

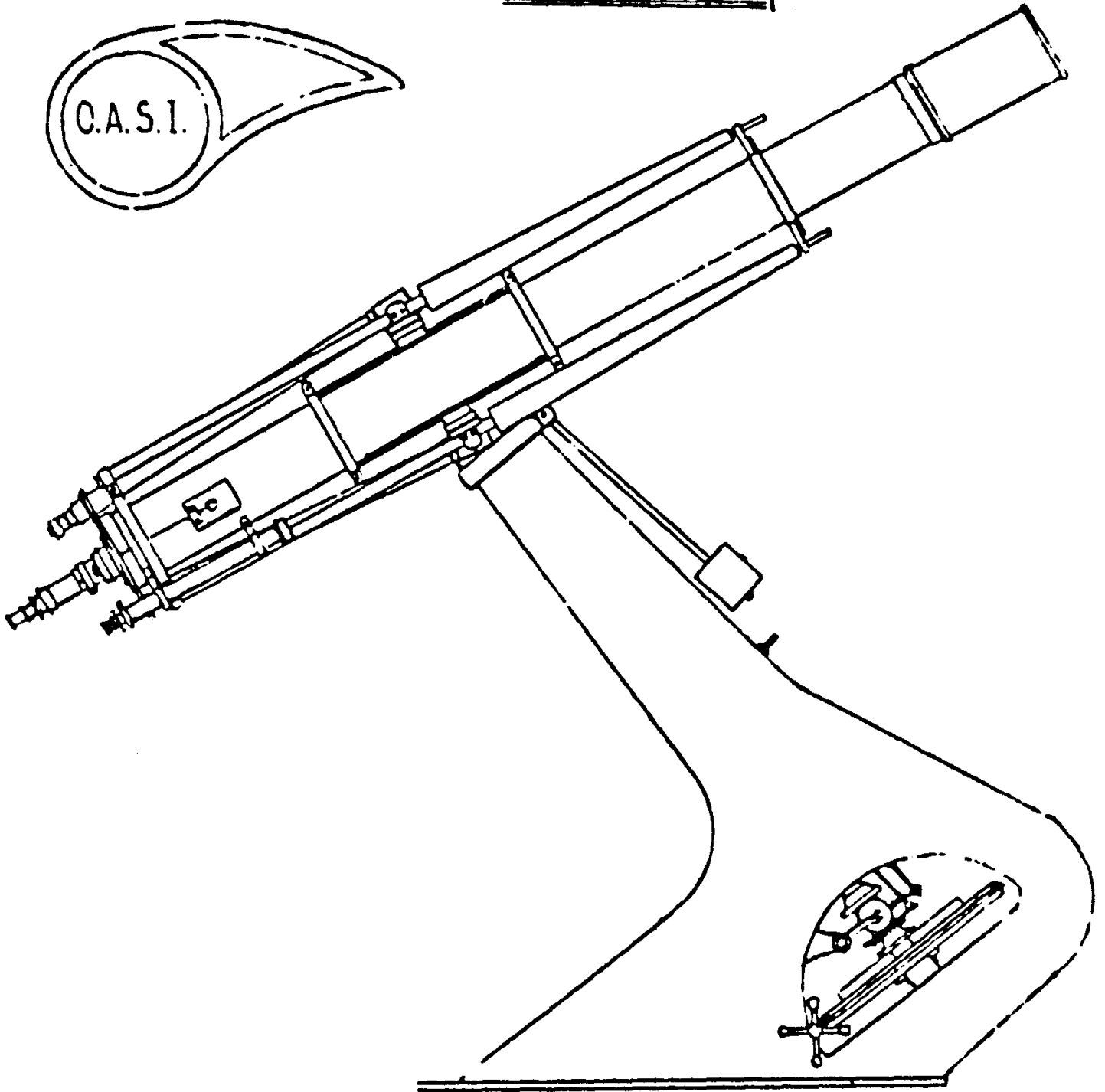
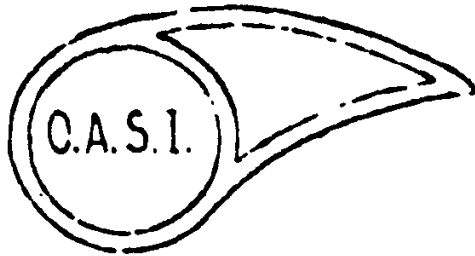
THE JOURNAL OF THE ORWELL ASTRONOMICAL SOCIETY (IPSWICH)

Editor: Mr. Paul Burt, [redacted], Ipswich IP1 6PP 'Phone Ipswich [redacted]

Producer: Roy Adams, [redacted], Ipswich IP2 9ST 'Phone Ipswich [redacted]

Your submissions of items for the Journal will be welcome.

MAY 1979



The Orwell Park Observatory 10-inch Astronomical Telescope at Hacton near Ipswich

The Plough still dominates the zenith area this month, while Virgo and Bootes are due south around midnight. Libra lies to the south-east of Virgo, and on the south-eastern horizon the brilliant red Antares in Scorpio can be found after midnight.

Antares has a 7th magnitude green companion, which is exceptionally difficult to see because of the primary's brightness and its low altitude in British skies. To the south-east Ophiuchus is visible by late evening, and the conspicuously crown-shaped Corona lies next to Bootes. The eastern sky is dominated by Hercules and Lyra and the head of Draco, lying just west of the lovely blue Vega. Leo is prominent in the western sky, and the whole length of Hydra is still visible winding from the southern to the western horizon.

#### THE SUN

Sunrise is at 04h40m at the beginning of the month, changing to 03h40m at month-end. Sunset changes from 19h30m to 20h10m. The Sun moves from Aries to Taurus during the month.

#### THE MOON - Phases

|               |           |              |           |
|---------------|-----------|--------------|-----------|
| First Quarter | 4d04h25m  | Last Quarter | 18d23h57m |
| Full Moon     | 12d02h01m | New Moon     | 26d00h00m |

#### Occultations

| Star  | Phase | Mag. | Time        |                   |
|-------|-------|------|-------------|-------------------|
| *1730 | D     | 6.5  | 8d01h17.4m  | D = Disappearance |
| 2791  | R     | 5.4  | 16d01h15.9m | R = Reappearance  |

Stars listed according to Zodiacal Catalog (ZC) numbers. \*denotes double star.

#### THE PLANETS

Mercury is a morning star this month, but too near the Sun for observation. Superior conjunction is on the 29th.

Venus is also a morning star at mag. -3.3, rising an hour before the Sun throughout the month. 10.1 south of Mars on the 20th.

Mars is another morning star, also rising about an hour before the Sun, at mag. +1.5.

Jupiter is visible until around 0100h at mag. -1.6 in Cancer.

Saturn is at mag. +0.9 in Leo, visible until early morning.

Uranus is at opposition on the 10th, at mag. 5.7, in Libra and will be visible all night this month.

Source: BAA Handbook 1979. All times are U.T. (-B.S.T. minus 1 hour).

#### METEORS

The eta Aquarids are scheduled to give a fair showing at the start of the month, from the 1st till the 8th, with maximum zenith hourly rate of 20 on the 5th. The radiant is 22h24m R.A. and its dec. is right on the celestial equator.

