

The SEXTANT



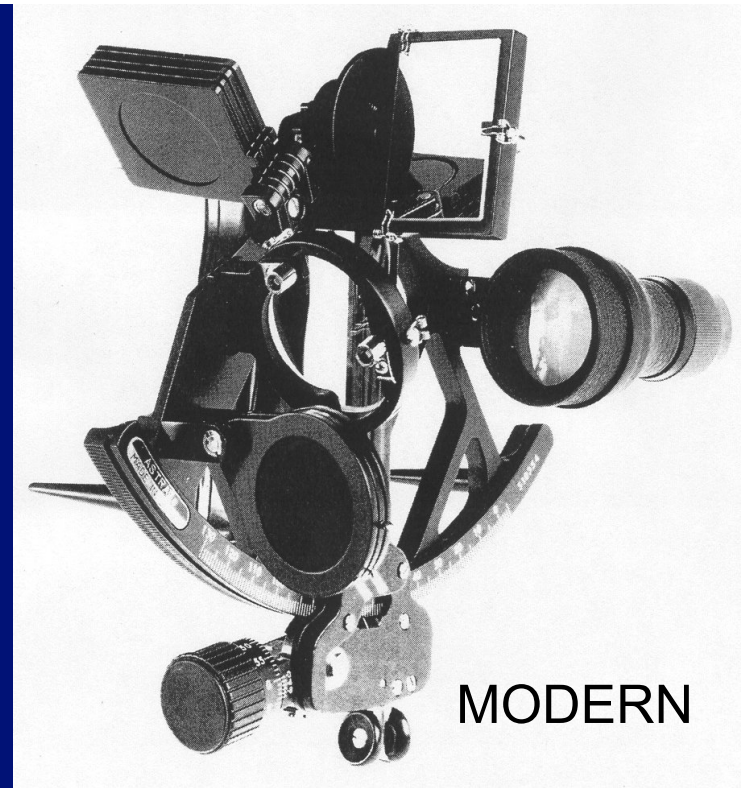
The Sextant is the Primary Celestial TOOL

We will explore

- Its component parts
- How they work together
- How it is adjusted
- How it is used

The SEXTANT

- Measuring Instrument
- Measures Angles with great accuracy
- Precision Instrument
- MUST be handled with CARE
- Arc Length $\frac{1}{6}$ of a Circle, hence it's name.

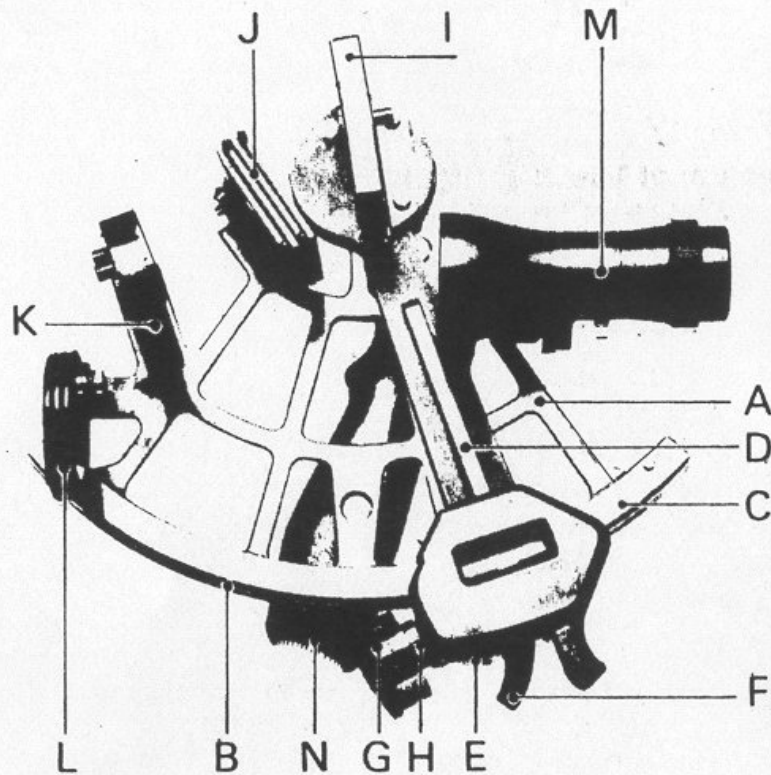


OPERATION

- Held in Right Hand
- Measures ANGLE between a Heavenly Body and the Visible Horizon
- Double-Reflection principle



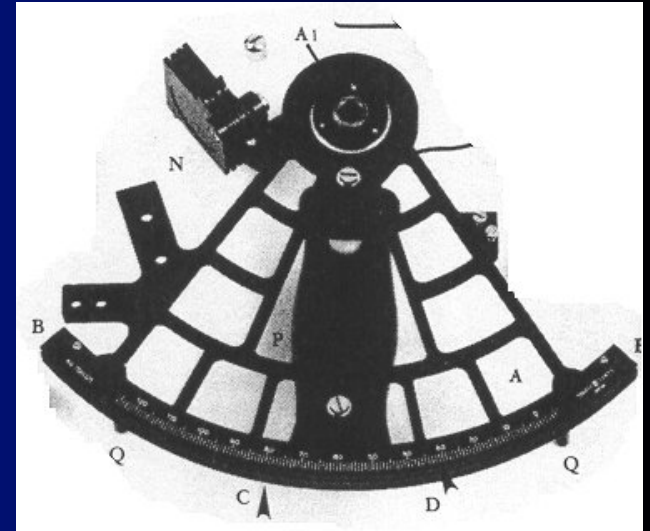
Sextant Parts



- A Frame
- B Limb
- C Arc
- D Index Arm
- E Tangent Screw
- F Release
- G Micrometer Drum
- H Vernier
- I Index Mirror
- J Shade Glasses for Index Mirror
- K Horizon Glass/Mirror
- L Shade Glasses for Horizon Mirror
- M Telescope
- N Handle

