H. J. EARLE.

AERO INCLINOMETER.

APPLICATION FILED APR. 19, 1919.

1,365,233. Patented Jan. 11, 1921.

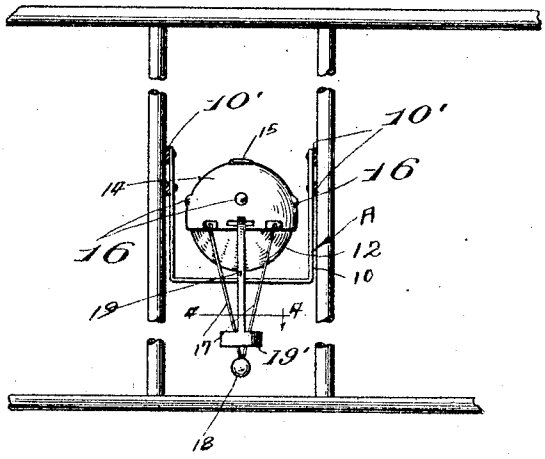


Fig. 1

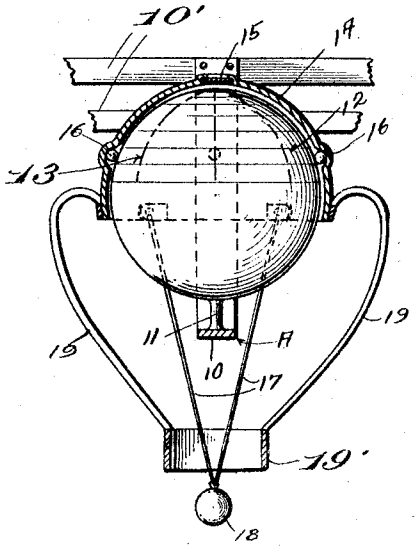
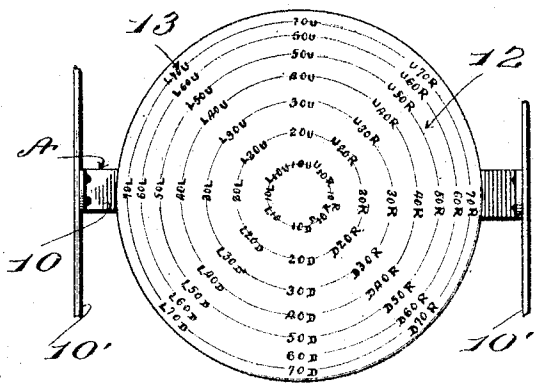


Fig. 2

Fig. 3



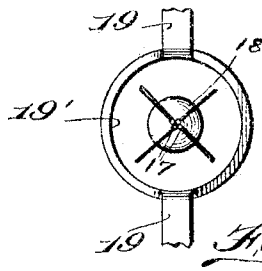


Fig. 4

Witness

Inventor

H. J. EARLE

By

Attorneys

UNITED STATES PATENT OFFICE.

HARRY J. EARLE, OF RAPID CITY, SOUTH DAKOTA.

AERO-INCLINOMETER.

1,365,233. Specification of Letters Patent. Patented Jan. 11, 1921.

Application filed April 19, 1919. Serial No. 291,178.

To all whom it may concern:

Be it known that I, HARRY J. EARLE, a citizen of the United States, residing at Rapid City, in the county of Pennington, State of South Dakota, have invented certain new and useful Improvements in Aero-Inclinometers; 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 invention relates to an indicating device, or aero-inclinometers, and more particularly to the class of angle indicators for use in heavier than air flying machines, such as aeroplanes or the like.

The primary object of the invention is, the provision of a device of this character, wherein the operator in an aeroplane can determine at a glance, and particularly in foggy or misty weather, the exact angle at which the machine is in flight.

Another object of the invention is, the provision of a device of this character, wherein the angular disposition of the aeroplane while in flight can be actually determined, either while the aeroplane is ascending or descending, or is tilted laterally to one side or the other from an an even or true horizontal position in the air, the device being of novel construction to occupy the least possible space and to automatically operate as it is extremely sensitive to the movements of the aeroplane and that will enable the operator to determine at a glance the exact angular disposition of the aeroplane on the reading of the device.

A further object of the invention is, the provision of a device of this character, which is extremely simple in construction, readily and easily applied to an aeroplane, thoroughly reliable and efficient in its operation and inexpensive to manufacture and install.

With these and other objects in view, the invention consists in the features of construction, combination and arrangement of parts as will be hereinafter fully described, illustrated in the accompanying drawing and pointed out in the claims hereunto appended.

In the accompanying drawings:

Figure 1, is an elevation of the device constructed in accordance with the invention and suspended within the body frame of an aeroplane, a fragmentary portion of which is shown.

Fig. 2, is a vertical sectional elevation thereof.

Fig. 3, is a top plan view of the spherical indicator forming a part of the device.

Fig. 4, is a sectional view on the line 4—4 of Fig. 1.

Similar reference characters indicate corresponding parts throughout the several views in the drawing.

Referring to the drawing in detail, A designates generally the support for the device, which in this instance is preferably in the form of a substantially U-shaped frame 10 adapted to be mounted for suspension within the body of an aeroplane so that the device can be conveniently viewed by the operator of the aeroplane, the frame being mounted rigidly in perpendicular position in any suitable manner in said aeroplane, being preferably hung from cross pieces 10′ connected to the opposed uprights or struts of the aeroplane body frame.

Formed centrally on the lower closed end or connecting portion of the frame 10 is a stud or mounting 11 supporting in said frame at a slight elevation from the extreme lower point of its periphery, a spherical body 12, which has printed or otherwise marked upon the major upper portion thereof, a scale surface indicative of angle degrees either in a longitudinal direction, a lateral direction or at intermediate points thereof, the scale surface being also provided with suitable indicia indicative of the forward, backward or side tilting position of the aeroplane.

