NOVA

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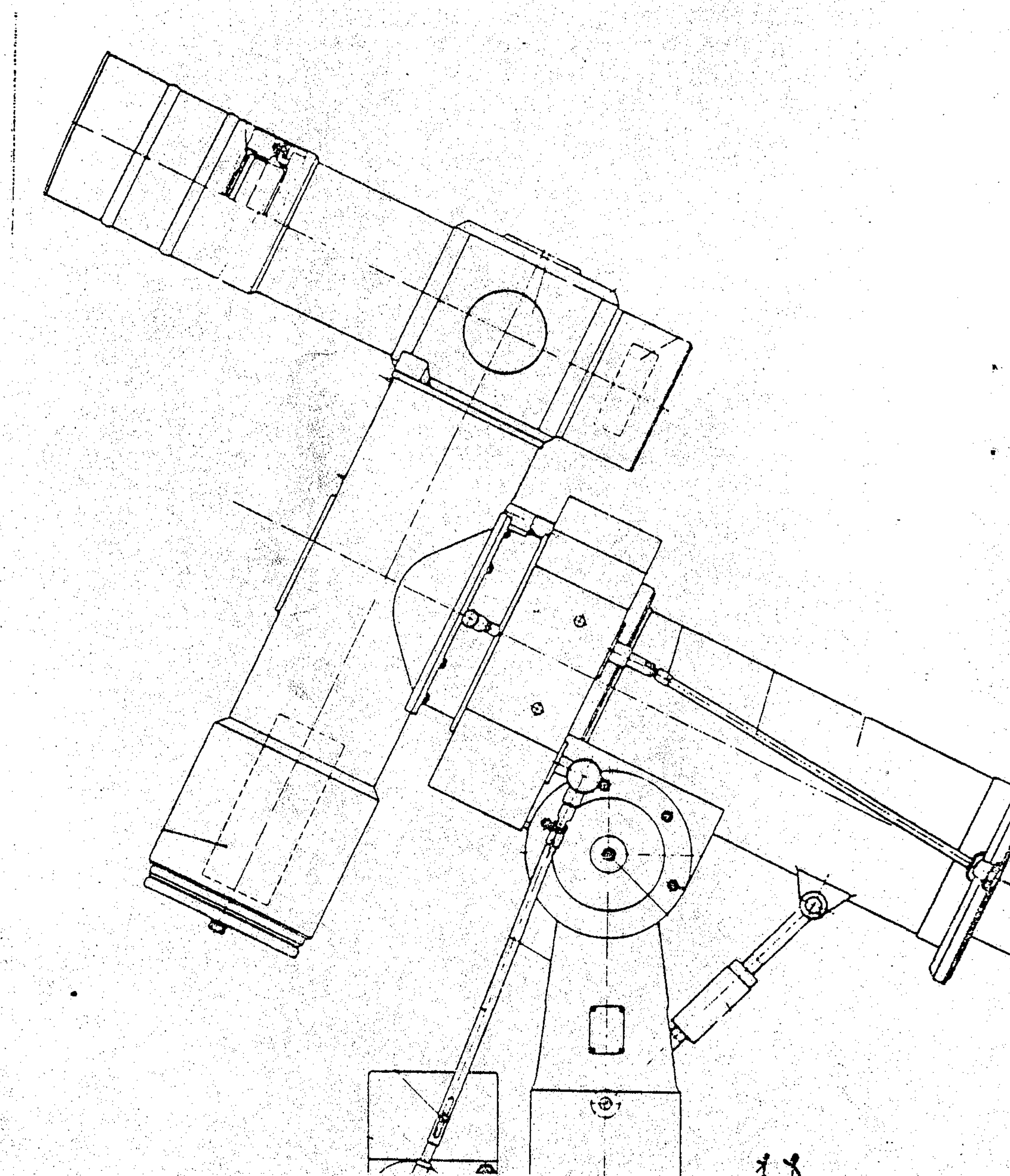
IN THIS ISSUE



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January NOVA 1980

A Newsletter of the Vancouver Centre
Royal Astronomical Society of Canada
Allen Stoneberg, Gregg Winter and Gordon Herke......................Editors

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EDITORIAL

For the past couple of weeks some of the editorial (us) have been somewhat under the weather, but then again so has everyone else that makes their home in the lower mainland. It is for this reason that NOVA finds its way (hopefully) to your mailbox somewhat later than normal. We would also like to mention the fact that Mars, Saturn and Jupiter are rising late in the evening and are well placed for observation at about 2:00 AM PST. We were surprized to see Mars looking so well. Two polar caps could be seen and several dark green areas were visible. As for Saturn, the edge-on rings were faint but visible and if you'relucky (as we were) you could see two or three of Saturn's moons appear to dance around on either side of the ring system. Hopefully we have arroused your astronomical tastebuds for some planetary observing and for some planetary NOVA articles (right Bob and Lance).

