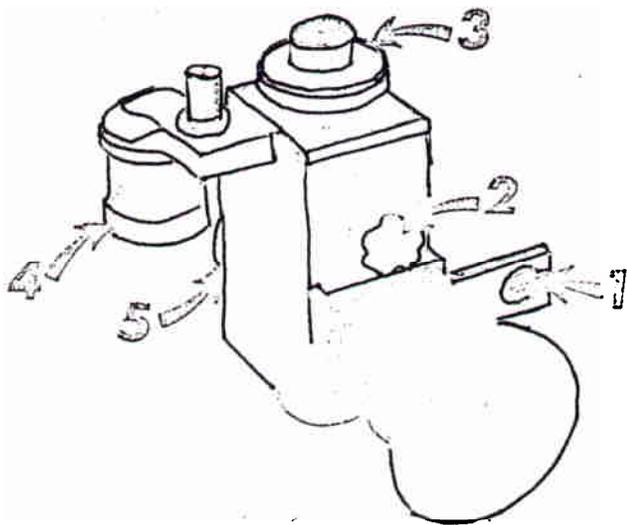


INSTRUCTIONS FOR USE OF BUBBLE ATTACHMENT

PLATH SEXTANT



1. Remove telescope from sextant and mount the bubble attachment. The mounting bracket (1) on the telescope and on the bubble attachment are identical, and fit the telescope holder on the sextant frame.

2. Plug the light wire into either light socket on the sextant handle. The bubble in the attachment cannot be seen without the light being turned on by pressing the light switch on the sextant handle. This prevents the light from accidentally being left on. A rheostat (2) on the bubble attachment adjusts the light intensity. If the light does not work clean the plug on the end of the wire and the unpainted area on the mounting bracket where the thumb screw on the telescope holder makes contact. The

light must be grounded to the sextant frame at this point in order to operate. The light bulb is located in the cap (3) which can be unscrewed for changing the bulb. Standard penlight batteries are used in the sextant handle.

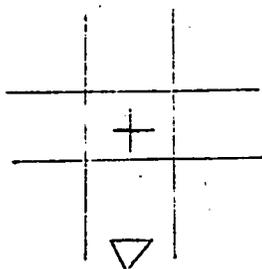
3. Hold the sextant in the normal vertical observing position and adjust bubble size. The knurled adjusting knob (4) is used to insert and remove the bubble in the field of view and to adjust its size. Turn the knob to the right to increase bubble size, and to the left to decrease. The bubble mechanism is delicate, and adjustments should be made slowly, never with a fast twist on the knob. For adjusting the bubble it must always be located in the triangle on the graticule in the field of view. This is accomplished by raising the front of the sextant. As will be noted on the attached leaflet there is a pressure compensating vessel containing air. Occasionally, especially if the bubble attachment has been stored with a large bubble in it, too much air will be in the bubble chamber causing the bubble to be excessively large. In this case the bubble will not always completely disappear when the adjusting knob is turned all the way out counter clockwise. In this case, it may be necessary to slowly turn the adjusting knob all the way in, as when enlarging the bubble, then back it off again. Repeating this procedure several times will reduce the bubble to proper working size.

4. The sextant is operated exactly as when using the natural horizon except that the bubble rather than the horizon is visible and the celestial body is placed in the center of the bubble rather than tangent to the horizon. Many observers prefer to use an elongating lens (astigmatizer) mounted on the index sunshade holder when making star observations as this elongates the star image from a point source of light into

a thin line. It is easier to judge when a line passes through the center of the bubble than when the point source of light star image is in the center.

5. The field of view through the bubble attachment is less than that of the standard 4 x 40 or 6 x 30 scopes on the Plath sextant. Most observers prefer to pre-compute the approximate star altitudes by using a star finder or sight reduction tables. This approximate altitude is set on the sextant readout and the star located in the field of view by searching at the approximate azimuth of the star.