This scale is shown in Figs. 2 and 3 of the drawings, in which degrees are indicated from zero (0) to about 70 to 75 degrees. In the designations given, the letter "U" indicates an upward tilt; the letter "D" indicates a downward tilt; the letter "L" indicates or designates a tilt to the left; the letter "R" designates a tilt to the right and the combinations of these letters, indicate tilt or direction in degrees therebetween. For instance, "L50U", designates a tilt of 50 degrees between left and up for the particular turn being made, and so forth. It is, of course, to be understood that any desired markings may be employed in lieu

of the markings stated providing the proper degree of tilt and the direction of the tilt, is ascertainable therefrom readily.

Arranged over the indicator surface 13 is a semispherical cap or hood 14, which is formed in the extreme top point of its periphery with a central peep opening 15 having a transparent section or covering such as a glass or the like, and carried at the inner face of the cap or hood 14 are antifriction bearings 16 which traverse the body 12 in the movement of the cap or hood 14 to render the latter susceptible of free movement with minimum friction, and the peep opening 15 will make visible the angle degree marks and the indicia of the angular disposition of the aeroplane on the reading of the indicator surface by the user of the device.

Connected at intervals, to the circumferential free edge of the cap or hood 14 are flexible suspension members, such as cords, or chains 17, which converge downwardly toward each other and are connected to a weight 18 constituting a pendulum serving to hold the cap in true perpendicular position irrespective of the angular movement of the frame 10 coincident to the tilting of the aeroplane when in flight either when forwardly tilting or tipping, rearwardly tipping, or side tilting thereof.

Mounted on the hood or cap 14 extending downwardly therefrom, is a guard 19 having a ring 19′ at its lower end, which prevents the suspension members 17 and the ball 18 from becoming tangled with each other or entangled with the guard portions supporting the ring, on the turning over of the aeroplane or the upsetting thereof.

On the relative movement of the body 12 within the cap or hood 14, which body varies in its movement according to the angular disposition of the aeroplane, an operator of said aeroplane can view the indicator surface 13 and observe the angle degree and the indicia indicative of the direction of the angle through the peep opening 15 in the cap or hood 14, and thereby accurately determine the angle of incidence of the aeroplane when tilted forwardly or rearwardly or, at either side of the true horizontal plane of travel thereof, or when the same is making a level flight.

From the foregoing, it is thought that the construction and manner of use of the device will be clearly understood, and therefore, a more extended explanation has been omitted.

What is claimed is:

1. In a device of the character described, a hanger support, a spherical body having angle and direction degree markings on the outer surface thereof, a hood or cap movable over the marked surface of the body and having a peep opening for making visible certain markings thereof, and a weighted pendulum connected to and depending from the cap or hood whereby the latter is maintained in the same position with respect to the horizon.

2. In a device of the character described, a hanger support, a spherical body having angle and direction degree markings on the outer surface thereof, a hood or cap movable over the marked surface of the body and having a peep opening for making visible certain markings thereof, a weighted pendulum connected to and depending from the cap or hood whereby the latter is maintained in the same position with respect to the horizon, and a guard carried by the hood or cap for the pendulum.

3. A device of the character described, comprising a rigidly supported spherical body adapted to be mounted within an aeroplane and having an angle degree scale on its outer upper half, a semi-spherical cap superimposed upon the body and having a centrally peep opening for making visible the degrees of the scale to determine the angular disposition of the aeroplane when in flight, and weighted means holding the cap in the same position with respect to the horizon during the angularly changing positions of the aeroplane.

4. A device of the character described, comprising a rigidly supported spherical body adapted to be mounted within an aeroplane and having an angle degree scale on its outer upper half, a semi-spherical cap superimposed upon the body and having a central peep opening for making visible the degrees of the scale to determine the angular disposition of the aeroplane when in flight, weighted means holding the cap in the same position with respect to the horizon during the angularly changing positions of the aeroplane, and a guard on the cap for the weighted means to prevent inoperativeness thereof on righting the aeroplane after being upset.

5. An aeroplane inclinometer, adapted to be suspended from cross members of the body frame of an aeroplane, comprising a U-shaped hanger, a support intermediately of the bight portion of the hanger, a spherical body rigidly supported thereon, said body having marked on its upper surface a scale indicative of angles in degrees radiating from the center of the top portion of the body, a shell-like hood enveloping the major portion of the top of the spherical body and through which the scale surface is visible, and means for holding the hood over the upper portion of the spherical body in the same position with respect to the horizon irrespective of the angular disposition of the latter.

6. An angle indicator for aeroplanes and the like, comprising a spherical body supported in an upward position from the ex-

treme lower end of its vertical diameter, said body having markings upon the upper portion thereof adapted to indicate various angular dispositions of the body of the machine, a hood enveloping the upper portion of the spherical body, anti-friction means between the hood and the body, pendent means acting upon the body, whereby the hood will be maintained in the same position with respect to the horizon during free independent movement of the body angularly with respect thereto, means for holding said pendent means downwardly disposed and against swinging, and a transparent section in the top portion of the hood through which the markings on the spherical body are visible as they approach the extreme upper point upon the periphery of said body.

7. In a device of the character described a spherical body having indicating markings on the outer surface thereof, an indicator loosely fitting upon the body and movable over the marked surface of the body, and a weighted pendulum connected to and depending from the indicator whereby it is maintained in the same position with respect to the horizon.

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

HARRY J. EARLE.

Witnesses:

GEO. H. WHITE,

J. GEO. LAMPERT.