

1,349,336.

C. C. HADDOCK.
AERONAUTICAL APPARATUS.
APPLICATION FILED FEB. 9, 1918.

Patented Aug. 10, 1920.
2 SHEETS—SHEET 1.

Fig. 1.

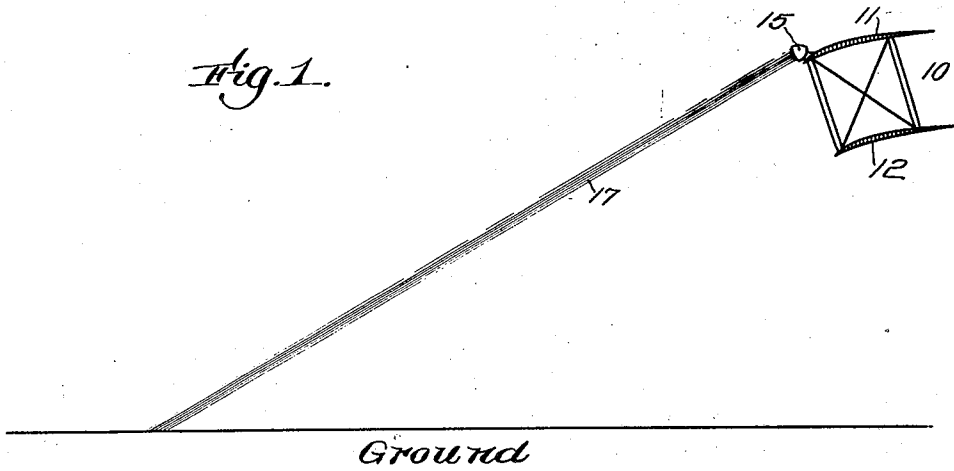
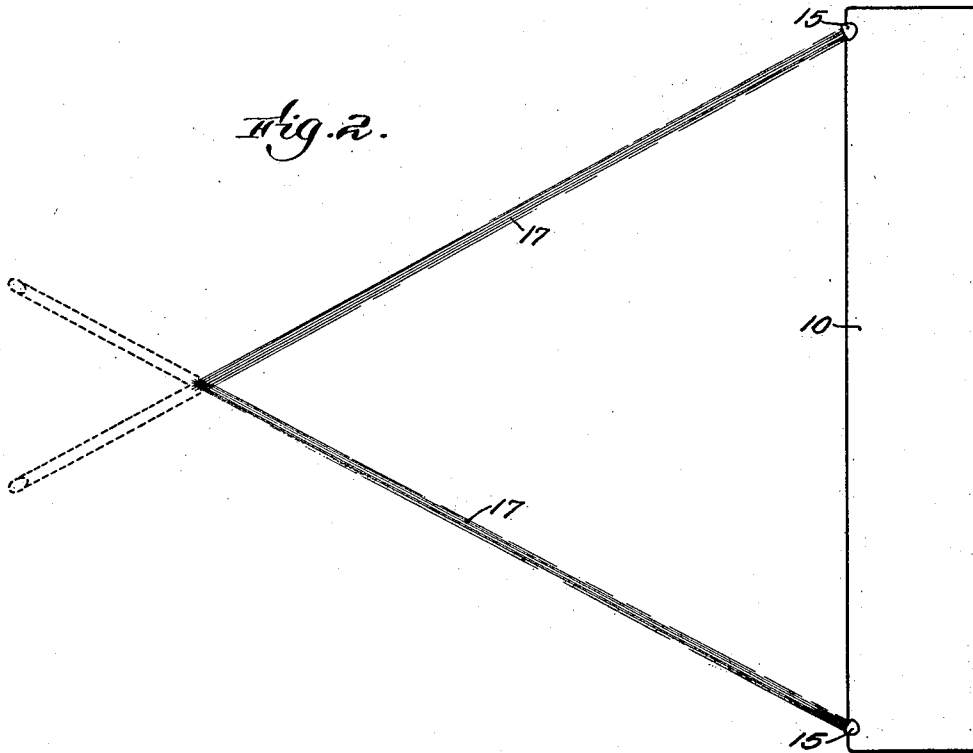


Fig. 2.