6. When observing the celestial body the bubble should be approximately in the center of the field of view. The graticule has a cross in the center to assist in this centering. In the field of view illustrated at the left this cross will be located above the triangle described above. If the bubble is vertically above or below the center of the field of view no appreciable error is introduced. The bubble located to either side of the cross will introduce a tilt error. This is the same as a tilt error which is avoided in regular sextant observations by rocking the sextant.



7. A small bubble should be used when making star observations as it is easier to estimate the center of a small bubble in the field of view. For observations of the sun or moon many observers prefer to use a bubble approximately the same size as the image of the body and superimpose one on the other.

8. The bubble attachment can be used as a regular three-power telescope using the natural horizon by removing the dark shade (5) which is snapped over the objective lens. When used as a regular telescope the light in the bubble attachment is not required.

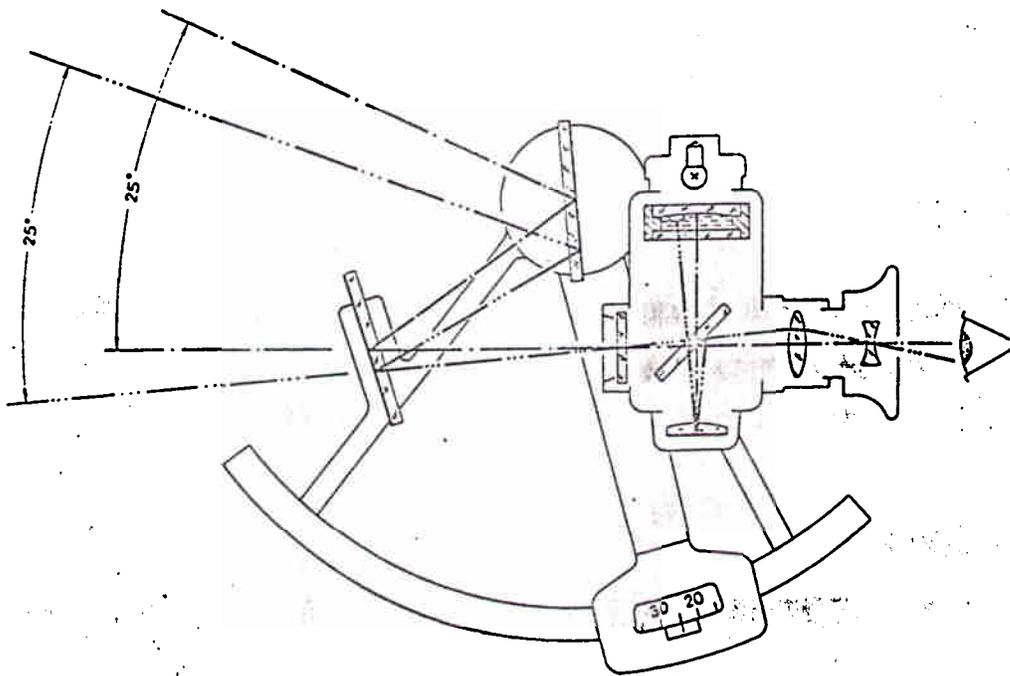
9. An adjusting screw is located on the bottom of the bubble attachment. The regular sextant adjusting key is used if adjustments are necessary. This adjusts the reflecting glass within the bubble attachment in the same manner as removing index error by adjusting the horizon mirror on the sextant. It should not be moved unless a large error is present. The attachment is factory adjusted when supplied on a sextant. If the attachment is purchased separately it may have to be adjusted to the sextant on which it is used. Alignment of the bubble attachment to the sextant can be checked using the natural horizon if the height of eye is known. To accomplish this the index arm is moved to near zero and an actual sight of the horizon is taken, placing the straight line of the horizon through the bubble. The reading on the sextant should then equal the dip of the horizon at that height of eye taken from tables. Any difference between the computed dip and that read on the sextant can be used as a correction.

