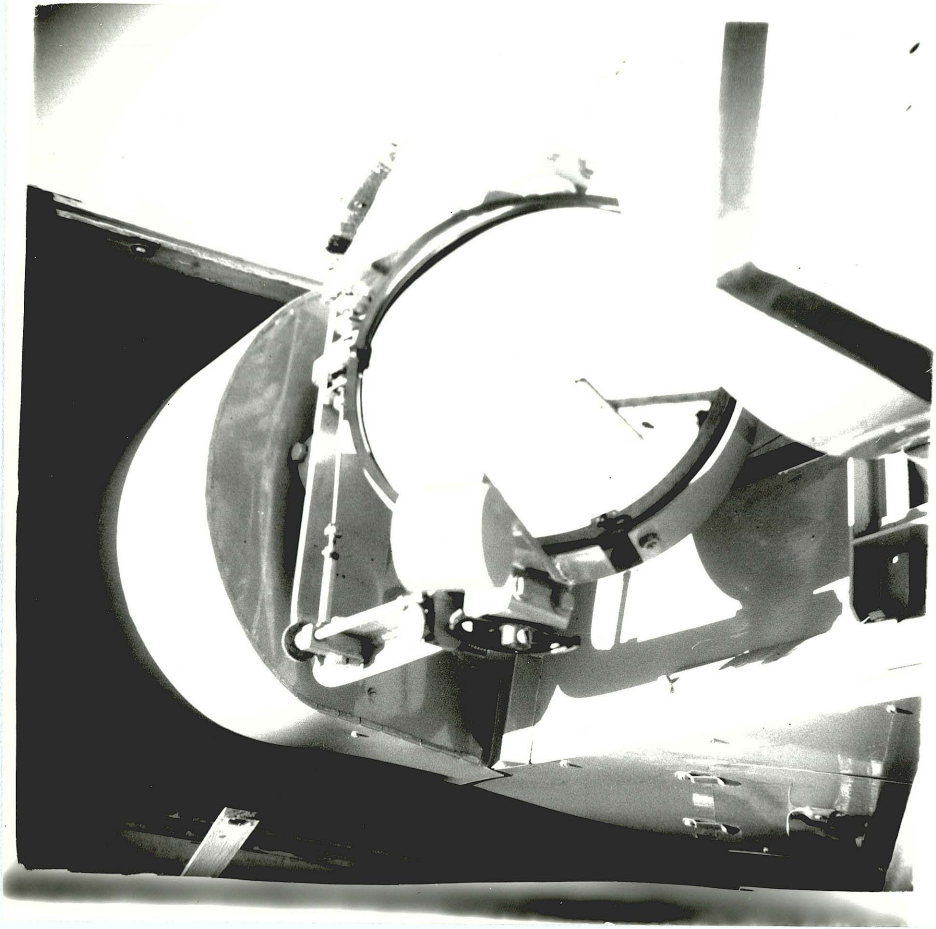
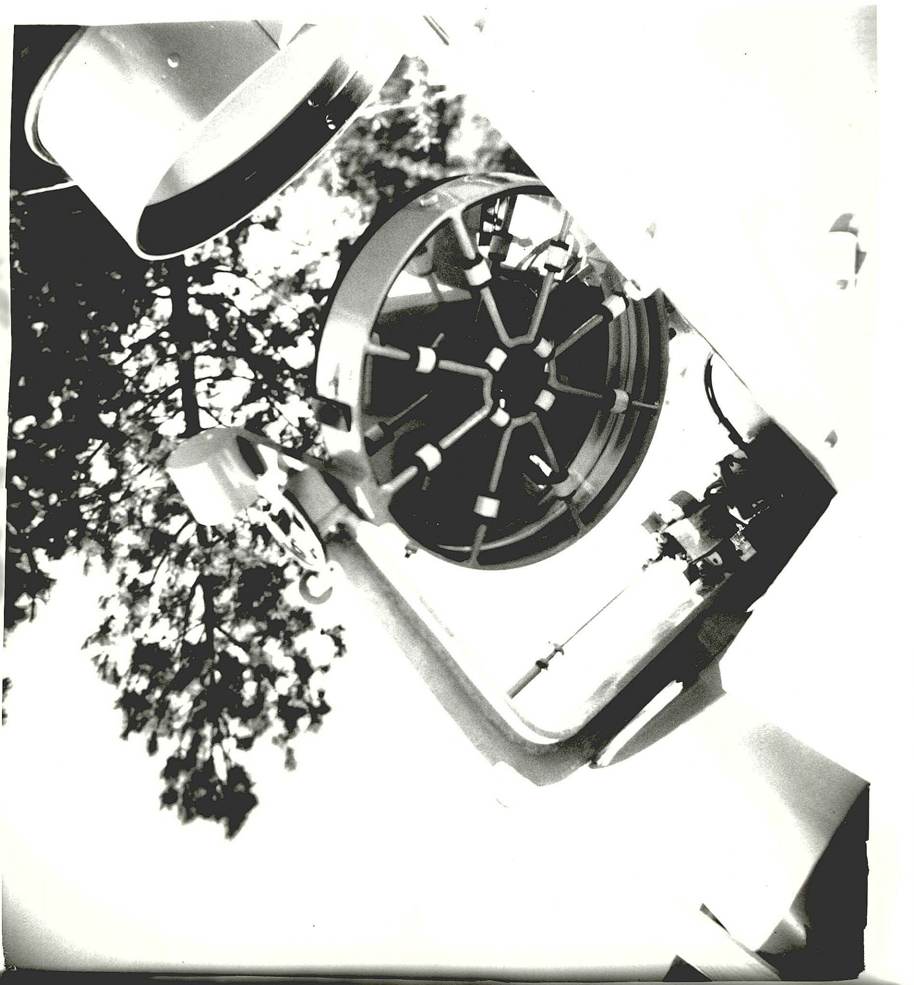