But getting back to the editorial, with all this bad weather we thought for sure our crossword puzzle would have to be unleashed upon you, but it would seem that you don't want to see it more than we don't want not to print it (we think). Fantastic!! We received articles dealing with red windows, 10 inch mounts and the second half of the 'binocular' article to name a few. So with this in mind we hope that you will attend the Instrument Night and either bring a friend or a telescope and make the whole night a complete success.

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LAST MONTH'S MEETING

At 8:00 December 11 the votes were cast to elect the new council. The winners of the Councilperson seats were Bill Hodgson and Chandra Madhosingh. Tom Tothill is our new President. Please consult the past issue for further info.

Next, Dale McNabb displayed some excellent slides of Orion's M42 . Nice work Dale!!!

The guest speaker was John R. Percy, National President RASC. His talk, Variable Stars for Fun and Profit, was enthusiastically received by the members present. Many questions were put to the doctor until we broke for coffee.

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NEXT MONTH'S MEETING

KEN HEWITT-WHITE

The next regular meeting of the centre takes place on Tuesday, January 8, 1980 in the Auditorium at the Centennial Museums and Planetarium. The theme for our first meeting of the new decade is "Instrument Night" and although such nights have been held before, this one will have a little twist to it. Quite a number of telescope making material from the estate of the late Dale McKelvay will be on display and for sale (in the member's lounge). The material includes almost every type of article related to telescope making from grinding compounds to completed mirrors. There will be a bit of something for everyone and the proceeds of the sale will go to the Support of Senter Solvency. Incidentally, the prices on these goodies were set down by Tom Tothill and are somewhat reduced compared to present day values. (see elsewhere in this issue)

As for the other part of the programme, succes will be measured by your response to the following plea. We'd like to exhibit in an unformal way as many different types of commercial and homemade telescopes as we can squeeze into the place. Size of instrument is of no concern to us except to say we'd like to see a complete spectrum of telescope apertures so that beginners and long-time observers alike can compare for their own interest. And the only way we'll have a large number of instruments is if everyone who has one, brings it in! So how about it? We can help with the loading and unloading at the planetarium and we don't even need much advance warning. However, if you are bringing a large instrument (bigger than 8") do try to give me a call (736-1652 at home or 736-4431 at the planetarium) just to say that you will be bringing larger stuff. That way, we can organize the space better. Also, please help us by bringing related equipment such as specialty cameras, electronic guiders, observing aids......

Now for all this to work we need some clever planning and your cooperation. And if all that comes to pass we may even be in line for a miracle- in the form of a clear night. Then we could spread outside as well, and actually have a look see through some of the equipment. Let's hope for the best. See you January 8 !!!

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TAURUS MAJORIS

- The deadline to next month's spine-tingling issue of NOVA is January 31, 1980.
- Robert Braun and Sandra Warkentin were married on December 22. Rob is working in the field of astrophysics at U.B.C. which explains why he wanted the ceremony to occur on the winter solstice. Incidentally, the night of the solstice happens to be the longest of the year -astonomically speaking.
- The editors would like to deny a rumour that talks are underway which are laying the groundwork for a future emalgamation of NOVA and an international "astological digest." Slanderous remarks such as these are usually construed by new-moon Geminiis whose thirst for envious revenge is only seconded by their wonton lust for Zeiss binoculars.

IN PRAISE OF AMATEUR-BUILT TELESCOPES

Tom Tothill

I suppose it was William Herschel who started it. He was a music teacher in Bath, England who suddenly started making his own telescope mirrors from speculum metal and, with the resulting telescopes which were the biggest and best of their day, made momentous discoveries.

On this continent it was a series of articles in Scientific American in the hungry thirties that really got amateurs working on telescopes. Russell Porter from Springfield, Vermont got an enthusiastic group together and contributed outstanding ideas on telescope design and mounting - so much so that he was asked to design the mount for the Hale 200-inch, the premier telescope in the world. The annual Stellafane convention of amateur telescope makers sprang from this group and many RASC members from Montreal and Ottawa have won awards there for their telescopes.