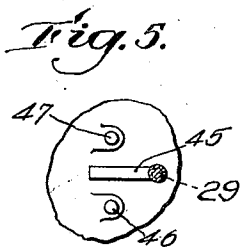
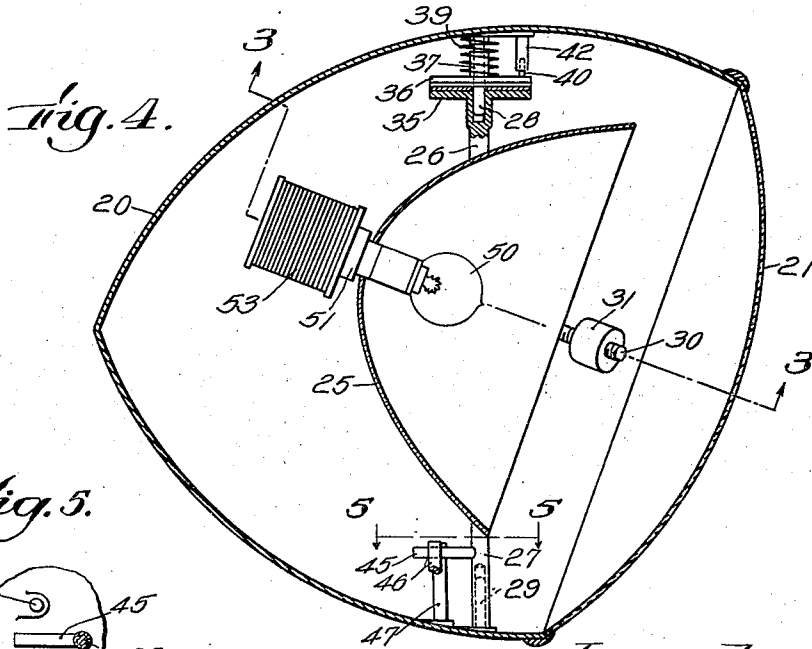
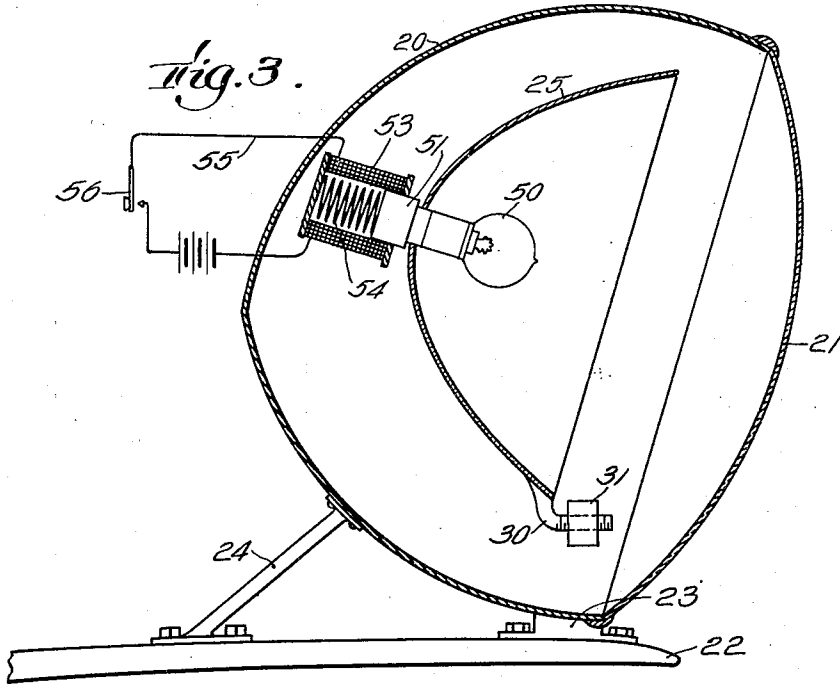


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2 SHEETS—SHEET 2.



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UNITED STATES PATENT OFFICE.

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AERONAUTICAL APPARATUS.

1,349,336.

