

*Astrola*

**REFLECTING  
TELESCOPES**

American Made

**CAVE OPTICAL CO.**

4137 E. ANAHEIM STREET  
LONG BEACH 4, CALIFORNIA

— Telephone —

Geneva 4-2613

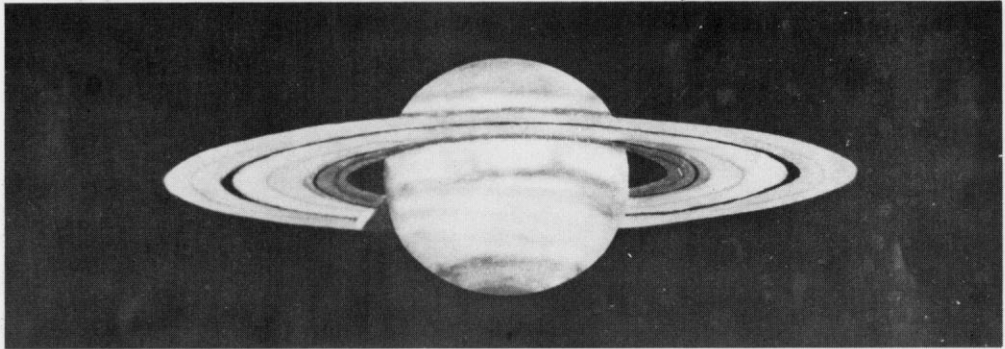


## PROOF IS IN THE OBSERVING

Almost since the discovery of the telescope in 1609 there have been Amateur Astronomers. The name "Amateur" in Astronomy should not always have the same connotation as is usually elsewhere implied. Many of the famous names in Astronomy in the 17th and 18th centuries were amateurs. Sir William Herschel, perhaps the most famous telescopist of all time, was an amateur until King George III became his patron. More recently such world famous observers as Burnham, Barnard, Lowell, Antoniadi, Molesworth, Phillips, Green, Wilkins, Moore, Peek, Haas, and Reese, to mention but a few of dozens who were amateurs, some later turning professional. The observing amateur with his personal telescope has always made important contributions to several fields of observational astronomy. The

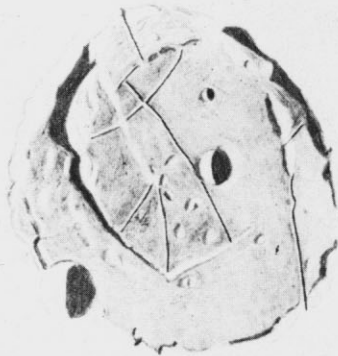
amateur telescopist has excelled in Lunar, Planetary, Variable Star, Double Star and Comet observing. A very large portion of the most valuable observations by amateurs during the last eighty years have been made with Newtonian Reflecting Telescopes of six to twelve inches aperture, and of first quality professional make.

On this page are a few drawings made by two experienced amateur observers, both using different 12½" Astrola Reflectors. Our six to ten inch Astrola Reflectors will reveal a large portion of the fine Lunar and Planetary detail visible in these sketches. Astrola Reflectors are made for discriminating telescopists by experienced opticians and observers.



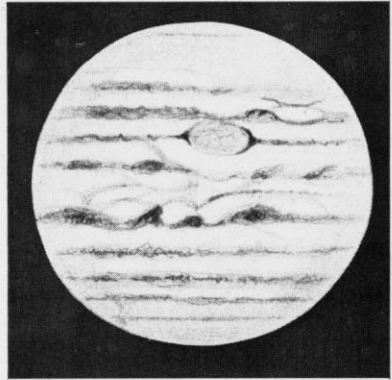
SATURN ..... by T. R. Cave, 1954

Approximately 8 weeks prior to opposition.  
12½" Astrola Reflector = 600x



LUNAR CRATER  
POSIDONIUS  
by A. K. Herring  
9h5m UT ... Sept. 13, 1957  
228x, Col. = 141"  
12½" Astrola Reflector

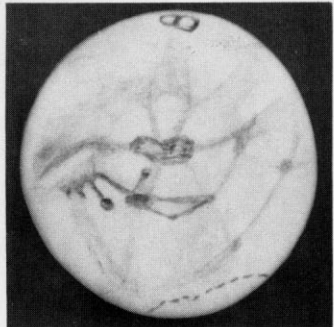
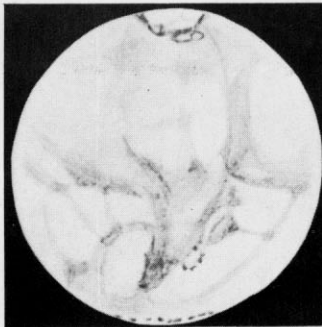
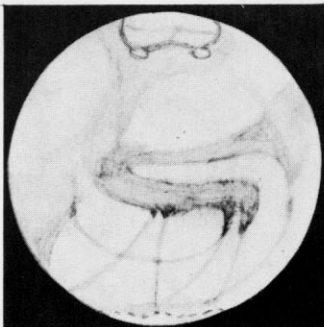
JUPITER  
by A. K. Herring  
4h10m UT ... May 1, 1957  
Sys. I = 210"  
Sys. II = 302"  
12½" Astrola Reflector  
228x



MARS ..... by T. R. Cave, 7h30m UT  
August 9, 1956  
CM = 336" Dia = 21.7"  
12½" Astrola Reflector = 450x

MARS ..... by T. R. Cave, 7h50m UT  
August 16, 1956  
CM = 280" Dia = 22.8"  
12½" Astrola Reflector = 450x

MARS ..... by T. R. Cave, 4h40m UT  
October 12, 1956  
CM = 88" Dia = 20.7"  
12½" Astrola Reflector = 350x



# INTRODUCTION

## THE HOBBY OF AMATEUR ASTRONOMY

Few hobbies can compete with Astronomy in promoting worthwhile education. Nor is this hobby limited to those who own large and expensive telescopes.

Models "A" and "B", 6" and 8" ASTROLAS, economically priced telescopes, will bring the wonders of the heavens to the observer of moderate means in never-ending experiences.

As he turns his telescope skyward toward that red planet MARS, he sees the melting snow caps in the Martian Spring and Summer, surrounded by the blue-green melt band. Dark Mare varying in tone and color, variegated tints of the deserts, transitory clouds drifting across the planet's face, lines crisscrossing the surface and now called canals.

And now the giant planet JUPITER engages his attention. Each year it puts on the planetary show of shows. Your ASTROLA shows you the Jovian belts with ever-changing details. Festoons and minute white and dark markings stand out distinct and clear. Under good seeing conditions, it is very easy to observe the 4 Galileian Satellites as definite discs and under ideal conditions details on the third Satellite (Ganymede) have been seen with our 8" Model "B" ASTROLA.

Turn your scope now to SATURN, that intriguing object with the ball within the ring. The belts are plainly visible. In addition to the famous Cassini division in the ring, observers have reported seeing the difficult division in the outer ring known as Encke's during the last Spring and Summer. The Crape ring is always a prominent feature under fair observing conditions with the darkening areas of the middle ring toward the Crape ring being often visible.

You scan the great blue dome where thousands of double stars are challenging you to resolve them. Star Clusters, both open and Globular, lure you with all their charms of other worlds. Illimitable are the targets for your ASTROLA.

Our nearest neighbor, the MOON, should not be neglected. The ASTROLA reflectors will reveal tremendous amounts of detail on the lunar surface, many thousands of craters, and long rough mountain ranges with some peaks higher than any on the earth. Under ideal seeing conditions minute details but a fraction of a mile in size become visible in these telescopes. The MOON will never cease to intrigue the novice or the serious observer in Astronomy.

## THE AMATEUR'S TELESCOPE

With few and rare exceptions, nearly all of the serious astronomical work done by amateurs during the last three-quarters of the Century has been done with reflecting telescopes of the Newtonian type with apertures from 6" to 16", and nearly all the instruments were of first-class professional make. The Newtonian reflecting telescope for nearly a Century has been the prime astronomical instrument of nearly all British amateur astronomers. Beginning with the silvered glass reflectors by George With, followed by Calver, Linscott, and more recently by Hargreaves, these competent English makers of the reflectors produced instruments second to none in type and better in performance than the best refractors of equal aperture. In America, near the end of the last Century and during the first two decades of this one, The Clarks, Brashear, and Lundin made many of the largest and best refractors in the world, and their small instruments found their way into the hands of many amateur astronomers. So often these fine instruments were compared to some amateur-made reflectors of mediocre quality, with the result that the poorly constructed reflectors suffered in comparison. Today the situation is changed. Professional made reflectors can hold their own with the best refractors of equal aperture, and their cost is but fractional.

## THE FOLLY OF BUYING CHEAP OPTICS

We do not make cheap mirrors or diagonals, but we are spending a lot of time correcting and refiguring them for the purchaser who has been led to believe he could get something good for an absurd low price. Quality always commands fair prices. This is true with telescope mirrors. Our optics are the result of high-skilled workmanship. They are thoroughly tested before leaving our plant, later sky tested, and are guaranteed to give satisfactory performance.

## SCHOOLS AND COLLEGES

The demand for instruction in Astronomy by students in High Schools and Colleges has led to the establishment of classes in Astronomy in these Institutions, many of which are trying to teach this subject without the benefit of any telescopes. It must be apparent that under such conditions, the teacher is deplorably handicapped, and the student must rely solely on photographs, drawings and descriptions of the Celestial objects, as shown in books.

In many instances, this condition prevails in the Schools, because the School Board or Regents have believed the cost of a telescope was prohibitive. They have not known how the ASTROLA Portable 6 inch, 8 inch or 10 inch could be utilized without any observatory or special building, and after a night of observing, could be replaced in some building until needed again.

Where the School or College is financially able to purchase a larger instrument, we offer the 12 $\frac{1}{2}$  inch and 16 inch for permanent mounting. Each of the above instruments is of such excellent optical quality, that real Astronomical work may be done with it.

## REFLECTORS OR REFRACTORS

Which are the better? We are often asked which are the better. Perhaps each has some advantages. We believe, however, that equal apertures is a fair test; and we also believe that our professional-made ASTROLAS will compare very favorably with fine refractors of like aperture, and they will cost but a fraction of the refractors. We have never seen a refractor of less than 6" that would give equal performance with our Model "A" 6" ASTROLA. The 6" ASTROLA is priced at \$325.00, f.o.b. our plant, while the 6" refractor is priced from \$2,500.00 to over \$6,000.00. True, the reflector is the poor man's telescope.

## PYREX DIAGONALS

For best performance of your reflector, you should use our pyrex elliptical diagonals, which are aluminized and quartz overcoated and good to 1/10 wave length or better. Our experience has shown that elliptical diagonal flats give very much improved performance over the older prisms, and we recommend them unreservedly. They are installed in our complete telescopes or sold separately, if desired.

## THE ASTROLA REFLECTORS

Our Portable Model ASTROLA Reflectors, "A" 6 inch; "B" 8 inch; and Model "C" 10 inch in the Standard and Deluxe versions, will give outstanding optical performance on nights of "good seeing", and mechanically are staunch and stable, of neat clean-line appearance. These portable models are very easily assembled and disassembled, and may be easily transported to areas of fine viewing in any modern automobile.

Our portable ASTROLAS fulfill a long existing need for a fine telescope of compact design and light weight, but of sufficient aperture for serious astronomical research in the fields of Lunar and Planetary study, Variable Star observations of fainter stars, comet seeking, etc. Every consideration has been incorporated in their designs for the observer who must have an instrument readily portable, but of large enough aperture for serious astronomical work. The 6 inch, 8 inch and 10 inch portables will perform far beyond the refractors of 3", 4" or 5" aperture; refractors of 6" to 10" aperture should be permanently mounted, and cost many times our prices.

In all ASTROLA Portables, the tubes are of fiberglass, reinforced with heavy, highly polished, aluminum and rings. With the exception of the 1 $\frac{1}{2}$ " solid steel shafting for the Right Ascension and Declination Axes, all other parts of the mounting are of virgin cast aluminum, heat treated, all parts beautifully finished and painted.

Our large observatory model ASTROLAS, 12 $\frac{1}{2}$  inch designated as "D" are the finest research telescopes of moderate aperture available, and at prices within the reach of many observers who for years have desired a permanently mounted telescope of professional research aperture. While these permanently mounted large ASTROLAS require a good weatherproof housing, this may vary from a simple roll-off shelter, to a complete revolving observatory dome. These telescopes require a permanent ground or floor level concrete base from three to

six feet in the ground, depending upon local soil. They all have full rotating tubes in finest bearings, clock-driven with declination slow-motions. They are available for long exposure photography, with push button electric slow-motions in both axis brought to the eyepiece. Truly no School, College or Institution teaching astronomy can afford to be without a permanent observatory ASTROLA telescope, and they are priced so all Schools can afford them.

