



New Series No. 5

Newsletter of the Instruments and Imaging Section

9 February 2012

This issue of *I&I News* includes some historic material. The first article is a contribution from Norman Rogers, who was elected a Member of the Association on 29 November 1941. He is now the third most long-standing Member, and today, 9 February 2012, is his 90th birthday.

Len Clucas's reminiscences of his work colleagues at Grubb Parsons in the mid-1950s are an evocation of the company more than twenty-five years before it became one of the many victims of the decline and eradication of British industry.

These reminiscences are augmented with contributions from Martin Cole and Kevin Kilburn, showing what can be achieved with now much more readily available modern and, for most amateurs these days, more familiar instrumentation, requiring new and different techniques and skills.

In addition, I have included some photographs from around two decades past, when astrophotographers (now called 'imagers') had to visually track and guide throughout extended, single exposures, and could not know the results of their labours until they had processed the film, often in the early hours of the same night. There are few now who can fully appreciate the difficulties and frustrations encountered in the days of 400 ASA emulsions, hydrogen-hypersensitisation, dry-ice cooling, and long hours spent at the telescope and in the darkroom.

Bob Marriott, *Director*

Seventy-five years of observing

Norman A. Rogers

On 13 June 1939 I purchased a 3-inch refractor for £15 from Broadhurst Clarkson, and on 28 June I opened my first little observatory. However, due to my military service it was closed on 20 October 1941. This was at 207 Long Lane, Hillingdon. In 1951 I moved with my parents to Brighton. Soon afterwards I moved back to Hillingdon, and in 1953 I got married.

My second observatory – a brick building housing a 4-inch refractor (purchased for £50) – was set up at 274 Long Lane. This observatory closed in 1966, and we moved to Ruislip (where I still live in the same house).

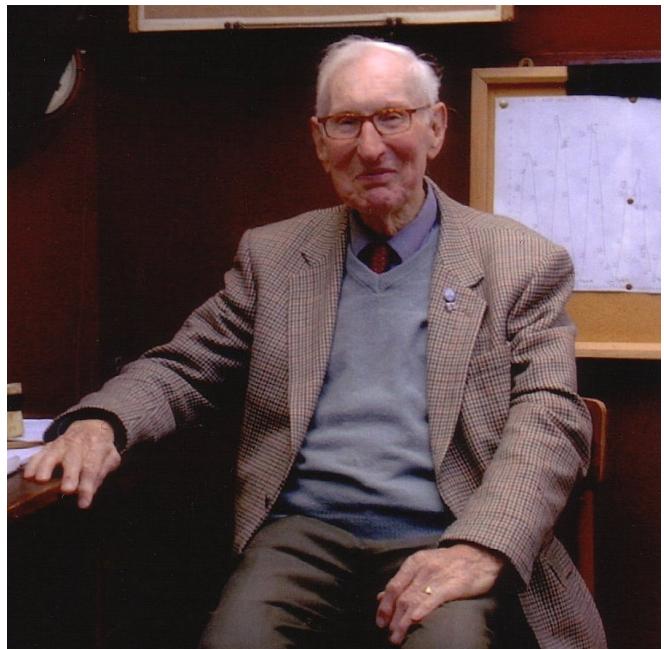
In 1969 I established my third observatory – 9 feet square with a run-off roof – which was opened by W. M. Baxter, the Director of the BAA Solar Section, on 27 June.

In 1973 it was agreed that I should have on loan from the Association a 5-inch Broadhurst Clarkson refractor, which had previously been on loan to M. R. Whippey. In 1981 the 4-inch and the 5-inch were set up on the same mount by Peter Drew. Since then I have used both of these instruments for solar, lunar, and planetary observations – and I still do so. Two years ago, during a violent storm, the roof was ripped off of the observatory, and my son replaced it with a plastic run-off roof with clamps to protect it against future storms.

I have observed the Sun since about 1936, and saw the largest sunspot groups ever recorded, in 1946 and 1947. I have never submitted any of my observations, but I have corresponded with the current Director of the Solar Section, Lyn Smith.



The prototype Dall–Kirkham (6-inch modified Cassegrain reflector), exhibited and described by Horace Dall at the Association's meeting of 29 June 1932. Bequeathed to the Association by the Revd M. P. M. McLean in 1949 (BAA Instrument No. 131).



These are the bare bones of a long life. I shall never forget those greats of the BAA in the past, when I attended the meetings at Burlington House (which I still do), and on one occasion at Sion College – P. M. Ryves, F. J. Hargreaves, W. H. Steavenson, F. J. Sellers, Will Hay... and, of course, my visit to what was then the BAA Office at 303 Bath Road, Hounslow West, and the considerable friendliness of Lydia Brown.