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To all whom it may concern:

Be it known that I, CHARLES C. HADDOCK, a citizen of the United States, residing at Beverly, in the county of Essex and State of Massachusetts, have invented certain new and useful Improvements in Aeronautical Apparatus; 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 aeronautical apparatus and more particularly to mechanism adapted to facilitate the alighting of the machine either upon land or water.

The danger of an improper landing is greatly increased in night flying as it is difficult, if not impossible, to estimate the height of the machine above the landing point. According to the method ordinarily pursued in alighting, the machine descends at a rapid rate until a point is reached, perhaps one hundred and fifty feet above the surface of the earth or water, and thereafter the planes are deflected to cause a gradual descent of the machine to the landing point. A considerable number of accidents have occurred in the past owing to the inability of the aviator to properly estimate this height in the darkness.

It is the object of the present invention, therefore, to provide an improved method and apparatus for accurately determining when the aeroplane is located at a predetermined height above the surface of either the land or water.

Accordingly a feature of the invention consists in projecting from the aeroplane two downwardly converging beams of light which intersect at a predetermined distance below the plane so that when the two spots of reflected light from the beams merge into one an unfailing indication will be given that the machine is then positioned at a predetermined height above the landing surface.

The apparatus comprises essentially two sources of illumination mounted at opposite sides of the plane and each adapted to project a downward and inwardly directed beam of light so that the two converging beams intersect at a given point below the plane.

A further feature of the invention contemplates the construction of the apparatus

in such a manner that the intersecting beams of light shall be directed downwardly at a fixed angle to the landing surface independently of the inclination of the supporting plane. In the simplest and most efficient form of the invention which has yet been devised this is accomplished by providing a reflector for each light which is movable within the casing of the light and is retained by gravity at a fixed inclination.

Still further features of the invention consist in certain novel features of construction, combinations and arrangements of parts hereinafter described and claimed, the advantages of which will be obvious to those skilled in the art from the following description.

In the accompanying drawings illustrating the preferred form of the invention, Figure 1 represents a partially diagrammatic view in elevation of the apparatus for locating the height of the plane; Fig. 2 represents a similar view in plan; Fig. 3 is a detail illustrating a vertical section in elevation of one of the lights; Fig. 4 is a similar detail showing a horizontal section of the light; and Fig. 5 is a detail illustrating the arrangement of the stops for limiting the oscillatory movements of the reflector.

According to the present method the height of the plane above the landing surface is determined by projecting two downwardly converging beams of light from the plane which at all levels except one are reflected from the surface as two spots of light. When the plane is located at a predetermined height above the surface corresponding to that at which the beams of light intersect the two spots of reflected light merge into one and provide an accurate and infallible indication of the height of the plane. According to the illustrated embodiment of the invention the downward inclination of the two beams of light is such that the indication is given when the machine reaches a height above the landing surface at which the abrupt descent is checked and a gradual descending movement is initiated to negotiate the landing. This point may be about one hundred and fifty feet above the landing surface although it may vary more or less and is dependent upon the speed of the plane and other conditions.

As shown in the drawings the aeroplane is indicated at 10 and is provided with upper and lower wings 11 and 12. A pair of lights

