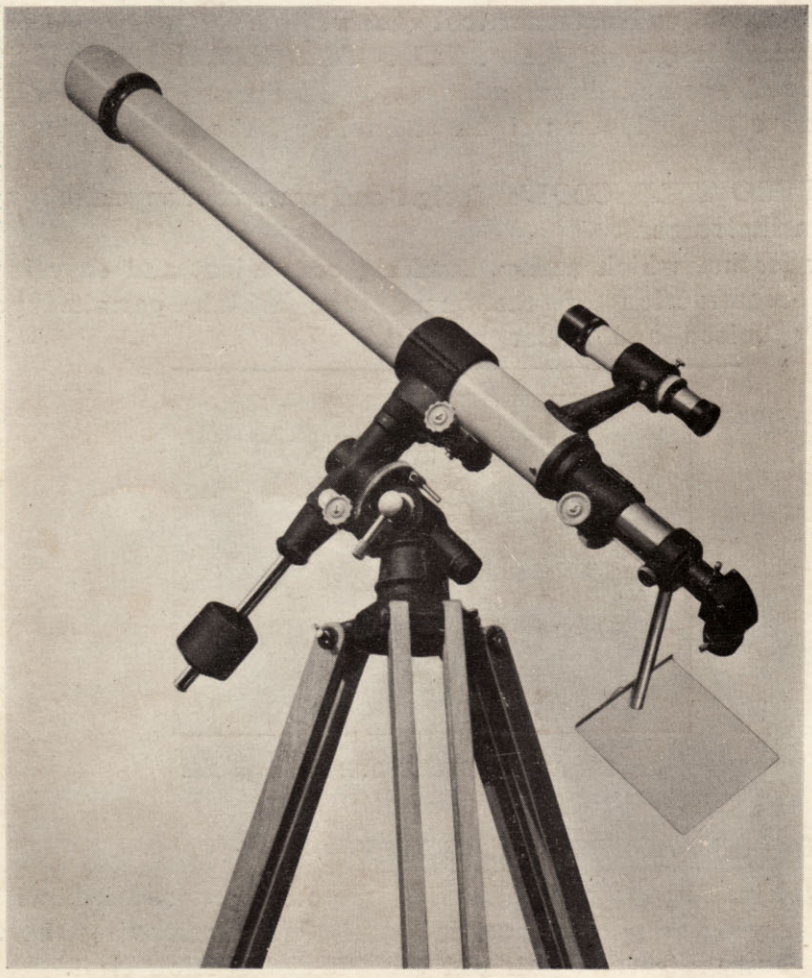
W. TURECKIE

# ☆ ASTRO ☆

## S-5 S-6 H-2 H-3

# INSTRACTION



## ASTRO OPTICAL CO., LTD.

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# ASTRO TELESCOPE

## FEATURES

1. **ASTRO TELESCOPE**'s unique alt-azimuth-equatorial combination mount contributes to the versatility and ease of operation of the **ASTRO TELESCOPE**. The telescope moves on three axes, the horizontal, polar and declination. Since the polar axis is supported by the horizontal axis in the **ASTRO TELESCOPE** and can be fixed at any angle from the vertical to the horizontal, the **ASTRO TELESCOPE** can be used in terrestrial observation as an alt-azimuth telescope or in tracking comets. In astronomical observation, the **ASTRO TELESCOPE** is used as an equatorial telescope. This versatile mount enables the **ASTRO TELESCOPE** to be used for both terrestrial and astronomical observation.
2. The special design of the **ASTRO TELESCOPE** permits its quick, easy assemblage and disassemblage. To disassemble, simply unscrew and remove the balance weight, and fold up the main tube and tripod legs.
3. The **ASTRO TELESCOPE**'s design and construction make it a superior precision instrument.
4. Another feature which makes handling convenient and easy is the free sliding construction of the main tube which permits positioning of the eyepiece and finder at will.

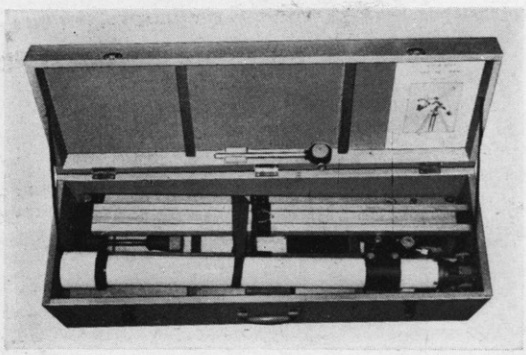


Fig. 1 – **ASTRO TELESCOPE** in the packed carrying case.