To some participants telescope making becomes almost a way of life. I remember the fellow with a large telescope with beautifully machined parts gleaming in their perfection, who evidently had a fully-equipped workshop in his basement. Towards midnight he said: "I think I'll take a look at Venus up there" and pointed it at Jupiter!

I have had the luck to look through a fair number of telescopes in the last 15 years or so, some made by amateurs and some made by professional companies catering to the amateur astronomer. I would say that the best eight or ten telescopes I have looked through were made by their owners by grinding, polishing and testing their own mirrors, and making their own mountings. To be sure, none of them were as good-looking as the professionally-made ones, but the owners had put them together and knew how to make the alignment stay put. The appearance had something to do with the materials they could scrounge from here or there and the tools at their disposal. Shaky mounts are not confined to amateur telescopes, some of the bought ones are awful. The chief fault I have found with bought telescopes is the alignment. Many of them can not take a bump without falling out of alignment, and as we all have to put our telescopes in and out of cars and set them up repeatedly this is important. In general I would have to say that bought telescopes are built down to a price in a competitive market and perform a good deal better in the advertisements than they do on the sky.

With the ready availability of fibreglass and aluminum for parts and tubing you may be surprised if I say that wood has become a highly underrated material for telescopes. Actually wood is much thicker and far less flabby than fibreglass of the same weight, and far easier to work. I have seen beautiful tubes made from strips of wood cut with the right bevel and glued together into a circle. The square-section plywood tubes favoured by Texereau's book on telescope making are also very effective and easy to make. One of the most ingenious telescopes I ever saw was made entirely of wood, bearings and all. The bearings were two fair-sized circles of wood sliding on one another with a clamp screw in the middle, but the middle of each piece had been hollowed slightly so they only bore on one another around the periphery so no rocking was possible. The whole telescope was rubbed wax finish to keep out moisture and quite beautiful.

The experts claim that grinding and polishing your own mirror is only 24 hours of actual work. That is, if nothing goes wrong. I think I took more like 36 hours spread over 6 weeks, but it was fascinating work - especially in the testing and figuring. The whole idea that you can make a mirror good to a millionth or two of an inch without elaborate equipment is amazing but true.

IN PRAISE OF BINOCULARS (part 2) J. Karl Miller

If you are interested in seeing details to the limit of your binoculars, the use of appropriate neutral density filters is indicated. The aim here is to reduce the sun's brightness by a factor of approximately 100,000, that is to only 1/1000 of 1% of the light which normally reaches us. An aluminum-coated plastic (mylar) called "solar screen" has the ability to reduce sunlight to this level. However, solar screen tends to make the sun appear blue. It is therefore not a "neutral" density filter in the strict sense of the word.

A neutral density filter of number "5" (= log 100,000) accomplishes the necessary light reduction without this "colour stuff". They can be obtained from photographic supply houses. This "density" can also be achieved by combining, say, a number 3 (log 1000) with a number 2 (log 100) neutral density filter. In any case, for direct binocular observation you will need one such #5 density filter for each "half" of your binoculars, and you will have to mount these filters IN FRONT OF THE OBJECTIVE LENSES. This requires only a little mechanical ability.

The simplest approach is probably a set of short cardboard tubes of a diameter which makes them fit snugly over the objective lens "rims", and into which the filter has been mounted. Gelatin filters of appropriate density can easily be cut to fit (keep fingers off the surfaces). In any case you are limited only by your mechanical ingenuity.

Nothing prevents the use of binoculars for Photography of the sun. In order to arrive at the appropriate exposure times, filters of the same neutral density used for direct observation are used. The problem with this approach is the mechanical alignment and coupling of camera to binocular (you will be using only one "half", so cover the unused section of your binoculars). There your mechanical ability sets the limits (if you want to build the necessary adaptors yourself). You may be able to find the necessary adaptors in photographic stores, or in the "junk box" in your basement, or wherever. Some binoculars are sold with camera adaptors as options.

In any case, the only practical camera to use is probably an SLR (single-lens reflex) camera, since this makes focussing a cinch. Use the SLR with its lens. Whatever your approach to camera-to-binocular mounting, the aim is to exactly superimpose the optical axis of camera and binocular. Once you have solved the problem of the mounting, you have yourself a good quality, long telephoto lens, which, when used without neutral density filters, can be employed for photography of the moon, or terrestrial photography.