### OUR FINISHED PARABOLIC TELESCOPE MIRRORS

All telescope mirrors produced and sold by Cave Optical Co. are entirely manufactured by our opticians. They are all made of Pyrex brand glass, and are first ground flat on the back side for ease of mounting. Each mirror is then ground to the focal length as ordered by the customer. We fully polish each mirror with finest rouge on our Draper Polishing Machines. Each mirror upon completion of polishing is completely hand figured and tested with the most modern type of Foucault test equipment until the mirror shows a perfectly smooth, even figure, free of zones, and exhibits the perfect classical parabolic shadings for its proper focal ratio. We have already completed over 1900 such mirrors, which are now in constant use through 48 states of this country, and in a dozen or more foreign countries. Their users attest to the consistent quality and splendid performance of Cave Optical Co. mirrors.

### HERE'S WHAT OUR

I am writing to tell you of the results obtained with your 8-inch Astrola. We are all thrilled with your telescope. In all the years I have been studying astronomy, I have never seen a more perfect telescope.  
1207 W. 168th Street  
Gardena, California  
Robert Cassell

I bought a 6-inch Richest Field Mirror from you, and I wish to recommend your optical work to anyone who is looking for first quality work and service.  
1735 S. Florence Place  
Tulsa, Oklahoma  
C. L. Tolliver

Received my telescope in good condition. I am really delighted and satisfied with the performance of your Astrola 8-inch. The sight of Cluster M-3 and M-13 is something that never bores me; both resolve nicely with high power. Thank you for a fine telescope.  
107 Fourth Avenue N.  
Virginia, Minnesota  
Louis Demorlis

The mirror came and I want to congratulate you on making a very fine job of it. On unwrapping the package, I was especially pleased to see the beautiful polish. The Moon at first quarter and Saturn gave fine views, but actual tests were made on the stars. Identical appearance of the rings on each side of focus, proves the mirror an excellent one.

Thank you for sending me a diagonal with the mirror. I am looking forward to many hours of enjoyment with the new mirror.  
1216 Leeds Terrace  
Baltimore 27, Maryland  
Charles Cyrus

"I am glad to recommend your telescopes. Everyone who has seen my scope in action comments on its high quality. I have yet to see a reflector of equal aperture that can surpass it."  
4849 Chevy Chase Blvd.  
Chevy Chase 15, Maryland  
Bill Doying

"The optical system of my 12-inch F/5.1 was figured by Cave Optical Company. The instrument performs perfectly at powers of 700 and above. I am glad to recommend the Cave Optical Company for their fine craftsmanship and their astronomical instruments."  
P. O. Box 25254  
West Los Angeles 25, California  
Millard Williams

"The 6-inch mirror I purchased from you has proven its excellence through use in observation. The optics are clearly of the most superior quality and I recommend them to anyone."  
R.F.D. #4  
Charles City, Iowa  
Charles Martens

"I am highly pleased with the two 8" mirrors you made for me. They certainly do everything you said they would. Your company is rendering a real service — especially to the Amateur Astronomer."  
223 Lullwood  
San Antonio, Texas  
Henry W. Poland

"I have bought three mirrors, a 6", 8", and 12½", from Cave Optical Company and I have been much pleased with all of them. With the 6" I have seen the Lunar Clefs near Sabine and Ritter and the major members of Virgo clouds. The 8" and 12½" have helped me find galaxies and planetaries. I have advised friends and strangers to buy Cave Optics. I believe that the Cave Optical Company is aiding Amateur Astronomy greatly."  
1124 State Street  
Santa Barbara, California  
Leland S. Copeland

"For more than a year I have used my optics, made by you, giving me ample opportunity to test them. The high standard of your work and the prompt and pleasant way of doing business cannot be beat. Your old customers know what I mean."  
Bayside Country Club  
#60 Sandy Lane  
Warwick, Rhode Island  
Joseph Machado

There is no substitute for truly fine optical quality in telescope performance.

### REFIGURING IMPERFECT MIRRORS

Few Amateur made mirrors are satisfactory. How often do we hear the complaint of the Amateur who sends us a mirror upon which he has spent many, many hours of labor, trying to grind and polish it according to his book of instructions. He has done everything the book said to do, yet even he, upon his first trial on the stars, can see that something is wrong.

He is right, something IS wrong. It has a turned down edge, is over or under corrected — has zones — lemon peel surface of other defects — and he does not know how to cure them. The book said it was easy — but it is highly technical and difficult to produce a fine performing mirror. We have made and corrected more than 2,000 mirrors, and we know of nothing that may be substituted for experience.

We can truthfully state that 95 percent of Amateur made mirrors will not give satisfactory performance.

Not many novices would undertake to do a fine machine job, but they have no hesitation in starting a mirror, although it is highly technical and far beyond their capacity.

We specialize in taking the imperfect mirror, refiguring, aluminizing and coating it, and making it into optics as fine as can be obtained, and do it at a reasonable price. We do not let a mirror leave our plant until it has been thoroughly tested, and we know that it will give excellent performance.

### CUSTOMERS SAY!

"Since May, 1954, I have been using a 12½" mirror and diagonal made by the Cave Optical Company. Their performance on the moon and planets has been very pleasing and I consider them superior to all of several dozen telescopes I have used from 1935 to 1956 with a possible exception of an 18" Brasher Refractor. Good seeing has revealed up to 10 dark belts in Jupiter and hints of detail on Jupiter III (Ganymede). I recommend the work of the Cave Optical Company very highly."  
1203 N. Alameda Street  
Las Cruces, New Mexico  
Walter H. Haus, Director A.L.P.O.

"I have used my 8" telescope to the optimum. It has equaled and surpassed the claims made for it by the Cave Optical Company. Space does not permit me to describe in detail its excellent performance but I am glad to recommend it to anyone who wishes the most for their money."  
800 Eighth Street  
Fairmont, West Virginia  
David Meisel

"The high quality of my 8" Astrola has been clearly demonstrated in the rigid tests to which it has been subjected. On many nights of good seeing, the Dawe's Limit of resolution was easily reached. Having been an observer for 15 years, I have been able to judge optical performance, and I congratulate you on the quality of your work."  
2241 S. Cuyler Avenue  
Berwyn, Illinois  
Joseph P. Vitous

"After using a Cave reflector for nearly a year, I am more than gratified by its performance. The combination of rugged mounting and optical perfection make it a pleasure to use."  
163 Lincoln  
Coalinga, California  
Wendell D. Flint

"It is indeed a pleasure to recommend the Cave Astrolas. My 8" arrived in perfect condition and I have nothing but praise for its performance. I highly recommend the Astrolas to all serious observers, who wish a fine instrument at a reasonable price."  
Box 607 - Georgia Tech.  
Atlanta, Georgia  
Daniel Lee Albritton

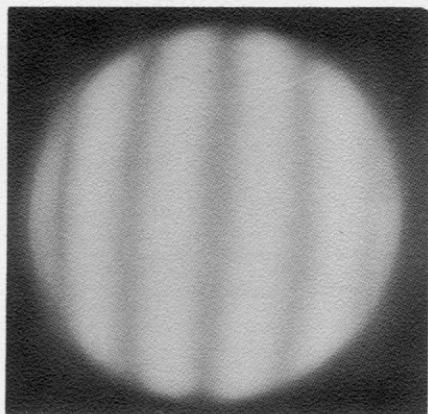
"Dividing the Twin Craterlets on the floor of Plato with a 6" Cave Mirror is a truly praiseworthy performance."  
119 Woodland Avenue  
Coatsville, Pennsylvania  
Howard G. Allen

"I had a poor mirror. The Cave Optical Company corrected it and made it into a real mirror. This company is not satisfied with anything but perfect mirrors."  
2011 La Mesa Drive  
Dodge City, Kansas  
B. A. Stevens

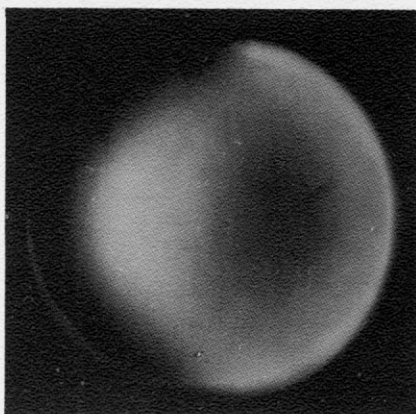
"The use of your 6" mirror has given me great pleasure in observing and knowing that I own the finest optical surfaces available. I recommend your work above all others."  
1553 Wayne Avenue  
York, Pennsylvania  
Theodore R. Hake

"The Cave Optical Company refigured my 10" mirror and I consider the optics of the highest possible quality. I am a member of A.L.P.O. and for Lunar and Planetary observations the finest definition and resolving power is necessary. I cannot recommend the Cave optical work too highly."  
Pierce, Nebraska  
Milton Rosenkotter

"The mirror you made for me is all and more than you claimed it would be. I am proud of my telescope. I shall be happy to show any inquiring parties the quality of your workmanship."  
1222 Mountain Lake Road  
Dallas, Texas  
Duane H. Platt



RONCHIGRAM



FOCOGRAM

Unretouched photographs taken of a standard 8" Cave Astrola mirror,  
54" focal length or F/6.7

## HOW GOOD DOES A TELESCOPE HAVE TO BE?

Such a question asked of any intelligent person would rate only one answer and that would be that its optics must be of the highest precision obtainable . . . yet how often are telescopes considered by their outward appearance alone.

Beauty in a telescope is of course desirable but the essential part of any reflecting telescope is its mirror, because only a true parabolic mirror can guarantee the excellence and exactness of performance you have always desired.

The above two photographs show one of the Cave Astrola's regular 8" mirrors of approximately F/7 focal ratio. On the left photo only five lines are shown just inside radius of a 200 line grating. The even curvature shows a perfect edge and a truly accurate parabola. The focogram on the right, also "unretouched", depicts the perfectly flowing shadows of a fully corrected F/6.7 parabola of better than really 1/10th wave quality.

We invite comparison and the foregoing paragraphs are only a guide or a starting point in selecting your telescope. While many telescopes will often give pleasing views of many celestial objects, the discerning amateur will realize that only optics of the highest precision will give him the finest resolution and contrast in minute lunar and planetary detail.

## "THERE ARE CHEAP OPTICS AND GOOD OPTICS BUT THERE ARE NO GOOD CHEAP OPTICS"



### OUR FRONT COVER—THE NEW MODEL "C" PORTABLE REFLECTOR F/7

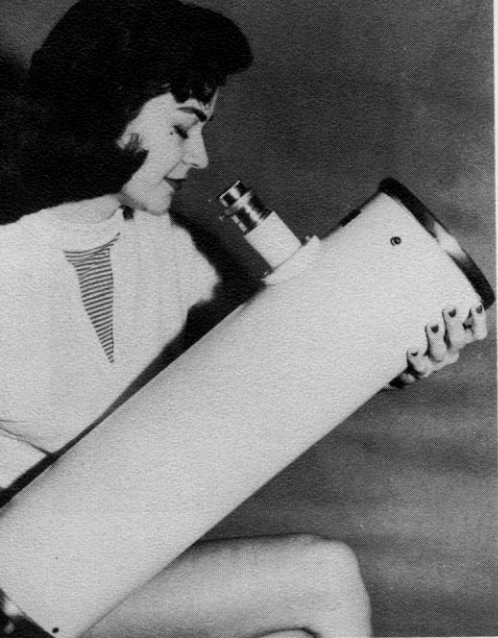
This Model "C" portable 10" is our most recent addition to our portable line of reflecting telescopes. ASTROLA Model "C" is very similar throughout, to the Model "B" Deluxe reflector. The seamless fiberglass tube is 12" diameter and only 72" in length. The rotating saddle is made of aluminum, using Teflon bearings for maximum ease of rotation and absolute rigidity. The massive aluminum stand, legs and equatorial head are all of cast aluminum, heat treated. The synchronous clock drive, as in all other clock-driven ASTROLAS, is completely enclosed so that dust and moisture can in no way affect the precise gears and motor of the clock drive. The setting circles are of the finest quality, solid brass, finely divided and easily read. The rotating tube rings are spaced 24" apart, and the saddle is 24" in overall length. The equatorial head has two large Seal Master cartridge insert ball bearings. The bearings are 12" apart. Dec. axis is also 12" in length and this mount-

ing without doubt is the strongest, most rigid and heavy duty mounting on the market in its price class.

