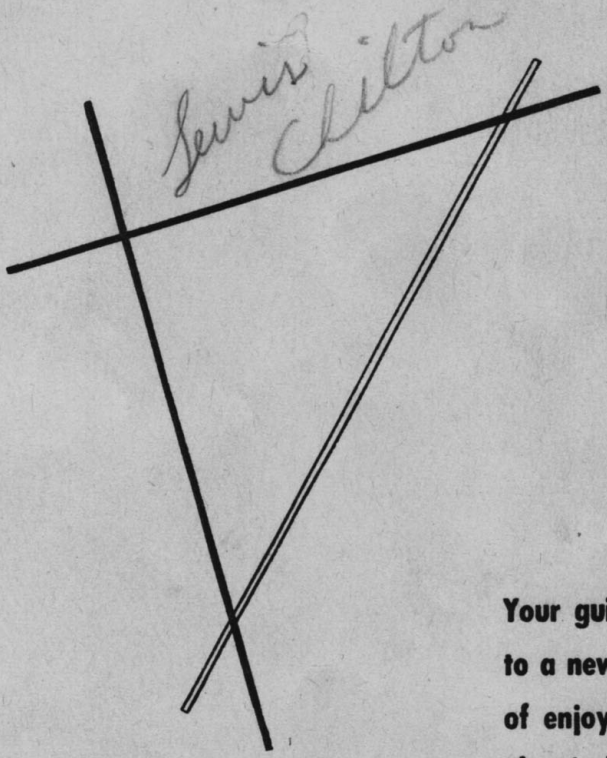
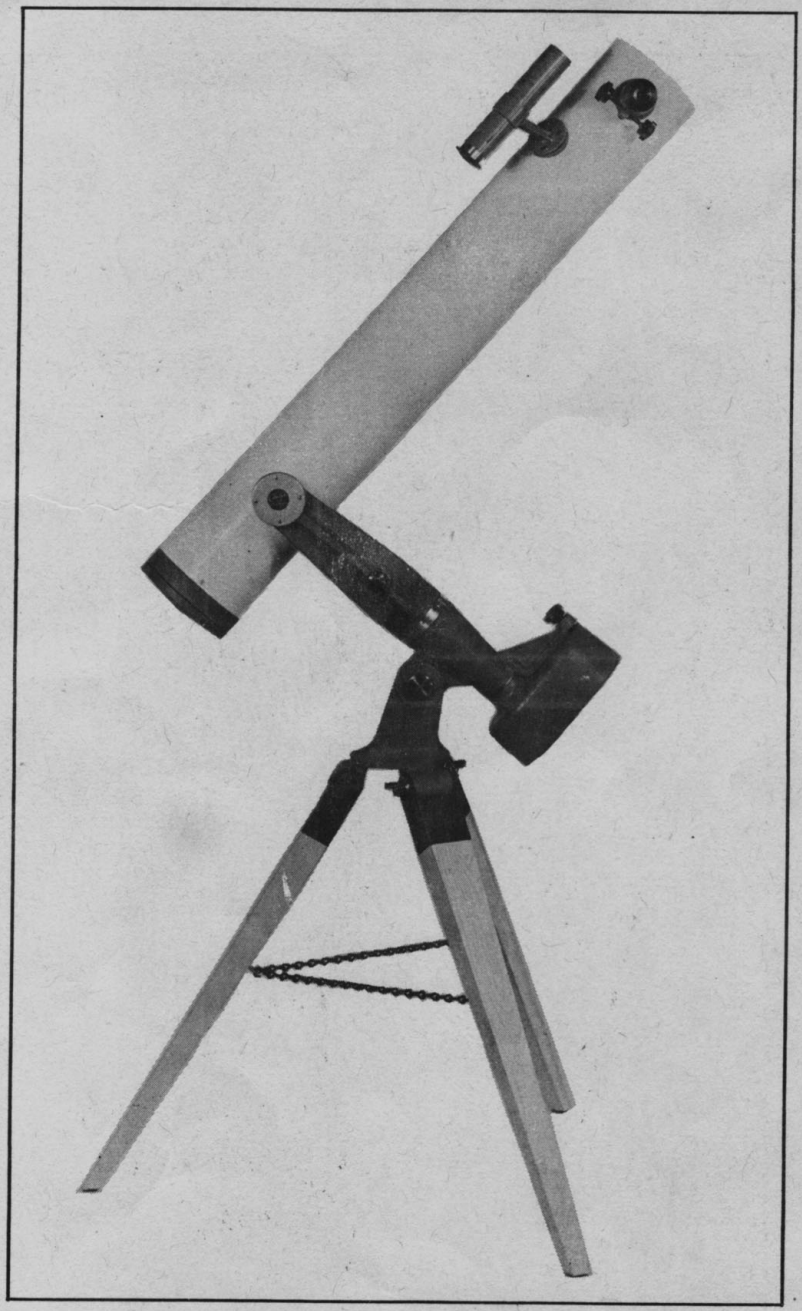
Celestar

