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PROVISIONAL SPECIFICATION.

Improvements in and connected with Artificial Horizons.

I, GEORGE WILSON HEATH, of Observatory Works, Crayford, in the County of Kent, Scientific Instrument Maker, do hereby declare the nature of this invention to be as follows:—

5 According to this invention I construct the artificial horizon with an oscillating balance enclosed within a sealed chamber of any suitable form filled with viscous fluid which steadies the oscillations of the balance, the latter being preferably provided with wings or other suitable parts adapted to offer more or less resistance to the motion of the balance in the fluid. The balance is provided with a collimation wire which comes in line with another collimation wire fixed in the
10 aforesaid sealed chamber or at some other suitable part of the instrument, when the latter stands level and pointing to the horizon. The sealed chamber is provided with telescope lenses, and with suitable arrangements for fixing it to a sextant, levelling or other instrument. It may also be provided with a lamp of special construction for illuminating the interior of the sealed chamber to enable the
15 instrument to be used at night, and for stellar observation, the necessary illuminant which receives the rays from the lamp being placed within the sealed chamber. The lamp is preferably provided with an arrangement, such as an iris shutter, for example, for shading the light of the lamp according to the illuminating power of the star or other object, the image of which is brought to the horizon
20 by the instrument.

The whole instrument may be adapted to slide into what is known as the Patent Hezzanith Sextant (for which a Patent was granted to me bearing date the 23rd day of August 1893 No. 15,917), or be provided with a screw collar or other suitable device to fix it on any sextant or other similar instrument.

25 Dated this 24th day of March 1896.

G. W. HEATH,

Per W. H. Beck,
115 Cannon Street, London, E.C., Agent.

COMPLETE SPECIFICATION.

30 Improvements in and connected with Artificial Horizons.

I, GEORGE WILSON HEATH, of Observatory Works, Crayford, in the County of Kent, Scientific Instrument Maker, 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:—

35 According to this invention I construct the artificial horizon with an oscillating balance enclosed within a sealed or liquid-tight chamber of any suitable form filled

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with fluid which steadies the oscillations of the balance the latter being preferably provided with wings or other suitable parts adapted to offer more or less resistance to the motion of the balance in the fluid. The balance is provided with a collimation wire which comes in line with another collimation wire fixed in the aforesaid sealed chamber, or at some other suitable part of the instrument, when the latter stands level and pointing to the horizon. The sealed or liquid-tight chamber is provided with telescope lenses, and with suitable arrangements for fixing it to a sextant, levelling or other instrument. It may also be provided with a lamp of special construction for illuminating the interior of the sealed or liquid-tight chamber or to project diffused rays of light in front of the object glass to enable the instrument to be used at night, and for stellar observation, the necessary illuminant which receives the rays from the lamp being placed within the sealed chamber to illuminate the interior thereof. The lamp may be provided with an arrangement, such as an iris shutter, for example, for shading the light of the lamp according to the illuminating power of the star or other object, the image of which is brought to the horizon by the instrument.

And in order that the said invention may be fully understood I will now proceed to describe the same with the aid of the accompanying sheet of drawings in which

Figure 1 is a side elevation of an artificial horizon constructed in accordance with my invention showing the lamp for illuminating the interior of the sealed chamber or for projecting diffused rays of light in front of the object glass,

Figure 2 a cross sectional elevation taken on line X—X of Figure 1,

Figure 3 a longitudinal sectional elevation taken on the line Y—Y of Figure 2, and

Figure 4 a cross sectional elevation taken on the line Z—Z of Figure 3 looking in the direction of the arrow in that figure.