The new Model "C" Deluxe comes complete with 4 of the finest orthoscopic oculars, giving magnifications of 75X, 111X, 222X, and 444X. The 10" pyrex mirror has a focal ratio of F/7 70" focal length and is hand figured to a very high degree of optical precision, thus making the Model "C" the largest, yet most compact ASTROLA Newtonian reflecting telescope available today. As in all other ASTROLA models, the Model "C" will give the very finest lunar and planetary definition, and will reveal faint stars under ideal atmospheric conditions to 14.9 magnitude. This instrument is truly a most ideal telescope for serious variable star observers, as well as a very compact instrument for lunar and planetary observing.

Model "C" Deluxe, complete, 4 oculars — \$750.00

Model "C" Standard, with 3 oculars, 10" F/7 — \$490.00



#### THE ASTROLA 6" "RICHEST FIELD" TELESCOPE F/4

The newest and smallest ASTROLA is truly portable. This small specialized telescope has an extremely wide field and is furnished with a low 22-power magnification. The telescope is to be used cradled in the observer's arms for a night of general viewing of the very rich star-filled sky. The 6" mirror and 13/4" elliptical diagonal are both of pyrex and are figured to an optically high standard and together with the 28 m.m. orthoscopic oculars give a field of view of over 21/2 degrees of the sky. The telescope tube is of fiberglass, only 26" in length; the spider is of our usual four-vane type; and both the spider and cast aluminum mirror cell are easily adjusted for very accurate optical alignment. Although this "Richest Field" telescope is a specialized, wide-field instrument, when mounted it has been used very satisfactorily with magnifications to 100X and beyond. The price of this telescope is \$125.00, f.o.b.

This "Richest Field" Telescope should be really ideal for observing the artificial Satellites of the earth during the coming geophysical year, 1957-58. Being cradled in the observer's arms, the telescope may be very rapidly moved in order to track these new earth Satellites; while conventional telescopes will make observation of these exceedingly difficult, if not impossible. Those desiring finest quality Richest Field Telescope for good performance with powers to 200X "Null-tested and Null-figured" add \$25.00 to the standard Richest Field Telescope.

This "Richest Field" telescope has found wide application among Moonwatch teams observing the artificial Earth Satellites. By utilizing "Optical Fence" methods and employing from five to nine of these instruments for each team, many of the small faint satellites have been accurately observed for position at apogee. Large extended nebulae totally invisible in conventional focal length telescopes become easy objects of beauty with the 6" and 8" Astrola "Richest Field" telescopes.

NEW—Also available, a 6" F/5 and F/6 as mounted above, with orthoscopic Brandon ocular (your choice) of the finest optical quality. \$125.00 without standard or equatorial mounting.

NEW—Now available for the first time anywhere, an F/4.5 Richest Field Telescope with 8" Pyrex mirror of 36" focal length, mounted in a 9 1/2" x 37" Parks fiber glass tube with cast aluminum mirror cell, heavy duty spider, and 2 3/8" diagonal and holder. Also including rack and pinion focuser and 30X Brandon orthoscopic ocular. This new 8" Richest Field Telescope has over a 2 degree field of the sky, and is ideal for Variable star observing, seeking comets, etc. Complete including wrapping, packing, and crating, \$199.00 f.o.b., Long Beach, California.

Simple equatorial solid mountings of aluminum now available for this Richest Field Telescope only, \$72.50. Also available, slow motion mounting for the 6" Richest Field Telescope F/4, F/5 or F/6 including slow motion, \$97.50.

#### MODEL "A" ASTROLA-6" NEWTONIAN REFLECTOR F/8

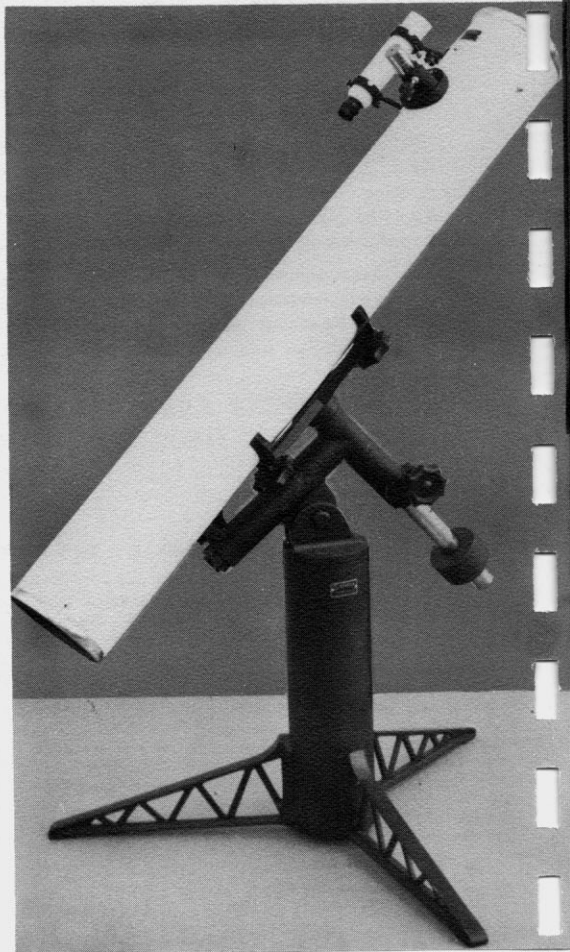
This Model "A" portable is a very convenient and light ASTROLA telescope. The tube is of fiberglass, much lighter, stronger and better thermally than aluminum. It has a standard 1 1/4" diameter rack and pinion focuser, large achromatic finder with fine cross hairs, the main mirror and elliptical diagonal are of pyrex, aluminized and quartz coated and hand figured to an exceedingly high standard. Telescope's equatorial head, saddle and stand are all of cast aluminum with R.A. and Dec. axes of 1 1/2" diameter steel shafting. The polar axis is very easily adjusted for any latitude. Three of the finest orthoscopic oculars are furnished with this telescope, and give the following magnifications: 72X, 180X, and 315X. These powers may be greatly increased by the use of a Barlow lens, when desired. The telescope stand and equatorial mounting are finished in black; the tube in white with trim end rings of polished aluminum. This telescope may be very easily disassembled for transit and reassembled in about three minutes' time. The weight of the telescope complete is approximately 65 pounds. The price is \$325.00 f.o.b. our plant, clock drive \$85.00, setting circles, \$50.00, rotation tube, \$60.00 additional.

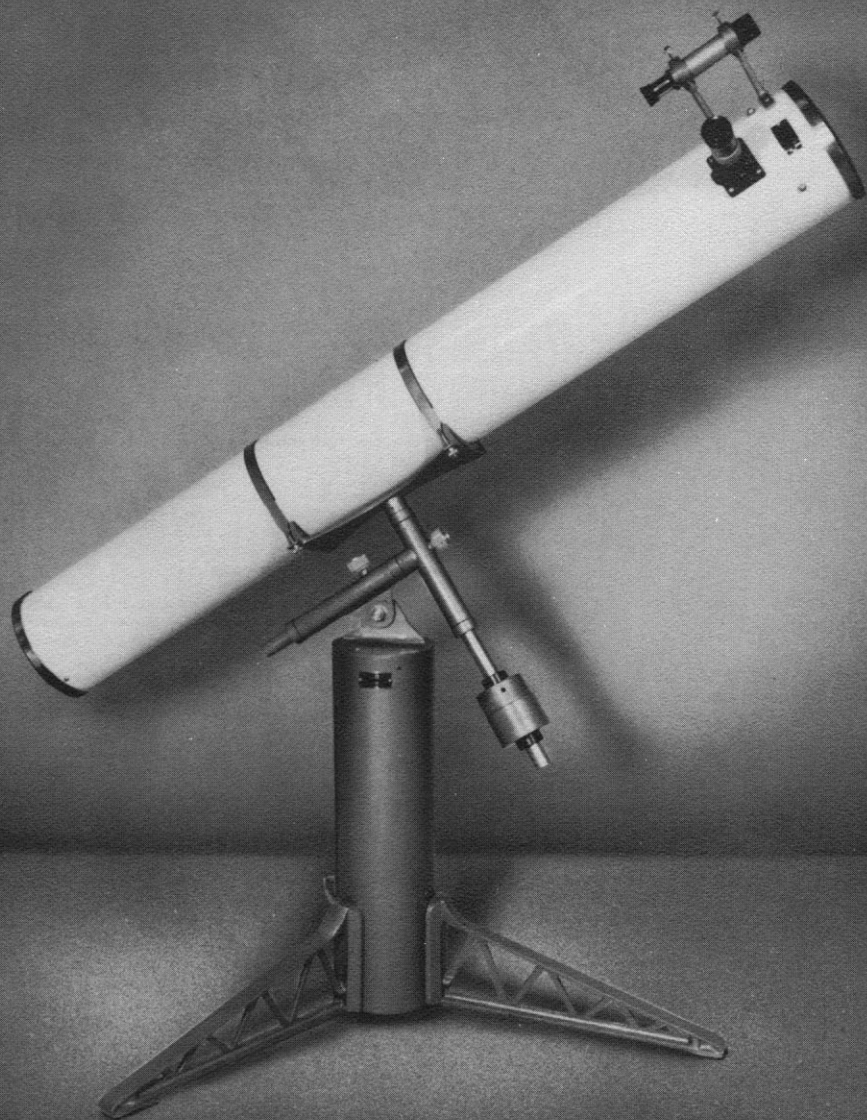
NEW—Deluxe Model "A" Astrola 6" F/8 with clock drive, rotating tube, and setting circles, identical to the 8" Model "B" except for aperture, \$500.00.

#### OUR OPTICAL GUARANTEE

We guarantee each and every telescope mirror; both for our Astrola Reflecting Telescopes and all that we manufacture new or refocused, to give absolutely top quality performance and that the internal and external focus images of stars will appear identical. These mirrors will resolve to, at least, the Dawe's Limit and will reveal exceedingly fine lunar and planetary detail.

Because of their outstanding optical polish by our special methods, they will reach the faintest stars at the threshold limit of each aperture.





### THE NEW ASTROLA STUDENT 6" REFLECTOR

The all new budget priced STUDENT ASTROLA has been completely designed with the beginning observer in mind. We have incorporated in the STUDENT the optical system and quality found in our larger and more expensive instruments; the finest hand figured F/7, F/8, or F/9 parabolic Pyrex mirror, with aluminizing by Pancro Mirror's exclusive process, a 1/10 wave pyrex elliptical diagonal and three good quality oculars giving powers in the F/9 of 50X, 110X, and 220X, and the oculars are 1 1/4" in diameter, American standard size. The same massive legs and column used on the larger portable ASTROLAS are combined with a strong, very rigid but lightweight equatorial mounting. The saddle straps about the tube allow the tube to be turned for comfortable eyepiece position when viewing in all parts of the heavens. The finder is 8X 30mm with excellent

crosshairs, and the focuser is a very smooth helical type with 4" of focusing adjustment.

In optical performance the STUDENT is the equal of any six inch reflector and is unconditionally guaranteed to resolve to Dawe's limit and reveal a wealth of lunar and planetary detail. The mirror cell is our standard aluminum cell and the spider and diagonal holder are also our standard type. The STUDENT weighs 48 pounds and may easily be assembled or disassembled. Perhaps best of all, we have priced this fine instrument for the beginning observer and student at only \$194.50 plus \$5.50 packing and crating. Very prompt delivery, often within seven to nineteen days after our receipt of your order. Optical RESOLUTION is 0.7" of Arc. Dark Sky Threshold limiting magnitude is 13.0.