INSTRUCTION MANUAL

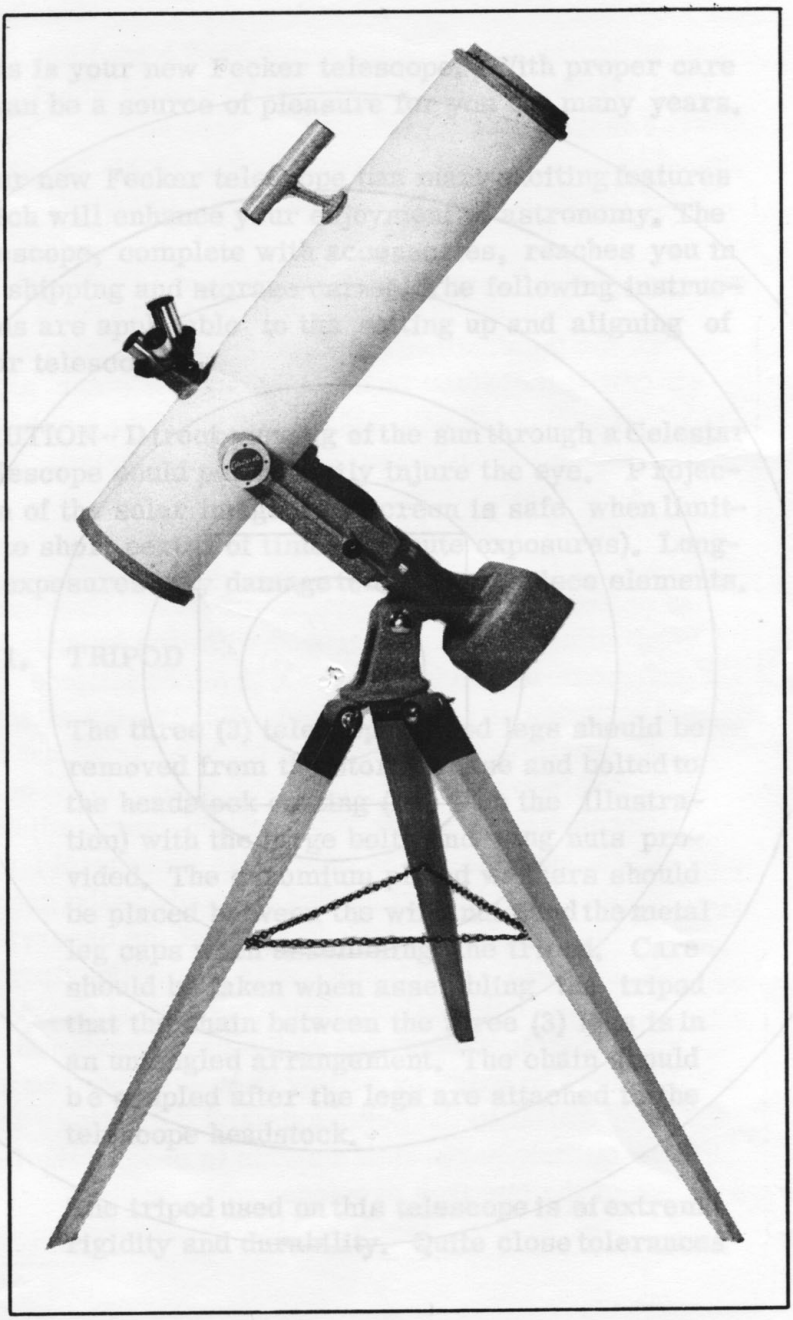


Your guide
to a new world
of enjoyment with the
electrically driven
Celestar
by Fecker