## ASSEMBLING OF ASTRO TELESCOPE

1. As shown in Fig. 1, the tube and tripod legs are tied with a tape in the carrying or packed position. When removing the telescope from the case, raise and pull out the eye-end section first.
2. Untie the tape and hold the telescope as shown in Fig. 2.
3. So turn the main tube that the finder faces away from the tripod legs. Let the tripod legs down. Lift up the main tube by the mount section and the legs of the tripod will fall naturally into the position shown partially Fig. 3.
4. The main tube slides freely. To balance the main tube, slide it a

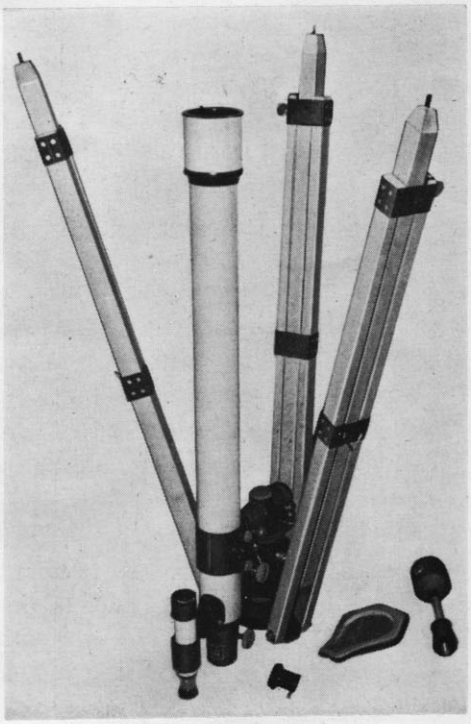


Fig. 2 – Folding down the tripcd legs, preparatory to setting up the **A TRO TELESCOPE**

little toward the eye-end, then the telescope will be in a position similar to that shown in Fig. 12. Tighten the wing nuts on the tripod lightly. It is unnecessary to make the nuts too tight. The legs of the tripod should not be spread apart too much.

5. Take the balance weight and screw it in as shown in Fig. 3.
6. The height of the tripod will depend on your posture on observation. Adjust the legs of the tripod occasionally.
7. When footing is instable, secure the legs of the tripod with the chain.
8. See it the various parts of the telescope are well balanced, and tighten the clamps after necessary adjustment.
9. The hexagonal accessories tray is then attached to a tripod leg as shown in Fig. 4. This is used as the tray for the various eyepieces.

## DISASSEMBLING ASTRO TELESCOPE

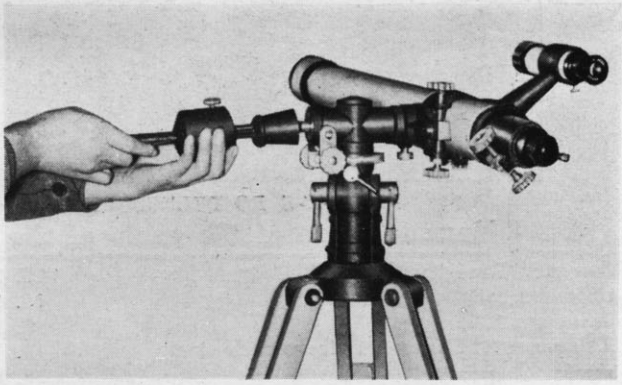


Fig. 3—Screwing the balance weight.

1. Disassembling procedure is the exact reverse of setting up. All accessories are first removed. Then the balance weight is unscrewed and removed.
2. The main tube, pointing straight up, is pulled up to the base of the finder and rotated to a position right by the recess of the base then, fold up the tripod legs one by one as shown in Fig. 2.
3. When tying the legs of the tripod and the main tube, the accessory tray is placed among the folded legs at the point of the middle bands. This makes a bundle tied. Rotate the main tube so that the finder may face toward the tripod legs, as in Fig. 1.