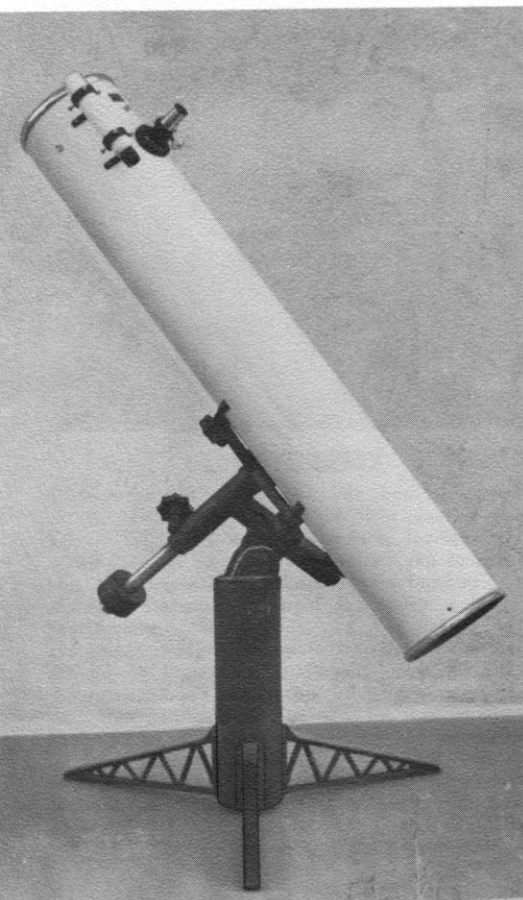


### THE NEW ASTROLA MODEL "B" DELUXE 8" NEWTONIAN REFLECTOR

Our Deluxe Model "B" portable 8" is a recent addition to the ASTROLA line of telescopes. Although essentially this telescope is similar to Model "B", it incorporates all of the advantages of the larger size permanently mounted instruments with the light weight and portability of the Standard Models "A" and "B". The Cave ASTROLA Model "B" Deluxe may be obtained in other focal ratios than F/7 at no increase in cost. The Deluxe Model "B" is equipped with the standard three orthoscopic oculars and working at F/7 will give magnifications of 84X, 210X, and 360X. As an ultimate instrument of its size, the Model "B" Deluxe allows the observer the many conveniences of larger observatory-type telescopes with the advantages of its absolute portability. There is no optical difference between our Standard Model "B" and our Model "B" Deluxe ASTROLA — only in the mounting and accessories are to be found the advantages in this telescope. We have only recently placed on the market our Deluxe Model "B" ASTROLA to fulfill a needed demand for this particular instrument. This telescope will particularly please the observer desiring maximum convenience and ease of observing operation. The price complete F.O.B. our plant, \$590.00.

The new 8" Model "B" Deluxe is on the identical equatorial head as the Model "C" 10" Deluxe. This instrument is without doubt the finest 8" Reflecting Telescope including deluxe features, offering on the market today in its class.

NEW—Model "B" deluxe Astrola now available also in F/6 or F/7 or F/8 focal ratios at above price.



### MODEL "B" ASTROLA-8" NEWTONIAN REFLECTOR F/7

Our Model "B" portable 8" has been designed for maximum portability of a moderate size telescope. All dimensions of this Model "B" still make it possible to easily store in a standard passenger automobile for portable transportation to good observing sites. The telescope mirror is of F/7 focal ratio, allowing it to be just as conveniently used for observation as the Model "A". The 8" mirror and elliptical diagonal of pyrex are hand figured to a very high optical standard. The equatorial mounting is identical with Model "A" and the tube is of fiber-glass 9 1/2" diameter by 58" in length. This 8" telescope has nearly twice the light grasp of our Model "A" 6" and comes with standard orthoscopic oculars, giving a magnification of 84X, 210X, and 360X. Under very fine seeing conditions, much greater magnifications are possible by using a Barlow lens. The weight of this telescope is approximately 72 pounds, making it very light and portable and easily stored. The optical resolutions of Model "B" for double stars of equal magnitude is .6" of arc. Price of this telescope complete is \$390.00, f.o.b. our plant. Added, clock drive, \$85.00 additional; setting circles, \$60.00, and rotating tube, \$70.00.

NEW—Model "B" standard Astrola now available in F/6 or F/8 focal ratios, at the above price.



## THE TRUTH ABOUT ASTRONOMICAL TELESCOPES

We have been hold on very good authority that the fascinating hobby of telescopic Astronomy is the fastest growing technical hobby in America. Astronomical observation has long been a hobby; two or three centuries ago, confined first to kings, noblemen, and the very wealthy. Beginning in England about a hundred years ago, this remarkable hobby began attracting considerable numbers of educated laymen from many walks of life. At this time, many of the finest telescopes were manufactured in Great Britain and Northern Europe. Henry Fitz, followed by Alvan Clark, first introduced refracting telescopes of remarkable quality in America. During the last hundred years, thinking men throughout the world have found ever increasing recreation and stimulating diversion from the exciting hobby of telescopic astronomy.

After the second World War, and particularly since the first launchings of artificial Earth Satellites, the public demand for astronomical telescopes has increased tremendously. Some American firms of excellent reputation have partially fulfilled this ever increasing demand for telescopes by creating instruments of sterling quality and reasonable aperture in the medium price range. Many small refracting telescopes, some of excellent quality and low price, are constantly being imported from the Orient. Unfortunately, too many telescopes of poor quality also are being sold today. Perhaps nothing is more disappointing to the beginner than a poor telescope. It is absolutely impossible to purchase a really fine astronomical telescope at a cheap price, whether it be American made or foreign import. The creation of a truly excellent parabolic mirror or achromatic objective is really much more than merely skilled craftsmanship—it is much more art. It is quite impossible to produce telescopes of the highest quality optically by production line technics. To be completely satisfactory, a telescope should not only be of the very finest optical quality, but it should also be of truly adequate size. Few experienced telescopists today consider any telescope much smaller than six-inches aperture large enough for serious observing, whether it be reflector or refractor. It far more often happens that a purchaser buys a telescope too small and poor than too large and good. We, at Cave Optical, have often said, "There are good telescopes, and there are cheap telescopes; but there are no good cheap telescopes."

### ANSWERS TO SOME QUESTIONS FREQUENTLY ASKED

**QUESTION:** Which is the best, a Reflector or Refractor?  
Refractor?

**ANSWER:** Actually the truth is that both are excellent, if optically and mechanically of first quality. But to be practical, few indeed can afford the cost of an excellent 6" or larger refractor (\$3,000.00 up). While many can and do purchase really excellent and portable 8" and 10" Newtonian Reflectors from us (\$400.00 to 750.00) which can easily be taken out of doors for observing, stored conveniently when not in use, and taken on trips and club star parties in the family auto. Our 8" and larger Astrola portables will show much fainter stars, far more fine lunar and planetary detail, and resolve closer double stars than any 6" refractor.

**QUESTION:** How much power can I use on a telescope?

**ANSWER:** This is certainly one of the questions most often asked by the beginner. The power of any telescope, large or small, is severely limited by certain factors. The "seeing" steadiness of the Earth's atmosphere (that ocean of air through which we must look to see the stars). The type of object being observed; extended objects such as large nebulae, open star clusters are seen best with low powers 10x to 25x per inch of aperture. Wider double stars, general views of the Moon and planets, are usually pleasing with 25x to 40x per inch of aperture. Powers above 50x per inch of aperture are generally considered high and should be reserved for close double stars detailed views of lunar and Planetary details, etc. These high powers can only be used when "seeing" is good to excellent and only

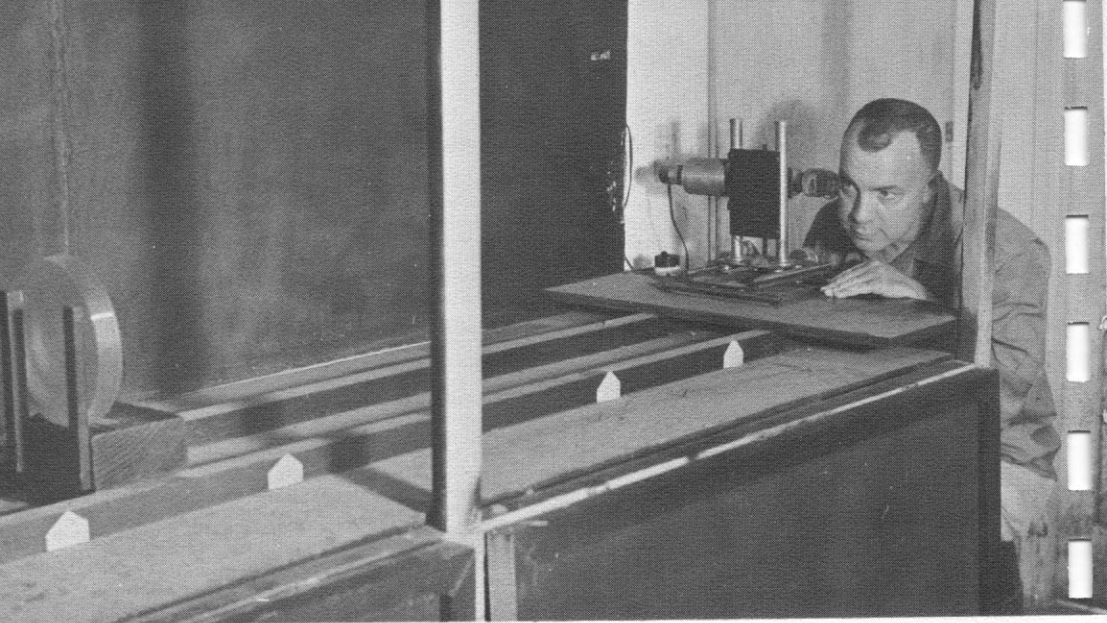
then effectively on certain classes of celestial objects; with the exception of some close visual double star work, even the large observatory telescopes, when used visually, rarely employ more than about 500x. A good rule is never be influenced by high power claims when buying a telescope.

**QUESTION:** To what fraction of a wave length do you make your mirrors?

**ANSWER:** Actually, advertisements guaranteeing the customer a certain fractional wave length parabolic telescope mirror or objective lens are rather recent. Few, if any, reputable manufacturers of astronomical optics used fractional wave length advertising until perhaps eight or ten years ago. All the famous telescope manufacturers of the past, whose names have become legend, never mentioned their outstanding quality of the instruments in this manner, relying rather on their own established reputation and the remarkable optical performance of their telescopes. In quite recent years, various manufacturers have constantly increased their advertised optical claims. Beginning with 1/4 wave or 1/6 wave length; quite recently some have claimed 1/20 wave or better quality, and then at competitive moderate prices. True, a highly skilled optician using a "Null" test and working very slowly under ideal conditions can spend many additional hours of labor to produce parabolic surfaces in the order of, perhaps, 1/20 wave length. The cost of each such mirror would undoubtedly be between double and triple the normal market price from Cave Optical Company. The Cave Optical Company, fully realizing this appalling situation, is no longer advertising their mirrors to be corrected to any particular fractional wave length. Instead, we now state that each and every mirror which we manufacture of normal focal ratios (F/6 to F/12 inclusive will render at thermal equilibrium intra and extra (inside and outside) focal start images which are identical. We, also, unconditionally guarantee that each of our new or refigured mirrors, including those for all regular Astrola Reflecting telescopes (Standard or Deluxe Models), will reveal a wealth of very minute lunar and planetary detail and will resolve double stars to at least Dawe's empirical limit. Our mirrors have an exceedingly fine, smooth polish and figure and will reach the absolute threshold limit for each aperture. We justly feel that a customer can pay much more than our prices for a mirror, but he will not obtain any better performing mirror than we produce at any price. Optical performance on the stars and planets is the final and last proof of the outstanding excellence of any telescope. A few thousand active observers already attest to our truly outstanding optical and complete telescope quality; when you buy from us you can buy with complete confidence.

**QUESTION:** What focal ratio is best in a reflecting telescope?

**ANSWER:** Actually, all reflecting and refracting telescopes are to some extent a compromise. Normally, the refractor is made long, about F/15, to reduce as much as possible the chromatic aberration (secondary spectrum). This defect does not exist in the reflecting telescope, and reflectors are made, normally, about one half the focal ratio of refractors (F/8). There is no practical reason why a reflector or reasonable aperture cannot give top quality high power definition at F/6. Serious variable star observers and comet seekers sometimes desire special short focus reflectors of very wide field at low power. We have made quite a number of reflectors to 12 1/2" in F/5 focal ratio. For all types of observing and to obtain the finest definition possible, we suggest from years of practical experience F/6 to F/8 focal ratios. In an 8" and 10", the F/7 is perhaps the most perfect compromise in length of tube, finest definition, and ease of observing. Some experts in the field of lunar and planetary observing have long advocated very long focus (F/10 to F/15) reflectors. We firmly feel that there is no real or adequate reason to build reflectors of this long and unwieldy ratio. Nothing is really gained in performance and the telescope becomes often quite difficult and uncomfortable to use and mount steadily due to its great length.