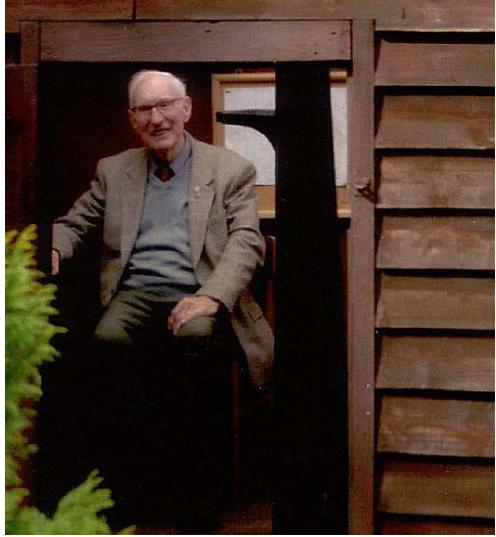
Ruislip, Middlesex

Tel: 01895 636705

The observatory.



The 4-inch Broadhurst Clarkson refractor, twinned with the 5-inch Broadhurst Clarkson refractor.



Reminiscences of Grubb Parsons

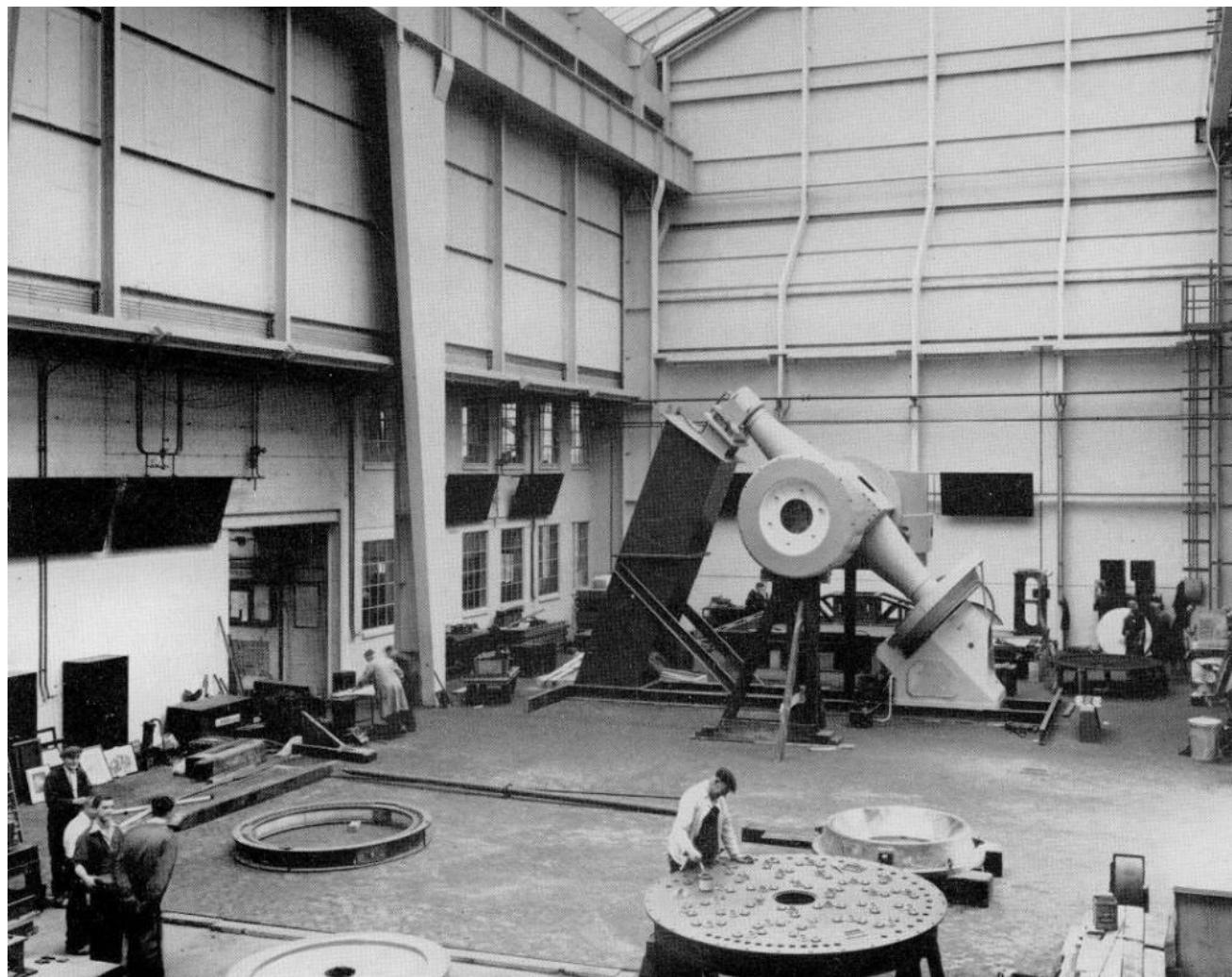
Len Clucas

In a previous issue of *I&I News* (New Series No. 2, 27 October 2011) I mentioned that I began work as an apprentice at Grubb Parsons in 1953, when I was 16 years old. In 1956 the company issued a catalogue containing photographs of some of the latest projects and instruments, some of which are reproduced here. The people mentioned in these notes were those whose skills and craftsmanship built the telescopes and other instruments shown. None of them had more than a distant interest in astronomy, but they, together with the design and draughting personnel, produced some of the finest instruments ever made.