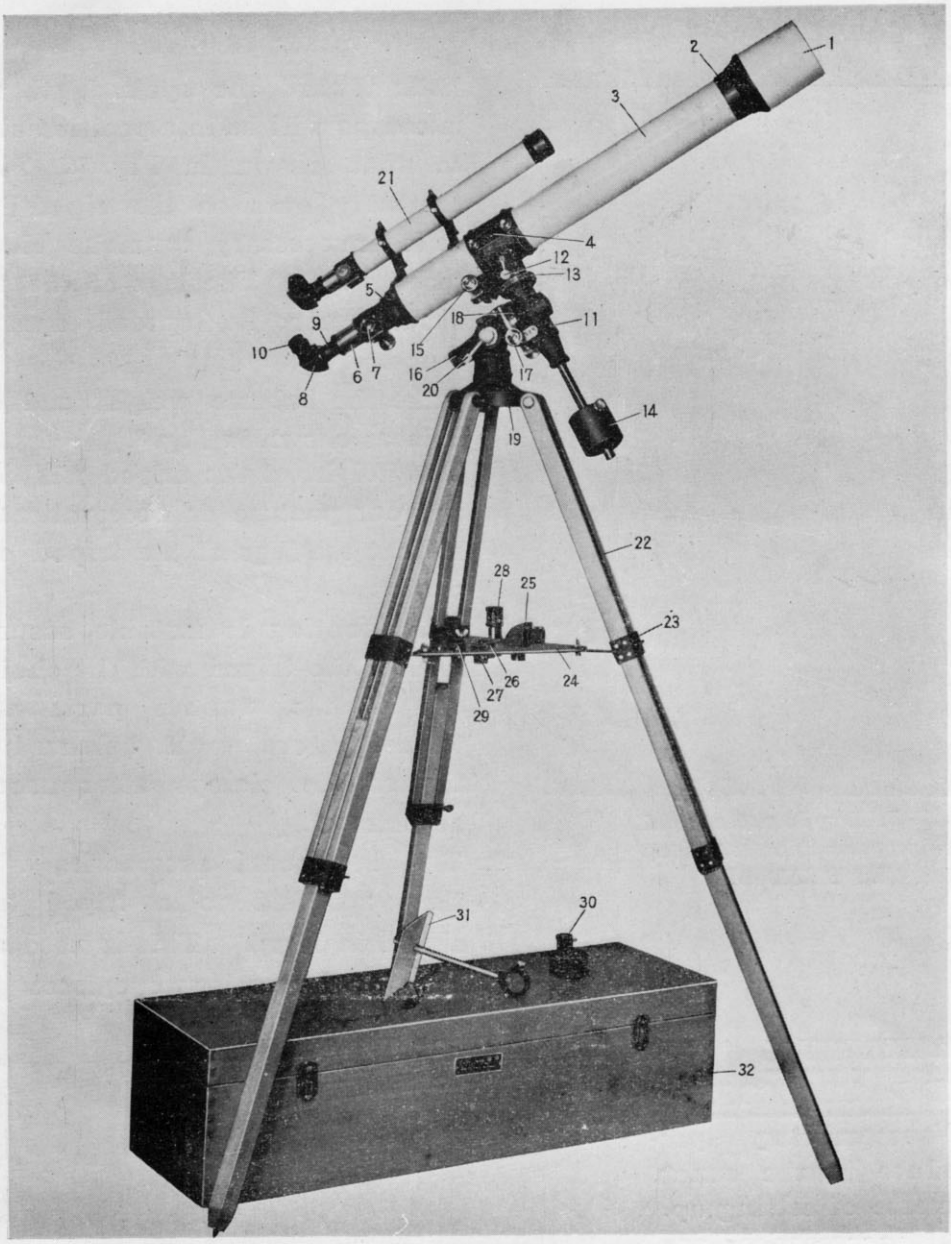



Fig.4 – **ASTRO TELESCOPE** as an equatorial telescope.

## Nomenclature of the parts of the ASTRO TELESCOPE

1. Dew cap (Lens hood)
2. Objective cell
3. Telescope tube
4. Telescope tube trunnion sleeve with clamp screw
5. Eye end
6. Eyepiece drawtube with rack and pinion motion
7. Micro focusing knob for eyepiece
8. Star diagonal prism
9. Eyepiece abapter
10. Eyepiece (HM 12.5mm)
11. Declination axis
12. Clamp lever for fixing the telescope to the Declination axis
13. Declination circle graduated in 1° in degrees
14. Adjustable counter-poise of the telescope with respect to the polar axis
15. Slow motion in Declination
16. Polar axis
17. Slow motion in Right Ascension
18. Hour circle graduated in 4 min. in time
19. Tripod head with adjustment in Latitude
20. Clamp lever fixing the inclination of the polar axis
21. Finder telescope (12x40mm)
22. Two section wooden field tripod
23. Tripod reinforcing band
24. Accessories tray
25. Sun diagonal prism
26. Eyepiece (HM 6mm)
27. 〃 (HM 9mm)
28. 〃 (KHA 26-32mm)
29. Sun-glass
30. Erecting prism
31. Sun projection screen
32. Wooden carring case