J. W. FECKER INC. • PITTSBURGH, PA.
A SUBSIDIARY OF AMERICAN OPTICAL COMPANY

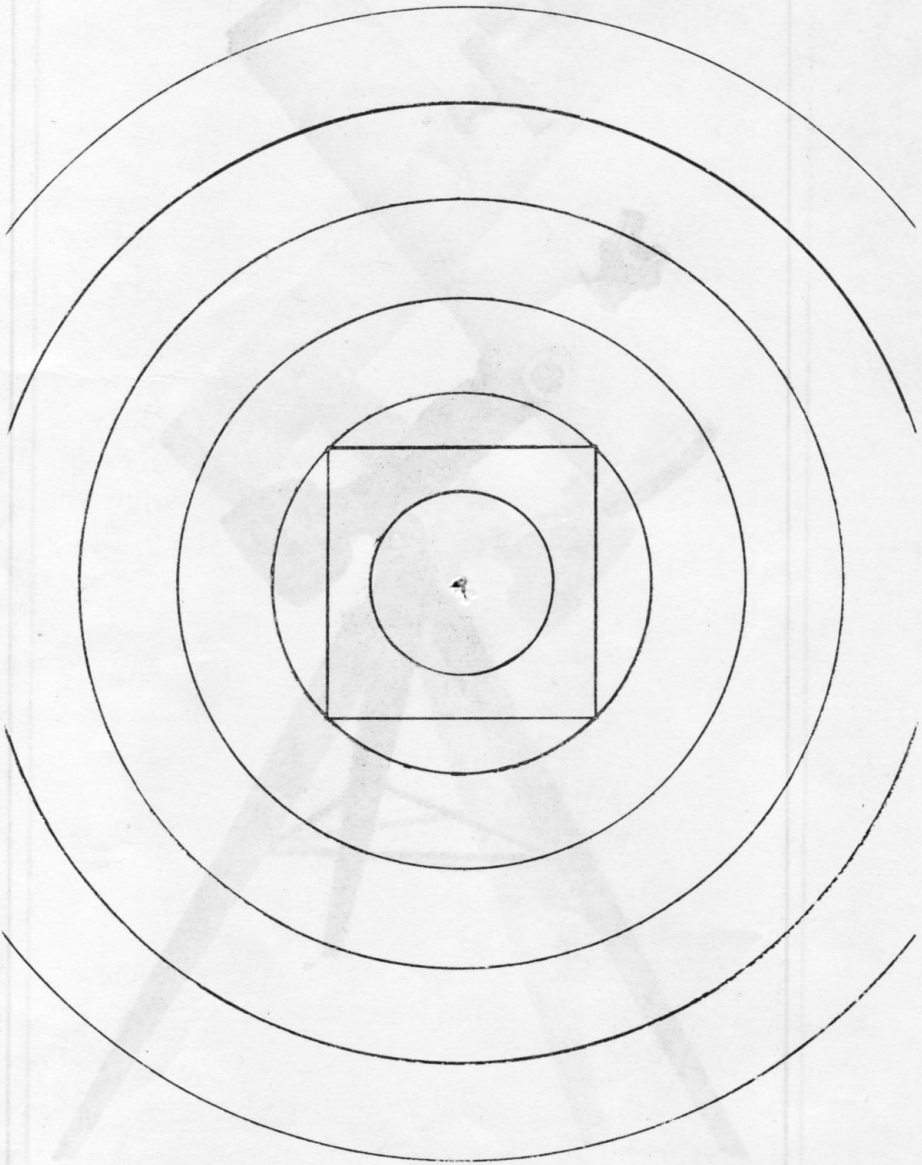


THE CELESTAR-4



THE CELESTAR-6

COLLIMATION TARGET



This is your new Fecker telescope. With proper care it can be a source of pleasure for you for many years.

Your new Fecker telescope has many exciting features which will enhance your enjoyment of astronomy. The telescope, complete with accessories, reaches you in its shipping and storage carton. The following instructions are applicable to the setting up and aligning of your telescope.

CAUTION - Direct viewing of the sun through a Celestar Telescope could permanently injure the eye. Projection of the solar image on a screen is safe when limited to short period of time (1 minute exposures). Longer exposures may damage telescope eyepiece elements.