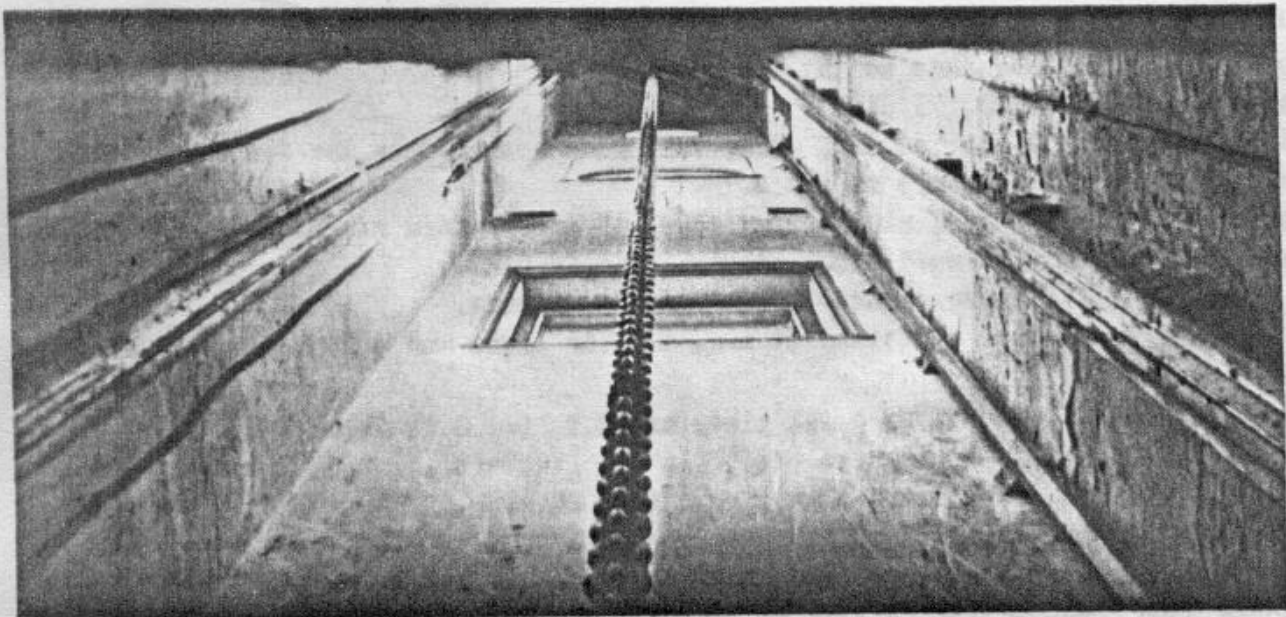
#### OBSERVATORY NEWS - for the third time 'running', your LIFT SPOT.

You will notice we are running a supplement in this issue, about the Orwell Park lift. The good news was that we got someone with lift experience to look at it at some length (though not necessarily its height - unless one thinks in terms of cost). The less good news almost inevitably resulting from this was and is, that 'the Man With the Experience' has submitted a confirmatory report/letter stating his belief that it would expectedly be more economic to instal a new, modern lift, than to properly renovate the old, which would to a great extent then not be the old anyway, as quite a bit of change would have to be made to make it up to working regulations. Had it been in a museum, better likelihood of its venerable anciency being financially attracting would exist, it was said. Anyway, all concerned can still hope. Maybe a good lift dismantled and available for some reason might be a good bet, some interested labour but official

Page 4 ) approval and monitoring might in places cut the cost a bit, but anyway, the cost could be anything from (very roughly, and not quoting the Company rep.) three to ten thousand Isaac Newtons - and twice as much for a new one. An awful lot of 5ps each way, although we get possibly 5 000 visitors per annum (not quoting our Chairman or any other source except my own quick evaluation). If we had a lift, maybe more would come! And pay 10p for the return trip! If half an annual visitry of 5 000 - that is, 2 500, paid the 10p each way for 5p, £250 p.a. income would result. If nothing went wrong with it, and it cost (second-hand) £2 500, it would start paying in ten years...assuming no inflation. A lot would depend on how the money was raised or made available, but I daresay a pound or two would drift into a donation box specifically supplied to give a change from the 111 steps up and 111 steps down, from some of our members.

It may be that the matter will be pursued further. Such possible furtherance has not yet been discussed and more at the moment I cannot say. But I would be sorry to see the lift shaft remain untraversed except for its ghost of former splendour, its chain felled with one final, long-drawn-out clank for some other use while it is still reasonably healthy. And without wishing to be presumptuous as to its use as such, it makes an awfully tall and rather small-percentedly usable cupboard!

Maybe to use the shaft as a solar telescope would be eventually more fitting than over-continuance of the present situation wherein it is left, or for some other research purpose? Anyway, time will tell, and we can only hope that some good will come from the mention of it. A picture of the lonely shaft appears below, taken by Yours Truly on the day of the lift's interview. RCA



#### PHOTOGRAPHY AT THE 10-INCH ... AND OTHER OBSERVATIONS

With Sunspot Maximum possibly not too far away, preparations are being made to supply the 10-inch telescope with one or two before-o.g. large diameter filters, so if it ever does really get hot this 'summer' (or for that matter, some other summer in the more distant future), observations can be made with better protection for the big lens, and less heating of it, though this would anyway be slight, affording the better form-keeping of the lens. We all know that even Pyrex glass expands, and that the 10-inch lens is not Pyrex, but ordinary (?) glass. The best work can only be done if the lens is kept as closely to form as possible, without serious frontal heating, and the best way to do this is to use a whole-aperture absorbing filter. It is hoped that some good-quality Perspex will suffice - some has been obtained and pilot tests have been made that indicate satisfactory results are possible.

If Perspex does prove to be insufficient in optical quality to do good justice to the performance of the object glass in good seeing conditions, then an endeavour will be made to obtain an optical glass filter of suitable diameter - about 12 inches if the material is left 'unframed'.

Such filtering in front of the lens helpfully absorbs some light - on photoelectric exposure meter checks, about 95%. This does not mean to say that Perspex will absorb this amount of heat, but even if 75% of the heat is stopped to the lens, it will help a lot. For serious study purposes, a solar disk projection on the observatory wall is off-shape and unnecessarily large at anything up to 100 inches equivalent diameter. The before-o.g. filtering reduces need to enlarge the image in reducing image light intensity for visual work as well as photographic.

Cameras with format larger than 35mm full-frame are really needed to capture detail of even individual spots at such image scales, but with filtering before the main lens, the slowest films, which are also the most contrasty and crispest in resolving power, can with filtering additional a little distance before the projection eyepiece, get in whole large spot groups and large portions of the solar disk with high-speed shutter 35mm cameras. A semi-floating 600mm back-extension interior-blacked and diaphragmed tube has been made up for use in part on the 10-inch, which will use large back-image scales without image reversal, directly on film, thus without camera-offset picture distortion. The effects of different wide-pass-band filters can be tried with high-contrast film and hard grade printing paper (more contrast) to see what detail in granulation and other phenomena on and maybe around the Sun, is registerable.