10. Sights obtained with the bubble attachment are reduced in the same manner as observations except that dip correction is not applied, and semidiameter correction for the sun and moon is not applied. Do not expect as much accuracy with a bubble horizon as with the natural horizon as the roll and pitch of the vessel creates accelerations on the bubble. It is best to average or graph several sights, at least six, taken in rapid succession on each body. The greater number of observations that are averaged the better. This eliminates the large random error

of a single observation of a body.

11. The bubble attachment should be stored with the adjusting knob in a neutral position, not screwed all the way in or out.

12. The Plath bubble is designed for marine use and although it does not produce the accuracy obtainable with a clear natural horizon, it does permit the taking of observations at night or when the horizon is obscured by fog or haze, and the celestial body is visible. As in the case of any observing instrument accuracy will increase with practice and familiarization with the instrument.

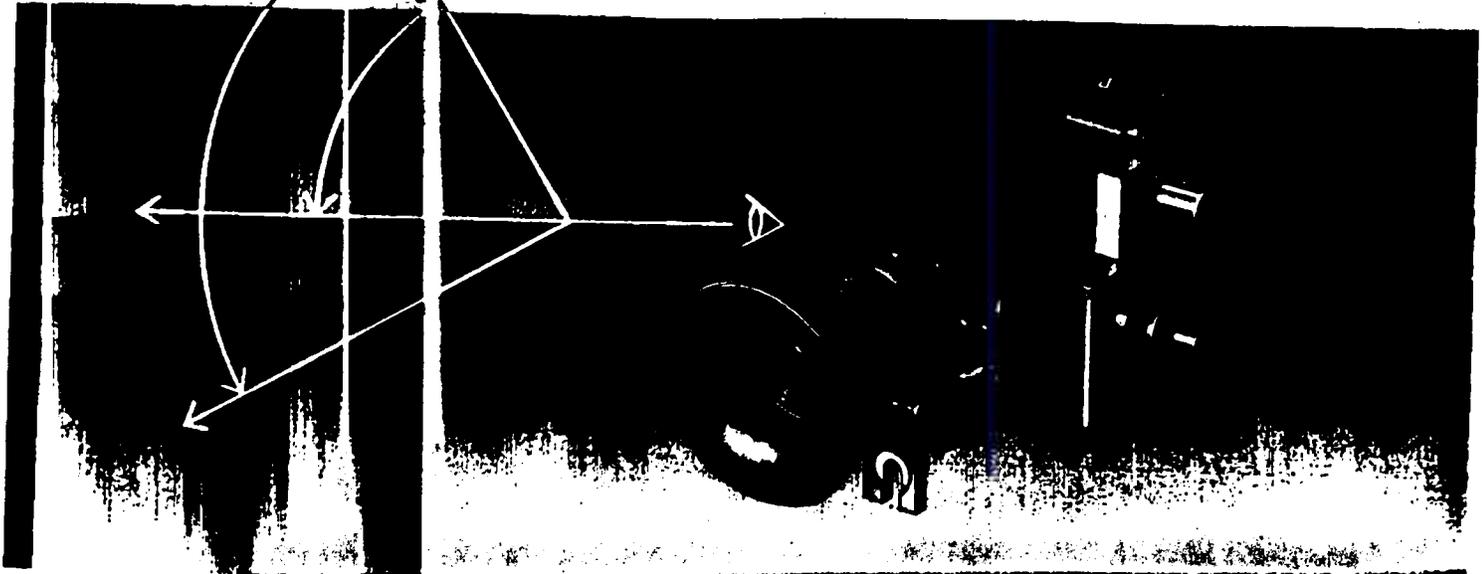


Bubble attachment; principle of operation

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PLATH

LIBELLENAUFSATZ BUBBLE ATTACHMENT



Der normale **Trommelsextant** ertührt durch den **PLATH-Libellenaufsatz** eine wertvolle Ergänzung. Mit Hilfe dieses Zusatzgeräts, das nach Abnehmen des Sextantfernrohrs an dessen Halterung befestigt wird, kann man Gestirns-
höhen auch dann messen, wenn die Kimm bei diesigem Wetter oder bei Nacht unsichtbar ist.