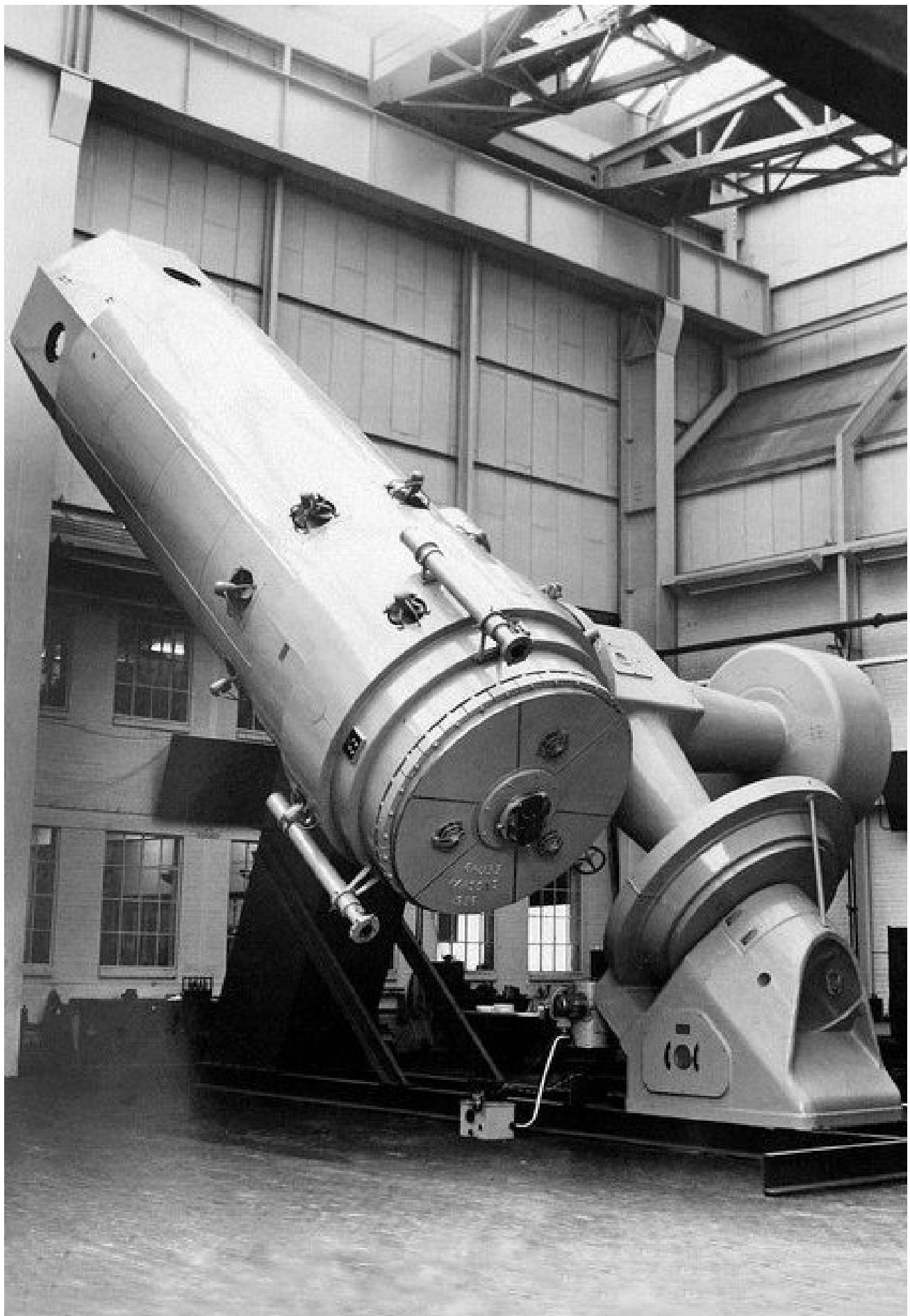
Wooler, Northumberland

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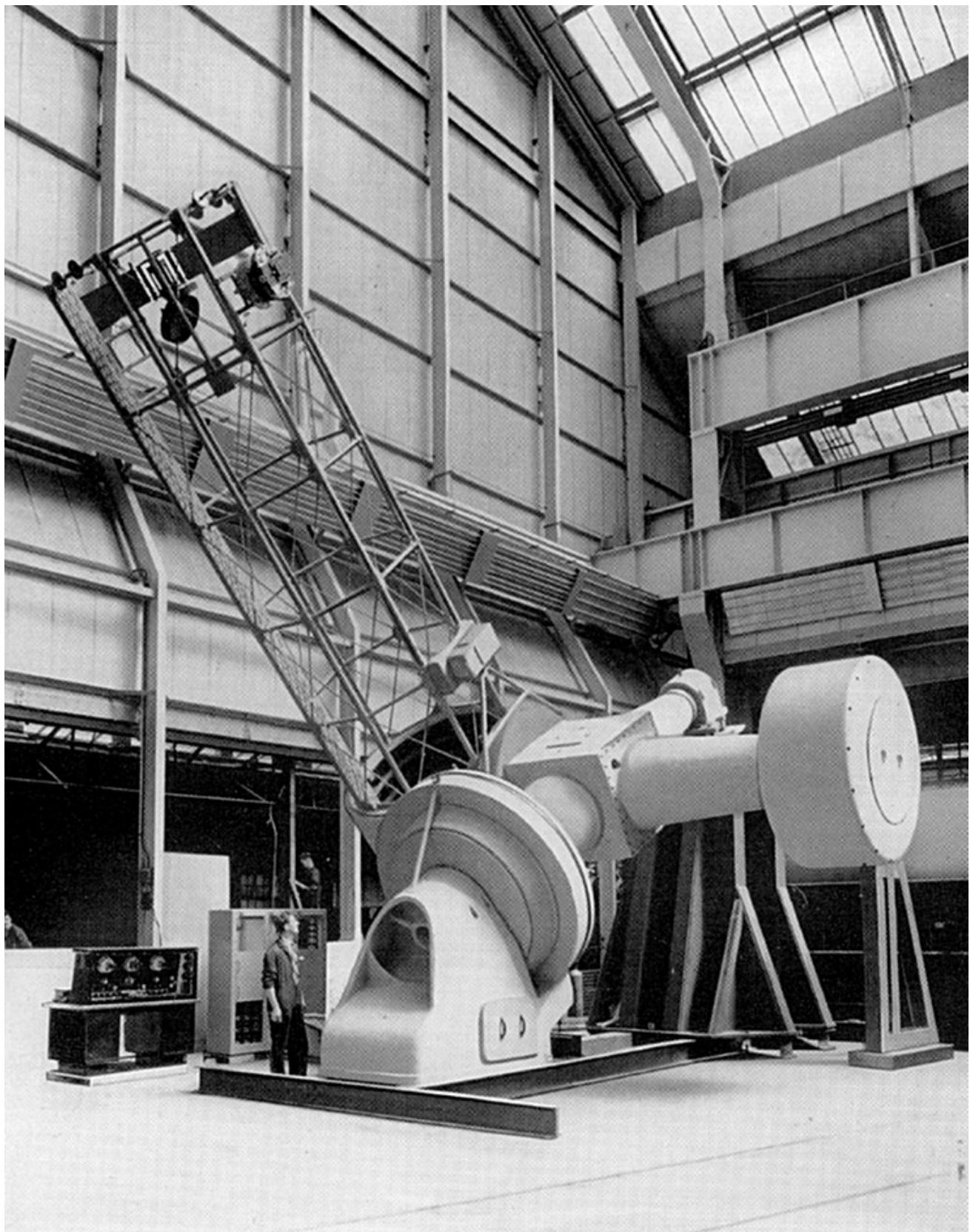
The first photograph shows the 72-inch reflector for St Michel Observatory, France, partly assembled in the large erecting bay. In the foreground is part of the mirror cell, with the multiple-lever support system for the mirror. The person painting the mirror cell is Alfie Swan. Alfie had a wall eye, and people would poke fun at him about this disability. 'Do you think you could see your way – sorry, I mean, half see your way to lending me ten shillings?' 'Five shillings you want, certainly', said Alf. I asked him if he got into the cinema half price. 'Only if my wife holds my hand and I crouch down low.' He was an amiable bloke who had heard all the jokes. The mirror cell had about 36 supports for the 72-inch-diameter 4-inch thick plate-glass mirror. They were individual pistons pressing on the mirror back, each piston at one end of a see-saw, while at the other end was an adjustable lead weight. It seemed a rather crude system, and was difficult to adjust precisely. The St Michel telescope was