The Sun has an enormous range of intensities from about 60 Watts per square foot (750 Watts per square metre) near noon in July, downwards to nothing (which is what we have experienced more of lately!) on any surface facing it - meaning about 36 Watts peak on the big o.g. If ever it was felt desirable to operate the telescope under such conditions without a filter at the time, for peak performance, a filter or two could be used for a short while to gradually accommodate the o.g. to the solar incidence, though it could be that the 'short' time might prove rather long.

Stopping-down with a diaphragm, central or off-centre, could under high solar incidence, cause somewhat undue strain on the glass, some part being heated while others are not, remembering also that glass is a poorly heat-conducting material. To use such a diaphragm without a before-o.g. filter could be running a risk to lens safety as well as performance, and so can hardly be recommended. But a stop-down diaphragm may well improve seeing conditions by giving less ray-path area to the lens to average-out, when viewing the Sun (in back projection or photographically) or at night on any object.

When the Sun is low in the sky, as in late Autumn and early Winter, or nearer the horizon than about 20°, no before-o.g. filter should be necessary as the atmosphere then absorbs more than 66% of maximum heat even on the clearest day. But at such altitudes, the greater path through the atmosphere may make seeing far more than three times worse what it is at maximum altitude of 60°, so if one is able, work should be done at the highest possible altitude - hence the need, sometimes, for a whole-aperture filter.

The simple apparatus being made will allow other test diaphragms to be fitted (or other filter materials to be tested, for that matter) over the front of the Big Ten. Not only for Big Ten use, but for seeing the performance for members' own telescopes of ideas they have. (Within reason of course - no fancy ideas about 1-cube-foot lumps of optically ground ice, for example - they're too heavy!) One viable example is a hexagonal diaphragm (if we get the angle right, it needn't be rotatable?) for viewing Sirius B. The idea of this being that diffraction valleys so formed between spikes leave the close companion of Sirius unobscured whereas before, the comes was a hard job or impossible to see.

If we could find a reliable very high density filter for before-eyepiece use, helped by the before-o.g. one, direct visual observation, maybe with stop-down also, may be

Page 6 ) possible for 'snap' checking of detail - the eye is al better than the photographic 'plate' for averaging-out resolution and atmospheric bling errors - but direct observation even through dense filters should never be recommended where large apertures are concerned and the observer wants to view for a long time, a high, clear Sun. Projection is much safer and certainly almost as good in presenting detail on a white card screen, as this way, dangerous ultra-violet and other possible radiations are avoided the eye (glass, even densely-coloured stuff, may not stop enough of everything!) To this end, a 'cone' back-projection box, a complete shroud but for a hole for a binocular diagonal at the side for image re-reversal (desirable with eyepiece back projection) is still planned. This could be openable for drawing on a detachable card over the screen position. Alternatively, if anyone can come up with some decent see-through material, we might try that as the screen for viewing from behind. But It has been found that halation (dispersion of light round detail and therefore some depletion of detail) occurs and supporting a large area of it would be problematical if it is thin enough.

To show an example, in lunar photography this time, of what the Big Ten is capable of, we are publishing one of Charlie Radley's Moonpics in the History of Orwell Park (out shortly) in slightly cut-down form, and another that there wasn't quite enough room in there for. (Be prepared to get that 'History' when it comes out - it's good value.) I've recently discovered that one of my yellow filters will fit snug between a pair of my camera's extension rings, so near first quarter, I'll be after doing some myself!

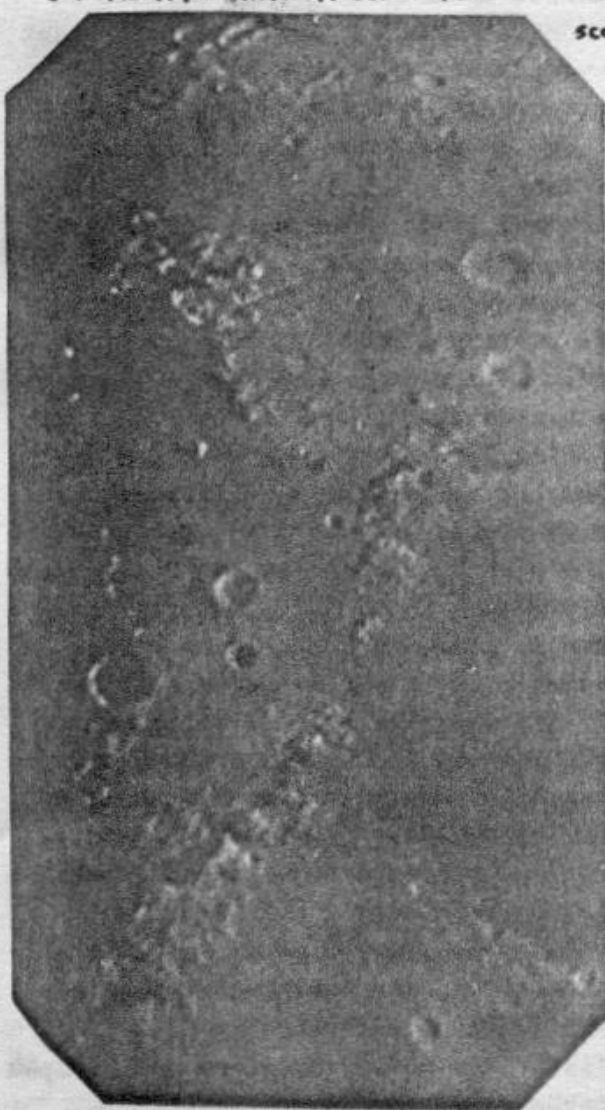
RCA

THE MOON AT FIRST QUARTER by C. Radley. N. is at the top. 2x prime focus neg on 11ford FPl4. using the Orwell Park 10 inch telescope

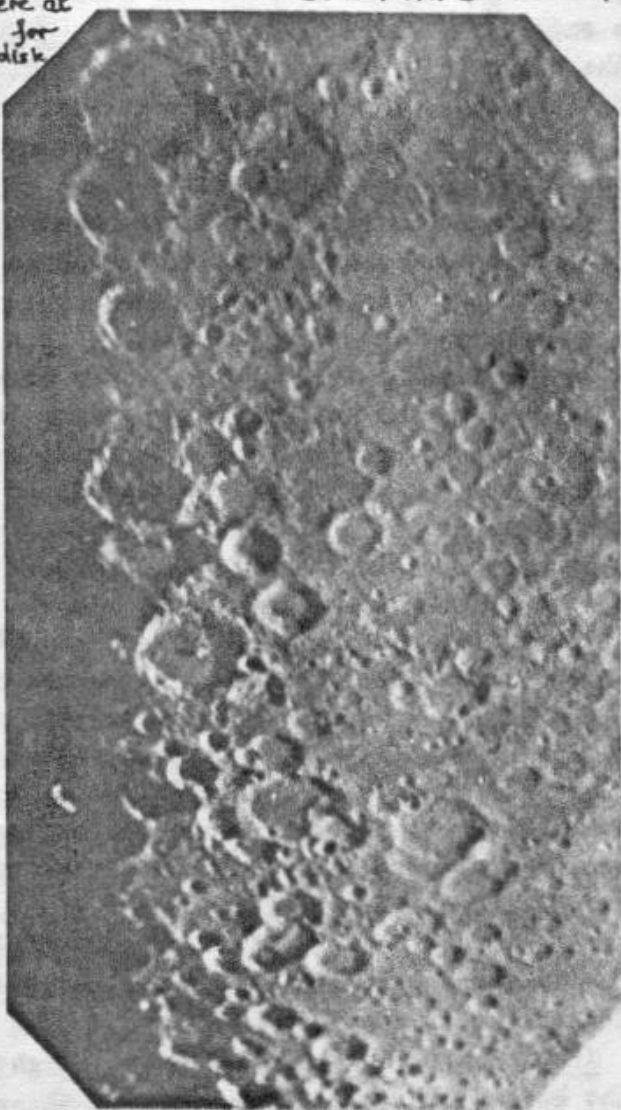
MARE IMBRIUM & N. CENTRAL.