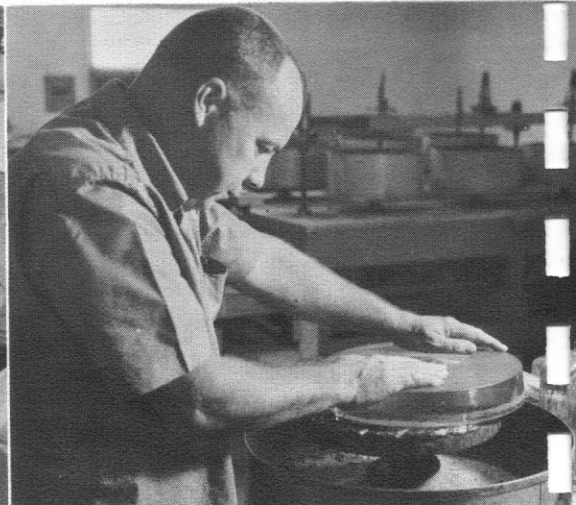
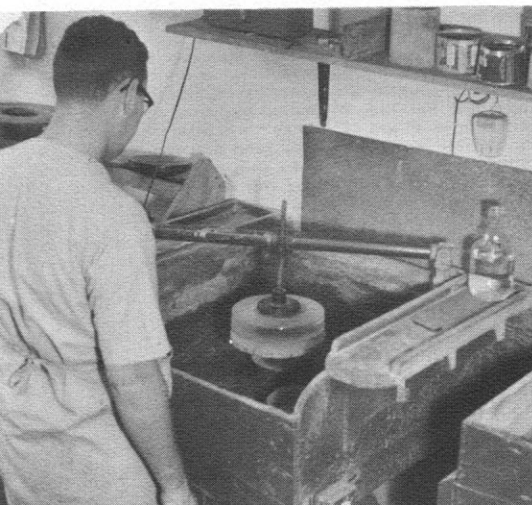


## MIRROR MAKING

A fine parabolic telescope mirror, like a fine painting, is truly a work of art. Perhaps nothing else made by man is so closely worked to absolute tolerance of perfection as a telescope mirror. Here, two or three millionths of an inch separate a perfectly figured mirror from one of second optical quality. We make all our mirrors of the finest precision annealed Pyrex glass. Grinding is done with exacting care to eliminate scratches, bubbles and minute pits. Several progressively finer grades of optical abrasive are used, and very special care is taken to carefully check the surface between abrasive grades. Once the grinding is completed, each mirror is polished on one of our fourteen large polishing spindles using nothing but the finest Zobel optical pitch. Polishing continues twenty-four hours a day on these automatic machines until the mirror is absolutely polished and free of pits and scratches and near spherical in figure.

The mirror is now ready for the most critical, exacting and time consuming operation — that of hand figuring the mirror to the true and fully corrected parabola. This parabolizing may require from several hours to sev-

eral days' time depending upon the size mirror, focal ratio, and etc., before the mirror is finally completed and ready for aluminizing and use in the telescope. From the very beginning of hand figuring, frequent use of the Foucault or Knife edge test is required and as the mirror more closely approaches the finished parabola, constant testing is required. The most painstaking and meticulous testing is important in the laboratory. Before the mirror or telescope is ready for delivery, a final performance star test in the field is always made which makes your final assurance of the ultimate optical performance quality. We unconditionally guarantee each and every mirror which we manufacture new or re-figure, to render equal inside and outside focal images with high power of a star image when the telescope mirror is at thermal equilibrium. Also, each mirror will pass perfectly or exceed the Dawe's empirical double star resolution limit, i.e.,  $4.56/\text{Aperture}$ . We feel that no finer astronomical mirrors are available than those which we manufacture or refigure. **YOU CAN PAY MUCH MORE, BUT YOU CANNOT OBTAIN A BETTER TELESCOPE MIRROR THAN WE MAKE.**



## Machining and Assembly

All deluxe ASTROLAS have incorporated in polar axis housing "Sealmaster ball bearings" eliminating forever the usual friction found in less expensive bearings, allowing the fine ASTROLA clock-drive to always function perfectly. Special tooling and jigs enable us to machine each component telescope part to consistently close tolerances. Unlike competitive telescopes, ASTROLA reflectors are not mass produced but are most carefully and meticulously hand assembled with great attention to every detail. Every ASTROLA is completely preassembled prior to painting and finishing, and then reassembled before field testing on stars and planets.

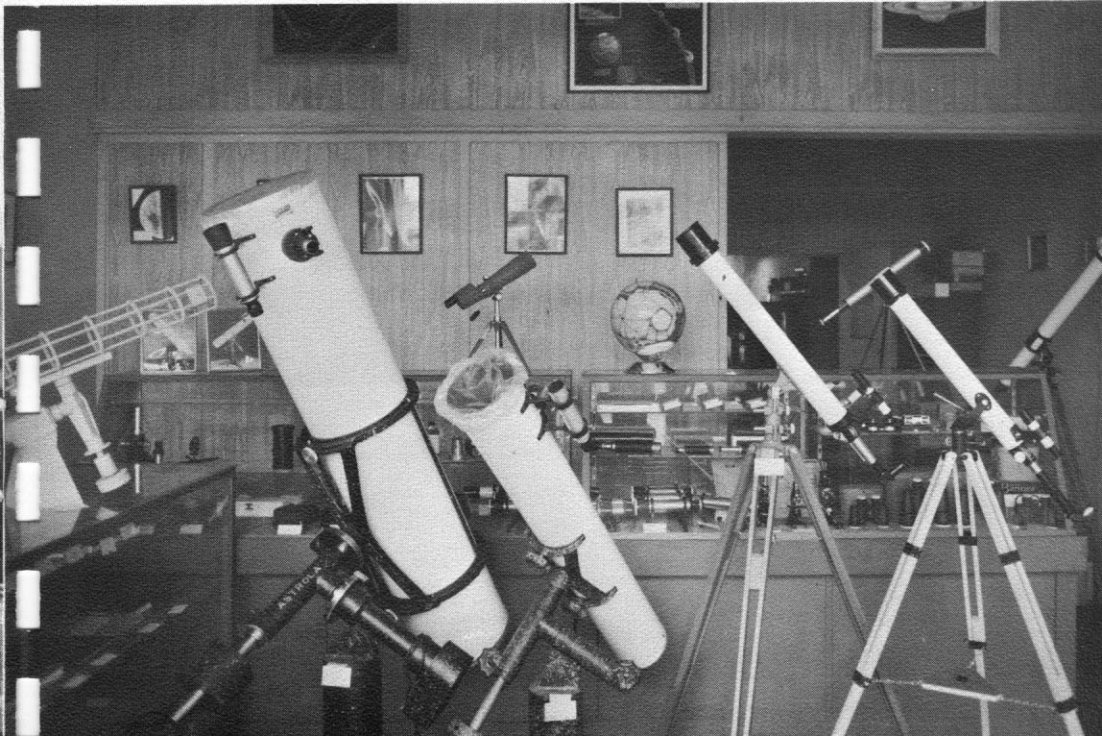
We at Cave Optical were the first to introduce on the national market reflecting telescopes of the highest optical and mechanical quality at reasonable and sensible prices. Since ASTROLA was introduced in 1953, there have appeared competitive models.

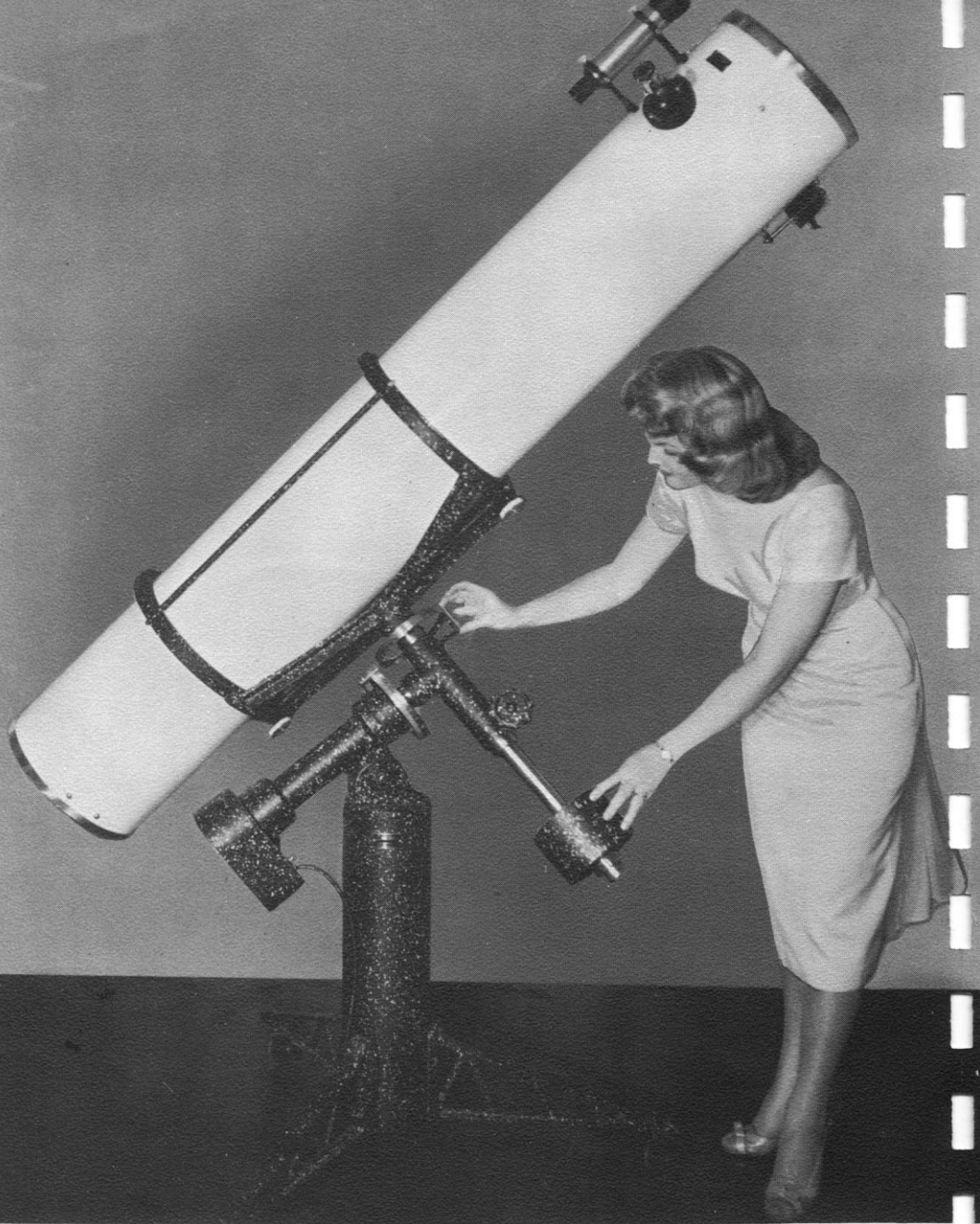


## OUR DISPLAY ROOM

The next time that you are in the Los Angeles area, plan on a visit to our display room and shop. We always have on display various models of our ASTROLA reflectors; some available for immediate delivery. We have selected from the many various makes of small refractors those of the very finest quality and at the lowest prices for the beginner not yet ready to step up to the larger ASTROLA reflector.

We have a large selection of the latest and best Astronomical books, maps, and Atlases. The scale model mockup of the  $18\frac{1}{4}$ " F/8 reflector is shown on the showcase, but one of the larger Custom telescopes is being regularly constructed by us. Plan on a visit to our shop and display room soon, we are open weekdays from 9:00 A.M. until 6:00 P.M. and all day Saturday until 5:00 P.M.