1 is a tube similar to a telescope tube adapted to fit into the ordinary telescope ring 2 of a sextant, levelling or other similar instrument and to be clamped therein by the screw nut 3 or other suitable device, or it may be adapted to slide into what is known as the Patent "Hezzaneth" Sextant for which a Patent was granted to me bearing date the 23rd day of August 1893 No. 15917. The interior of the tube 1 is formed into a sealed liquid-tight chamber by being closed hermetically at the two ends; at the eye-piece end by means of the lens 4 and its mounting 4*, which is secured in place by the screwed ring 5 bearing against a leather or other impervious washer 6 which covers the joint between the lens mounting 4* and the inside of the tube 1; and at the object glass end by means of the object glass 7 secured in place by the screwed ring 8 and impervious washer 9. 10 is a cylindrical, or other suitably shaped case fitted into the tube 1, and adapted to carry the aforesaid oscillating balance. For this purpose the case 10 is cut away at 11, and the parts 12 are bent inwards and upwards, as shown clearly in Figure 4, and notched at the top as shown in Figure 3; these notches form the bearings or supports in which the knife edges of the balance rest. The balance consists of a strip of metal or other suitable material 13 of segmental or other convenient shape, as shown in Figures 3 and 4, hung to the notches on the top of the supports 12 by hooks or knife edges 14 formed on a ring 15 secured to the strip 13. 16 is a ring secured to one end of the strip 13, and having fixed to it a collimation wire 17. The end 18 of the case 10 is provided with an opening 19 across, or partly across which is secured a collimation wire 20. It will now be understood that the strip 13 and ring 16 are accurately balanced on the supports 12, so that when the collimation wire 17 in the ring 16 coincides with the collimation wire 20 in the opening 19, the optical axis of the telescope formed by the tube 1, the object glass 7, and the lens 4 in the eye piece stands level and pointing to the horizon. The liquid-tight chamber formed by the tube 1, lenses 7 and 4 and lens mounting 4* is preferably filled with a more or less transparent liquid, which may be more or less viscous, for the purpose of steadying the oscillations of the balance. In cases where water is not liable to be frozen

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that liquid may be employed to effect the above object. The balance may be provided with special wings or other suitable parts adapted to offer more or less resistance to the motion in the liquid; but in most cases the long and tolerably broad strip of material 13 forming the body of the balance offers sufficient resistance to steady and control its oscillatory motion. In order to provide for expansion and contraction of the liquid due to changes of temperature, a corrugated diaphragm 22 is provided at the top of a chamber 23 which communicates with the tube 1 through the holes 24 or otherwise the said diaphragm bulging outwards when the liquid expands, and inwards when the liquid contracts.

When the instrument is to be used at night the collimation wires may be rendered visible within the tube 1 by means of a lamp 25 which may be hooked on to the tube 1 so that its lens 26 stands opposite a glass window 27 in the side of the tube 1. The rays of light from the flame 28 of the lamp pass through the lens 26, and window 27 striking a bright body such as a bead 29 fixed within the tube 1, and are reflected to the eye at the orifice 30 of the eye-piece 31 so as to render the collimation wires 17 and 20 visible, which they would not otherwise be on a dark night.

Or, instead of the lamp 25 being hooked on to the tube 1 in a position to illuminate the interior of the liquid-tight chamber as above described, it may be hooked on to the tube 1 in the position shown in dotted lines in Figure 1 so as to project the rays of its light in front of the object glass 7. In the latter case the lamp should be provided with a plane glass instead of a lens 26 in order to diffuse the light instead of concentrating it, as in the former case. Whichever method be adopted the collimation wires are rendered visible by the light from the lamp.

The lamp 25 may be of any suitable construction, but I prefer to make it as shown in section in Figure 2; that is to say with an oil reservoir 32 entirely closed except where the lower wick-tube 33 passes through its top 34. The upper wick-tube 35 and winder 36 are carried in a removable wick-holder 37 provided with a downwardly projecting rim 38, which fits snugly over the rim 39 projecting upwards from the top of the reservoir 32. By these means the escape of oil in the event of the lamp being overturned or while the wick 40 is being renewed is rendered almost impossible.

It will be understood that as the visual rays have to pass through the liquid in the liquid-tight chamber, the focal lengths of the lenses constituting the telescope have to be adapted to suit the density and consequent refraction of the said liquid. The lenses 4 and 7 between which the oscillating balance is placed are preferably focussed so as to be suitable for observation of the sun.

Instead of collimation wires any other suitable indicating means may be employed.