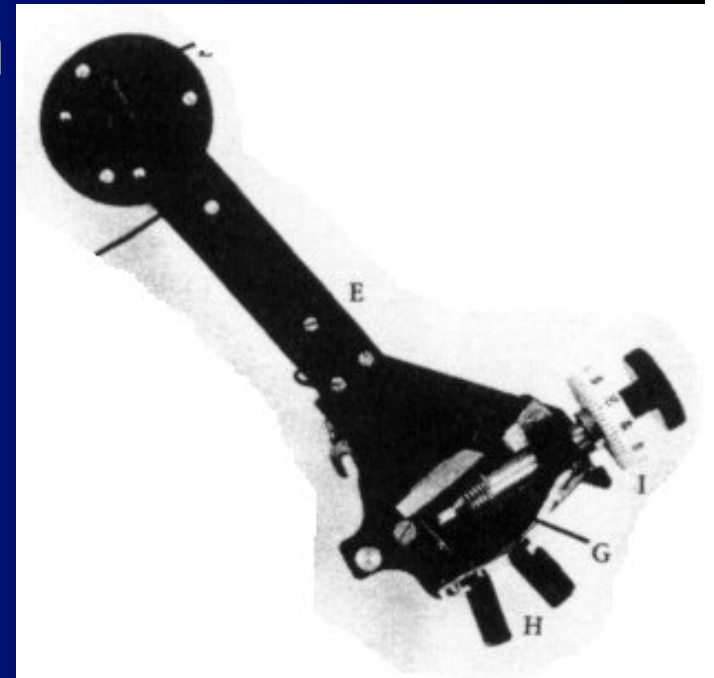
FRAME

- Structural member
- Material
 - Metals - Brass, Aluminum
 - Plastic
- Limb - ARC
- screw teeth
- Printed Degree Graduations



Index Arm

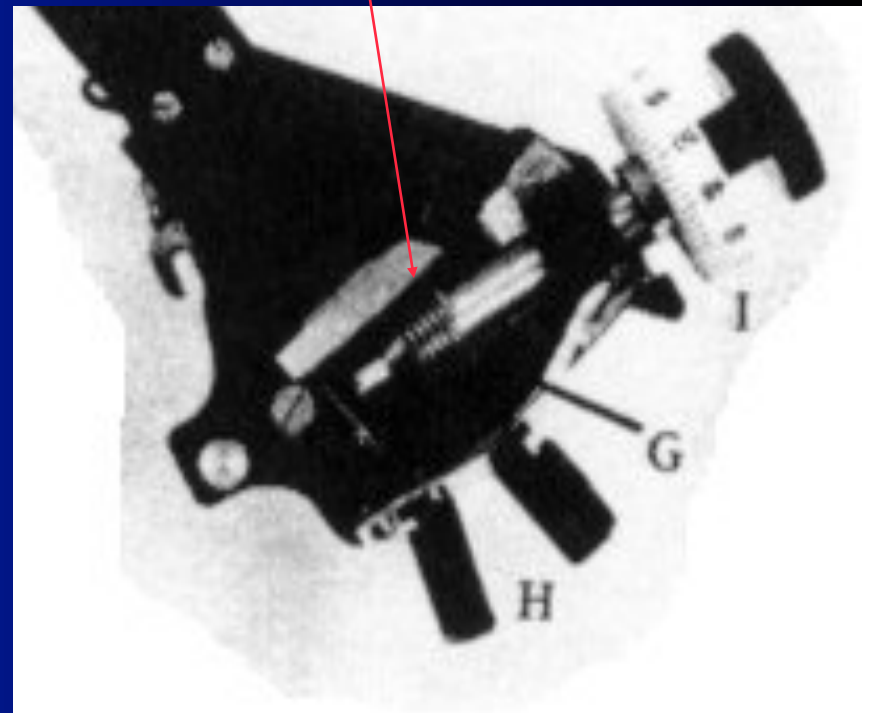
- Attaches to and Pivots on the frame
- Same Material as frame
- Window
- Vernier scale
 - 0.1' or 0.2' increments



Micrometer Drum

- Cylindrical
- Screw teeth
- Pivot – release levers
- One rev = 1° of Arc
- Graduated in Minutes of Arc