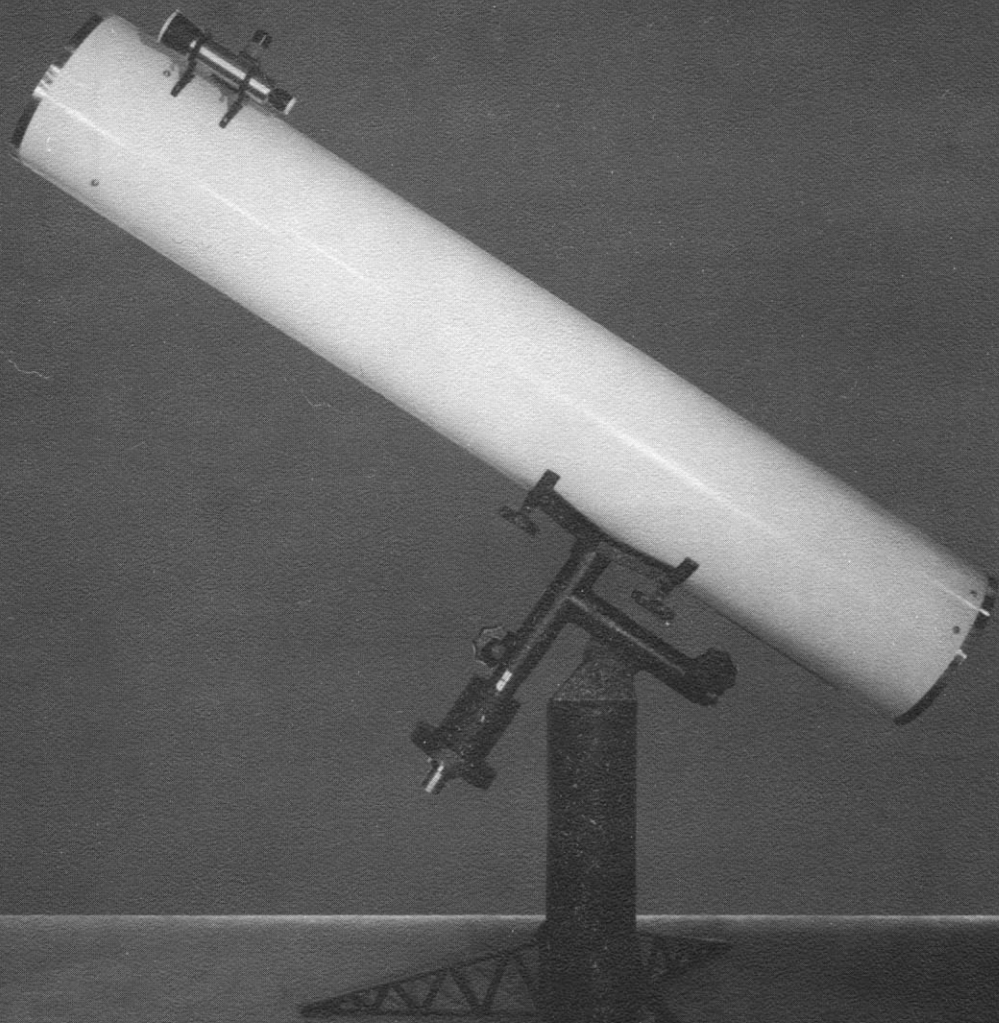
#### THE NEW MODEL "C" PORTABLE REFLECTOR F/7

This Model "C" portable 10" is our most recent addition to our portable line of reflecting telescopes. ASTROLA Model "C" is very similar throughout, to the Model "B" Deluxe reflector. The seamless fiberglass tube is 12" diameter and only 72" in length. The rotating saddle is made of aluminum, using Teflon bearings for maximum ease of rotation and absolute rigidity. The massive aluminum stand, legs and equatorial head are all of cast aluminum, heat treated. The synchronous clock drive, as in all other clock-driven ASTROLAS, is completely enclosed so that dust and moisture can in no way affect the precise gears and motor of the clock drive. The setting circles are of the finest quality, solid brass, finely divided and easily read. The rotating tube rings are spaced 24" apart, and the saddle is 24" in overall length. The equatorial head has two large Seal Master cartridge insert ball bearings. The bearings are 12" apart. Dec. axis is also 12" in length and this mount-

ing without doubt is the strongest, most rigid and heavy duty mounting on the market in its price class.

The new Model "C" Deluxe comes complete with 4 of the finest orthoscopic oculars, giving magnifications of 75X, 111X, 222X, and 444X. The 10" pyrex mirror has a focal ratio of F/7 70" focal length and is hand figured to a very high degree of optical precision, thus making the Model "C" the largest, yet most compact ASTROLA Newtonian reflecting telescope available today. As in all other ASTROLA models, the Model "C" will give the very finest lunar and planetary definition, and will reveal faint stars under ideal atmospheric conditions to 14.9 magnitude. This instrument is truly a most ideal telescope for serious variable star observers, as well as a very compact instrument for lunar and planetary observing.

Model "C" Deluxe, complete, 4 oculars — \$750.00

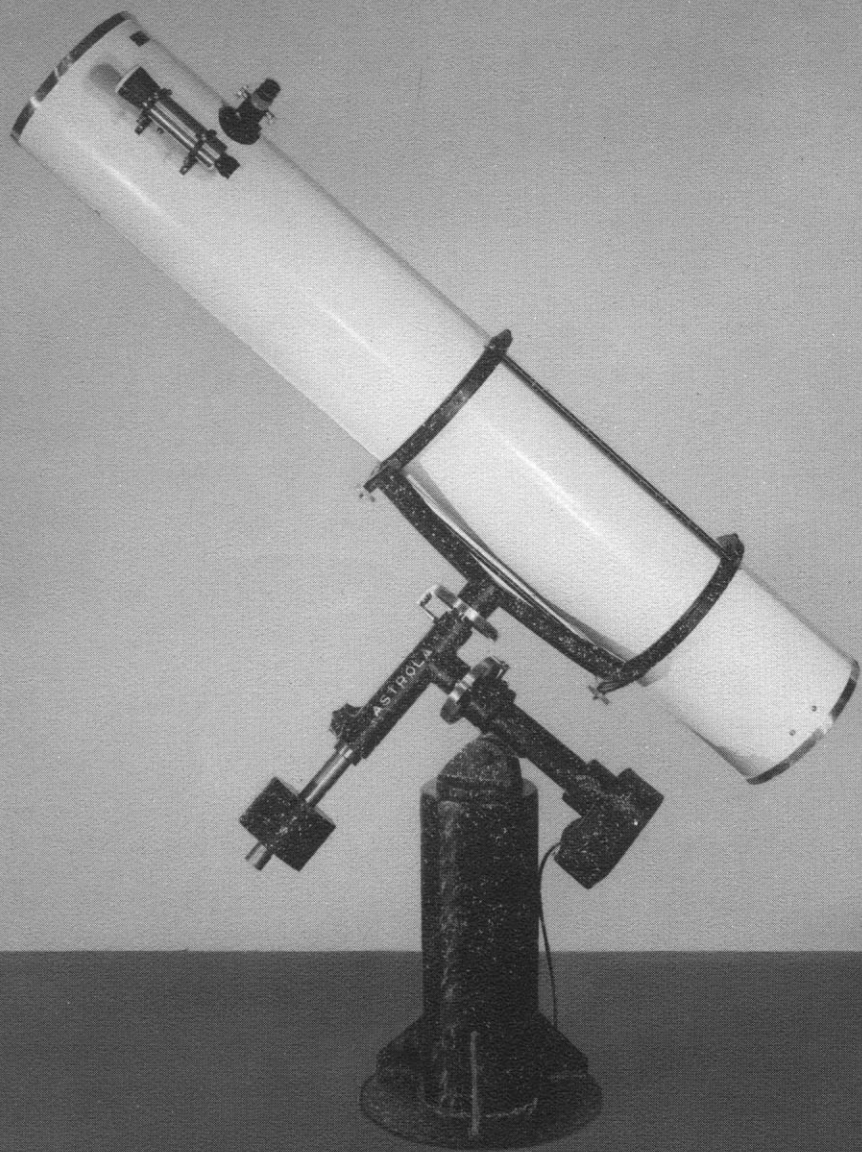


### 10" STANDARD MODEL "C" ASTROLA

Our Model "C" 10" Standard Astrola is our largest aperture, budget priced reflecting telescope. This 10" Standard makes an excellent telescope of very great light grasp on a simple and light weight, yet very sturdy and rigid, equatorial mounting. The portable column of the telescope stand is  $6\frac{1}{2}$ " diameter and 24" in length. The three legs are of heavy cast aluminum 18" in length, each leg being equipped with a heavy roller so that the telescope may easily be rolled. Equatorial head is of heavy cast aluminum No. 365, and each component part is T-6 heat treated. Axes shafts are  $1\frac{1}{2}$ " diameter. Main telescope tube is of Parks fiberglass with large, highly polished end rings. Mirror cell is of cast aluminum. A solid brass spider and 8 x 50 mm finder and our newest rack of pinion focuser. It also has a helical fine adjustment sleeve. This telescope comes equipped with three of the finest Orthoscopic oculars with normal magnifications of 75x, 222x, and 444x on the F/7 focal length tele-

scope. Entire telescope is priced at \$490.00, f.o.b. our plant. Packing and crating is \$15.00 additional.

Although normally this 10" Standard Model "C" Astrola is made in F/7—70" focal length, focal ratios of F/6—60" focal length or F/8—80" focal length are available when desired at the same price. At any time after purchase of Standard Model "C" Astrola, instrument may be converted to a Deluxe model by adding clock drive, rotating ring assembly, and setting circles. Price of rotating rings are \$90.00, setting circles \$60.00, and clock drive \$85.00. This is an outstanding telescope for serious lunar and planetary observing as well as variable star and other stellar observational work. This lowest priced telescope with such a large aperture fully fills needs of serious observer wishing as large a telescope as possible at a budget price.



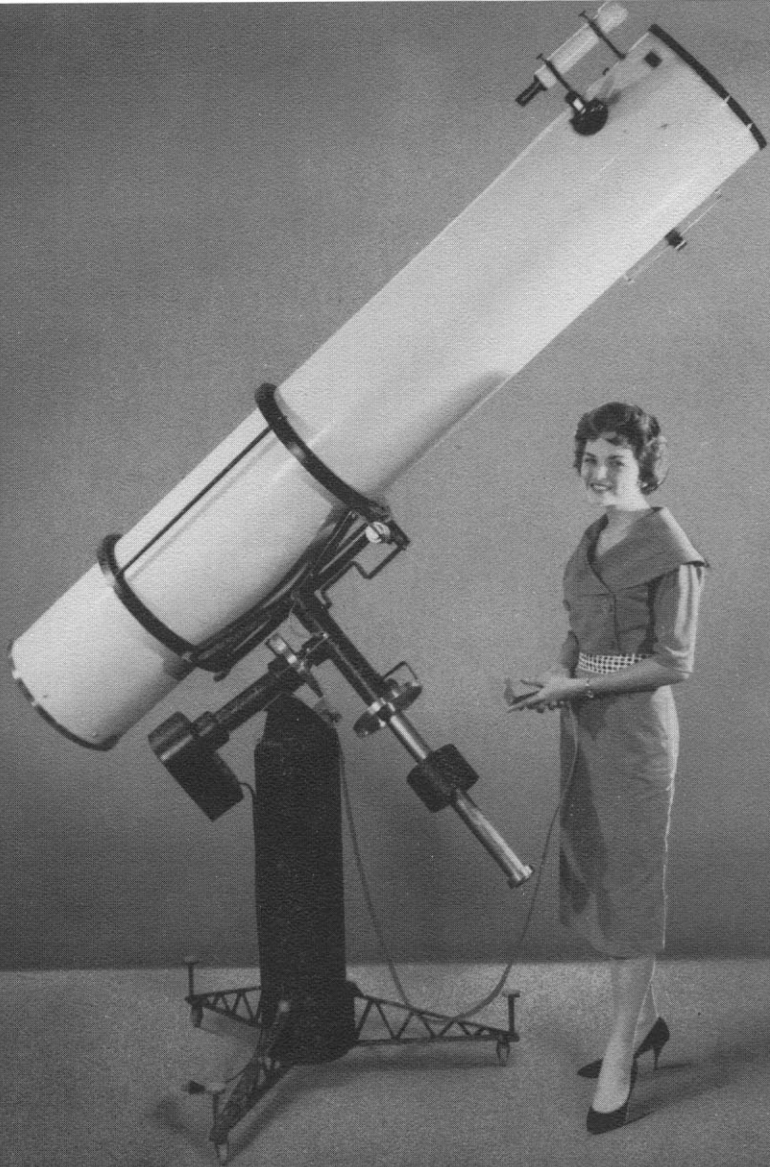
### THE 10" ASTROLA MODEL "C" OBSERVATORY REFLECTOR

The new permanently mounted 10" Deluxe Observatory Astrala fills perfectly the needs of the serious observer wishing to mount his Astrala in a small dome or sliding roof observatory. Truly ideal for the observer wishing to do serious work with a permanently mounted telescope, but where limitation of observatory space or local "seeing" conditions do not warrant a larger reflector. The permanent steel pier is 20" diameter at the base and the upright column is 9" diameter. The normal height of the steel pier is made from 24" to 30", dependent upon the focal ratio of the telescope.

With the exception of the pedestal, this new 10" Deluxe observatory Astrala is identical to the 10" Deluxe portable Astrala. A choice of F/6, (60" focal length), F/7 (70" focal length), or F/8 (80" focal length) is available at the same price. The serious Astronomical photographer will find this instrument ideal for long exposure guiding when equipped with two important accessories. The electric tangent arm slow motion with remote control push buttons for Declination for only \$80.00 additional. A fine transistorized frequency oscillator is also

available for remote control of the speed of the sidereal clockdrive allowing a 50 per cent variation of the sidereal rate to be made for correction of the clockdrive for long exposure photographic guiding. Price of this frequency oscillator is only \$149.50 additional.