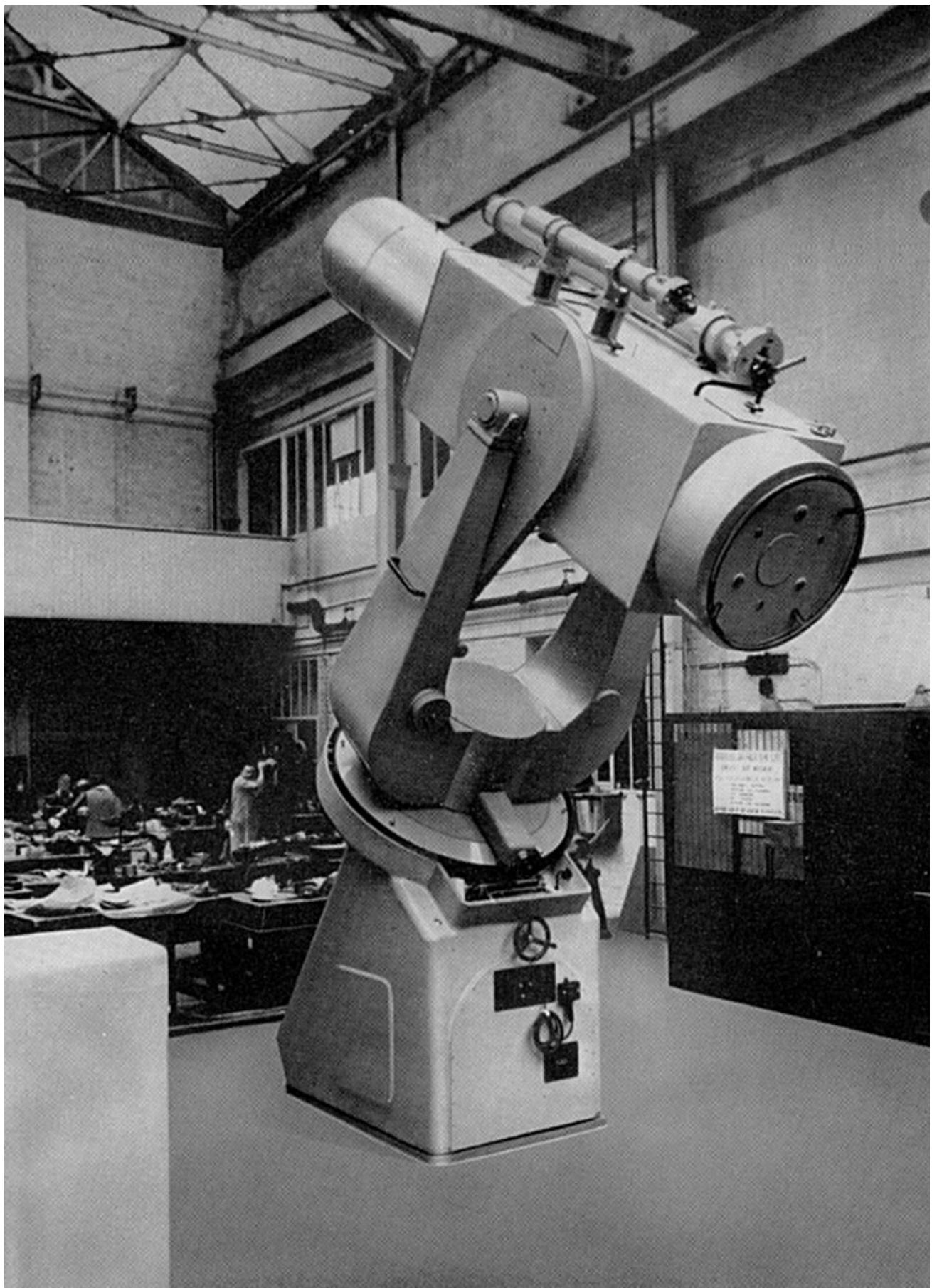
really one large experiment. The normal lattice tube of a Grubb 72-inch instrument was clad on the outside with 8 x 4-foot thin aluminium sheets. The same was on the inside, except that the sheets were perforated with hundreds of ½-inch-diameter holes. Near the top of the tube the sheets had about twice as many holes per square foot as there were in the sheets at the bottom. Fine mesh nylon was used to filter the air drawn in by four large fans situated on the sides of the mirror cell just above the mirror. The theory seemed to be that air was pulled from the whole tube length and expelled to the outside. A steady flow would be induced from the tube mouth to the bottom. Did it work? Who knows. I have never seen any report. A ratio of diameter-to-thickness of 18/1 in the mirror seems excessive even by Dobsonian standards. Professor Couder reckoned that these dimensions were necessary for rapid thermal stability. At the left foreground of the picture are four men. The one with his hands behind his back is Norman Gibson (who lived in the street next to where I lived). He was a labourer, 6 foot tall, slender, with intense blue eyes; and he had a very handsome daughter, 5 foot 10 inches tall, slender, with intense blue eyes. The man on the extreme left is Jimmy Hardaker, labourer. Jimmy could bore the hind legs off a herd of donkeys at 300 yards; but he redeemed himself the day he retired. George Sisson, the General Manager, surrounded by the population of the machine and fitting shops, said a few words, and presented Jimmy with a nice wrist-watch, bought by his fellow workers. 'Well', said Jimmy, 'I will miss you all, but looking at this watch I can console myself that it's my time I'm wasting and not the gaffer's.'