Screw Teeth

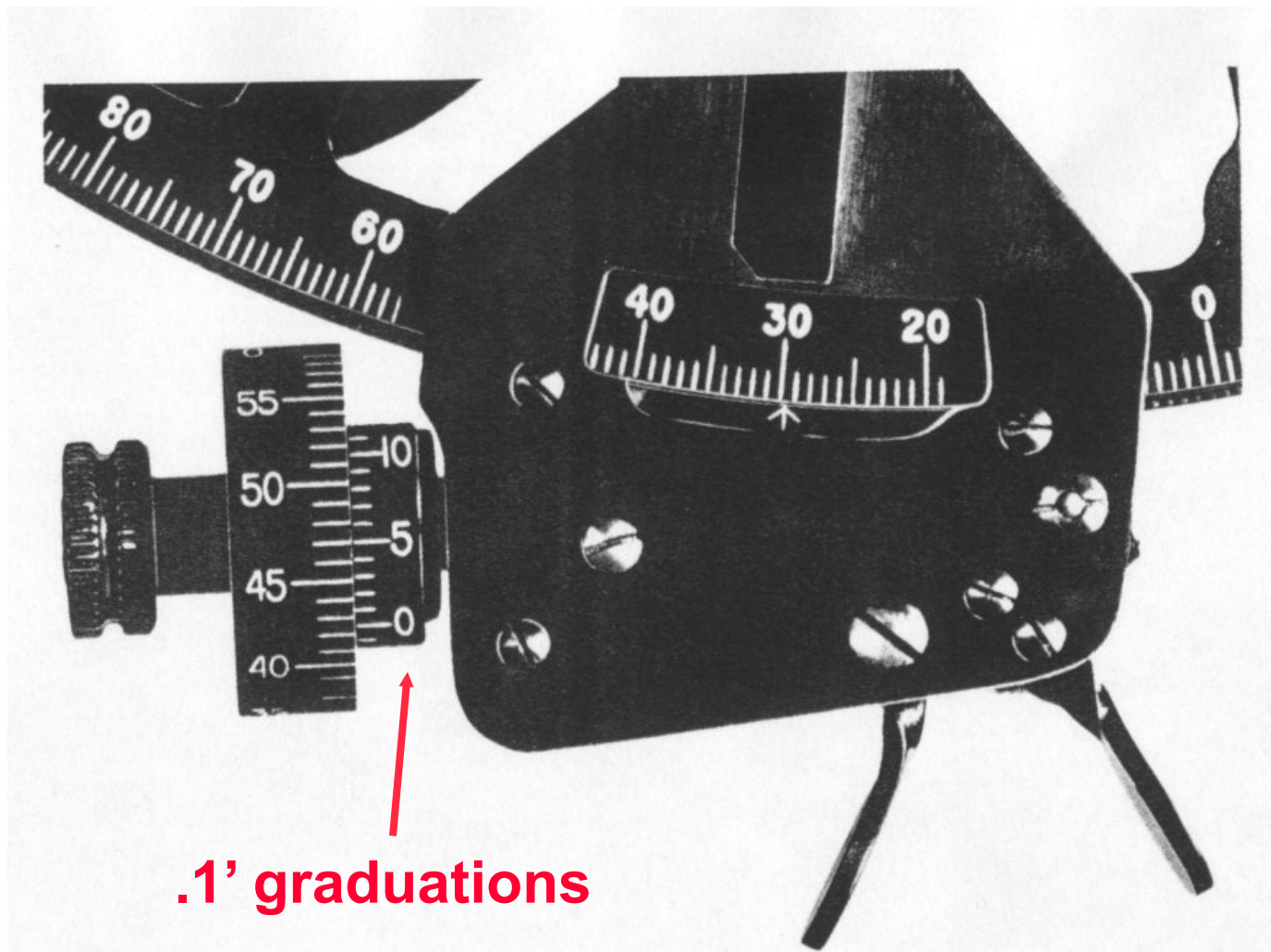


Lower Index Arm and Micrometer Drum



0.2' graduations
Reading 0° 00.0'

Lower Index Arm and Micrometer Drum



.1' graduations

Reading 29 ° 42.5'

MIRRORS

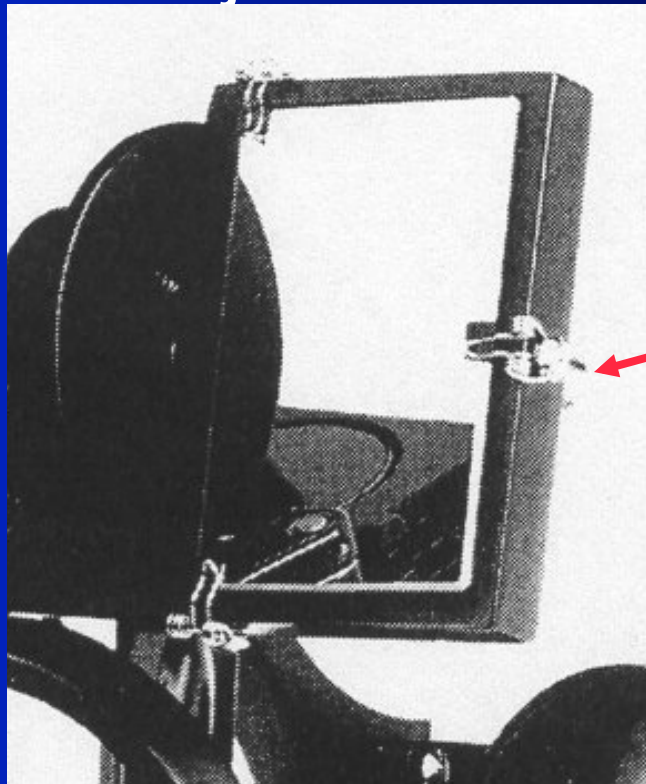
- Basic operational members
- Performs a Double-Reflection of the Viewed Image
- 2 Types
 - Index Mirror
 - Horizon Mirror

Traditional

Whole Horizon

INDEX MIRROR

- mounted perpendicular to Index Arm
- parallel to the Axis
- Has 1 Adjustment Screw

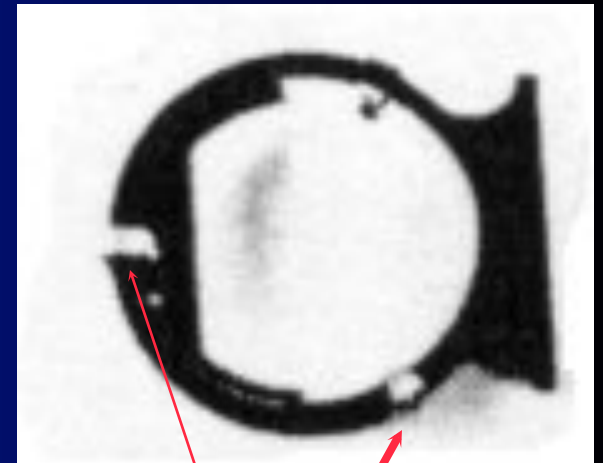


Adjusting Screw

HORIZON MIRROR

- perpendicular to the Frame
- parallel at 0°
- 2 adjustment screws
- 2 configurations