## ATSRO TELESCOPE AS AN EQUATORIAL TELESCOPE

1. The equatorial telescope, one of roles of the versatile **ASTRO TELESCOPE**, is a special instrument for astronomical observation used to observe and trace the movements of heavenly bodies.
2. Generally speaking, the daily and nightly movements of heavenly bodies through the sky are regular and unvarying. This is because the celestial sphere turns on its axis of the north (south)pole of the heavens accordingly, a motion identical with the rotation of the earth on its axis. Accordingly the movements of the heavenly bodies can be followed on an axis of observation which parallels the earth's axis. This parallel axis is called the polar axis.
3. The polar axis points to true north, the angle of inclination being equal to the degree of latitude at the point of observation.
4. The equatorial mount of the telescope is built so that, as shown in Item 16 of Fig. 4, the polar axis of the telescope may point to the north pole of the heavens.
5. For practical purposes, it is sufficient to point the polar axis of the telescope at the North Star. Once this is done, the polar axis is secured at the place of observation and unless the telescope is moved, it is properly oriented.

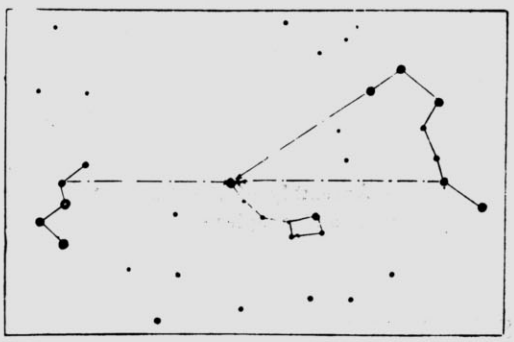


Fig. 5- A sketch of the area around North Pole showing the Big Dipper (Ursa Major), the Small Dipper (Ursa Minor) and Cassiopeia. In lining up the telescope for astronomical observation, the telescope is normally sighted on the North star.

## ACCESSORIES

### STRONOMICAL EYEPIECES

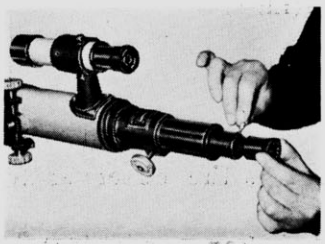


Fig.6 - Inserting the eyepiece into the adapter

1. As shown in Fig. 6, the astronomical eyepiece is inserted into the adapter simply by being pushed in and clamp with a screw. To focus, turn the eyepiece slow-motion knobs.
2. The engraved "HM" on the eyepiece cap stands for "Huyghenian Mittenzwey", a type of ocular which is an improved model of the Huyghenian. "K" stands for "Kellner". "AH" is for "Achromatic Huyghenian". The engraved number shows the focal length of the eyepiece in millimeter.

3. The magnifying power of the telescope can be obtaind by dividing the focal length of the objective lens by the focal length of the eyepiece.
4. Observers who wear other than astigmatic glasses should, if possible, remove them in observation.
5. The KAH eyepiece forms a part of the **ASTRO TELESCOPS**'s terrestrial eye-end. However, when used separately, it may be used in com bination, as shown in Fig. 7, with the astronomical eyepiece K 26 mm or the AH 32 mm.
6. The tube of the astronomical eyepiece has the international standard diameter of 24.5 mm. The diameter of the thread of the eyepiece cap is 25.4 mm with account of 48 threads to the inch.

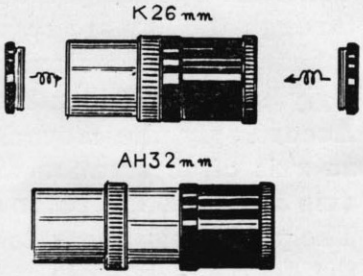



Fig. 7 - The KAH Eyepiece and its position as the AH 32 mm.