In order to be able to calculate exposure times for all previously mentioned uses, we have to know something about the effective focal ratio and effective focal length of the camera-binocular combination. This brings us back to the exit pupil of our pair of binoculars. For a pair of 7 X 35 binoculars this has a diameter of $\frac{35}{7} = 5$ mm. This 5 mm diameter light beam is all the camera lens can "see". In effect, the camera lens has been "stopped down" to a diameter of 5 mm. If the camera lens has a focal length of 55 mm, the effective focal ratio (EFR) is 55/5=f 11. For a pair of 7 X 50 binoculars, the EFR is:

$$\frac{50}{7} \text{ equals approx. } 7 \text{ mm (exit pupil)}$$

$$\text{EFR} = \frac{\text{focal length of camera lens}}{\text{diameter of exit pupil}}$$

$$\text{EFR} = \frac{55 \text{ mm}}{7 \text{ mm}} \text{ equals approx. f 8.}$$

UNIQUE!!! **CHANCE OF A LIFETIME!!!**

GIANT SALE

M I R R O R S

- $4\frac{1}{4}$ - 6 - 7 - 8 - 10 - 12 inches!!!
- Seventeen - count 'em!!!
- Focal ratios f/4 to f/11 - Rich Field to Planetary!!!
- Some blanks - untouched, waiting for your ideas!!!
- Ten tools, most with pitch laps in place - no fuss, no mess!!!
- Some finished and aluminized - or ready to!!!

T E L E S C O P E P A R T S

- Mirror cells, elliptical flats - aluminized and overcoated, finders, ring mounts, draw tubes, focusing mount, eyepiece, Barlow mounted in tube, star diagonals, Herschel wedge, setting circle rings, tube rings, achromats, lenses - AND MUCH, MUCH MORE!!!

V A L U A B L E, S U P E R - P R E C I S I O N I N S T R U M E N T S

- Dial gauge, not just 1/1000 inch but 1/<u>10000</u> inch!!!
- Another, 1/1000 inch, range 0.4 inch. Excellent!!!
- Spherometer. Read off your focal length anytime as you grind!!!
- Foucault tester. A superb instrument. Fitted for Foucault, Ronchi, Caustic tests. Shows up errors of a <u>millionth</u> of an inch - mere microns are 40 times bigger!!!

<u>LADY, LOCK UP JUNIOR'S PIGGY BANK!!!</u>

<u>SIR, WATCH OUT! SHE'LL TRY TO GET YOU TO THAT FASHION SHOW INSTEAD!!!</u>

<u>BE FAIR! A 12-INCH FOR YOU, A MAGNIFIER FOR HER - RIGHT?</u>

<u>FOR FAST SERVICE (OR ANY) BRING MONEY. YOUR CREDIT RATING IS NIL AROUND HERE!!!</u>

<u>THIS IS POSITIVELY YOUR LAST AND ONLY CHANCE TO GET 1965 PRICES IN THE YEAR 1980!!!</u>

<u>SORRY, MEMBERS ONLY! AND THAT MEANS PAID-UP MEMBERS ONLY, IN CASE YOU WONDERED!!!</u>

D A T E : Tuesday, January 8, 1980, at the Planetarium.
Our Instrument Night.

T I M E : Viewing, 8:00 - 8:45 p.m.
Auction, 8:45 p.m.