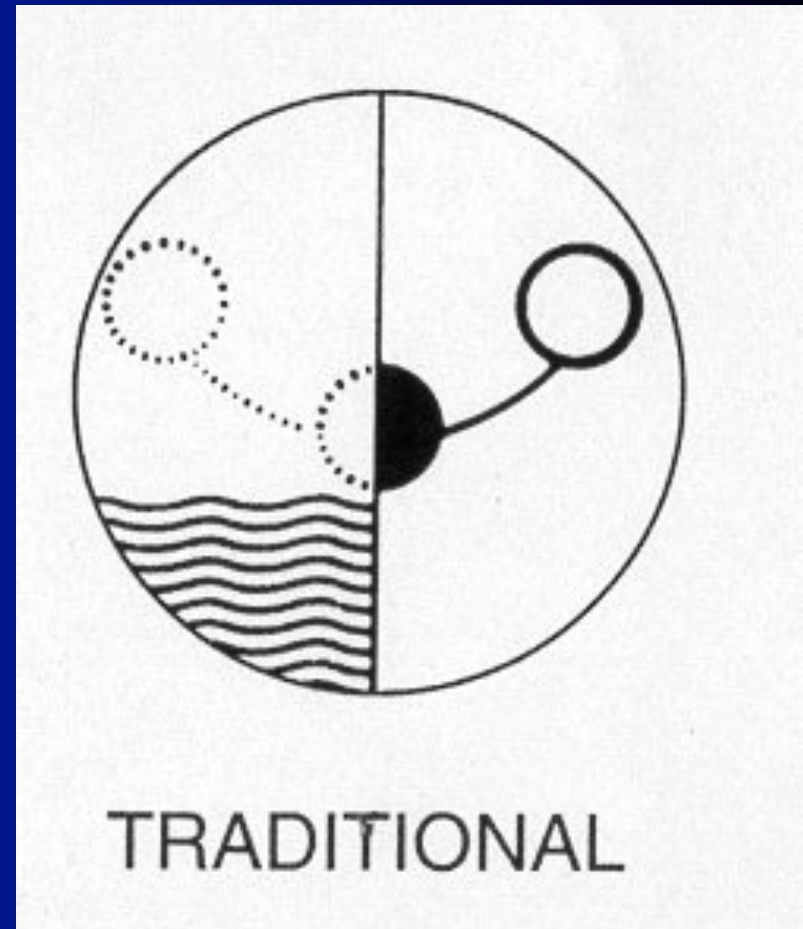
Whole Horizon Mirror



screws

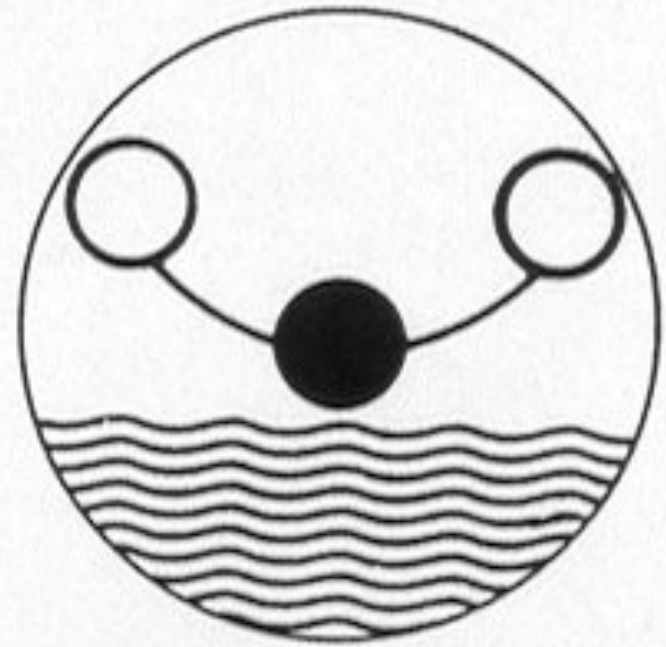
TRADITIONAL HORIZON MIRROR

- A Split configuration -
Half of Mirror is Clear
Half of Mirror is
'silvered'
- Clear view horizon
- Silvered - reflected
image.



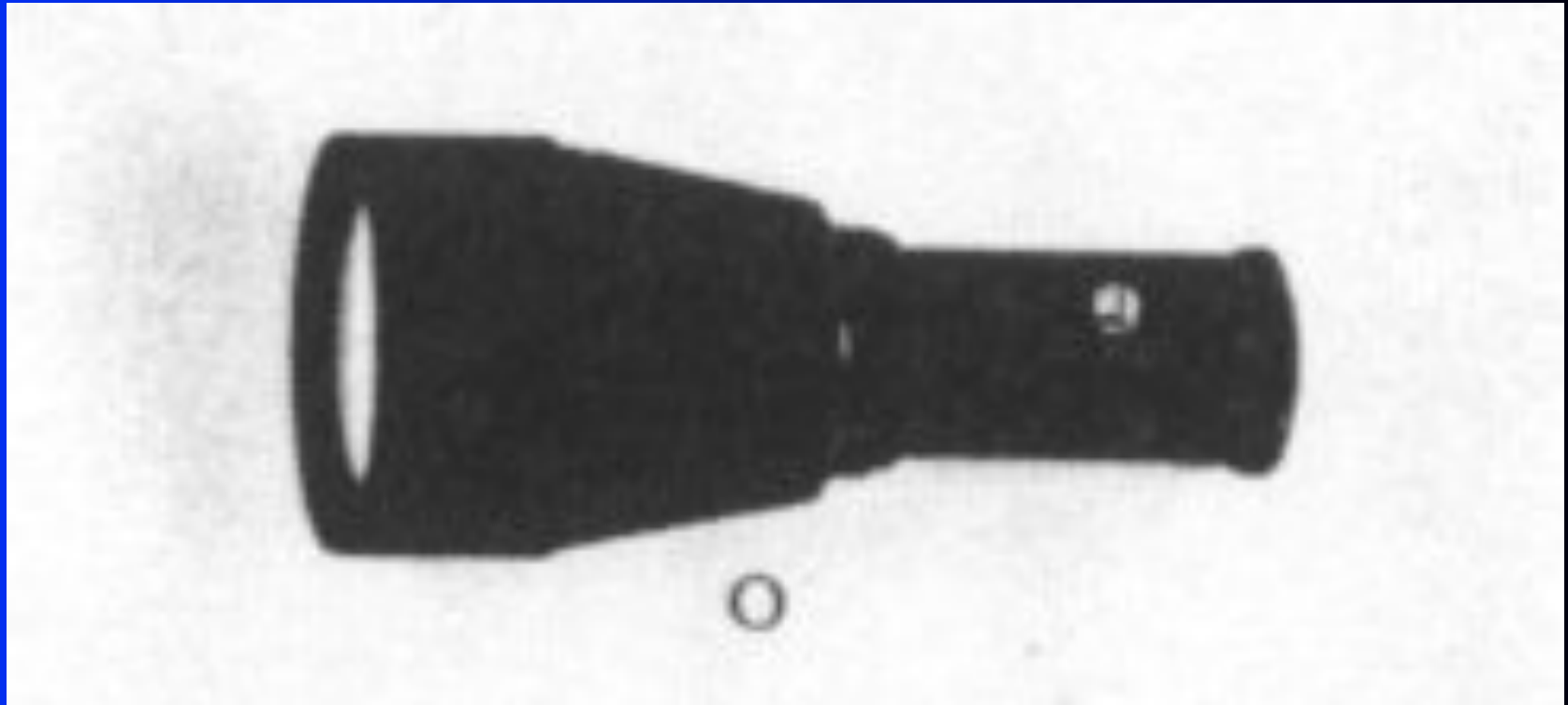
WHOLE HORIZON MIRROR

- one-way mirror
- Entire horizon is visible
- The Heavenly Body Image is reflected in the mirror