(III)



May 20,1961.

Richard T. Hansen
High Altitude Obs.
Boulder,Colorado.

Dear Dr. Hansen;

Enclosed please find four (4) views of the solar laboratory apparatus set-up here. These are not good,due to using up odds & ends of material in clearing out the darkroom,as well as a rather hurried job of it. However,they show the general arrangement,at least for now.

One very peculiar thing---the tower-head apparatus was painted (housing of drive-mirror cell-lens cell,etc,.) with a non-reflectance Dove-Grey paint;when the whole of exterior (tower--tubework,etc,.)was painted with a Titanium Dioxide of 70% values in pigment. In bright sunshine,this is so very brilliantly-white------in cloudiness,it is a muddy-grey------and at sundown,it picks up a purplish cast. Numerous attempts to photograph this,at various angles,and with various settings,in various lighting,all fail to show good & sharp contrasts. The thing is disgusting hiding-out,at all times,it would seem. Standing alongside this painted surfaces,even when it is hot,the whole remains as cool as the preverbial cucumber. In photography,I believe the use of filters may cure the bad results. The accompanying shots are from some of the general-run snaps taken.

Cordially,

B.C. Parmenter

The building photo (1)---shows the general arrangement. It is 38' feet long--10' feet wide,and has the wide overhanging flat roof,with screened louvres across the ceilings for the whole length. The tower is of heavy angle-iron,when the whole head-unit weighs around 600-700 lbs,and mirror is 16' feet above the ground-level. The shutter is a hinged-off to North,from motor-control below. The tube along the polar-incline is 12' feet long--with elbow--to run 8' back into building. The small black box near building and alongside of tube,is the exhausting system---mounted on separate pillar,and rubber-grommetted into the metal tube jacket---to avoid vibration. The tube itself has a 12" X 12" inch square interior tubing--hermatically sealed--with the 16" X 16" inch square outer jacket, also sealed. When the exhausting fan is started,the rising hot air between tubes is pulled back down---when "bleeder holes" near the tube-top admit of fresh air being drawn in and replaced. After several minutes of running,the tube is relieved of it's heat,due to direct sunshine,and becomes very cool---causing an even temperature gradient within the inner tubing. The small window (to right) admits of light into the "visitor's entry",with the lattice -covered porch just to far right. The left-hand window reconstructed to an air-conditioning arrangement for the hotter days. The access-door may be made out at the tubing "elbow"--with outer and inner doors---rubber sealed---to admit of getting into the quartz flat,which folds the beams from the main lens. The other and smaller tubing,also along the polar-incline,is a one-tube within another arrangement,having a small flat at a point below the "cap",to direct sunlight into a 2" aperture refractor farther down the tube,and so through projection at the tail-stock,onto the rotating disk on the sloping desk-top----right at ones elbow. Here,the general integrated light disk of the sun may be studied at lieasure,with a 7" image (under drive control), when the orientation is made--spots counted--faculae noted--and active-looking regions noted---towards work with the spectrograph. The whole observing-chamber is 10' X 14' feet,so one has enough room to work about various "stations".