1. TRIPOD

The three (3) telescope tripod legs should be removed from the storage case and bolted to the headstock casting (No. 1 on the illustration) with the large bolts and wing nuts provided. The chromium plated washers should be placed between the wing nuts and the metal leg caps when assembling the tripod. Care should be taken when assembling the tripod that the chain between the three (3) legs is in an untangled arrangement. The chain should be coupled after the legs are attached to the telescope headstock.

The tripod used on this telescope is of extreme rigidity and durability. Quite close tolerances

on the bolt bore diameters and leg widths have been held so that no "play" will be found in the assembled tripod.

2. NORTH ORIENTATION

In the Northern Hemisphere, the polar axis in its housing (4) should be oriented to point toward the true pole. The Fork end of the instrument will therefore face north, and the polar axis housing (4) will fall along a north to south line when the telescope is properly situated.

3. LATITUDE ANGLE ADJUSTMENT

The latitude angle on your Fecker telescope is adjustable to correspond with the latitude at your observing position. The latitude adjusting screw is shown as No. 2 in the attached sketch of the telescope. In order to adjust the latitude angle of your instrument, it is only necessary to loosen the latitude angle adjusting nut (3). The polar axis housing (4) may then be adjusted so that its angle to the ground is equal to the latitude angle of the observing position. The telescope is then aligned properly for celestial operation in polar angle. A very close approximation of the proper orientation may be made by setting the telescope tube axis parallel to the polar axis and adjusting the latitude angle until Polaris is seen in the field of the one inch eyepiece.

If this procedure is used, the drive mechanism will track quite accurately throughout the course of an evening. When that adjustment has been achieved the declination circle (5) should be set opposite its pointer on the fork trunnion to 90^{o}.

4. ELECTRIC CLOCK DRIVE

Your telescope is equipped with an electric drive which enables it to track the motion of celestial objects automatically. The electric drive is housed in the section labeled (6) in the accompanying illustrations. The clutch and drive assembly has been factory set and should require no attention whatever. The motor is lubricated for life, and the clutch tension has been factory adjusted. The electric drive operates on 110 volt, 60 cycles alternating current. The drive may also be operated from a small converter used to change 6 or 12 volts direct current to 110 volt, 60 cycle alternating current. Such inverters are available commercially and will function satisfactorily with the telescope drive used here.

5. TELESCOPE SLOW AND FAST MOTIONS

The telescope may be slewed in either right ascension or declination and also moved with the appropriate slow motions controls (7) and (8) whether the electric drive is operating or not. Both the right ascension and declination axis are clutched so that the telescope may be moved

to any position in the sky by hand without danger of damaging the electric drive or slow motion controls. The controls operating the telescope slow motions are shown by Numbers (7) and (8) in the accompanying illustration. These controls are used to closely position an object in the center of the observing field. A small movement of the appropriate control will provide a relatively small motion of the telescope tube along the desired axis. The right ascension slow motion is located just in front of the electric drive housing and declination slow motion control is located on the fork of the telescope mount on the same side of the tube as the eyepiece focusing control. As with any fine machine or piece of measuring equipment, the final adjustment should always be made in the same direction; in this case by a counter clockwise adjustment of the slow motion knob. It is necessary to achieve the more gross adjustment by hand slewing and then the final adjustments by use of the appropriate slow motions.

6. FINDER TELESCOPE

Your new instrument is supplied with a small finder telescope located on top of the main instrument tube and shown as Item (9) in the sketch. It is intended that the finder telescope be brought into a position that is co-axial with the main telescope tube.

This adjustment has not been made at the factory. In order to achieve this alignment, the main telescope should be focussed on a bright star. Then, the finder is so aimed that the same bright star appears in the center of the finder field. The attaching screws mounting the finder are then tightened while the star is maintained at the center of the finder field. From then on, it is only necessary to locate a star in the center of the finder field and the same star will be visible through the main telescope.