In actual performance the 10" Deluxe portable or permanent Astrala leaves nothing to be desired. Extremely fine details are visible in the belt system of Jupiter, the minute divisions on Saturn's rings and all the belt detail on the globe of Saturn. Mars is seen in a wealth of very fine maria and canal detail. Much of the finest detail on the Moon is within the reach of the 10" Astrala. The 10" Astrala is large enough in aperture for the most serious observing, yet compact enough to carry as a portable in an automobile or mount permanently in an 8 foot or 9 foot observatory building. The full price, packing and crating included, of the new 10" Deluxe observatory permanent Astrala with four Orthoscopic oculars is only \$795.00, F.O.B. our plant, Long Beach, California.

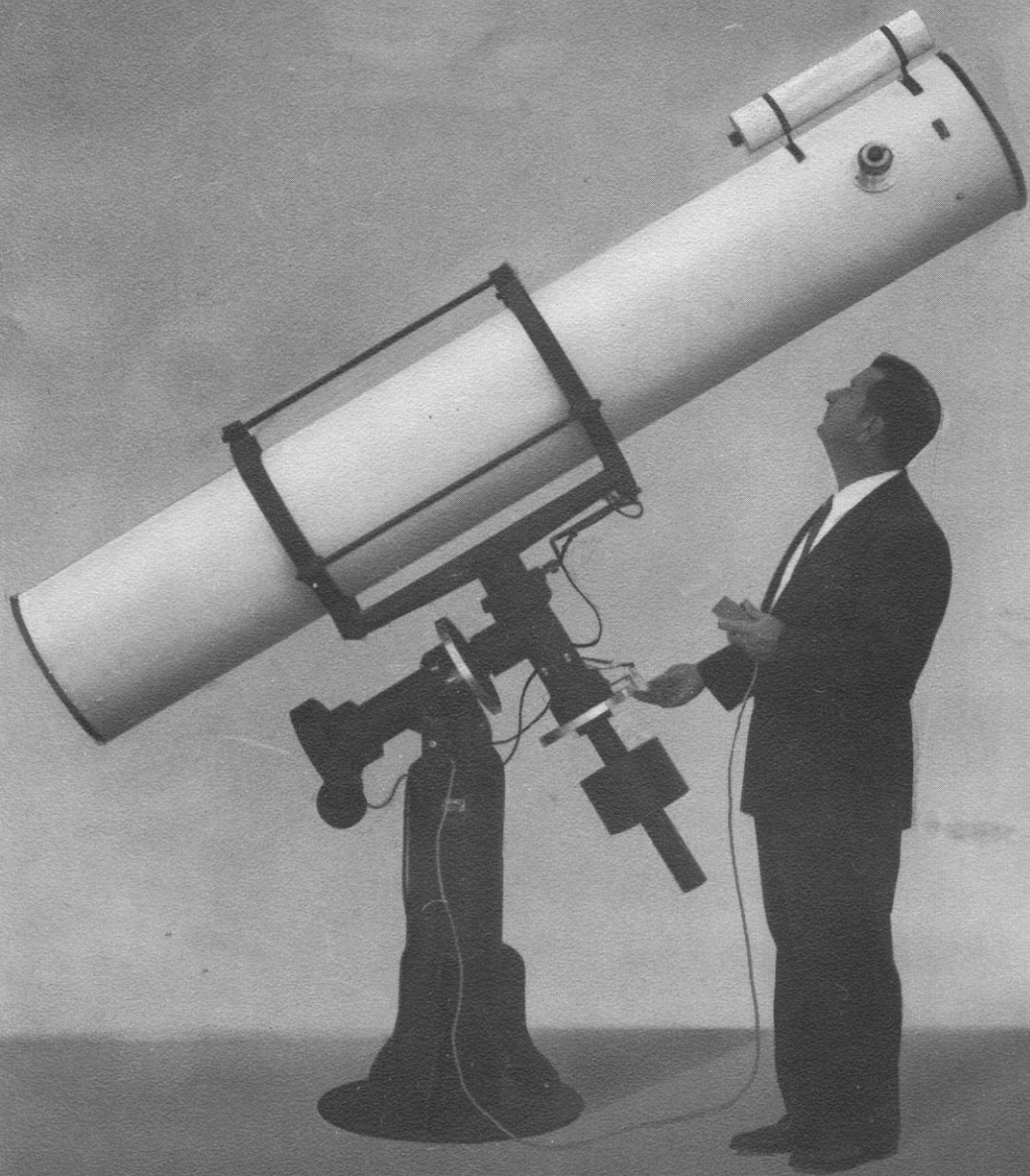


### NEW ASTROLA 12 $\frac{1}{2}$ " MODEL "D" TRANSPORTABLE REFLECTOR

This is our newest and largest fully transportable ASTROLA with a full 12 $\frac{1}{2}$ " aperture in F/6 or F/7 focal ratio (75" fl or 87" fl). The heavy 8 $\frac{1}{2}$ " diameter aluminum column and massive three detachable legs are equipped with large rollers. The equatorial head has "Sealmaster" ball bearings in the polar axis housing 12" separation. The Declination Axis is full 2" diameter and the bearings are a full 12" also in separation. Both setting circles are very finely divided and 8" diameter, the hour circle is of the Porter slip ring type and reads direct in the heavens. The electric motor drive is very large and heavy duty and remarkably accurate in following celestial objects. Each instrument is equipped with an electric declination slow motion with the control box brought to the observer at the eyepiece. The rotating tube rings are spaced 24" apart and are of the very finest construction allowing the tube to rotate

exceedingly smooth thus keeping the eyepiece always in a most convenient position when observing. As in all other ASTROLA reflectors both the mirror and diagonal are of reannealed pyrex glass and hand figured to very close tolerances. In optical performance this instrument leaves nothing to be desired, yielding inside and outside focus identical star images, your assurance of the ultimate in optical definition. A standard large 10X finder and five of the finest Orthoscopic oculars are standard equipment. Although similar to our permanently mounted 12 $\frac{1}{2}$ " Observatory ASTROLA this new model is of considerably lighter weight and easily transportable in a station wagon automobile.

Normal delivery can be made on this new model in six or eight weeks. Full price including packing and crating F.O.B. our plant is \$1150.00.

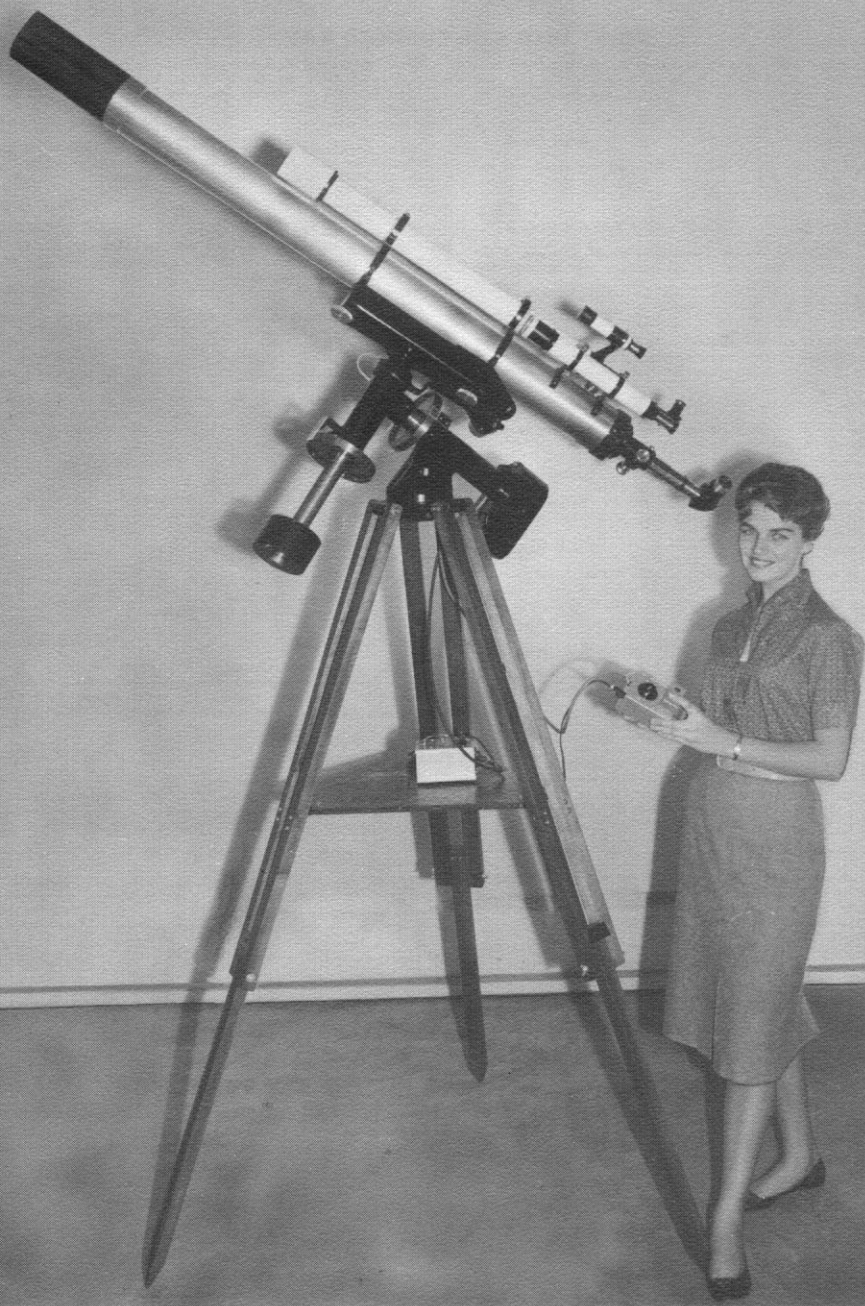


### MODEL "D" ASTROLA 12½" OBSERVATORY REFLECTOR

The 12½" Model "D" ASTROLA reflectors are built for permanent erection only, and should normally be housed in some type of observatory building. These instruments are ideal for schools and colleges and for the discriminating advanced amateur who desires the finest reflector of professional size. Truly, these are research instruments, and incorporate all of the advantages to be found in large research telescopes. They have rotating tubes of very heavy seamless fiberglass, the rotation accomplished by 3 large Teflon wheels mounted in each massive aluminum, outside saddle ring, adjustable for rotating tension; 10" diameter aluminum setting circles, and 3" C.A. achromatic finder with cross-hair eyepiece 15X. The equatorial mounting is of very heavy cast aluminum and exceedingly massive, utilizing 2½" diameter shafts for both axes, synchronous electric clock drive, and electric slow-motion declination clock drive, with

pushbutton controls brought to the eyepiece. These equatorial mountings are adjustable for any latitude. The optical components, both mirrors and diagonals are of pyrex, hand figured to our very finest quality, and fully guaranteed to give superb Dawe's Limit resolution of double stars, and the finest definition on lunar and planetary detail. Each telescope is equipped with 5 orthoscopic oculars, giving magnifications of 75X, 160X, 250X, 400X, and 600X. Model "D," with push-button electric slow-motions in both R.A. and declination, as well as precise sidereal drive, designed especially for photography — \$1,780.00 f.o.b. our plant. The limiting Stellar magnitude of the telescope under ideal conditions of "seeing" and transparency is 15.6. The telescope will give definitions, on nights of best "seeing," on the Moon and planets rivaling the finest quality 12" refractor.





### NEW ASTROLA REFRACTING TELESCOPES

We have recently introduced our 4" and 6" refracting telescopes which are of outstanding optical and mechanical quality. Instruments are entirely American made, using our heavy 10" reflecting telescope equatorial head with special saddle, heavy wall aluminum tubing with internal light baffles, the finest rack and pinion focuser, star diagonal, and five Orthoscopic oculars. These 4" and 6" Achromatic objective lenses are air spaced and fully coated and of finest optical quality. The 4" tripod mounted refractor is pictured above with several accessories. Instrument, as illustrated, has a heavy Oak tripod equatorial head with Sealmaster insert ball bearings, clock drive, 6" solid brass setting circles, five of finest Brandon Orthoscopic oculars, priced at \$795.00. Also available is 60mm guide refractor and mounting brackets for \$60.00 additional. Tangent arm electric declination slow motion \$80.00. Frequency oscillator

\$149.50. Heavy wood carrying cases are included at standard price.

The above accessories are also available when the instrument is ordered. A 10x 40mm finder is furnished as standard equipment. 6" refractor, not illustrated, is on a heavy steel column permanent pier 5 1/2' high. This instrument is available only with clock drive, frequency oscillator, tangent arm declination slow motion, seven Brandon Orthoscopic eyepieces, 60mm guide refractor, 10x 40mm finder, star diagonal. A very complete observatory 6" refractor F/15 90" focal length priced at \$1,895.00.

Delivery of the 4" refractor made within six to eight weeks of receipt of order. Delivery of the 6" refractor made within three months.