WHOLE HORIZON

TELESCOPE or Sight Glass



MAGNIFIES OBJECTS –usually 4x30 can be 6x40

HANDLE

- Mounted on back side of the frame
- lighting system batteries

SHADES

- protect Eyes from SUN
- Mounted on frame
- Can be configured as multiple colored lenses
- Can be Polarized glass
- 2 sets included



MECHANICAL ADJUSTMENTS

- There are 3 Adjustments that can and should be checked and done if necessary
- Plastic Sextants require frequent adjustment.
- Once a metal sextant is adjusted, it should remain in adjustment
- ALL Adjustments should be checked frequently

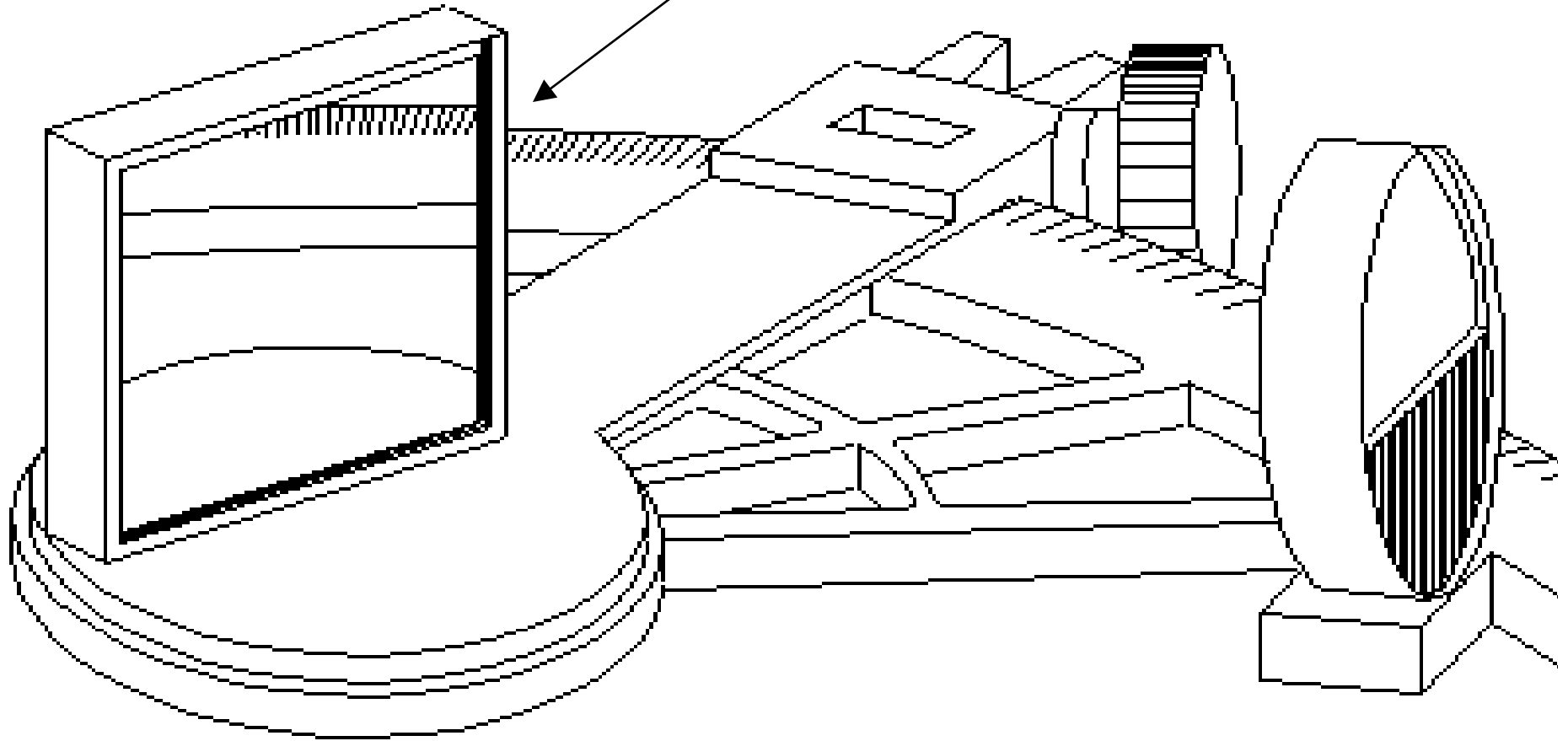
3 Types of Adjustments

- Index Mirror Perpendicularity
- Horizon Mirror Side Error
- Index Error

Index Mirror Perpendicularity

- Adjustment made on Index Mirror
- Adjust with Screw on Mirror Frame
- Set Sextant at 45°
- Hold Sextant at eye level, looking from the Index Arm Pivot end
- Is image of limb as seen in the Index Mirror in line with the actual limb that you see in front of you?
- If not turn screw until the images are lined up