Der Libellenaufsatz enthält eine 3fach vergrößernde Fernrohroptik, die Kammerlibelle mit Strichplatte, eine unter 45° zum Strahlengang des Fernrohrs stehende planparallele Glasplatte, ein reflektierendes optisches System, ein Beleuchtungslämpchen mit Verdunklungswiderstand, dessen Batterie und Einschaltknopf im Sextantgriff eingebaut sind.

Hält man den Sextanten in der üblichen Stellung mit waagerechter Fernrohrachse, so erblickt man im Fernrohr bei eingeschaltetem Lämpchen die Strichplatte mit der Libellenblase; durch Drehen der Alhidade bringt man das Gestirnsbild mit der gleichzeitig scharf gesehenen Libellenblase in Deckung, und zwar im mittleren Quadrat der Strichplatte. Die Größe der Blase ist regelbar; damit kann man sie der Größe des Gestirnsbildes anpassen und den Einfluß von Temperaturänderungen ausgleichen. Bei Fixsternen und Planeten wählt man die Blase möglichst klein, bei Sonne und Mond entsprechend größer. Zum Verändern der Libellenblase bringt man sie in das mit einem Dreieck bezeichnete Feld der Strichplatte und regelt ihre Größe durch sehr geringes, langsames und vorsichtiges Verstellen der gerändelten Libellenschraube. (1)

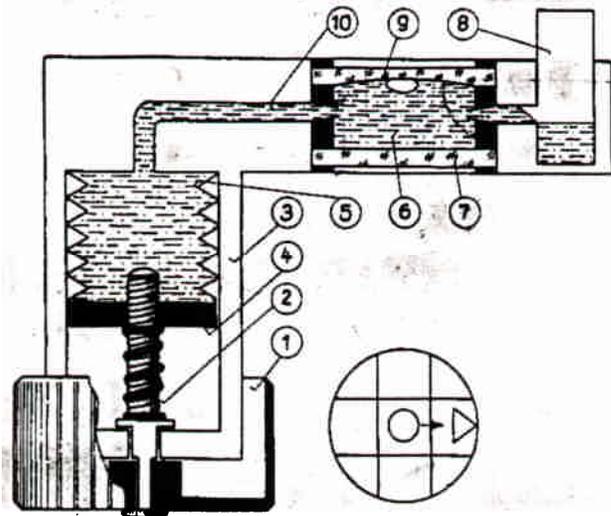
Bei der Auswertung der abgelesenen Gestirns Höhen ist die Gesamtberichtigung für die Augeshöhe Null anzubringen und bei Sonne und Mond der Halbmesser wegzulassen. Messungen von Gestirns Höhen mit dem Libellenaufsatz sind unabhängig vom Standpunkt des Beobachters.

The standard type sextant can be supplemented by a special bubble attachment which takes the place of the telescope, and creates an artificial horizon, thus allowing sights of celestial bodies when the natural horizon is obscured, due to mist or fog, or at night.

The bubble attachment is fitted with a 3 power telescope, and consists of the bubble device with graticule, a glass plate fitted at an angle of 45° to the path of rays of the telescope, an optical system for reflection, a lamp with rheostat, for which a push button and battery are provided in the handle.

By keeping the instrument horizontal, the small bubble appears in the graticule and becomes visible if the lamp is switched on. By means of turning the alidade arm, the celestial body becomes visible in the telescope. When celestial body and bubble coincide in the centre square of the graticule, the observation angle can be read off the arc and micrometer drum. The size of the bubble is adjustable, thus enabling the observer to vary the bubble according to the star, or Sun, and to compensate the effect of temperature changes. In case of fixed stars or planets, it is advisable to have the bubble very small. For observations of Sun or Moon, the bubble should be larger. Adjustments of the bubble are achieved by putting the bubble into the triangle of the graticule, and by turning the milled knob of the screw (1).