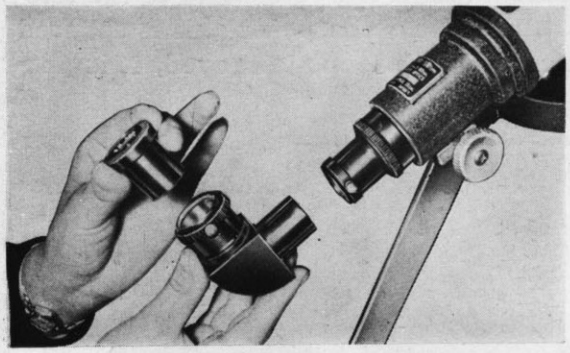


Fig. 8- Assembly of the diagonal prism and eyepiece

## DIAGONAL PRISM

1. The diagonal (right angle) prism is also known as the zenith prism. It permits greater ease in astronomical observation.
2. The diagonal prism is inserted as shown in Fig. 8. When the diagonal prism is inserted, the drawtube must be pushed into the depth of approximately 60 mm to allow for the diagonal prism additional focal length.

## SUN-GLASS

1. The sun-glass interceptng the heat and glare of the sun's rays, permits safe solar observation.
2. It is inserted as shown in Fig. 9.

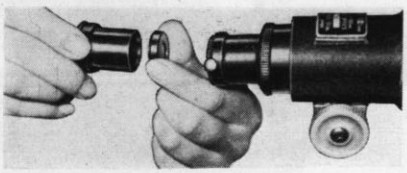


Fig. 9 - Putting in the sun-glass or moon glass (filter)

## FINDER TELESCOPE

1. The finder is a small guide telescope and enables the observer to sight his telescope on the object easily.
2. The eyepiece of the finder has crosshair. When the object, viewed through the finder, is centered at the juncture of the crosshairs, it should be in the center of the view on the telescope. If you should ever find this is not so, sight with your telescope on some landmarks such as a smokestack or telephone pole at least 500 meters away.

When this object is centered in the telescope's view, look through the finder and turn the adjusting screw of the finder till the object appears at the juncture of the crosshairs.

3. To focus the eyepiece of the finder, turn the adjusting ring.
4. The eyepiece of the **ASTRO TELESCOP**'s finder can be used as an astronomical eyepiece of the telescope itself, simply by being inserted into the adapter of the drawtube. The finder's eyepiece is used at times because its crosshairs permit exact centering. However, the delicate crosshairs are so breakable that the finder's eyepiece should be handled with special care.

## ERECTING PRISM

Any astronomical telescope can be to given an erect image, and used for terrestrial purposes by the addition of this erecting prism. The image is erected by means of two right angle prisms, an ordinary astronomical eyepiece being used in conjunction. Considerably less light is lost than with the ordinary erecting eyepieces, and a wider field of view is obtained. If the prism is used, the draw tube will require shortening by approximately 10 cm.



Fig.10—Erecting prism

## MOON-GLASS

Used as the same purpose of the sun-glass in the moon's observation when its phase being so large near a full moon.

## SUN DIAGONAL PRISM

Consisting of an optical surface, which reflects only 10 % of the sun's heat and light rays, thus eliminating the danger of the sun-glass being broken, with the consequent risk of injury to the eye, besides affording a more comfatable observing posture. It is attached to the telescope tube in place of the eyepiece, and the eyepiece is inserted into the adapter of the prism by being pushed in.

## HOUR AND DECLINATION CIRCLES

Hour circle (Right ascension circle) is fitted to the polar axis and Declination circle is fitted to the declination axis respectively. Hour circle graduated in 4 min. in time, and Declination circle graduated in 1° in degrees. These circles enable so helpfull to the stellar observation or other as follows;

(1) To find the stellar time at the instant of the observation.
(2) To lead a faintest or dicernible heavenly body (but its position is known) into the field of the telescope.
(3) To observe the brilliant star as Venus in the day time.
(4) To know the apparent position of a Comet or a Nova.
(5) To set the telescope's pillar exactly.

When the mounting being assembled as the equatrial mount, if not the polar axis installed exactly, the circle does not indicate true value. Enables to know the altitude and the azimuth of the object by these circles when the mounting is assembled for the alt-azimuth mount.