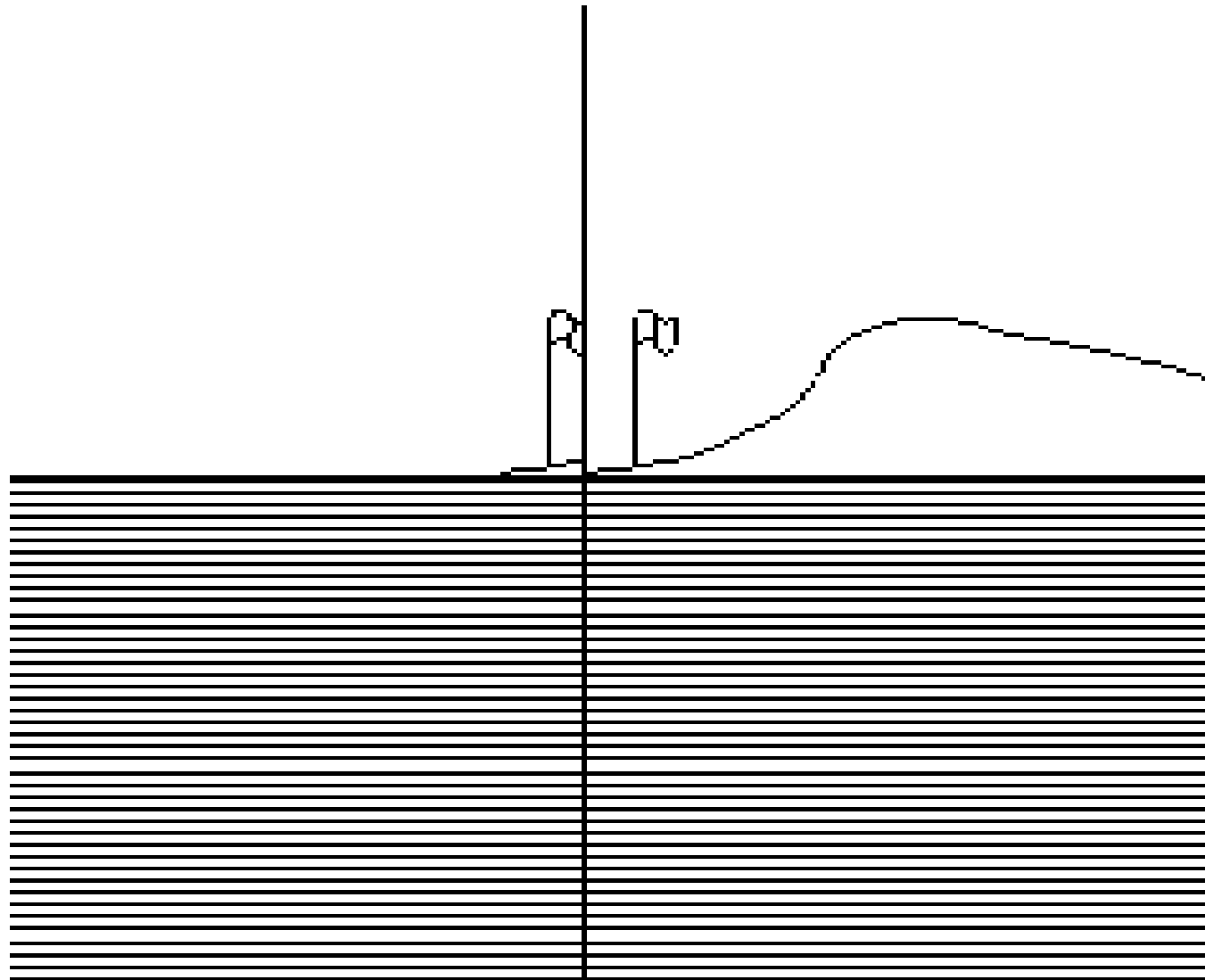
NOT LINED UP



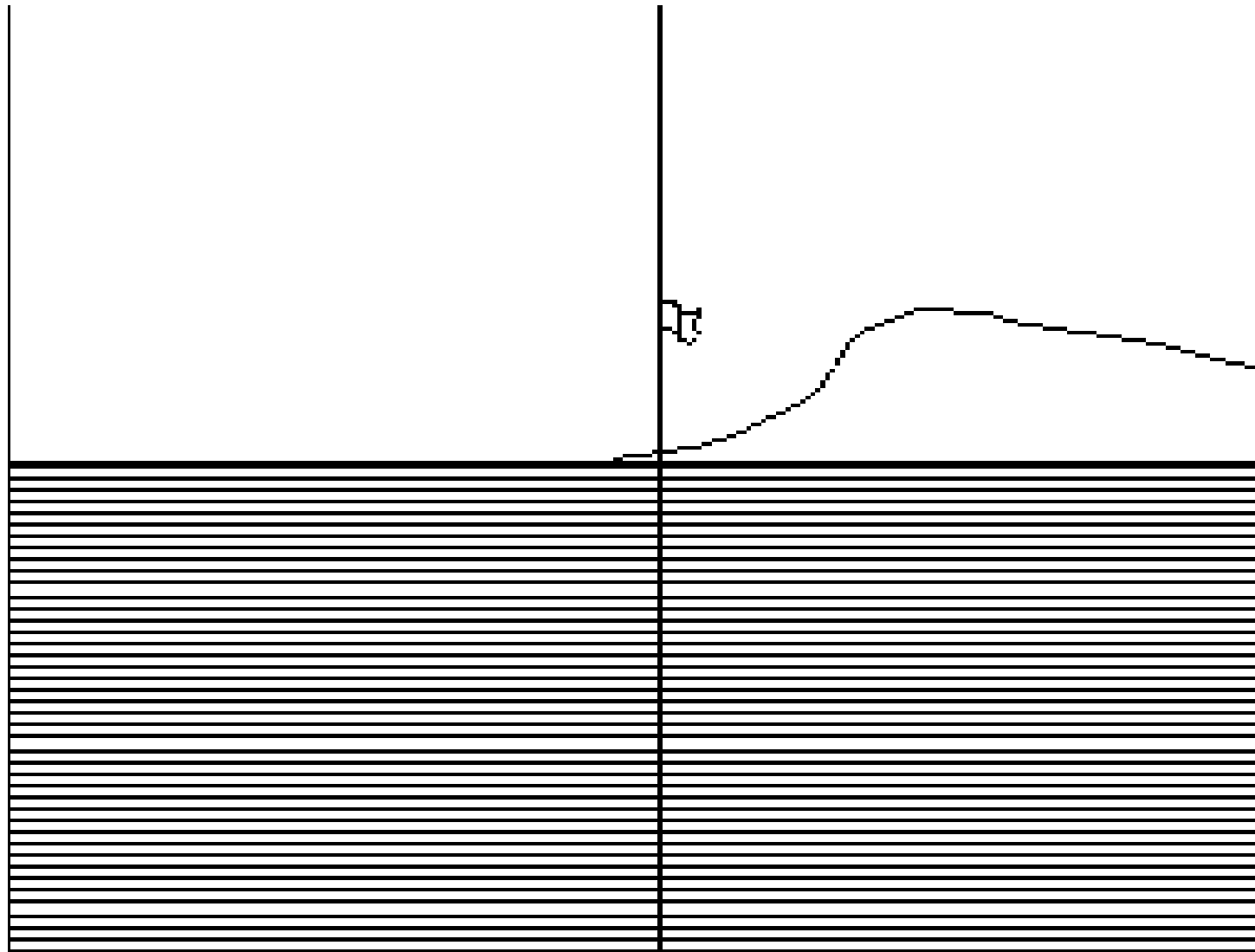
INDEX MIRROR PERPENDICULARITY CHECK
MIRROR IS NOT PERPENDICULAR
IT IS LEANING FORWARD