7. SETTING CIRCLE ADJUSTMENTS

Two (2) setting circles are provided, one in each axis. These are shown as Numbers (5) and (10) in the accompanying drawing. The right ascension circle (10) is located at the base of the fork on the polar axis housing. This circle is of the "slip ring" type. To use the right ascension slip ring circle to locate stars, a star chart or ephemeris is needed. A bright known star is located within the field of the main telescope and its right ascension at any given time noted. The slip ring circle is then set to correspond to that right ascension time. The right ascension slip ring circle is then in the proper position for the nights observing and should not be touched. If the same ephemeris or table is used consistently, the position of any other star may be determined and that star brought into the field of the telescope by setting the instrument to the proper right

ascension and declination of the second star as indicated on the slip ring circles. The elapsed time between the first observation and the second reading must be subtracted from the tabulated right ascension circle reading. The declination circle (5) is located on the trunnion hub of the telescope fork. With the instrument, pointing toward the true pole (for most purposes pointing the main telescope at Polaris is sufficient) 90° should be set opposite the pointer. The declination circle is then ready for use with an ephemeris for the location of any desired celestial object.

8. TELESCOPE COLLIMATION

Your Fecker telescope has been accurately collimated at the factory. Regardless of this, however, it remains possible that during the course of shipment the optical elements have lost their precise alignment. This may be easily ascertained by observing the quality of images obtained from the telescope. If asymmetrical star images or astigmatic images are obtained when using the instrument, the latter are due entirely to miscollimation. Each telescope has been thoroughly checked for optical quality both during the process of manufacture and as a completed unit before shipment is made. Should the instrument prove to be out of collimation the following is the procedure for correcting this difficulty.

CELESTAR-4 COLLIMATION:

First, remove the cover (11) over the diagonal mirror support system. Loosen all attaching screws on the diagonal support and pull the single vane spider with the diagonal attached out to the edge of the main telescope tube. It is not necessary to remove the diagonal, it is only desirable to remove it from the center of the telescope tube at this time.

Make a white card with an accurate cross and a series of concentric circles. (The front page of this book is an ideal collimation target.) These circles should have the cross as their center. They should have radii of 1/2 inch, 1 inch, 1-1/2 inches, and 2 inches. Then make a small hole at the center of the cross. Holding this perforated card in front of your eye with the lined portion facing the telescope, stand approximately 2 feet in front of the telescope tube. If the primary mirror is in proper collimation, the image of the card and its concentric circles will appear concentric with the telescope tube itself when the cross is at the center of aperture of the tube. If this is not the case at first, the three(3) sets of push-pull screws (12) at the back of the primary mirror cell should be adjusted until this condition is obtained. When the primary mirror is thus collimated, re-insert the secondary flat into the optical path. Then look down the eyepiece tube with the eyepiece removed. Adjust the flat mirror until all the circles seen

when looking down the eyepiece tube appear to be concentric. You should be able to see the following circles. The mirror edge, the apparent round flat mirror, the image of your eye in the primary mirror, the image of the round flat mirror in the primary mirror, the aperture of the telescope tube and the aperture of the eyepiece adapter tube. All these circular images should appear round and centered the telescope is perfectly collimated. This condition may be achieved by the proper adjustment of the three (3) sets of push-pull screws located on the flat mirror mounting adapter plate. When the flat mirror is accurately collimated the mounting plate should be recovered with the cover originally removed. Your telescope is of particularly rugged design with regards to collimation and should not be necessary to recollimate the instrument frequently.

CELESTAR-6 COLLIMATION:

First, remove the corrector Plate Cell (14). Next, with the tube in a VERTICAL POSITION, remove the diagonal mirror. This is accomplished by removing the snap-in plug (15) at the bottom of the primary mirror cell and loosening the three pull screws then exposed. Be extremely careful to support the diagonal holder when loosening the last screw so that the diagonal holder does not fall and damage the mirror. Do not loosen or remove the nut holding the threaded slotted stud to the adjusting plate.

Then, fasten crossed strings to the front of the tube where the corrector plate cell was mounted. The strings should be about 1/32" diameter and should be precisely positioned so that one is vertical and one horizontal, crossing at the tube center. Masking tape is recommended to hold the strings in position.

Make a white card with an accurate cross and a series of concentric circles. (The front page of this book is an ideal collimation target.) These circles should have the cross as their center. Then make a small hole at the center of the cross. The collimation target card should be attached to a portable stand so that it may be positioned in a fixed reference position. An ideal mounting stand will allow adjustments vertically, horizontally, and laterally. With this collimation target mounted approximately three feet in front of the open tube and with the lined side facing the telescope, peer through the small central hole in the target. The collimation target will have to be moved so that when peering through its hole, the tube and aperture and the mirror aperture appear as concentric circles. If the primary mirror is in proper collimation, the image of the card and its concentric circles will appear concentric to the tube itself, and the cross on the collimation target should align both vertically and horizontally with the

crossed strings on the tube end.