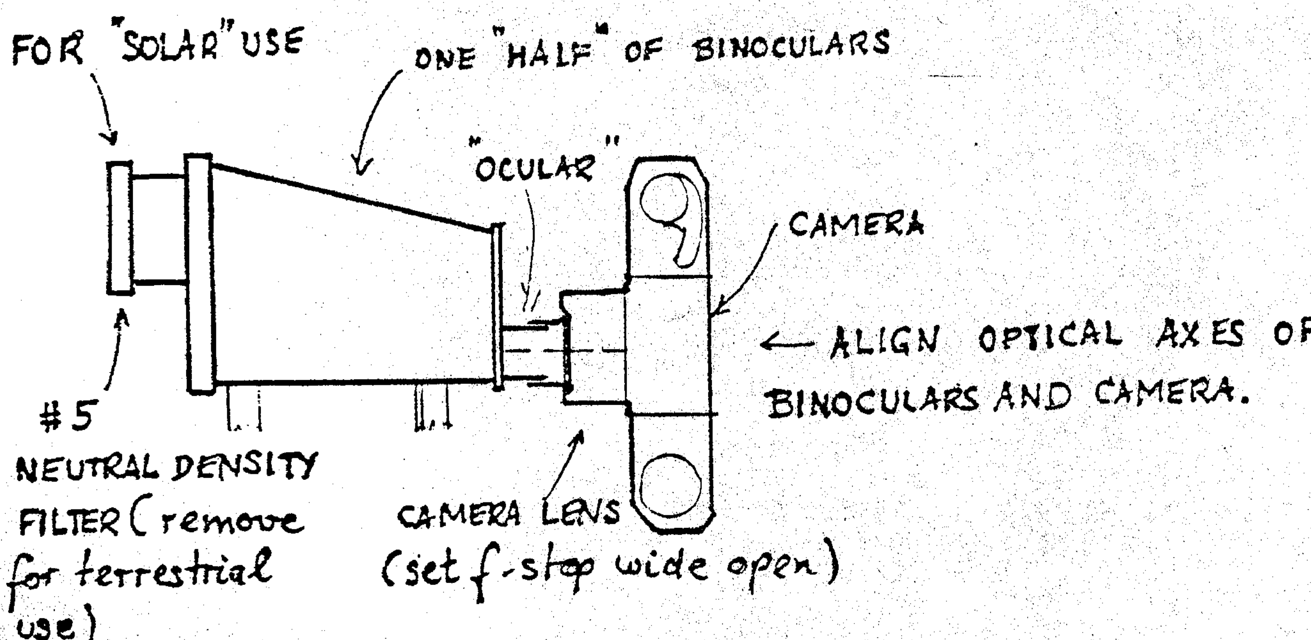
These items are from the estate of former member D.K. McKelvay, telescope maker.

When using your camera in conjunction with binoculars, set the f-stop setting on your camera to wide open (i.e. f 1.4, 1.8, 2 or whatever your lens's focal ratio is).

The EFR in our case is fixed and exposure variations are made by changing exposure times.

The EFL (effective focal length) of your camera-binocular combination is simply the product of camera lens focal length and power of the binoculars. For our previous examples,

Binocular	Camera Lens	EFR	EFL
7 X 35	55 mm	385 mm	f 11
7 X 50	55 mm	385 mm	f 8
10 X 50	50 mm	500 mm	f 10 (use f 11)

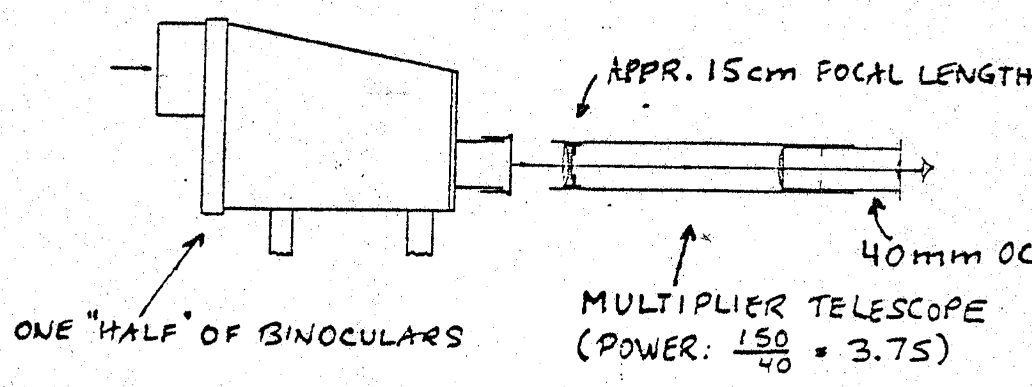


COUPLING A CAMERA TO BINOCULARS

The use of a camera in conjunction with binoculars leads me to another possibility of "extending" the use of binoculars. When binoculars are focussed at "infinity", the rays of light entering the "objective" as well as those leaving the "ocular" are parallel with respect to each other. As a result, the attached camera must also be focussed at infinity.

It is possible, because of this feature, to "increase" the given magnification of a pair of binoculars. Why and how? As to the why, I'll give a couple of examples. Binoculars, as stated before, and in contrast to larger telescopes, possess only one fixed magnification. This magnification is usually in the range of 6 to 10 "power". This is just below the power which would make observing the moon, for example, a real enjoyable experience. A power of, say, 18 (and up) shows a tremendous amount of detail on the moon, the sun, and begins to be of use for planetary observation. In addition, binary stars are far more easily separated, and any "colours" are better seen.