S. CENTRAL REGION

Printed here at scale 300mm for the whole disk



MARE FRIGONS  
Alps  
Aristillus  
Aetolycus  
Archimedes  
Apennines  
Manilus



Ptolem-aeus  
Albat-agnius  
Alphon-sus  
Arzachel  
Purbach  
Werner  
Walker  
Stoffler  
Mauro-lycus  
(edge of) Moginus

FROM OTHER JOURNALS - Chiron - Just Visiting? The minor planet found in (Page 7) 1977 by Charles Kowal orbiting between Saturn and Uranus, originally called Object Kowal and now called Chiron, has been found to have a chaotic orbit by University of Denver scientists. They say that within a few million years, the 160-km lump of rock will encounter either Saturn or Jupiter, and will be pulled into a hyperbolic orbit and ejected from the Solar System. This throws up a mystery as to its origin, because if it can spend only a few million more years in the Solar System, it cannot possibly have been around at the Solar System's formation. It either came from outside as a short-period comet, or formed within the Solar System, like an asteroid. (Evidence shows that asteroids themselves could be temporary objects.) Since we don't know how either of these types of body are formed, Chiron's origin is unknown. (New Scientist)

Expanding Universe - More Evidence. New measurements by the High-Energy Astronomical Observatory-2 satellite (HEAO-2), otherwise known as the Einstein satellite, launched last November and equipped with an X-ray telescope, have given more weight to the ever-expanding-universe theory, as opposed to the expansion-contraction one. The satellite has found unexpectedly intense X-ray emission from quasars more than 10 000 million light years distant. It is thought that this X-radiation may account for a significant proportion of the low-level background of X-rays in the heavens, which had formerly been attributed to hot interstellar gas. If it existed, such gas would provide the 'missing mass' required to gravitationally pull the Universe back on itself. But the pinpointing of the intense X-radiation from quasars suggests that there isn't enough hidden mass in the form of this gas to hold the Universe from eternal expansion. (New Scientist)

Jupiter Has a Ring. Just before its Jupiter fly-past, Voyager I 'accidentally' discovered a sparse ring around the planet. The ring, estimated to be 8 000 km wide and 30 km thick, circling some 55 000 km above Jupiter's cloud-tops, appeared edge-on in an 11-minute photograph exposure that Voyager's narrow-angle camera was taking of the Praesepe star cluster. The ring showed-up only because of the spacecraft's oscillation which blurred the ring's edge and produced kinks in the images of background stars. At magnitude 22, it would require some pretty deft observation to see the ring from Earth. (JPL/New Scientist)

ARTICLES TO READ - "Rocks on the Ice" - New Scientist, March 22nd. An account of the recent abundant meteorite finds in Antarctica.

"Jupiter's Enigmatic Variations" - New Scientist, April 5th. A fascinating look at the intricacies of Jupiter's atmosphere and moons as seen from Voyager I.

"Ultra-Violet Astronomy Comes of Age" - New Scientist, April 12th. A report on the discoveries made by the International Ultra-Violet Explorer (IUE) satellite during its first year of observations.

#### NEWS REVIEW

by S.G.H.

Spacelab Costs Soaring - The ESA is having seriously to consider increasing funds for Spacelab. Current costs are standing at 120% of the 370-million-dollar valuation made in 1973. The main reasons for the increase are changes in the Space Shuttle's cargo bay design and an underestimation of the complexities of building a space laboratory with human life support systems. (Flight Int.)

Shuttle - SRB's are OK - A Solid Rocket Booster motor has successfully completed the last of its 'development firings'. It reached a thrust of 13 million newtons. NASA are now proposing three qualification test firings to make absolutely sure that the SRB's are ready for the first Shuttle flight. Meanwhile, NASA are studying the best way to increase the payload-to-orbit capability of the Shuttle. The aim is to be able to launch a Shuttle from Vandenburg AFB with a payload of 32 000 lbs to a height of 150 nautical miles at 98° inclination. The plans are to add mini SRB's to the existing ones, and this move has probably been made necessary by the reduction of design standards during the Shuttle's construction, due to Rockwell's inability to meet them. (Rockwell)

Shuttle Budget - The U.S. Congress has granted NASA \$27m in their 1980 budget to keep

Page 8 ) open the option of a fifth orbiter. Dr. Froesch said that interest was growing in the Shuttle and its uses - particularly in the Air Force. If the money had not been forthcoming Rockwell may have had to scrap special orbiter building equipment, which would have meant astronomical costs for any further orbiters, if needed. If the fifth Shuttle is not procured then the money will buy spare parts for Shuttles. (Rockwell) Columbia Tiles - False Alarm. Despite reports in the news, the thermal protection tiles on the Columbia Shuttle did not fall off during its test flight. They were merely some foam tiles used to make the surface smoother during transportation, held on by the space-age method of sticky-tape, which inevitably came away. Engineers later resorted to the more technological method of using glue, and Columbia was able to continue its move to KSC, Florida. (Rockwell)

Pioneer Venus Award. The man in charge of the Pioneer Venus mission - Charles Hall - received the annual Astronautics Engineer award at the Goddard Memorial Dinner on March 30th. The Pioneer Venus orbiter is still taking measurements, and as mentioned in an earlier journal, one of the atmospheric probes survived for an hour after impact. PV must undoubtedly be one of the most successful space science missions ever conducted. (NASA-AMES)

ARIANE Mock-up. The ARIANE 'Propellants Mock-up' has been successfully erected on ESA's Guiana launch pad. However, no engines were fired, and ballast took the place of a satellite, though the importance of this operation should not be minimized. All the electrical systems were tested and all the tanks successfully filled with fuel, and the launch control bunker worked perfectly. The first ARIANE launch is scheduled for November 3rd this year. (ESA)

The next News Review will be in August this year, so here's a chance for all you budding astro-journalists to fill some 'space' with any news, views or writings on your pet celestial subject.