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

First. The improved artificial horizon which consists of an oscillating balance enclosed within a sealed or liquid-tight chamber containing a more or less transparent liquid, the said balance being provided at one of its free ends with a collimation wire which comes to coincide with a collimation wire fixed in the optical axis of the instrument, when the said axis is level and pointing to the horizon, substantially as described.

Second. An artificial horizon consisting of an oscillating balance placed within the focus of two telescope lenses set to solar focus, substantially as described.

Third. In an artificial horizon the employment of a lamp so arranged and adapted as to illuminate and render visible the collimation wires or other indicating means substantially as described.

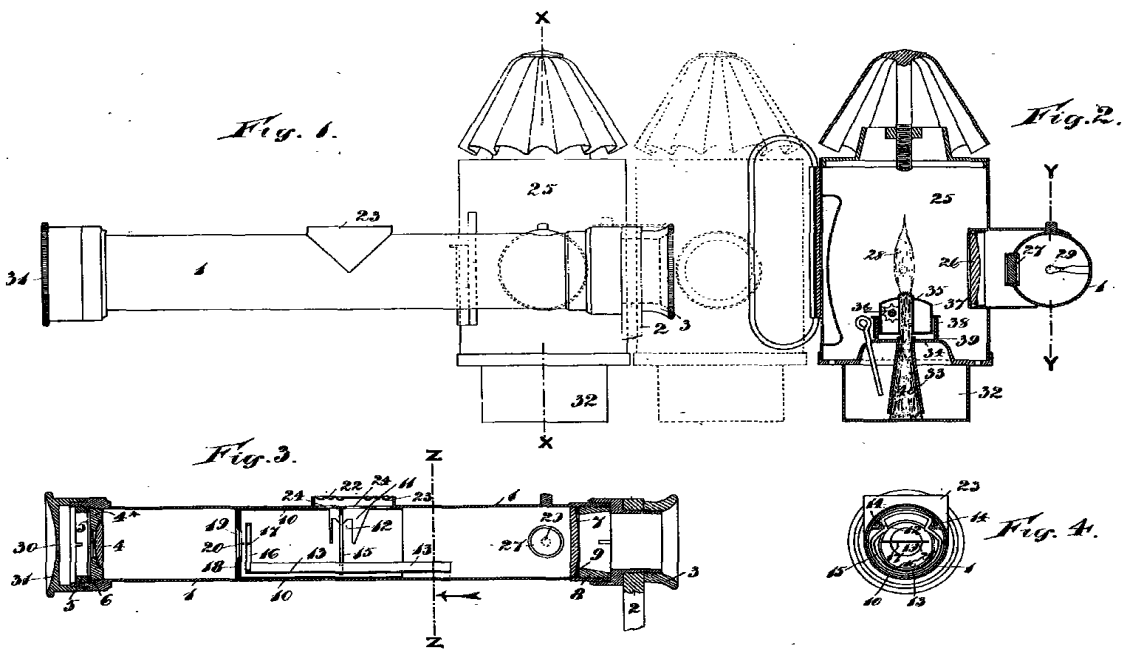
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Fourth. The lamp for use in connection with an artificial horizon, constructed substantially as described.

Dated this 24th day of December 1896.

G. W. HEATH,
Per W. H. Beck,
115 Cannon Street, London, E.C., Agent.

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This drawing is a reproduction of the Original on a reduced scale.

Fig. 1.