Horizon Mirror Side Error

- Adjustment made on Horizon Mirror
- Adjust with Screw closest to Frame
- Set Sextant at $0^{\circ} 00.0'$
- Look at a vertical line
- Should see a single image
- If 2 images are showing side by side, turn screw until images are aligned



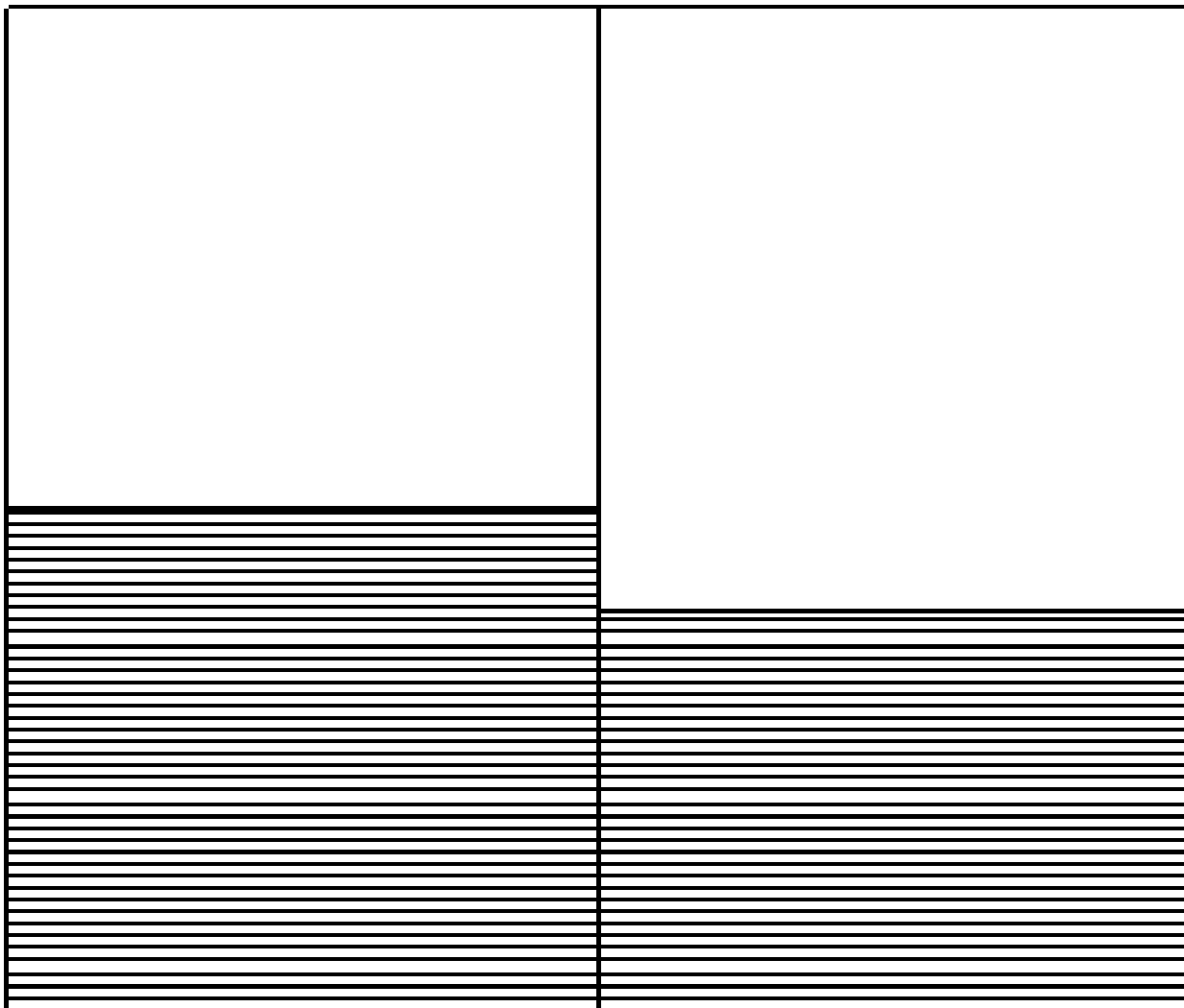
HORIZON MIRROR
PERPENDICULARITY ERROR



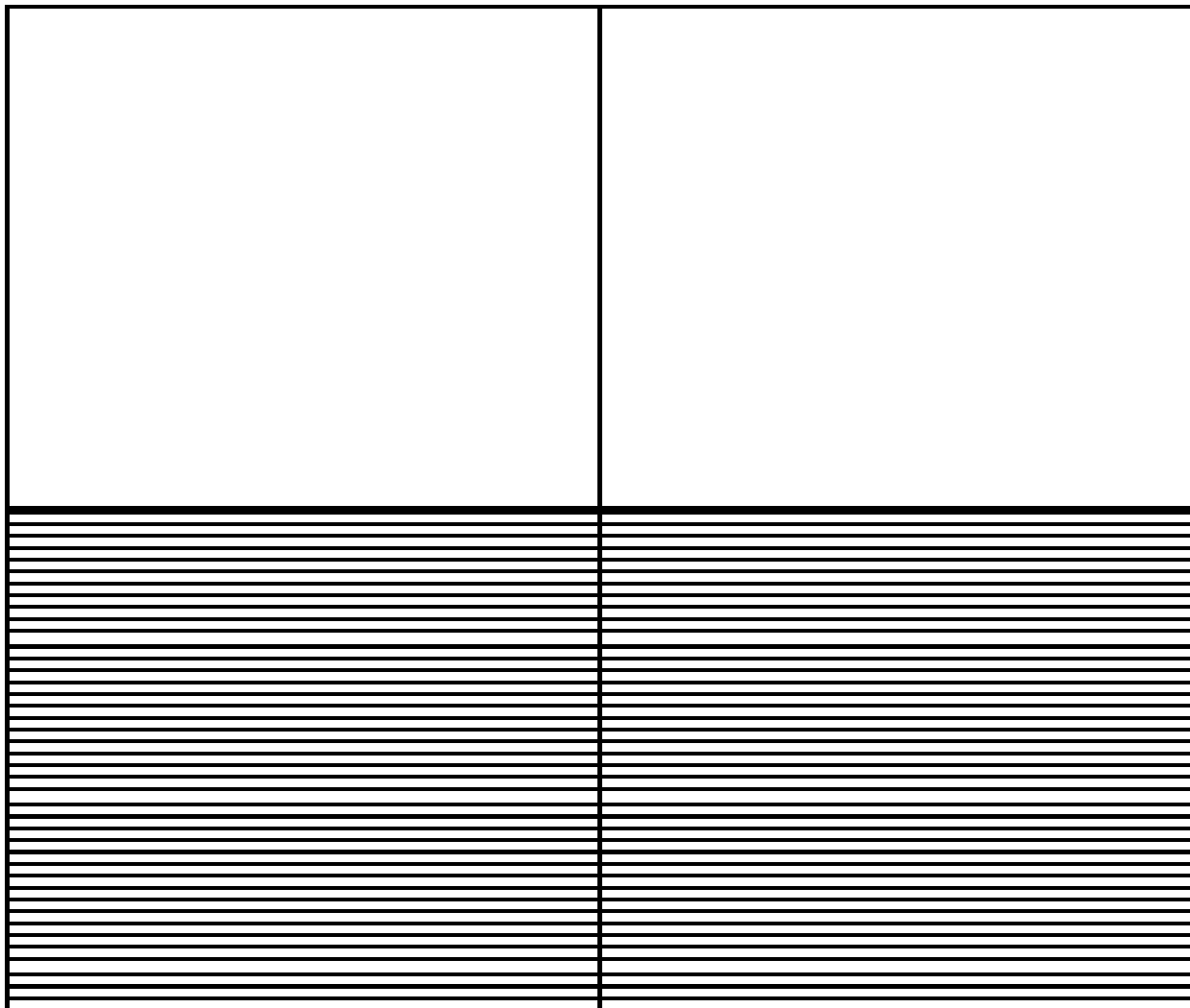
HORIZON MIRROR
NO PERPENDICULARITY ERROR

Index Error

- Adjustment made on Horizon Mirror
- Adjust with Screw furthest from Frame
- Set Sextant at $0^{\circ} 00.0'$
- Look at Horizon through telescope
- Should see single image of horizon
- If 2 horizons are visible, one above the other – turn screw until 1 image is visible



SEXTANT SET AT 0°
INDEX ERROR SHOWING



SEXTANT SET AT 0°
NO INDEX ERROR

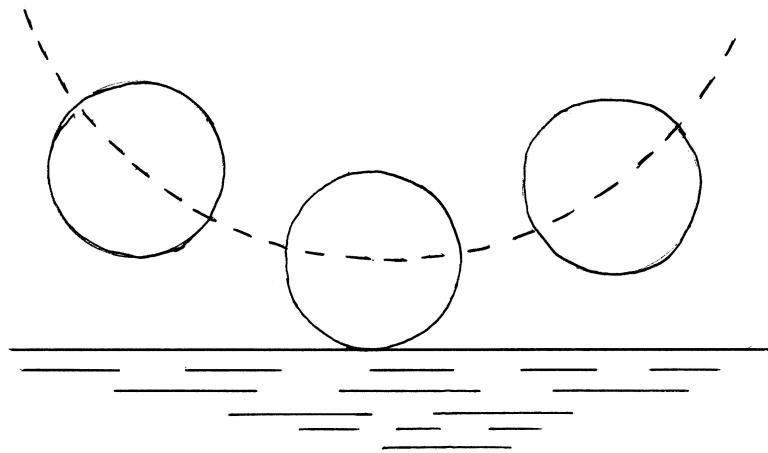
OPERATIONAL USE - 1

- Check Index Error before each use and note any Error