Photo # 2 shows the drive-head housing,with fork and flat mirror. Just above the flat and to right fork-arm bend,can be seen the duo-motor for rise & fall control of mirror. Since reversible motor with brushes was not wished,(due to moisture-troubles), two squirrel-cage rotor type motors were used,with opposing field-starts--which were flex-coupled together------these run the long little trident-fork-rod across the fork to a 1:50 ratio worm-gear at left bend side. The shaft down the fork-arm towards you then goes thru another 1:50 worm-gear ratio, and so into the main quadrant worm-gear (1:100 ratio) to be seen on the shaft of mirror-cell. (The counter-balance weight covers edge of mirror). Another weight on the other arm of fork (hidden),balances the whole so nicely that it comes to within 2 ounces----one's handkerchief laid on the west fork arm will cause the whole to be thrown out of balance.

A diffraction-ring is let in over edge of flat. In the lower left-hand corner of photo made be seen the access-door into the slew-motor cubical. Very little trouble has been noted from mounted this whole on the roof-top,as the whole roof is heaving-trussed,and supported,of course,on the block building. The observing floor is "floating",so the only transmission of vibration is around thru the older building part--which is a long-travel sort of thing.

Photo # 3 shows the flotation-pad arrangement at rear of flat mirror. The whole of mirror is "open" to dissapate heat,with a leather ring about the edges for the cell-studs (6) to rest against----have found no appreciable distortion for different positions of the mirror. The mirror is of Pyrostress,when the action under direct solar light is neglible. The 10" lens sets about one foot below the mirror,to start it's focal-cone before the is any appreciable narrow-angle scatter becomes badly widened. It is highly corrected for spherical --- aberration on it's front (R1) surface;when the R2 surface is concave--having it's center of curvature-radius near the focal-plane--or at a considered point,for the action of the "corrector-lens" unit ------(which lies on a "prod" extended into the horizontal tube into building)-----to give the considered final correction. The foval length of this lens is around 27'feet to it's prime image,and fall some 4-1/2' feet short of the spectrograph-head. The corrector-lens unit lengthens this to the spectrogragh-head,when the final image is also corrected well for color,and is 4" in diameter,---operating at a slightly greater F:ratio (around F: 40). The corrector-lens "prod" is controlled by a dolly,running on a focusing-track, with crank handy to the operator.

Photo # 4 might be termed a "gag" shot-------yes,the "hard-bitten" & "calculating" appearing individual is none other than myself,with the "pate" full-glistenign in the bright sunshine,and lost to the sky back over the pines which covere the area. I made this,since I "caught" my reflection therein,as I focusing in the camera---and like most humans,couldn't resist it! Furthermore, I have always been greatly "intrigued" by the delicacy of a good flat surface,as compared to those one shaves before,in one's bathroom!

As a final note or two,for now,I might state that the lens in the Littrow spectrograph is of the same order as the main 10" lens---being,however,of 5" dia., with 115" focal length,and off-axis figured,to provide for the astigmatic-throws in the apparatus. In effect,with the selector-slit between these two lenses,the whole becomes of the past-day "rapid-rectilinear" in it's make-up,,when a nearly "achromatic" correction is obtained for the whole station. Furthermore,for the "telescope" end alone,the thing is in the nature of a "Galilean" instrument----- wherein the grating would be used directly behind such---in nearly parallel light, not withstanding the slit and collimator. Selectively,the beams are such that the "over-spill" of any lighting at full aperture falls much as in the coronagraph, when this light is of the cell-edge diffration,and is not used in the main beams. Scanning made so far,throughout the whole,in white-light,has shown a tendency to extreme clarity of definition. At this time of writing,preparations are being made towards the installation of the grating,and"general clearing up",when we will note if this is upheld in monochromatic observances,as well.

The drive-head of the flat has proven out well. A reversible-motor,thru it's train of gears,drives the main slew-gear on the polar-axis. This gear is not fastened directly to the shaft,however,but simply "floats" thereon. Then the drive unit rides "piggy-back" on the North face of the slew-gear,,when it's gear is fastened directly to the polar-axis shaft. Transmission of slew is had thru the whole,and when slew is stopped,the drive takes over. The only noticeable errors have been from temperature-effects in the lubicants not being completely free-flowing. Since the drive unit is never at the same position around the main shaft, a "brush" take-off to rings is had for current-carrying to the motor. Also, a "tele-indicator" sytem to lights on the control-panel tell the operator the approx. position for the main head-mirror.

Work was started on this October 12,1959---when it has been a daily "role" towards the many task each day since. Now,as the thing draws closer to the final steps of operation,Iam beginning to once again feel more relaxed,when it will be "good" to get back to observing. Many adjuncts will no doubt be added as time goes on,such as occulting methods--arc apparatus--stops and diaphragms,etc,etc. One of the first will be the attachment of camera, "matched" to the visual observances.