Well, what about the "how"? The illustration below will give you an idea as to what I have in mind. Again, construction details are subject to your mechanical ingenuity, and the power of the "multiplier telescope" should not exceed 4. The actual useful power of any "multiplier telescope" is determined by the optical quality of the binoculars with which it is used. The quality of the multiplier telescope "objective" is not so critical, since the exit pupil of the binoculars limits the light rays to the centre of the multiplier objective (most lens errors occur near the edge of the lens).



Not all is rosy, of course. Let us take an example: A pair of 7 X 50 binoculars has an exit pupil of 7 mm (approx.) If we now couple a 3-power multiplier telescope to it, we further reduce the exit pupil to 2.3 mm. $(7 \div 3 = 2.33)$. Since the brightness of any object when viewed through a telescope is a function of the "square" of the exit pupil diameter, a smaller exit pupil means a "fainter" image. We could consider the square of the binocular exit pupil (which has a value of $(7)^2 \approx 50$) as the "intensity" of the image (the intensity of 6 X 30 binoculars is $(30/6)2 = (5)^2 = 25$). Therefore, the intensity ratio of 7 x 50 binoculars with a 3-power multiplier is:

$$\frac{(2.33)^2}{(7)^2} = \frac{5.33}{50} = 0.11,$$ that is, 1/9 of the intensity value

of the binoculars. This means that the "multiplied image" is only one ninth as bright as that of the "unaided" binoculars. People who own larger telescopes know (and dislike) this trade-off well; the higher the power, the lower the brightness of (extended) objects. This is, of course, one of the reasons why telescopes are made bigger; larger telescopes give a brighter image for any given value of magnification. Well, you never get something for nothing (though often the other way around).

'RED SKY' AT NIGHT ---ASTRONOMER'S DELIGHT

Dan Graham

Last R.A.S.C. meeting, the editors of NOVA requested (actually I begged and pleaded - ed.) that members submit descriptions of what they do with their instruments.

Among my telescope activities is (strangely enough) 'red sky' photography. I became interested in this area upon discovering that there exist few astro-photographic programs that can be successfully carried out under the light-polluted sky of North Burnaby.

Since contaminating light (city luminaries, atmospheric nightglow, moonlight, and so on- compliments of Murphy) registers on film faster than the faint nebula I wish to record, it is important that light transmission be restricted to a narrow 'window' in the spectrum. The objective thus, is to select the best filter/ film combination which will both transmit nebula emissions and effectively block those wavelengths of undesired background light.

To record the brightest emission line of gaseous nebula, one must produce the narrowest window possible about the H-alpha line (656 nanometers). I use spectroscopic 103aE film with an economical "sharp cut" filter.

Spectroscopic 103aE must be used because this film is sensitive to H-alpha light, it suppresses latent image decay (reciprocity failure), it has a transmission curve cut-off slightly above the desired wavelength, and it may be hypersensitized with either water or hydrogen gas.

The filters I have tested are the readily available gelatin type; Kodac Wratten #29 and #92, as well as the more durable glass type; Corning CS 2-58. Such filters are designed to abruptly cut off transmission just below the desired wavelength. The filter and film together produce; the narrow window needed.

I have seen some positive results with 'red sky', and wonder if other RASCals in our centre dabble in this specialized area. For anyone who would like to get into this promising field, be sure to first aquire experience at developing spectroscopic film in D-19, so as to be able to remove the film's antihilation coating without risking damage to the emulsion.

If anyone requires further information on the material mentioned, I'd be happy to be of service. Till next time; align properly, guide accurately and let ol' Murphy bother someone else!

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FASHION NEWS '80

Spiro A. Bration

What, you may ask, will fashionable amateur astronomers be wearing this year? Last year, Saturn neck-ties and 6" f-8's were the craze. This year however, because of a movement to shorter hem lines, we expect that Bermuda shorts (with solar eclipse scenario) and 6" RFT's will be in the forefront.

There is, however, a radicle fashion movement in the east promoting the 'mystic man on the mountain' look accompanied by Ziess 3X6 opera glasses. In the west, a prominent member of a well known society is setting new trends: he was seen at a regular meeting carrying a 14" blanck in a box.

As a rule, astronomical fashion has been left up to the individual until very recently. With growing pressure to conform, however, more and more astronomers realize that to keep in step with others, careful adherence to trends is fashion is essential.