15 are mounted at opposite ends of the upper wing and each light is designed to project a downwardly and inwardly directed beam 17 which intersect at a predetermined point 5 beneath the plane. During the descending movement of the plane and prior to reaching this predetermined level two separated spots indicate the point at which these beams are reflected from the landing surface. As 10 the plane gradually descends these spots converge into one, as shown in the drawings, which informs the aviator that the proper level is attained. As the plane continues to descend the single spot of light separates 15 into two spots which gradually separate from one another along the paths indicated by the two beams of light. The indication afforded by the two projected beams of light is equally trustworthy whether the landing 20 is to be made over the land or water, as in either case the reflection produces a luminous spot of light which is readily discernible. Furthermore although this invention is especially applicable to night flying when 25 the landing surface may not be seen, it may also be useful in connection with flights in the mist or fog or under any other conditions which tend to obscure vision of the landing surface so long as the beams of light 30 are of sufficient intensity and quality to be followed by the aviator. The two lights which project the beams are identical and are oppositely inclined to one another so that the beams shall converge. Each light 35 comprises a stationary outer casing within which is swiveled a reflector normally maintained by gravity at a fixed inclination to the landing surface independently of the inclination of the outer casing. An outer 40 casing 20 is provided with a transparent front 21 and is securely fastened to a base 22 through a front support 23 and a brace rod 24. The base 22, as shown clearly in Fig. 3, is slightly curved to correspond to 45 the camber of the wing surface. The outer casing is inclined both downwardly and inwardly, as shown in Figs. 3 and 4, respectively, so that the longitudinal axis of the casing is substantially parallel to the projected beam of light. A parabolic reflector 50 25 is swiveled within the casing upon oppositely disposed trunnions 26 and 27 which are journaled upon fixed studs 28 and 29 projecting inwardly from the walls of the casing. The reflector is normally main- 55 tained at a fixed inclination by gravity and to this end the lower portion of the reflector is provided with a curved stem 30 upon which is threaded a weight 31 which 60 may be conveniently adjusted to vary the center of gravity and in consequence the inclination of the reflector.

It may be desirable under certain circumstances to provide means for dampening the

movements of the reflector and to this end a 65 pair of braking surfaces are supported upon the trunnion 26 and stud 28, respectively, and serve to slow up the movements of the reflector and prevent the back and forth oscillatory movement which might take place 70 before the reflector came to rest in the proper position. As shown clearly in Fig. 4 a clutch plate 35 is formed upon the trunnion 26 and coöperates with a similar clutch plate 36 having a hub 37 which slides upon 75 the stud 28. The two clutch plates are held in engagement by a light spring 39 interposed between the clutch plate 36 and the casing 20. The clutch plate 36 is held against rotation relative to the casing by a 80 pin 40 projecting from the plate into a recessed lug 42 secured to the casing. With this construction if the casing is moved owing to a change in inclination of the plane the engagement of the two clutch plates 35 85 and 36 tends to impart a corresponding movement to the reflector 25 which is resisted by the weight 31 tending to retain the reflector in its original position. The movements of the reflector in either direction are 90 limited by the engagement of an arm 45 projecting from the trunnion 27 with one of two stops 46 and 47 secured to the casing 20.

In order that the lights may be employed 95 for purposes of illumination in addition to providing an indication as to the height of the plane, means are provided for causing the lights to emit diverging rays of light instead of the parallel rays heretofore described. To this end a solenoid or equivalent 100 apparatus is employed for moving the electric light bulb from a position approximately at the focus of the parabolic reflector into a position out of focus with the parabola. The electric bulb 50 is provided with 105 a base 51 slidably received in a solenoid 53 and normally retained in the position shown in Fig. 3 of the drawings by a light spring 54. The solenoid is embodied in a circuit 110 indicated at 55 having a switch 56 which may be closed to energize the solenoid and draw the light inwardly against the resistance of the spring. The light is retained in this position so long as the circuit re- 115 mains closed and upon opening the switch it is again ejected by the spring 54.

While it is preferred to employ the specific construction and arrangement of parts shown and described, it will be understood 120 that this construction and arrangement is not essential except so far as specified in the claims, and may be changed or modified without departing from the broader features of the invention. 125

The invention having been described, what is claimed is:

1. An aeronautical apparatus comprising

an aeroplane, two sources of illumination mounted upon the aeroplane and each arranged to project a beam of light downward and toward the beam of the other in a manner to cause the two converging beams to intersect at a given point below the aeroplane.

2. An aeronautical apparatus comprising an aeroplane, a pair of lights mounted on the aeroplane and inclined toward one another to cause the lights to project converging beams, and means for retaining the lights in a fixed position of inclination to the hori-

zon independently of the inclination of the aeroplane.

3. The method of determining when an aeroplane is at a predetermined distance above the ground which consists in projecting from the aeroplane two downwardly converging beams of light which intersect at a predetermined distance below the aeroplane and in noting during the descent of the aeroplane when the two spots on the earth of reflected light from the beams merge into one.

CHARLES C. HADDOCK.