ADDITIONAL SNIPPET from BBC1 TV, 'Tomorrow's World, 5th April last:

'NASA to launch a satellite, 'Solar Maximum Mission' in October 1979. Solar maximum expected to be second-highest on record. Boulder, Colorado, somewhere, has a weather-monitoring station with special accent on solar effects.'

NOTABLE ASTRONOMICAL ANNIVERSARIES - JOSEPH LOCKYER

by Roy Gooding

Joseph Lockyer was born in Rugby on 17th May, 1836. In 1857 he started a career as a clerk at the War Office. This employment included editing 'Army Regulations', a job that held no inspiration for him. Lockyer's attention was directed toward astronomy. This began as a hobby but subsequently was to become his full-time profession. He started his observations with a 6.1/4-inch refractor, by Thomas Cooke of York.

For the first few years Lockyer observed the planets, singling-out Mars for special study. When Lockyer heard of the work being done by Kirchhoff and Bunsen he decided to take up spectroscopy, as Huggins was doing (see February Journal). He conducted his spectroscopic observations quite independently of Huggins. Lockyer concentrated on observing the Sun, leaving the studying of more remote stellar spectra to others.

He was the first to study the spectra of sunspots. By 1866 Lockyer had amassed sufficient information to show that sunspots appeared dark against the Sun's disk for two principal reasons:

- 1 Sunspots emitted much less light than their surroundings (already widely accepted).
- 2 Sunspots absorb more sunlight than their surroundings.

Two years later he discovered that prominences could be observed in daylight by widening the slit at the front of the spectroscope and directing the light through the edge of the prism. Before this time prominences had only been seen fleetingly during total solar eclipses. The method of observing prominences in daylight was also discovered independently by Pierre Janssen, and a little later by Huggins.

In 1868 a total eclipse was visible from India. Janssen went to India to observe

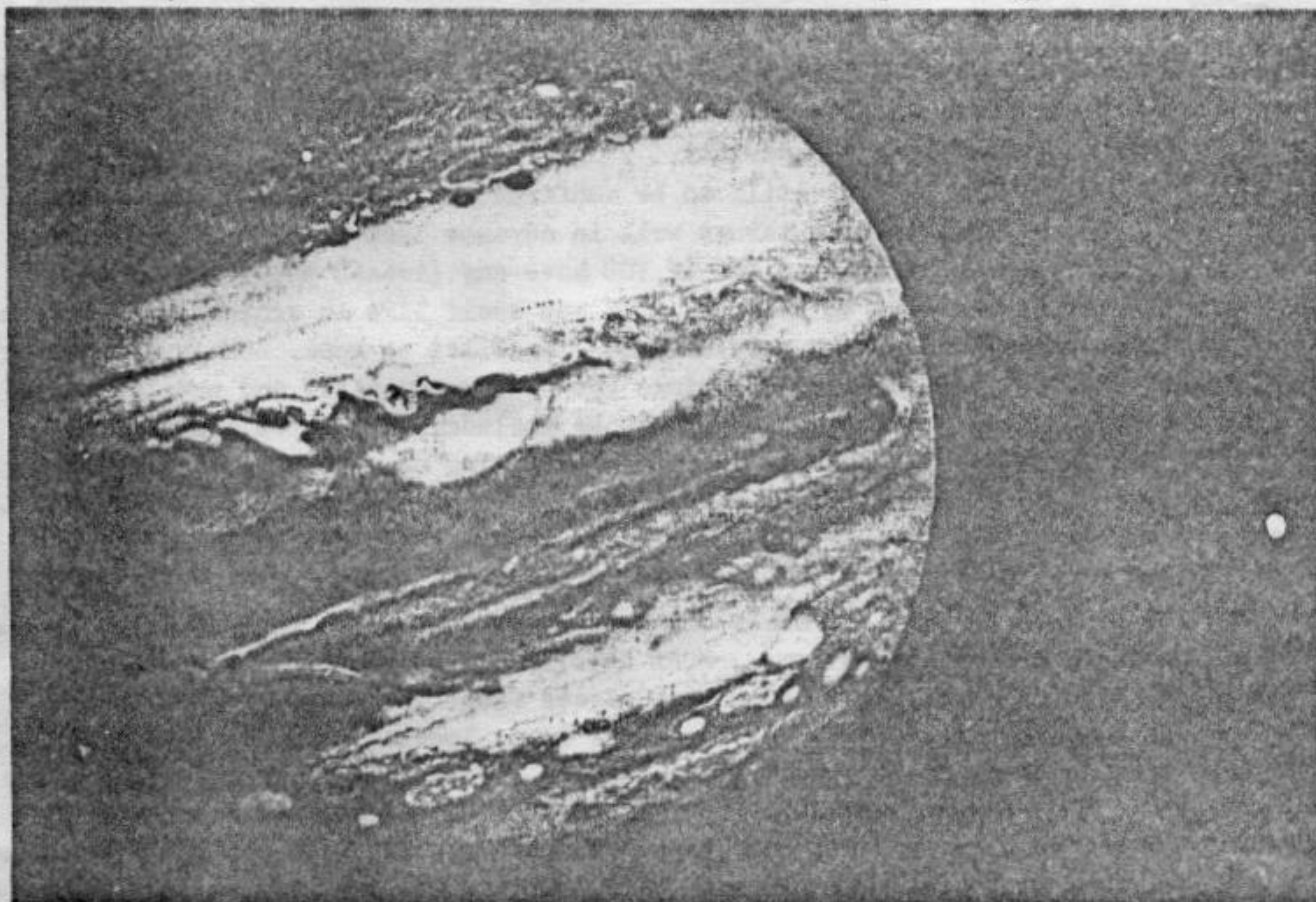
the phenomena having ~~been~~ to co-operate with Lockyer with the observational (Page 9 results. Janssen obtained a spectrum of the Sun, noticing a previously unidentified spectral line. The results were forwarded to Lockyer. Lockyer was unable to identify the line, concluding that it must belong to a new element that had not yet been discovered on Earth. He named the element Helium. Helium was not identified on Earth until Ramsey found it at the turn of the nineteenth century.

During 1869 Lockyer founded the science magazine 'Nature', taking up the editorship of it as a spare-time job, though officially he was still working for the War Office. The following year he was appointed secretary to a Royal Commission on Scientific Instruction and the Advancement of Science. It was six years before any conclusions were reached. One recommendation was to set up an observatory for solar study. The observatory was built at the Science and Art Department in South Kensington. (This centre has since been renamed, now being the Imperial College of London University.) Lockyer was transferred from the War Office to direct the new observatory. Now able to pursue astronomy on a full-time basis Lockyer extended his work from the Sun to research into other stellar spectra.

Lockyer received a knighthood in 1897 for his services to astronomy. Four years later he retired, moving to Sidmouth, where he quickly established a new observatory even though he was in his seventies. Lockyer continued observing until his death in August 1920.

NOW, SOME JUPITER PICS FOR YOU, COURTESY OF VOYAGER I AND FLIGHT INTERNATIONAL.

This one, from about 28m kilometres away. Whitish spot to right is satellite Europa.



AND THIS ONE IS OF  
A VOLCANO ON IO,  
SHOWING AN UMBRELLA  
OF EJECTION 100 KM  
HIGH.