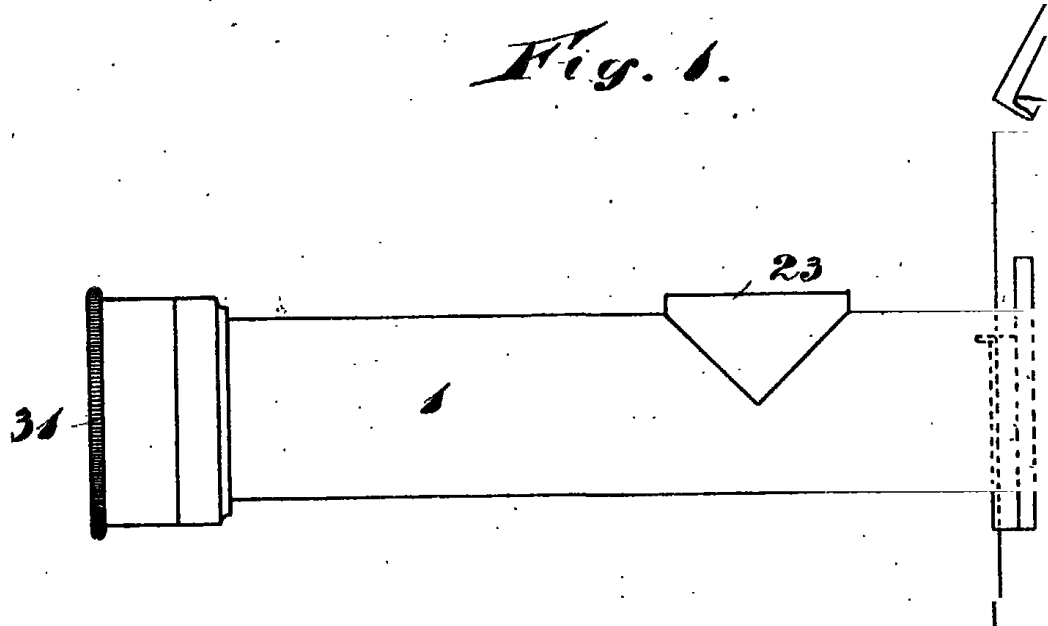
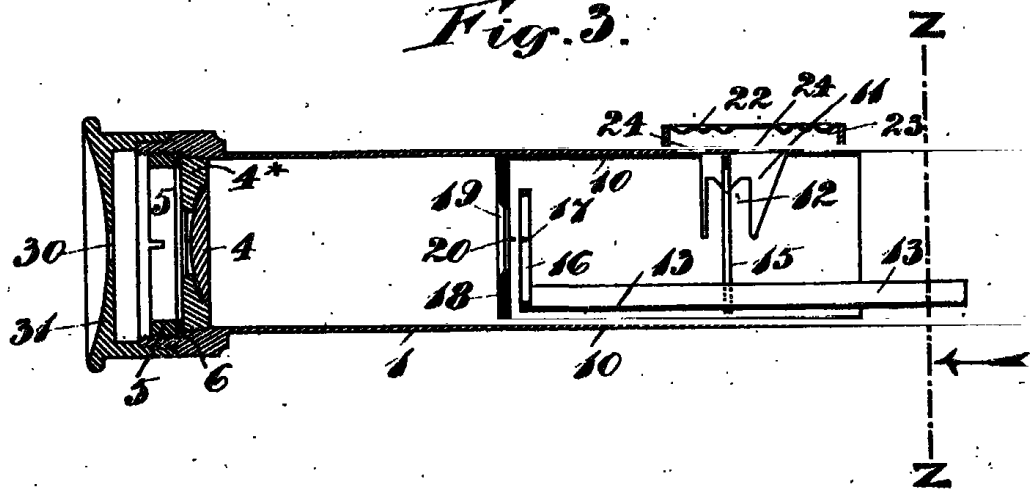


Fig. 3.