If the mirror does not appear properly aligned with the tube, the three (3) sets of push-pull screws (16) at the back of the primary mirror cell should be adjusted until this condition is obtained.

Next, the diagonal mirror must be re-assembled and aligned with respect to the eyepiece draw tube and the main telescope tube. With the telescope in a vertical position, carefully re-insert the diagonal holder into the mirror cell opening and tighten the three pull screws. Peering directly into the center of the eyepiece draw tube, the elliptical diagonal should appear round, centered in the tube aperture, and the image of the crossed strings at the end of the telescope and the coincident cross on the collimation target should appear centered in the mirror. Peering through the collimation target once again into the open end of the telescope tube, the diagonal and its image should appear centered in the tube. The adjustments to achieve all these conditions is the set of three push-pull screws in the bottom of the primary mirror cell and the slotted stud for twist motion. All the above conditions must be met before the diagonal is aligned. When the primary mirror and diagonal are thus collimated, remove the crossed strings at the tube end and reinsert the corrector plate (14) into the tube

with the three push screws loose. Then tighten the three pull screws. Again peering through the hole in the collimation target, align the corrector plate using the push pull screws (17) until the crosses on the reflected image off the primary mirror and the reflected image of the aluminized spot on the corrector plate are coincident in both directions.

Your Celestar-6 is now collimated, and will meet or exceed the theoretical resolution for a 6" aperture telescope. Be careful when tightening the adjusting screws not to over tighten them, as a strain set up in the cells may distort the precision optics and effect the performance of this fine telescope. The rugged construction makes re-collimation rarely necessary.

9. USE OF EYEPIECES

CELESTAR-4

Your Celestar-4 is supplied with three (3) eyepieces; two 1 inch focal length and a 1/3 inch focal length eyepiece, together with the achromatic Barlow lens which doubles the power of either eyepiece . Used with the 1 inch eyepiece alone, the telescope has 35 power. Used with the Barlow in combination with the 1 inch eyepiece the telescope has 70 power. Used with the 1/3 inch eyepiece alone, the telescope has 105 power,

and used with the 1/3 inch eyepiece in combination with the Barlow lens the telescope has a magnification of 210 power. When any of the eyepieces are used alone, they are simply inserted in the eyepiece adapter and the telescope appropriately focused. In order to use the Barlow lens, remove the eyepiece from the eyepiece adapter (13) and insert it in the larger O. D. section of the Barlow lens. Insert each eyepiece to the fullest extent possible in the Barlow adapter tube. Then insert the Barlow adapter in the eyepiece draw tube, and focus the instrument as before. The second 1" eyepiece is for use in the finder telescope.

CELESTAR-6

Your Celestar-6 is supplied with four eyepieces and a turret (18). The 1/3 EFL Orthoscopic eyepiece (270X) should be inserted into the shortest of the turret tubes. The 1/2" EFL Hastings eyepiece (180X) should be inserted into the medium turret tube. The 1" EFL Hastings eyepiece (90X) should be inserted into the longest turret tube. These three eyepieces thus placed will require little change in focus when switching power. The other 1" EFL Ramsden eyepiece is for permanent use in the finder telescope (9).

Should you possess the Praktica Camera with adapter, it should be used as follows:

The adapter should be screwed into the camera lens barrel housing. With the turret removed, insert the adapter with camera into the draw tube (19). The image may then be focused using the rack and pinion focusing arrangement while viewing the image through the camera reflex finder.

10. CARE AND CLEANING OF OPTICS

When the instrument is not in use, the optical components should be protected with the supplied dust-cover. The coated optical surfaces are as hard and as well protected as it is possible to make them, still the coatings are easily destroyed. They should be cleaned only when it is absolutely necessary. A small amount of dust on the optical elements will not appreciably effect the performance of the telescope.

When the optical elements must be cleaned, the procedure should be as given below: Remove the element from its cell and sluice the surface carefully with distilled water. Repeat using filtered ethyl alcohol. A soft cotton may be used without pressure to assist in removing the dirt film. With the gross dirt thus removed, the surface should then be carefully cleaned with a solution of grit free detergent (such as Orvus). A soft grit free cotton swab should be used. The surface is then wiped dry with grit free cotton without rinsing away the detergent.