More next issue.





TUESDAYS from 7 pm: Planetary Section May 1st, 15th, 29th; 12th

Directors Mr. J. Hood, [redacted], Ipswich

and Mr. J. Ranson, [redacted], Ipswich 'Phone Ipswich [redacted]

TUESDAYS from 7 pm: Solar and Lunar Section May 8th, 22nd; June 5th

Directors Mr. J. Hood, [redacted], Ipswich

and Mr. M. Barritt, [redacted], Ipswich

WEDNESDAYS from 8 pm: Nebulae and Faint Objects Section May 2nd, 9th, 16th, 23rd, 30th;

Directors Mr. D. Payne, [redacted], Wickham Market, June 6th &

Suffolk 'Phone Wickham Market [redacted] 13th

and Mr. M. Cook, [redacted], Ipswich 'Phone Ipswich [redacted]

PLEASE NOTE THURSDAYS HAVE BEEN DROPPED TEMPORARILY - WHO'S INTERESTED? ALSO FOR MONDAYS?

FRIDAYS from 8 pm: Variable Stars Section May 11th, June 8th

Directors Mr. R.S. Manning, [redacted], Ipswich

and Mr. M. Siggers, [redacted], Ipswich

SATURDAYS from 8 pm: General Section May 12th, 26th; June 2nd & 9th

Directors Mr. M. Barriskill, [redacted], Ipswich (Phone Ipswich [redacted])

and Mr. R. Adams, [redacted], Ipswich 'Phone Ipswich [redacted]

\*Mike works nights, 'phone times somewhat restricted.

METEOR SECTION MEETINGS There may be one of these after the next Committee meeting,

on May 5th. Meteor Section info. from Mr. D. Barnard, [redacted], Ipswich,

'Phone Ipswich [redacted], or from Mike Barriskill.

NEXT COMMITTEE MEETING - May 5th, 8 pm at the Observatory.

LECTURE PROGRAMME - The next meeting is on MAY 25th, at the FRIENDS' MEETING HOUSE, 39

FONNEREAU ROAD, IPSWICH, when Heather Couper will be talking about Exploding Galaxies.

VISIT TO GREENWICH OBSERVATORY This now has an almost certain date for/of JUNE 23RD.

It's a bit early for final details, which will appear in the next issue. The coach trip return should be about £2 a head only.

OPEN DAY 1979 - SEPTEMBER 29TH is still to be confirmed but this is the date we're planning on. And we are planning things well in advance this year. Several ideas for the OPEN DAY have been discussed and if YOU have any (ideas) about things for it (OPEN DAY) then don't hesitate to tell us. If you would like to exhibit any instrument (even binoculars! which can be very useful) please let us know. We are thinking of appointing an OPEN DAY Committee so things are better organized and not left till the last minute. Educational exhibits are to be included, and maybe a stall where members' items can be seen and partly go for fund-raising or otherwise. A 'UFO' CORNER' has been suggested, but bearing in mind ours is predominantly an ASTRONOMICAL society, we may make it a stipulation that to see this attraction, if included, one sees the other exhibits first! (Mustn't get carried away, must we?!)

OTHER MEETINGS, such as visits of other clubs to us, and of us to them, occur. Special observing projects are sometimes run. MORE DETAILS can be gained from Observatory

Directors, Editor Paul Burt, or R. Adams (addresses front cover) or

Assistant Chairman, Mr. Alan Smith, [redacted], Ipswich, 'Phone Ipswich [redacted], or

Treasurer, Mrs. P. Long, [redacted], Ipswich, 'Phone Ipswich [redacted] (YES - any

more subs.??) PLEASE NOTE THAT ALL GROUP VISITS MUST BE ARRANGED ONLY through

Chairman, Roy Cheesman, [redacted], Ipswich, but ones and twos can be 'accommodat'd'

by simple arrangement (Section evenings or not). REMEMBER - NEW MEMBERS ALWAYS WELCOME!

O.A.S.I. ADS. \*\*\* O.A.S.I. STICKERS FOR SALE, 10p each. Good conversation piece.

• Working electric kettle required for drink-making duties at the Observatory (donated?)

• Robot dusters (male or female) required for the Big Ten, lately unusually light grey(!)

• FOR ALL CLOCK REPAIRS big or S M A L L, ancient or modern, by competent craftsman Society member, 'phone Ipswich [redacted] (evenings) for all inquiries.

by Roy Adams.

David Baker, of I.B.C., an architect, and a Mr. Jackson, a lift representative of Marryat & Scott, Engineers, and myself, visited the Observatory with the main aim of looking at the lift which has for many decades been left unused, on Tuesday afternoon, 790327. Mr. David Baker is an O.A.S.I. member, keen on seeing what can be done with the lift.

The rep. was much taken with the telescope, and we all spent over 1.5 hours examining the lift and building as far as possible without access to keys to other nearby doors looking for pipework.

During the session, I took 4 pictures, which may show the shaft, the cage and underneath when developed.

Mr. Jackson said the telescope and the lift was ahead of its time - and the 'hydrant' object on the stairs platform.

The principle of operation of the lift is still somewhat uncertain - but the most likely explanation seems to be that there is a single cylinder about 55 feet long directly beneath the shaft floor, in which there is a double-acting piston connected through a seal-gland to the floor of the lift compartment. Ropes run through holes in the lift compartment roof and floor are anchored at the top (presumably - photos may tell otherwise, and there was difficulty in seeing) of the shaft and when pulled from any part of the lift shaft, (normally when the lift is stationary at the start of a journey either up or down) a handle connected to a valve (or valves) is pulled, the handle in each case sprung, it seems, so that the rope pulled returns to the tautened vertical when operation of the valve is over.

Whether there are 4 valves separately and positively operated as per simple circuit POSSIBILITY ONE below, or whether in fact only two valves ropes, or even only one necessary for operation, still has to be determined. For the sake of positive action and easier setting of valve connections, over the long length of rope and for stability with time (and humidity and humidity's effect on ropelength) I would think at least two valves were needed.

If the lift cage was always to be counterbalanced only to a certain amount that allowed it always to remain heavier than its counterweight, then descent could always be by gravity, with drain-away as regulation. If the lift cage was at any time lighter than the counterweight, then header-tank supply would be necessary to descend the lift as well as ascend it. This lift-cage-lighter-than-counterweight situation is allowed in possibility ONE for lesser piston load on ascent with lift occupied.

Whether valve operation is to be completed while the lift is stationary, or not, is not clear yet. It could be possible for a valverope to remain slack while the lift travels, though perhaps not best-advised. Two ropes could for this mode be linked - pulling one tautens the other, and valves or one valve connected to the 'yokebar link' are operated or operates accordingly.