- When sighting SUN use ALL shades at first, removing shades as necessary
- Starting with Index Arm at $0^{\circ} 00.0'$, turn toward SUN reflection on Horizon
- Look at Horizon through telescope, squeeze release levers and slowly move Index arm until the reflection of the SUN is seen in the Horizon Mirror.

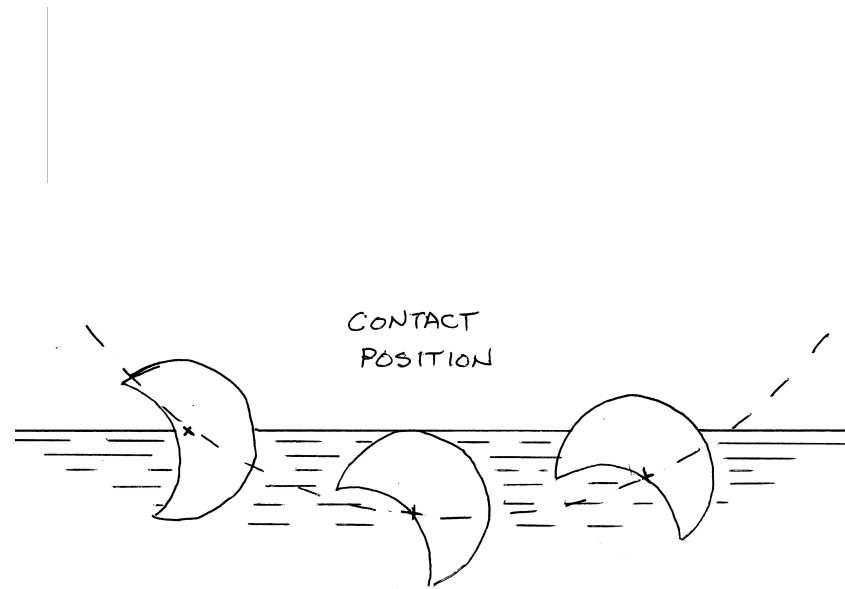
OPERATIONAL USE - 2

- With both eyes open – make sure that the horizon in the horizon mirror and the actual horizon are lined-up.
- This ensures that the sextant is at the correct level
- Once the SUN is on the horizon, rock the sextant to be sure that it is being held vertical

Rocking the Sextant



LOWER LIMB OBSERVATION
WHILE ROCKING THE SEXTANT



UPPER LIMB OBSERVATION
WHILE ROCKING THE SEXTANT

Summary

- You have been introduced to the SEXTANT the primary tools of the Celestial Navigator
- You will be using it in class out on deck