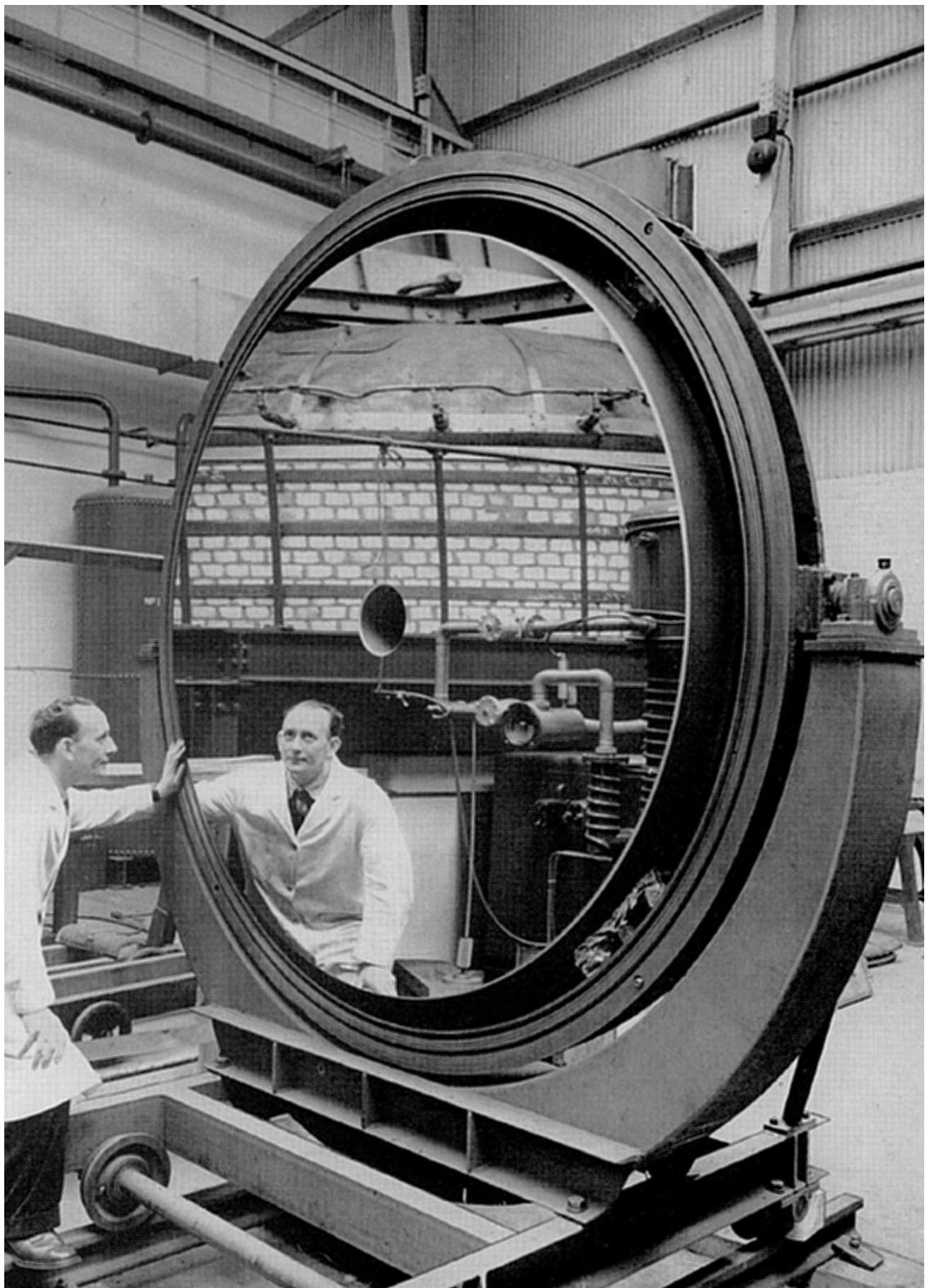
The assembled 72-inch reflector for St Michel Observatory.