If the operation of the cylinder is four-stage - meaning there are four cylinders, telescoped when the lift is at the bottom of the shaft, and to some extent somewhere always telescoped unless at the very top of the shaft, there would have been less depth of pipework. But I doubt very much if a simple 55-foot hole could not have been bored or in some way 'piled'down or sunk, with a loading platform at the ground level if the sinkage was easy. The diameter of the top-piece just visible beneath the lift would have had to be much larger had 3 concentric inner tubes had to be run in a fourth for a telescopic piston action involving three seal-glands as in POSSIBILITY TWO. And the weight of 3 x 20-foot tubes would be a lot

A THIRD method of operation not involving a piston effect is possible, but there seems to be need to avoid water spillage in this third possibility - a changeable-weight counterweight, the weight changed by adding or releasing water. Fill-holes and empty ways, and possibly valves to operate each of these paired with entry or exit holes in the counterweight, and associated handles and ropes, would be necessary for every incremental stopping position or starting position, and unless one was

restricted to shaft (top and bottom only) levels, or layers to and under the floor slabs, and the third possibility seems remote

The cross-sectional area of the ram piston (or pistons - but I doubt the latter) must be about 20 to 25 square inches. If the load to be acted on is 500 lbs, when counterweighted, water head would need to be maintained above 55 feet. As the ram cylinder is all below ground, and any drain piping not much above ground, this in possibility ONE is quite in order. But Possibility TWO is ruled out by this - the head of water in the telescoped-out pipes would virtually cancel-out the reasonable tank head expected without a 120-foot tall tower having been provided, and we can almost be sure that a tower so tall was not - especially as the Possibility ONE can do with only 55-foot head of water!

It is interesting to note that the Possibility THREE might allow an even lesser head of water, if the counterweight had an opportunity to descend rather lower than the lift cage, and empty at a lower level. The highest position of the counterweight would then not need to be top of the lift shaft, but a little way down, thus not needing so much head.

If the lift was to ascend or descend the approximately 55 feet in one minute, flow through a 2.5-inch diam. pipe (() supply system) would need to be only about 5 feet per second, which is quite reasonable.

Mr. Jackson said that in the absence of finding a nameplate it could be a very early Waygood. The general era for Waygood lifts was about 1880. This firm then became Waygood and Otis, then Otis Elevator Company. Norwich may be where Waygood's used to be. Denn(e)y of up North (Scotland?) did lifts like this, too. There is possibly a lift like this at a girls' school in or near Diss.

Sometimes, the cylinder was capped profusely with concrete (&c?) as there was no intention of ever raising it again, thinking the thing would last for ever or as long as necessary. Now B.-o.-T. regs do require that cylinder as well as ram-piston be looked at and possibly reannealed or whatever, after 50 years at any rate? and that chains (for counterbalance presumably) are replaced by cable even on direct-acting lifts like this where the descent can never reasonably be excessive in speed, unless the height of the shaft is very small. Mr. Jackson said the counterweight couldn't travel very far as it is now, and that the lift was safe as it was. He said it would expectedly be uneconomic to refurbish it really, although certainly not impossible. If the lift had been connected with a museum rather than an observatory, economics (reading into what he said - by means of grants etc?) may have been easier. As it was, it seemed that it would be more economic to install a new lift rather than repair the old total mechanism. But he still wished to keep the matter open, and would send a report to David Baker, whom it was who had contacted Mr. Jackson in the first place. This report would, he said, be written.

Meanwhile, further results may be obtainable by emptying the lift of its load of files and enormous filing cupboard, so that any nameplate now obscured may be made visible, and so that the lift cage might be raised a little to see better what is underneath. Also, adjoining rooms might (under supervision if necessary, and maybe when boys are substantially on vacation as was the case at the time of our inspection on 27th March) be opened to checking for pipework and also the clock tower nearby, and plans of any or all parts of the building likely relevant and roof area/s, found and made available for further information. Contacting of Waygood's successors could also be a good idea, and industrial archaeology files on water-operated lifts, I now suggest.

It was suggested that there may be a small, but large enough, header tank for lift operation in the telescope tower somewhere. This might even be somewhere within the internal pier, where it would also act as a temperature sink for the pier to keep rate of change of temperature in the pier and for that matter, outer structure, slower, as is better for the telescope use. Mr. Jackson said many London hydro lifts had been updated to oil op, and double cables provided.

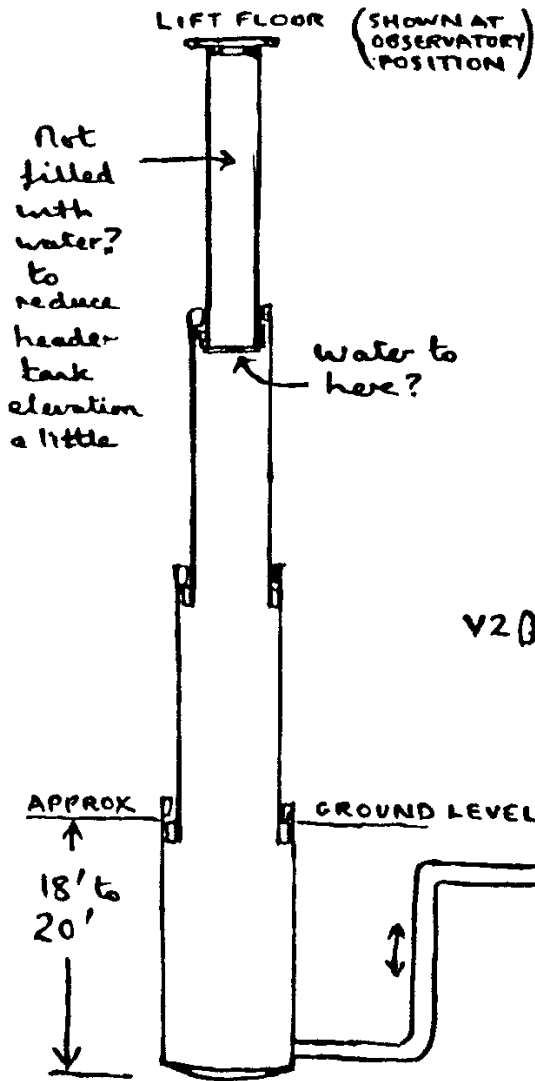
SEE diagrams next sheet.

The description of the lift in the new O.A.S.I. 'History', <sup>at</sup> a four-stage lift may be in fact alluding to the four positions, or levels served: 790330

- 4 Observatory
- 3 'Library'
- 2 1st floor
- 1 ground floor.

But a telescopic set of four cylinders may be 'masked' by this: oo:

POSSIBILITY TWO though for reasons given in the sheet 1 text, it is rather unlikely, apart from less length of pipes of ram in one piece being in favour of it.



Note a ram single cylinder full-shaft-height could have been used, with a chain from the top of a contained piston, but this doesn't seem safe as there would presumably be only a chain holding up all the lift and contents, and the piston area would need to be large!