## SUN PROJECTION SCREEN

1. The sun projection screen, as its name indicates, is used for the projection of the image of the sun, as observed through the telescope, on the screen in observation.
2. The assembling of the sun screen is done as shown in Fig. 11. When attaching the ring of the rod holding the screen to the drawtube, be sure that the grooved side of the ring is directed toward the drawtube.
3. The HM 12.5 mm eyepiece is used for projection of the image occupying 10 cm in diameter of the screen. Use of the diagonal prism will project an upright image on the screen.
4. For best results, it is advisable to fasten a sheet of pure white paper on the reflecting side of the screen with a paper clip.
5. To get a magnified image of sun-spots, use a high power eyepiece.

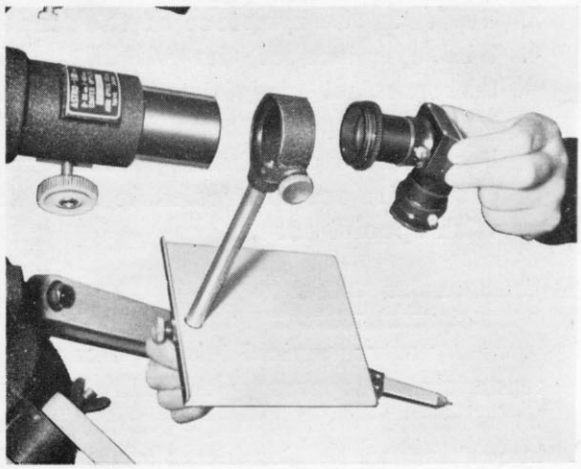


Fig. 11 – Assembling the sun projection screen

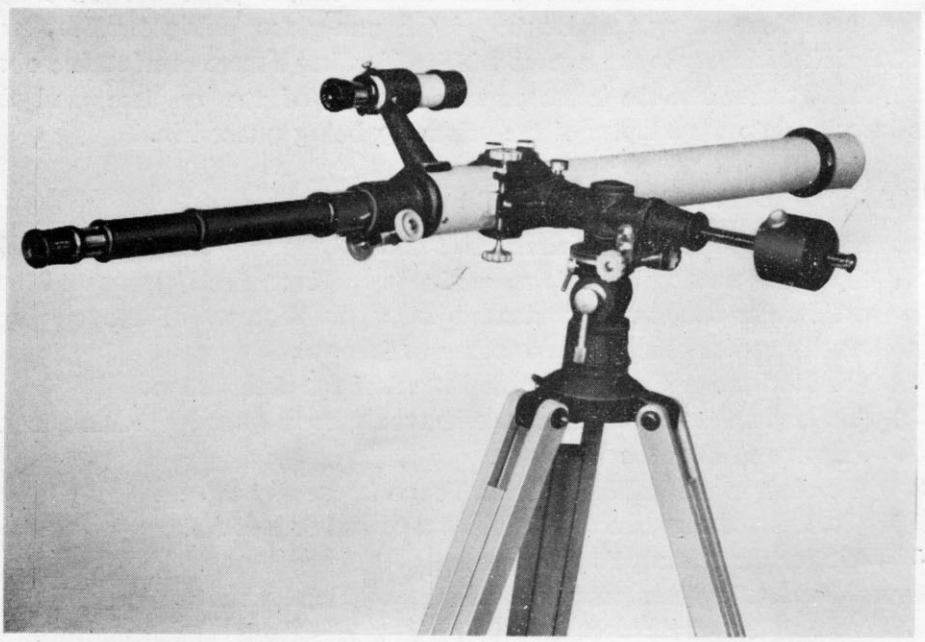


Fig. 12 – The **ASTRO TELESCOPE** in alt-azimuth position as a terrestrial telescope

## HINTS ON TERRESTRIAL OBSERVATION

1. Under good observing conditions, the **ASTRO TELESCOPE** can make out human figures at distances up to 40 kilometers (24 miles). At 10 kilometers (6 miles), the **ARSTO TELESCOPE** can distinguish the sex and general appearance of persons viewed. At distance of 4 kilometers (2.4 miles) and less, the **ASTRO TELESCPE** enables the observer to make individual identification.
2. In terrestrial observation, it is important to remember that under conditions of haze or fog, the telescope will not enable you to see much more clearly than seeing with your naked eye.
3. In observing the direction toward the sun, the glare prevents good observation.
4. If the windows, through which you are observing, or the lens of telescope are exposed direct to the Sun, the view is sometimes distorted due to the uprising air-current.
   This is also true when observing on rooftops. Under such conditions, it is advisable to use in as small as low a magnification as possible.