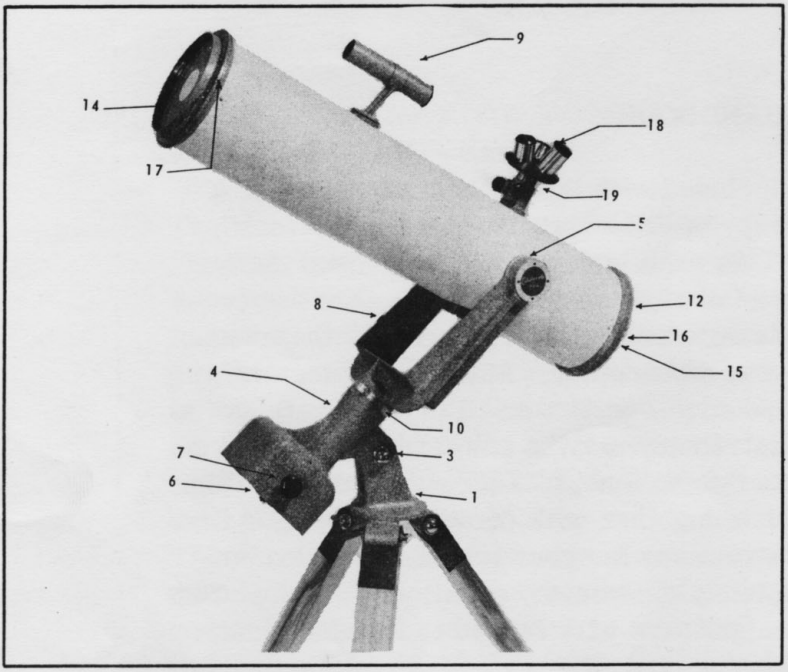
11. ADJUSTMENT OF SLOW MOTION AND DRIVE CLUTCHES

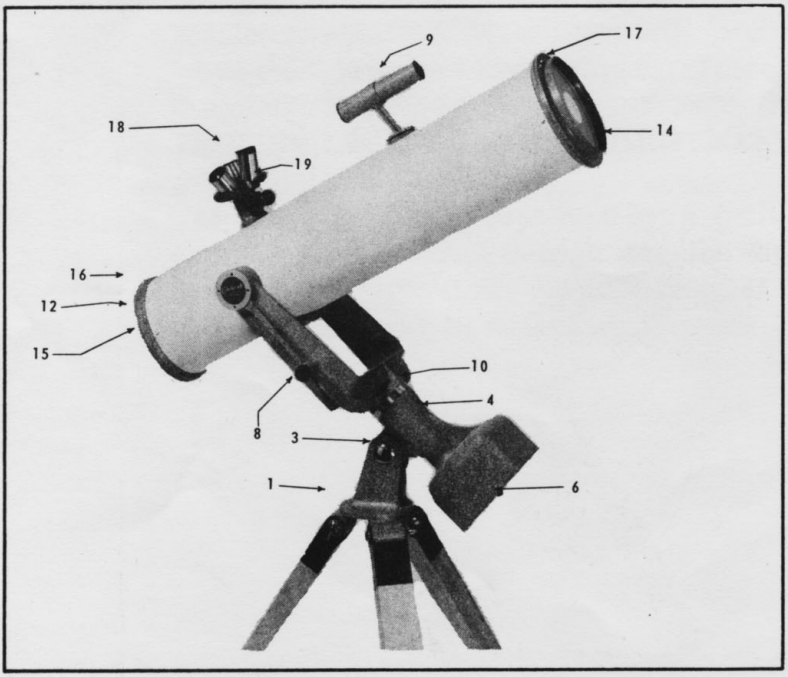
The slow motions and drive clutches were adjusted properly at the factory. However, as the clutch material may wear, simple adjustments can be made to keep them operating properly. The declination clutch adjustment is made by removing the trunnion plate cover (on the same side as the declination circle) and tightening the 5/8" NYLOCK Socket head screw until the correct slow motion action is obtained. The drive and right ascension slow motion clutch may be adjusted by removing the drive housing cover (where the motor wire is attached) and tightening the 1/4-20 NYLOCK Screw and compressing the spring until the correct slewing tension is obtained. If the drive will properly move the telescope without slipping of the clutch, the clutch is properly set. DO NOT OVER TIGHTEN EITHER CLUTCH ADJUSTMENT.

