29 and 31.

The two operators regulate the position of the apparatus by manipulating cranks 23 and 26'' in such a manner that, by giving small displacements of 1° to 2° in one direction or the other, the noise which reaches them passes from one ear to the other and until this alternation ceases to be produced. The adjustment of the sound-detector at any given instant does not correspond with the actual position of the object, but with the position which the object occupied when the sound received was emitted. It is, therefore, obvious that the searchlight must be pointed in a direction given by the horizontal angle of the sound-detector plus the angle through which the object has traveled while the sound has been traveling to the receiver. In practice, the necessary correction can be made with sufficient accuracy by hand, by turning the rheostat 1 on the pivot 2, the distance being judged, for example, by the loudness of the noise made by the aircraft, and tables may be prepared for directly reading the angle of correction required by the rheostat, this angle being a function of the assumed speed of the aircraft. The direction thus given will generally be within the beam of the searchlight associated with the sound-detector. If the object is not in the beam, the searchlight can be slightly shifted, to find the object by sweeping the region indicated.

Referring to Fig. 1, E designates a listening post, P designates a distant searchlight post, and C a control post about 50 meters from the searchlight. At posts E and P are rheostats 1 and 3 connected by electric conductors L', L''. Rheostat 1 is provided with a pair of brushes 5, 7 revolvably mounted on a pivot 2, and rheostat 3 is likewise

provided with a pair of similar brushes mounted on pivot 4. Brushes 5 and 6 are connected through a coil 20 of the voltmeter 9 at the control station C and brushes 7 and 8 are connected with each other through a companion coil 21 of the same voltmeter 9. A battery 15 is bridged across the conductors L', L''.

The position of the brushes 5 and 7 at listening station E is determined by the position in azimuth of the sound-detector D, as here illustrated. To secure this result, pivot 2 is provided with a gear 25^b engaging a worm 26^a on a drive shaft 26'. A second worm 26 on this shaft engages a pinion 25^a on the vertical spindle 25 carrying the sound-detector D. By turning the crank 26'', the detector D is rotated in a horizontal plane and a corresponding movement is imparted to brushes 5 and 7 of the rheostat 1, thereby causing a corresponding deflection of the needle of voltmeter 9 at the control station C.

At the searchlight post P, the searchlight F is trained in accordance with the movements of the sound-indicator. For this purpose, a motor N at the control post C is provided, whose field-coil and armature are connected to feed-wires S. The commutator A of motor N is provided with a pair of supplementary brushes B', B² which are electrically connected to the armature of a motor M and are adjustable by hand by means of the control-lever L. It will be clear that, when the brushes B', B² are perpendicular to the axis of the neutral zone, the motor M will be at rest, and that its direction and speed can be controlled at will by moving the lever L one way or the other. To keep the brushes B' and B², and the commutator A in good condition, it is desirable to use very narrow and resistant carbon brushes, and to have commutator segments in such number that the potential difference between two consecutive segments be less than one volt. The shaft of motor M is adapted to rotate the brushes 8 and 6 on their pivot 4 and also to train the searchlight F through gear connections 32, 33, 34 and 35. The operator at control station C operates the brush handle L in such direction and extent as to position contacts 6, 8 on the rheostat where they will give a zero reading to the voltmeter 9. At this position, the searchlight F will be given a training corresponding to that given the sound-detector D.

At the control post the operator or operators in charge of the searchlight, and the levers which they have to control are located on a turntable, so as to take part in the training movement of the searchlight, so that the target is kept in front. The mounting of this apparatus is shown in Figs. 4 and 5 wherein G designates a table carrying volt-meters V, V' one of which, V for

example, corresponds with voltmeter 9 of Fig. 1 showing my system for training the searchlight in azimuth. V' is the voltmeter which would control in an identical system not shown the searchlight in zenithal direction. Crank K corresponds to brush operating handle L Fig. 1 for controlling the potential applied to motor M for training the searchlight in azimuth and crank J controls identical brushes not shown for applying potential to a motor for training the searchlight in zenithal direction. It is to be understood that cranks K and J are independent of each other and belong to two identical systems one of which controls the searchlight in azimuth and the other in zenithal direction.

The tipping of the searchlight, is accordingly like the training thereof, an intuitive action that is, for example, when the table is turned right-handed the luminous beam of the searchlight also turns to the right. This is a feature of great importance, and is indispensable for the purpose in view, especially when the pilot finds that he is detected and seeks to evade the searchlight.

Instead of this motor control device any other equivalent motor control device may be used, for example one according to the well known Ward Leonard system.

The tipping of the searchlight is effected in a wholly similar manner, by means of a combination of mechanism including an electric transmitter at the listening post, a receiver at the searchlight post, and a voltmeter and control lever at the control post; the brushes moved by this second lever may be mounted on the commutator of the motor N or on the commutator of a second motor fed in the same manner as the motor N. The two control levers must be mounted so that they move, respectively, in a horizontal and in a vertical plane.

One of the essential and characteristic features of the invention is that the two voltmeters, as well as the motors controlling the horizontal and vertical movements, with the respective levers, are mounted on a bed or platform turning on a vertical axle so that it can be turned by or with the operator or operators, to follow the training movement.

If a single operator located near the rotatable frame or platform is charged with (both directing movements horizontal and vertical), a simple device consists in providing the operator with a belt attached to a lever or arm connected to said platform, it being in that case part of the operator's functions to turn with the beam when the same is traversed, and the platform being rotated by this means.

If there are two operators, one for the lever L and the other for the tipping lever, they may have seats fixed side by side upon

the turning platform, and a third operator may rotate the platform by following the beam. It may be noted that when the operators can see the object with the naked eye it is not essential that the direction given to the platform should correspond exactly with that of the beam, a deflection of 10 or 20 degrees being of no consequence.

A frequent occurrence in connection with the training and tipping mechanism of searchlights is that the training movement reacts upon the tipping mechanism, that is to say, when the handle for training the light is actuated without actuating the tipping handle, the vertical angle is nevertheless slightly altered.

This error may be corrected by connecting the repeater rheostat of the tipping mechanism on the search-light apparatus to the training mechanism, by means of suitable gearing.

What I claim is:

1. In combination, a listening post provided with sound-detecting and locating means, a distant post having a searchlight, a control post having indicating means con-

trolled by said sound-detecting means, and manually-controlled means for training said searchlight in accordance with the indications of said indicating means.

2. In combination, a listening post provided with sound-detecting and locating means, a distant post having a searchlight, two rheostats provided with a common source of current and each provided with a pair of movable contacts, one pair having operating connections with said sound-detector, a control post having a voltmeter controlled in the contacts of both rheostats, a source of variable potential thereat, and a motor means at the searchlight post having operating connections with said second set of contacts and with said searchlight for operating the latter and controlled by said source of variable potential as indicated by said voltmeter.

In testimony whereof I have signed this specification.

JOSEPH LOUIS ROUTIN.

Signed in the presence of—

PETER PETERSEN,
LOUIS GARDET.