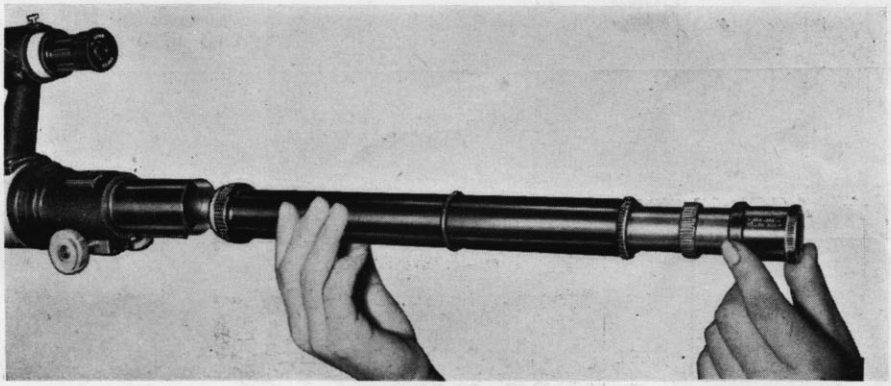


Fig. 13 - Assembling the terrestrial eyepiece

## The **ASTRO TELESCPE**'s TERRESTRIAL EYEPIECE

1. The terrestrial eyepiece assembly reverses to an erect position the upside-down image of the astoronomical telescope. It is attached to the drawtube simply by being screwed into the place.
2. The terrestrial eyepiece assembly is composed of the erector tube with its four-elements color-corrected erector lens and the eyepiece lens. The **ASTRO TELESCPE**'s standard KAH 26-32 mm lens, used in terrestrial observation, is used in the AH 32mm position (see Fig. 7.)
3. If a higher power than 30× is desired in the terrestrial eyepiece, the HM 6 mm or HM 12.5 mm is used instead of the KAH lens. These give magnifications of from 80× to 160×. These are used only in unusual circumstances, but as for the purpose of high power close-up observation, push as the individual characteristics of a butterfly or an ant you can observe them clearly at 30meters (100yards).

## ★ OPTICAL EFFECT

| Model | OBJECTIVE (Fraunhofer type, achromat, hard coated) | | | | | | Magnifications | |
|---|---|---|---|---|---|---|---|---|
| | Lens aperture | Clear aperture | Focal length | Light collecting power for naked eye | Resolving power with respect to the doblue stars | Faintest discernible star | Astro. | Terr. |
| | mm | mm | mm | | m | m | | |
| S-5 | 62.5 | 60 | 910 | 73.5× | 2.0 | 10.7 | 152×,73×,(45×), (35～28×) | 30× |
| S-6 | 〃 | 〃 | 〃 | 〃 | 〃 | 〃 | 152×,101×,73×, 45×,35～28× | the same as astro. |
| H-2 | 79 | (3 in.) 76.2 | 〃 | 118× | 1.6 | 11.2 | —〃— | —〃— |
| H-3 | 〃 | 〃 | 〃 | 〃 | 〃 | 〃 | 227×,152×,101×, 73×,45×,18× | —〃— |

## ★ ACCESSORIES

| Model | Eye-pieces | Sun glass | Moon glass | Star diagonal Prism | Sun diagonal Prism | Finder telescope | Sun projection screen | Erecting prism | Hour and decl. circles | Carrying case |
|---|---|---|---|---|---|---|---|---|---|---|
| S-5 | HM 6 mm<br>HM 12.5 〃<br>KAH 23～32 〃 | 1 | — | 1 | — | 6× 30 mm | 1 | — | — | 1 |
| S-6 | HM 6 mm<br>HM 9 〃<br>HM 12.5 〃<br>H 20 〃 | 1 | — | 1 | — | 〃 | 1 | 1 | — | 1 |
| H-2 | HM 6 mm<br>HM 9 〃<br>HM 12.5 〃<br>H 20 〃<br>KAH 23-32 〃 | 2 | 1 | 1 | 1 | 〃 | 1 | 1 | — | 1 |
| H-3 | Or 4 mm<br>HM 6 〃<br>HM 9 〃<br>HM 12.5 〃<br>H 20 〃<br>H 50 〃 | 3 | 1 | 2 | 1 | 25× 40mm | 1 | 1 | 1 | 1 |

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