The motor gearing is protected by a built in clutch, and this clutch is used for the Right Ascension slow motion. No adjustment of this clutch should ever be necessary.

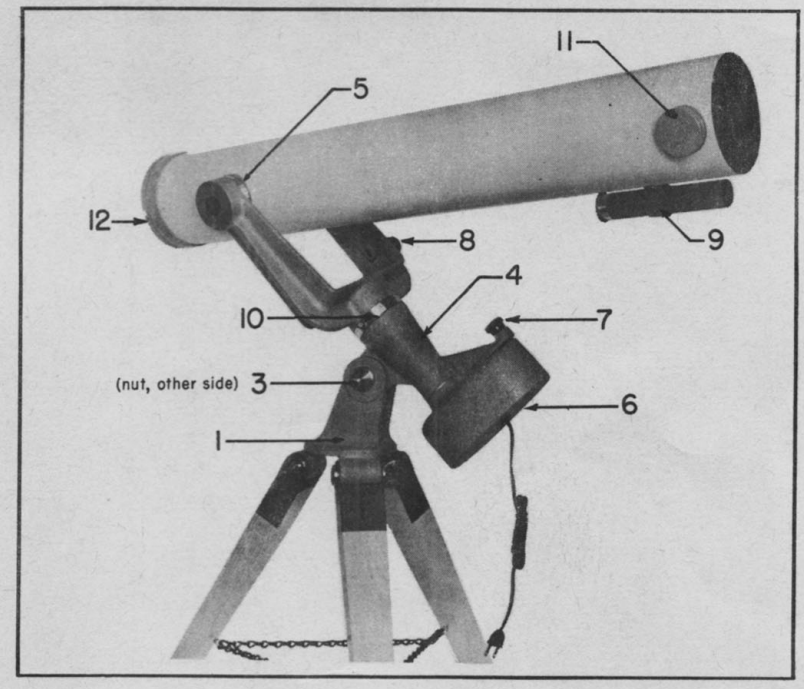
12. HANDBOOK

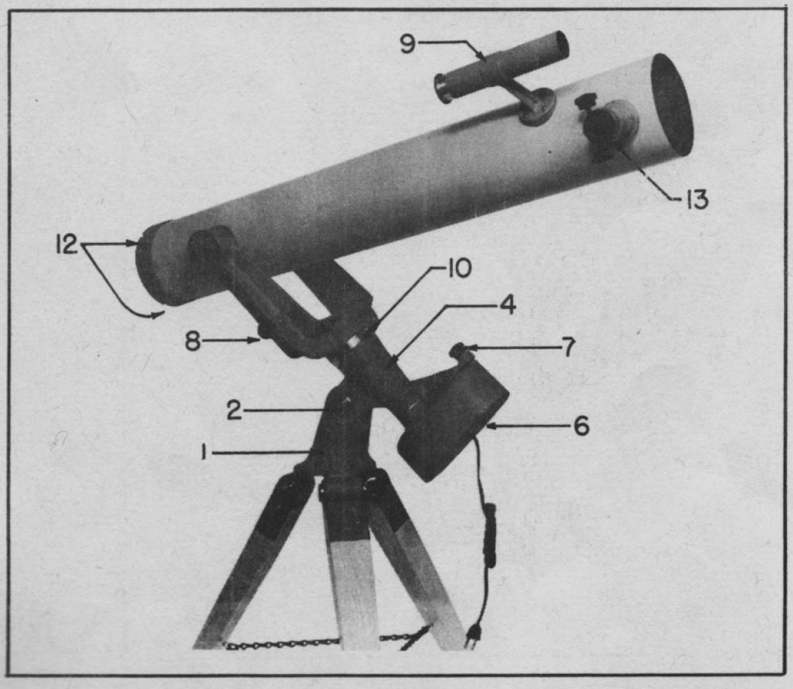
Included with the Fecker telescope is a copy of "New Handbook of the Heavens". This excellent volume will open new vistas of astronomy for you. It will serve as an excellent source book for the amateur astronomer. Most of the amateur's questions with regard to observational astronomy may be answered by reference to this volume. It is hoped that this volume together with the above operating instructions for your telescope will completely answer any questions which you might have with regard to its alignment, use or operation.





THE CELESTAR-6





THE CELESTAR-4