Die Kammerlibelle mit regelbarer Blase besteht in der Hauptsache aus der eigentlichen Libellenkammer (6), dem Libellenregler (3) und dem Ausgleichsbehälter (8). Die Libelle ist mit einer Spezial-Flüssigkeit gefüllt, welche innerhalb des in der Praxis vorkommenden Temperaturbereichs weder gefriert, noch verdampft (siedet). Um die Größe der Blase regulieren zu können, ist die Libellenkammer durch ein feines Rohr (10) mit dem Libellenregler verbunden. Durch Drehen der Libellenschraube (1) wird der Kolben (4) bewegt, der die Flüssigkeit entweder durch das Verbindungsrohr (10) aus dem Federkörper (5) in die Libellenkammer (6) und weiter in das Ausgleichsgefäß (8) drückt oder aus der Kammer in den Federkörper zurücksaugt. Der Libellenaufsatz ist dabei so zu kanten, daß die Libellenblase vor die Öffnung des Verbindungsrohrs zum Ausgleichsbehälter kommt. Diese Stellung ist erreicht, wenn die Libellenblase im Dreieck der Strichplatte liegt. Nur in dieser Stellung ist die Größe der Blase durch kleinste Verstellung der Libellenschraube zu verändern. Die Haarröhrchen, durch welche die Luft aus dem Ausgleichsgefäß in die Libelle eintritt, sind sehr fein; daher entsteht durch hastiges Drehen der Libellenschraube leicht ein sehr hoher Druck in den engen Röhrchen, welcher für die Lebensdauer des Geräts schädlich ist.



Der Indexfehler des Sextanten mit Libellenaufsatz kann am einfachsten dadurch bestimmt werden, daß man von einem Standort mit bekannter Augeshöhe mit Hilfe der Mikrometerschraube des Sextanten die Kimm durch die Mitte der Libellenblase, die sich im Mittelquadrat der Strichplatte befinden soll, hindurchgehen läßt. An der Ablesetrommel soll dann der Wert der Kimmtiefe für die betreffende Augeshöhe abgelesen werden. Ist dies nicht der Fall, so hat der Sextant einen Libellen-Indexfehler, der gleich ist der Ablesung minus der Kimmtiefe für die Augeshöhe des Beobachters.

To evaluate the observation readings of celestial bodies with the standard instrument, or with a bubble attachment, the following corrections are applicable: —

Standard Sextant		Sextant with Bubble Attachment	
Sun or Moon	Star or planet	Sun or Moon	Star or planet
Index error	Index error	Index error	Index error
Dip	Dip	—	—
Refraction	Refraction	Refraction	Refraction
Parallax	—	Parallax	—
Semi diameter	—	—	—

The main element of the bubble attachment consists of the bubble chamber (6), the bubble regulator (3) with the pressure compensation vessel (8). The bubble is filled with a special liquid which neither vaporises nor coagulates within the usual ranges of temperature. In order to compensate the effect of temperature changes, the chamber is connected with the bubble regulator by a fine tube (10). By turning the milled knob of the screw (1), a piston (4) is moved so that the liquid is pressed from either the elastic body (5), through the joining tube (10) into the chamber (6), and further into pressure compensation vessel (8), or sucked out of the chamber back into the elastic body. The bubble attachment is to be inclined so that bubble appears before the fine tube (10). This

is the case, if the bubble lies in the triangle of the graticule. Only in this position it is possible to reduce, or enlarge, the size of the bubble by means of slight turns of the milled knob on the screw (1).

The capillary vessels, through which air passes from the dome into the bubble, are very fine. By hasty operation of the screw, there might easily originate, in the capillary vessels, a very high pressure which would diminish the life of the bubble device. The index error of the sextant, with bubble attachment, can very easily be determined at a place with known "height of eye". If the horizon coincides with the centre line of the bubble, the angle of dip may be read off. (N.B.: — The bubble is always to be in the centre square of the graticule.) If the specific angle of dip for the known "height of eye" differs, the instrument has an index error, equal to the reading angle minus the angle of the "height of eye" established in tables.