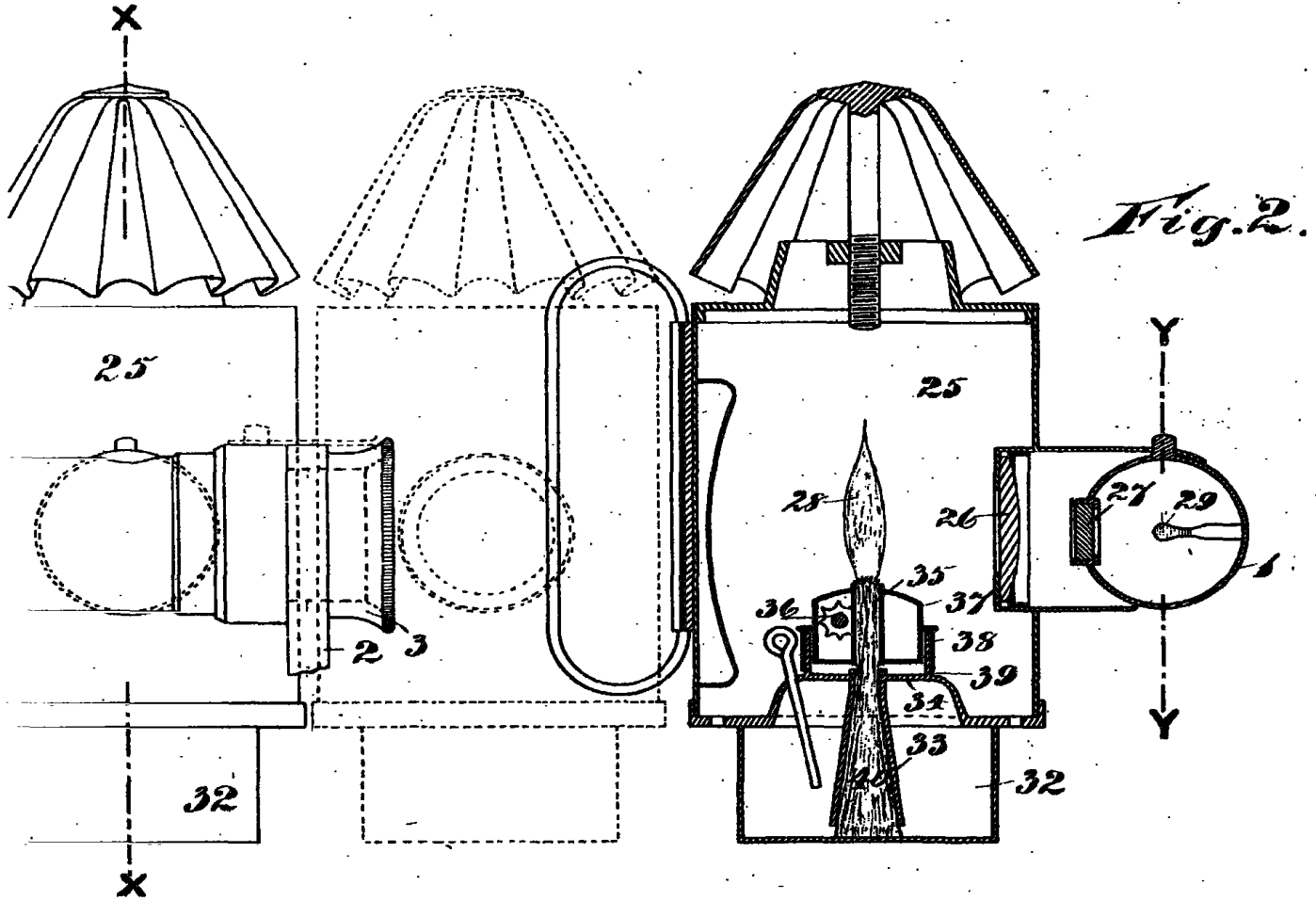


Fig. 2.

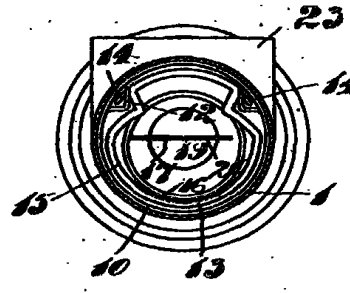
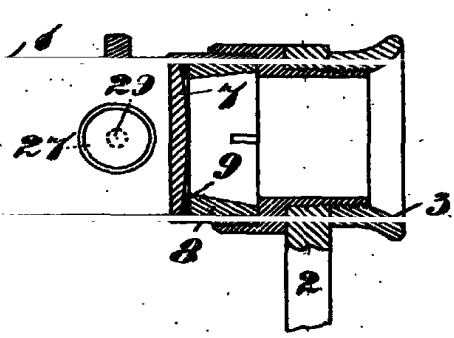


Fig. 4.