The man looking at the 74-inch Helwan telescope is Bob Hay. I served a year of my apprenticeship with him, and I must say I never met a finer and more thoughtful and funny fellow than him. Until he died in 1970, in his early fifties, he was the man who erected all the larger instruments at Grubbs. He always turned out immaculate work. Sometimes a works 'smoker' was organised, and Bob would be asked to get up and sing. 'No', Bob would say, 'I will have to down a couple – throat lubrication – before I can perform.' Eventually he would mount the stage, and as professional as Sinatra tee up for *Begin the Beguine*. Cole Porter never had a better rendition. Bob had all the body language, and a better voice than Sinatra. Cries for 'encore' would not shift him – that was, until next time. The instrument was first erected in a corner of the huge machine shop in C. A. Parsons. I worked on it with Bob. In the meantime the erecting shop at Grubbs was being built, and when finished the telescope was re-erected as in the photograph. It was then dismantled and boxed up for shipment. Unfortunately for Grubbs, the British attacked Egypt, so the final shipment was about two years later.



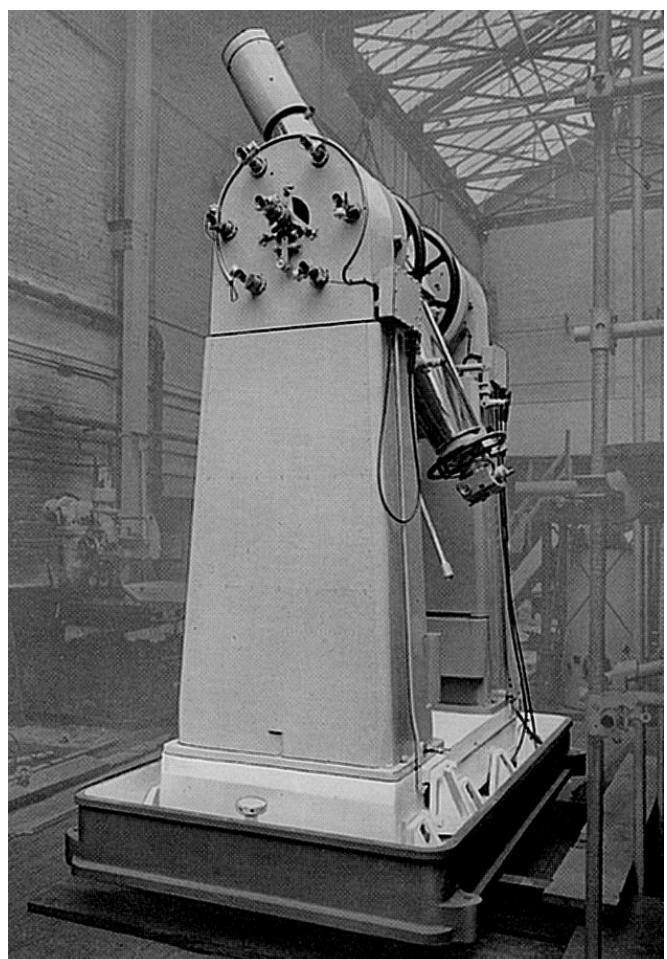
This instrument – the first Schmidt camera that Grubbs made – was nicknamed ‘The Sauce Bottle’. Just to the left of the telescope is Jack Lindsey, First Aid Man, using a drilling machine. He went very pale at the sight of blood. On one occasion I had a bad cut on my finger, and while Jack opened his drawer for the first aid kit I was dripping my initials onto the floor in blood. He turned around, saw this, and went astonishingly pale – but he gritted his teeth and got on with it. At the left of Jack you can see the fair hair and white collar of a young man. That is me – age about 17½.