Valve operation  
 O = Open C = Closed

TO ASCEND



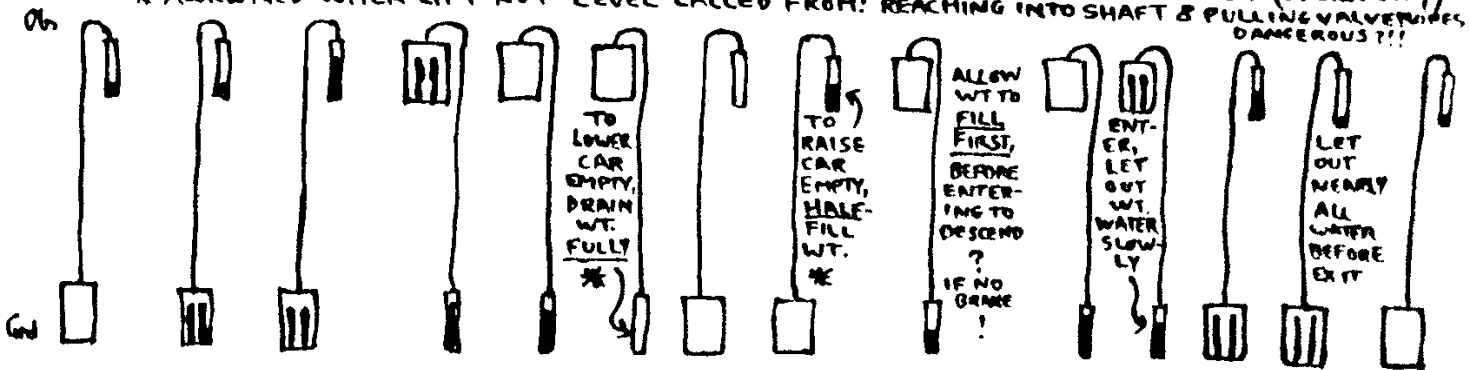
TO DESCEND



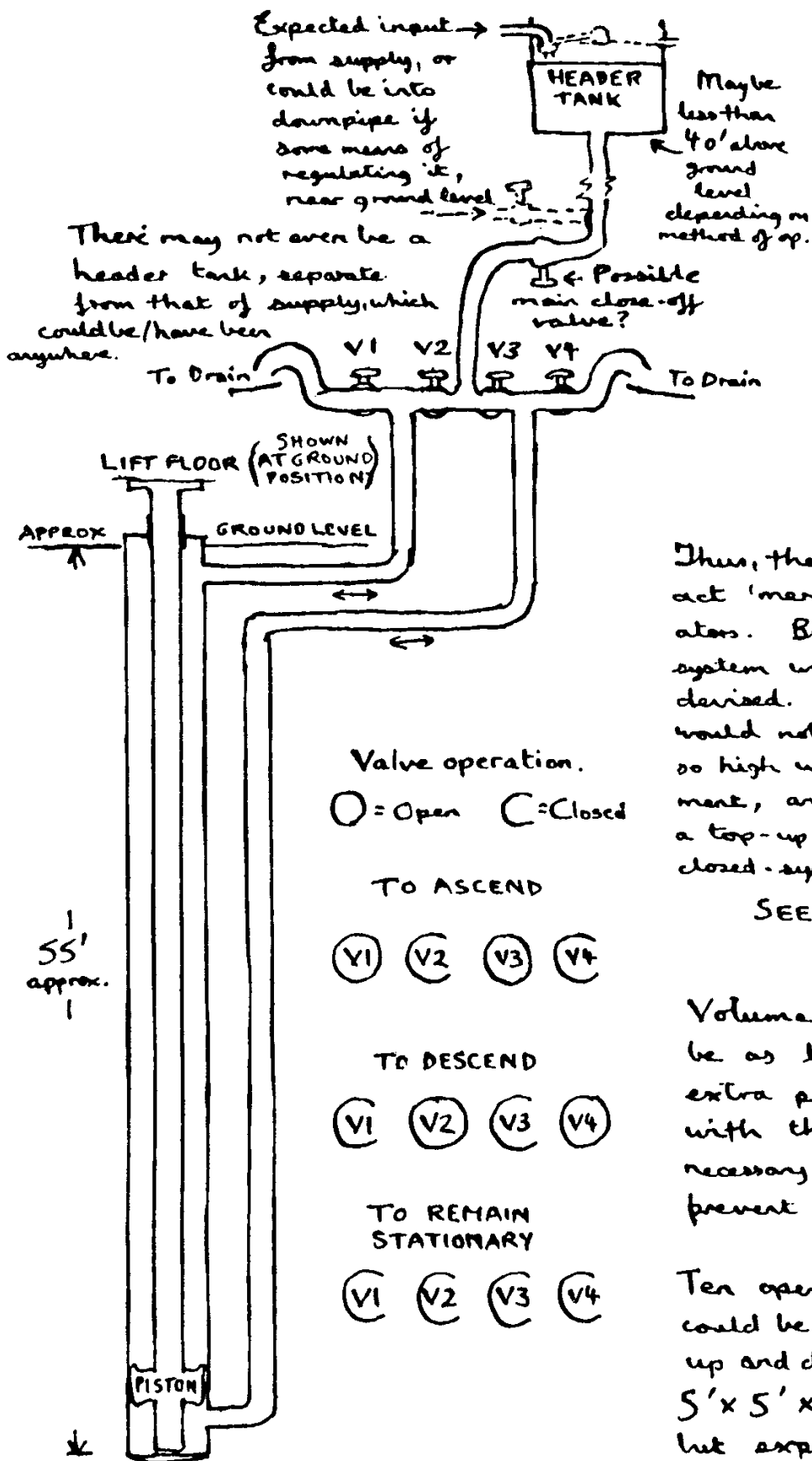
TO REMAIN STATIONARY



POSSIBILITY THREE - VARIABLE-WEIGHT COUNTERWEIGHT- EXAMPLES: (sketch only)  
 \* AWKWARD WHEN LIFT NOT LEVEL 'CALLED' FROM! REACHING INTO SHAFT & PULLING VALVEPIPES DANGEROUS!!!



POSSIBILITY ONE  
 SINGLE-CYLINDER DOUBLE-ACTING RAM



If there was some means of changing the application of the 'balance' weight, so it tended to help the lift up on lift ascending, and helped it down on descending, it may even be possible that the lift in descending, would pump back the water to the header tank.

Thus, the water and piping would act 'merely' as lift speed regulators. But a reliable clutching system would have had to be devised. The header tank would not have needed to be so high up with such an arrangement, and the header need only be a top-up tank for a virtually closed-system.

SEE ALSO NOTES SHEET 1.

Valve operation.

O = Open C = Closed

TO ASCEND

(V1) (V2) (V3) (V4)

TO DESCEND

(V1) (V2) (V3) (V4)

TO REMAIN STATIONARY

(V1) (V2) (V3) (V4)

Volume of ram cylinder could be as low as 8'<sup>3</sup>, but some extra piston diam compared with the connecting 'rod' is necessary to localize seal and prevent excessive friction/binding.

Ten operations of the lift could be made (cycles complete up and down) from a tank 5' x 5' x 4' without refilling, but expectedly, a 'continuous' supply was available to any such tank if not a 'closed' system.

MAY'S LECTURE

at The Friends Meeting House  
Fonnereau Road,  
IPSWICH.

on

Friday 25th May

at

7.30p.m.

given by

Miss Heather Couper,  
Director of the Greenwich Planetarium

on

EXPLODING GALAXIES

ADMISSION FREE EVERYBODY WELCOME

( Please note the starting time  
of this lecture. )