A 10" REFLECTOR ON A FORK MOUNTING

Robert Campbell

The telescope I have at present is a 10" f 5.6 reflector on a fork mounting. The mounting itself is from "Astro Works" (a picture of which can be seen in Sky & Telescope) and consists of a large cast aluminum fork (40 lbs.) with arms long enough to allow the mirror end of the tube to swing through the fork for polar observations.

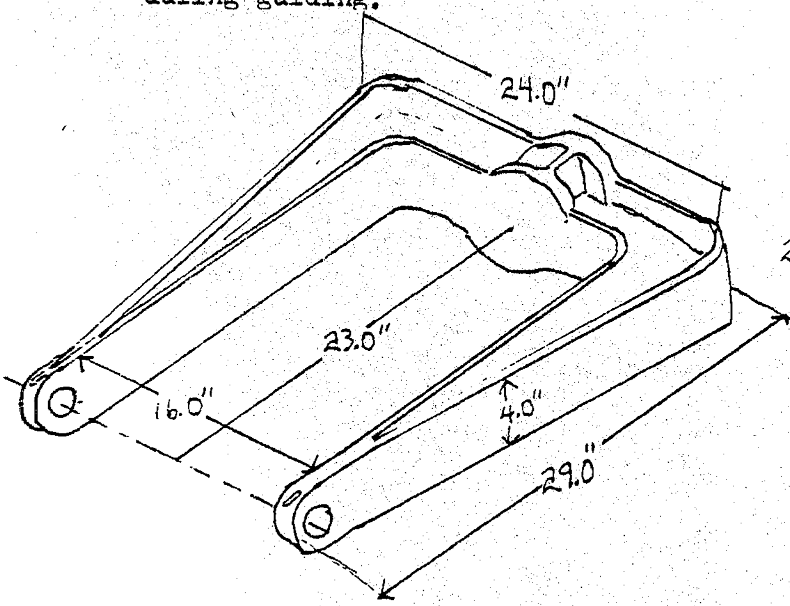
The declination axles on the fork are 1.5" case hardened shafts which apparently gives them an 36% increase in tortional (twisting) strength than over ordinary steel as used in other commercial mountings.

The polar axis assembly itself is a single casting weighing some 75 lbs. in all. It consists of a 2" diameter case hardened shaft held by Timken tapered roller bearings installed opposite one another. The polar axis on this cast assembly comes at a 40 degree angle, so for our latitude the extra 10 degrees is included in the concrete pier which has to be constructed to hold the mounting. A Byer's Clock Drive is used and consists of a 9.3" diameter drive gear with a Porter Slip Ring setting circle. This setting circle acts as a siderial clock while the clock drive is running.

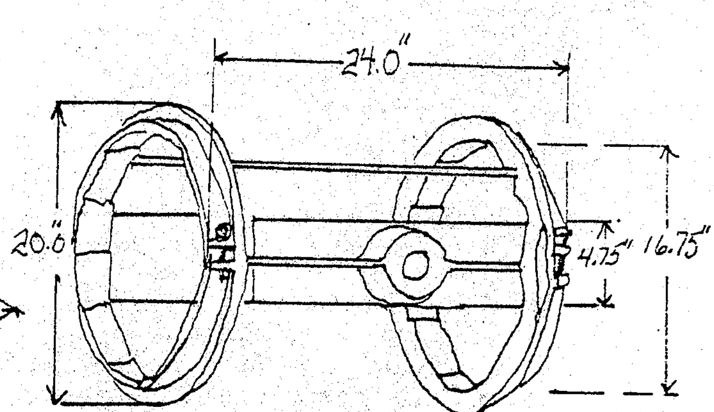
The declination circle is 6" in diameter on black anodized aluminum marked for every one degree, while the R.A. circle is graduated every five minutes.

For attachment of the tube between the fork, a rotable tube saddle is used. It allows for the rotation of the tube when the saddle is in the horizontal position. The tube sides of the cradle are covered by eight cork covered aluminum surfaces, which prevents the tube from slipping in the saddle when the scope is pointed up.

The electronic drive corrector is set right into the polar axis assembly, for long exposure photography. For motions in the declination axis, a tangent arm with a precision screw is run by a reversible servo motor. Both motor drive rates are controlled through a continously variable two axis hand-held joystick. The joystick automatically recenters when released. In practice, I have found the drive to run very smoothly indeed, producing a few fine photographs. The only set back was not having the polar axis precisely oriented; thus making a lot of declination corrections neccessary during guiding.