## WHAT OUR CUSTOMERS SAY

"I am very pleased with the performance of my mirror. I get very good views of Jupiter with the 210X. Thank you very much for the good workmanship you put into the scope. We are all very pleased with its performance."

211 N. Nelson Street  
Stockton, Texas

David Lowell

"My 8" Astrola is very sturdy and is a beautiful instrument. As for its performance: excellent. I look forward to many fine views of Mars, and I know I will have many good years of observing with it."

905 Berkshire Road  
Grosse Pointe 30, Michigan

Edwin J. Hammer

"I am very satisfied with the workmanship of my 8" telescope. I am especially happy with its operation on the planets, star clusters, and nebulae."

9220 Cumberland Street  
El Paso, Texas

Daniel J. Graham

"I was amazed at the results I obtained from my new 8" reflector. The view of the Great Nebula in Orion was marvelous. Jupiter was brilliant in all of its splendor. I am very proud to say that I own an Astrola telescope."

642 S. Lombard Avenue  
Oak Park, Illinois

Ronald K. Hill

"My telescope has given me unceasing pleasure. I have yet to see a telescope that can out perform mine."

Box 769  
Opelousas, Louisiana

Stephen Schiff

"You do the most excellent work . . . and you say you guarantee the work 100%. I can say that you mean every word of it. You merely put a mathematical plus sign in front of it."

Clarkston, Washington

Frank Mosher

"The optics on my telescope are really superb. The resolution of small objects is crystal clear. Double stars show like tiny clear diamonds, craters and mountains on the moon are unbelievably distinct. It is a great satisfaction to own such a telescope."

1637 Micanopy Ave.  
Coconut Grove, Florida

Dr. Joseph M. Reeves, Jr.

"Recently I had the pleasure of purchasing one of your 8" Astrola telescopes. The mirror is excellent, and I am perfectly satisfied that it will approach the theoretical limit with ease."

4868 Hedrick Avenue  
Arlington, California

Harold E. Kaiser

"I am pleased to inform you that my 8" Astrola performs far better than my highest expectation. With it a vast treasure-house of observing pleasure, heretofore unavailable, is opened. You may be sure that the Cave Optical Co. is highly recommended among all of my friends and acquaintances."

2500 Sherwood  
Charlotte, North Carolina

Bruce Gebhardt, Jr.

"After four months of using your telescope my eye is beginning to grasp just a part of the potentialities of it. May I compliment you on the beautiful simplicity of your drive. The ratio work is beautiful; and I feel I may add have received many comments from my close friends."

12842 Landale Street  
Studio City, California

Jay Inge

"My 8" deluxe Astrola is most satisfactory in every way. It gives superb definition on the Moon and planets. In the short time I have had it, I have seen many beautiful star clusters, and spiral nebulae."

1511 Sharon Road  
Tallahassee, Florida

Finley E. Belcher

"Never have I seen a mirror with such excellent definition. It has been my pleasure to allow other amateur astronomers here in Savannah to examine this mirror with my Foucault testing apparatus."

1212 E. Duffly Street  
Savannah, Georgia

A. A. Alnutt

"Two years ago this June I received my 8" Astrola deluxe from you, and I thought I would write and tell you how much I've enjoyed it. I've had so many excellent views of the Moon, Saturn, Jupiter, plus many of the stars, Nebula, Globular, etc."

Ridgeway, Virginia

George Shumate

"The high standards of your work and the prompt and pleasant way of doing business can't be beat. Your old customers know what I mean."

Bayside Country Club  
60 Sandy Lane  
Warwick, Rhode Island

Joseph Machado

"I have been able to use 70D magnifications on my telescope, when seeing was good, and even 80D, with excellent results on planets. I had not been able to approach such ranges with any refractor that I had in the past."

P. O. Box 830  
Auburn, Alabama

G. M. Kosalopoff

"The scope is all I hoped for. I really can't find words to describe it. The images are so fine, detailed and clean, that I am completely unaware of the scope . . . it is as if I were viewing the objects with the naked eye."

9631 Idlewild Lane S.E.  
Albuquerque, New Mexico

G. H. Johnstone

"The 6" mirror which you made for me performs to my highest expectations. I am so well impressed by the quality of this mirror that I am ordering two more. An 8" and a 12½" diameter."

664 Holly Trail  
Sierra Madre, California

D. P. Avigliano

"I have nothing but praise for the 8" Cave Mirror, which I have used during the past year for planetary photography. Its resolving power exceeds Dawes's Limit. When used visually, the mirror reveals more detail on Jupiter's disc than I have observed with instruments of considerably greater size."

Grays 29-30 - Harvard College  
Cambridge, Massachusetts

Philip R. Lichtman

"My home-made 6" mirror turned out badly — your reworking it made it into a first-rate mirror capable of fine performance. I am proud to have the name of Cave Optical Company inscribed on it, and I am glad to recommend your work to all who want no less than perfection."

911 Hays Park  
Kalamazoo 30, Michigan

Philip Steffey

"The 6" reflector which you built for me has been thoroughly tested during the past year. Its excellent performance has been a constant source of encouragement in my efforts to become a more proficient amateur astronomer. It is a pleasure to recommend your fine instruments."

400 E. Park Avenue  
Menomonee Falls, Wisconsin

Philip R. Glaser

### FINISHED PYREX MIRRORS WITH DIAGONALS OF PYREX, ALUMINIZED AND QUARTZ OVERCOATED

4" with diagonal 1.050 Minor axis.....	\$ 42.00
6" with diagonal 1.300 Minor axis.....	60.00
8" with diagonal 1.550 Minor axis.....	92.50
10" with diagonal 2.142 Minor Axis.....	160.00
12½" with diagonal 2.610 Minor axis.....	250.00
16" with diagonal 3.000 Minor axis F/8, F/9 only.....	875.00
16" with diagonal 3.500 Minor axis F/6, F/7 only.....	950.00

### REFIGURING, WITH DIAGONAL, ALUMINIZED AND COATED

4" Mirror.....	\$ 24.00
6" Mirror.....	35.00
8" Mirror.....	50.00
10" Mirror.....	75.00
12½" Mirror.....	120.00

Prices for Larger Mirrors on Application

### ELLIPTICAL PYREX DIAGONALS, GOOD TO 1/8 WAVE LENGTH OR BETTER

	Not Aluminized	Aluminized
1.050 Minor axis.....	\$ 4.50	\$ 6.00
1.300 Minor axis.....	6.50	8.00
1.550 Minor axis.....	9.50	11.00
1.780 Minor axis.....	11.50	13.00
2.141 Minor axis.....	15.75	18.00
2.610 Minor axis.....	19.50	21.50
3.000 Minor axis.....	30.00	32.00

### Specifications on Mountings Subject to Improvement Change Without Notice

Prices Subject to Change Without Notice  
Optical Components Postpaid

Complete Telescopes Shipped Freight or Express Collect

**Terms: One-half with order, balance when ready for delivery.**

### SHIPPING

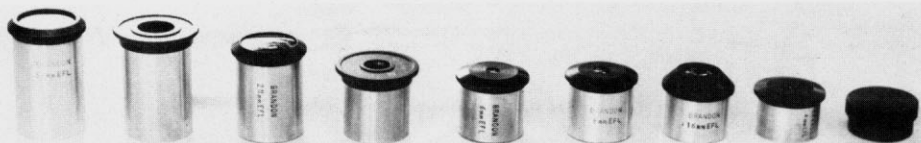
We normally pack for shipment all of our complete Astrola Reflecting Telescopes and equatorial mountings, plus other large or heavy items. The charges below include wrapping, very careful packing, and blocking of all parts within the crates and boxes.

6" and 8".....	\$12.50	10".....	\$15.00
12½".....	\$20.00		

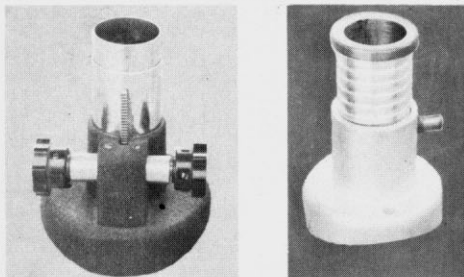
## CAVE OPTICAL CO.

4137 E. ANAHEIM STREET  
LONG BEACH 4, CALIFORNIA

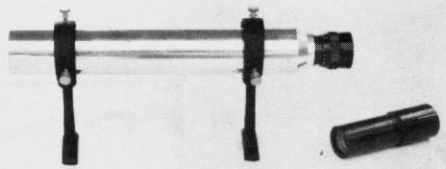
Telephone  
**GEneva 4-2613**



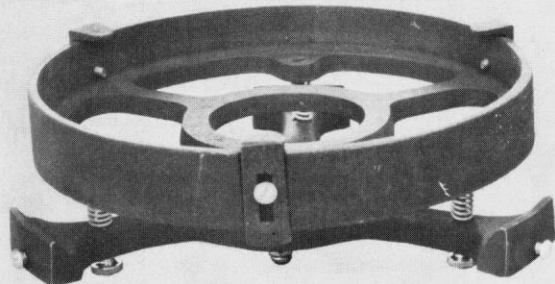
Brandon and Gayland orthoscopic oculars ranging from 32 to 4 MM. Left to right: 32, 28, 24, 16.3, 6, 8, 16 and 4 MM, and collimating cap. Not shown: 12, 10.5 and 7 MM orthoscopic highly corrected oculars.



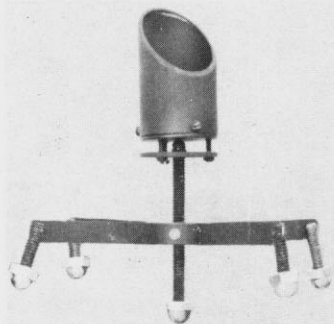
Rack and pinion focuser used on 6" and 10" Astrola reflectors. Helical focuser as on 6" R.F.T.



Finder telescope of achromatic astronomical quality 9 X 38 MM. Achromatic Barlow— $3\frac{1}{2}$ " negative f.l.



Mirror cell of virgin heat treated aluminum with alignment, locking screws. Sizes for 6", 8", 10" and  $12\frac{1}{2}$ " mirrors only.



Spider of four vane brass with adjustable diagonal holder for 6", 8", 10" and  $12\frac{1}{2}$ " telescopes only.

## WHAT MAKES A TELESCOPE REALLY GOOD?

There is a great deal more than labor and material which goes into making a truly excellent Astronomical Telescope. The most painstaking care must be placed on each step in the making of a fine instrument. The main mirror itself is surely the very heart of any good reflecting telescope. It must be well ground to proper curve, and certainly well polished. The figure of the mirror must be parabolic, exceedingly smooth in contour, and good from the center to the very edge. In this figuring of the mirror, which must be done to the very limit of the master opticians' skill, goes more than careful handwork, constant patience, and meticulous testing, but some of the skilled artisans' own personality. Each mirror which we make new or refigure contains the feeling of the optician for what the finished telescope will reveal with unrivaled clarity when turned toward the Heavens on a clear and steady night. The telescope mounting and tube must be made to exact standards so the optics will perform at their optimum; however the main mirror and diagonal must first be made as good as possible. It has been only by rigid adherence to these standards of perfection that the Astrola Reflecting Telescope and optics by CAVE OPTICAL CO. have achieved an excellent reputation in a few years.

### OUR BACK COVER — THE ASTROLA 8" MODEL B DELUXE

THE ALL NEW 8" ASTROLA MODEL "B" DELUXE leaves nothing to be desired for the discriminating observer, teacher or amateur telescopist. Recently improved and redesigned, the Model "B" Deluxe is now available in the normal F/7 (56" focal length) or in either F/6 (48" fl) or F/8 (64" fl) at no additional cost. The entirely new equatorial head features very massive Sealmaster cartridge ball bearing and a completely new synchronous electric clockdrive. Heavy 3" diameter rubber rollers and  $\frac{3}{4}$ " diameter leveling screws are now included as standard equipment on each Deluxe Astrola. The Parks porcelainized Fiberglass tube is now available in Astrola White, or several Pastel colors; Fiberglass being the lightest, most thermally perfect and indestructible material for reflecting telescope tubes yet discovered. In optical performance the 8" Deluxe Astrola is unsurpassed and we unconditionally guarantee equal or better definition and resolution than any other make of 8" telescope regardless of price. For more than four years the 8" Astrola Deluxe has been an exceedingly popular telescope with not only those new in the wonderful hobby of telescopic observing, but also with many leading observers. A great many Schools and Colleges have found this instrument of distinctive value in the teaching of Astronomy. The complete price is \$590.00 F.O.B. Long Beach, Calif. Packing and Crating \$12.50 additional, Tangent Arm Slow Motion in Declination \$55.00 extra.