10" Fork.



10" Cradle (rotatable)

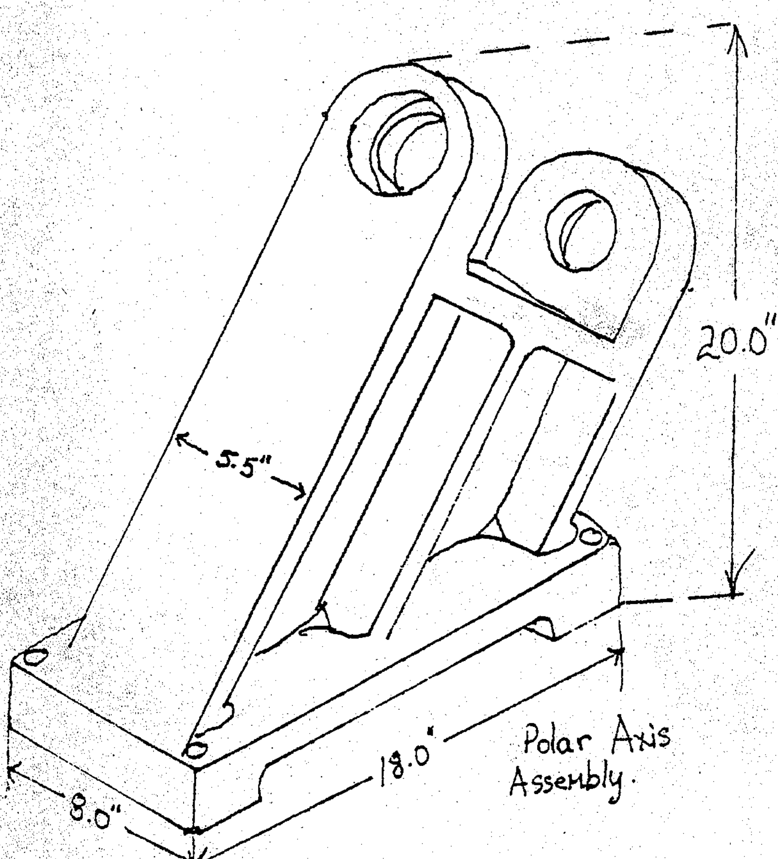
A 10" REFLECTOR ON A FORK MOUNTING (cont'd)

Price-wise the mounting is not cheeap. It has increased once since the time I had purchased it and a 25% increase is due in Feb./80. The prices at present are:

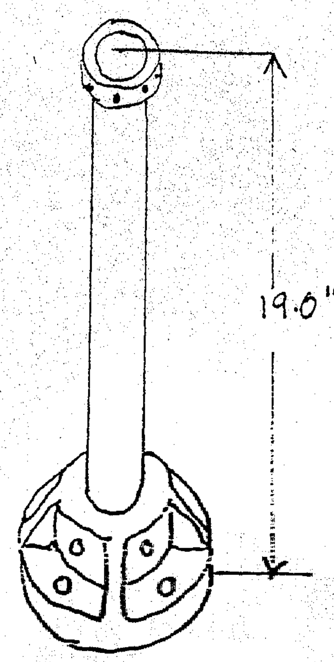
Complete 10" mount with 9.3" clock drive
and rotatable tube $1280
Complete 12" mount with 9.3" clock drive,
larger fork and cradle $1500
Complete 14.25" mount with 12" clock drive
and rotatable tube $2000
Built in electronic R.A./ Declination
control panel, joystick, tangent arm .... $350 (U.S. funds)

So by the time you pay for the exchange rate and duty and the new price increase, it will cost you a great deal of money. In fact, about $3000 for the 10" mount after next Febuary. WOW!!

So for my next planned telescope, (16"-20") I plan to build once again. Now that I have seen what goes into the mounting I plan to copy it (increasing it in size of course) and get it done locally. I have found a foundry that will do the aluminum casting ($3/lbs. for aluminum), as well as a machine shop to do the machining. Also, cast hardined shafts are available as well. It may take more work, but after examining my mount, one could replicate it far cheaper than to order it from the States. So why not build, and obtain the materials locally. The only large part that would have to be obtained from the States would be the clock drive unit.



Polar Axis Assembly.



Polar Axis with Mounting Flange (to fork).