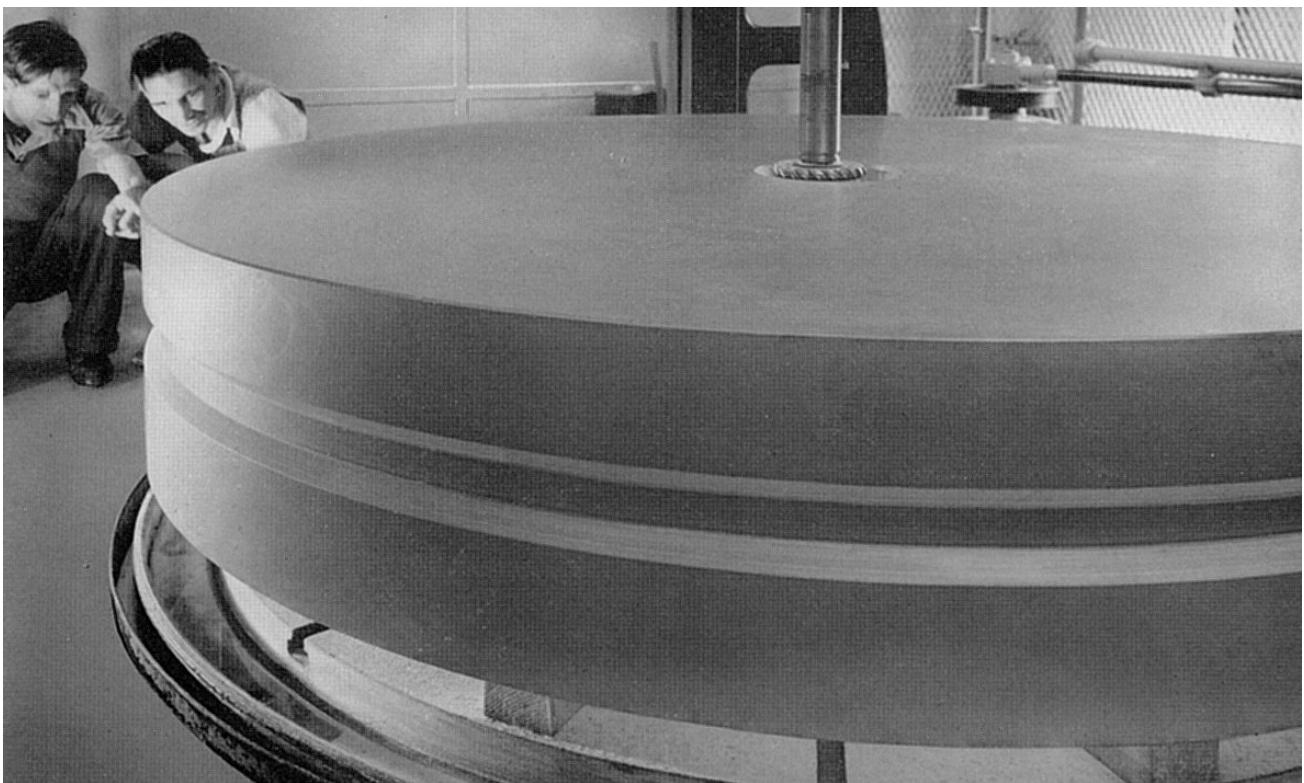
George Oliver with the 74-inch mirror for Mount Stromlo Observatory, in the aluminising laboratory. The laboratory had several vacuum tanks, and also produced gratings for infrared spectrometers. Even with an assistant, Albert, the loneliness of the lab must have affected George, and he took to alcohol. He seems to have forgotten the basic rules of timekeeping, and most days he came back from a hydraulic lunch at three o'clock in the afternoon. Inevitably, he had to go – and he went.



One of the laboratories. The seated man was called Milne, who did not stay long with the company. The figure in the laboratory coat is Backhouse. He had worked there for perhaps five years, and most days conscientiously put in an extra hour or two. He then found out that staff were paid for overtime at a premium of 1½ times. I do not know if he tried for back pay. When he retired he was given the concession for servicing and repairing the old prism instruments. On one occasion, when my boss Jack Shields was in London at a scientific gathering, he met Backhouse, who asked him where his hotel was. 'Well,' said Backhouse, 'I will take you there, as it's near my place; but can you do me a favour?' After a hard day's meeting the favour turned out to be helping to carry a prism instrument weighing 150 lbs up three flights of stairs to Backhouse's workshop. Jack Shields had been lame since boyhood. It took him a month to recover.



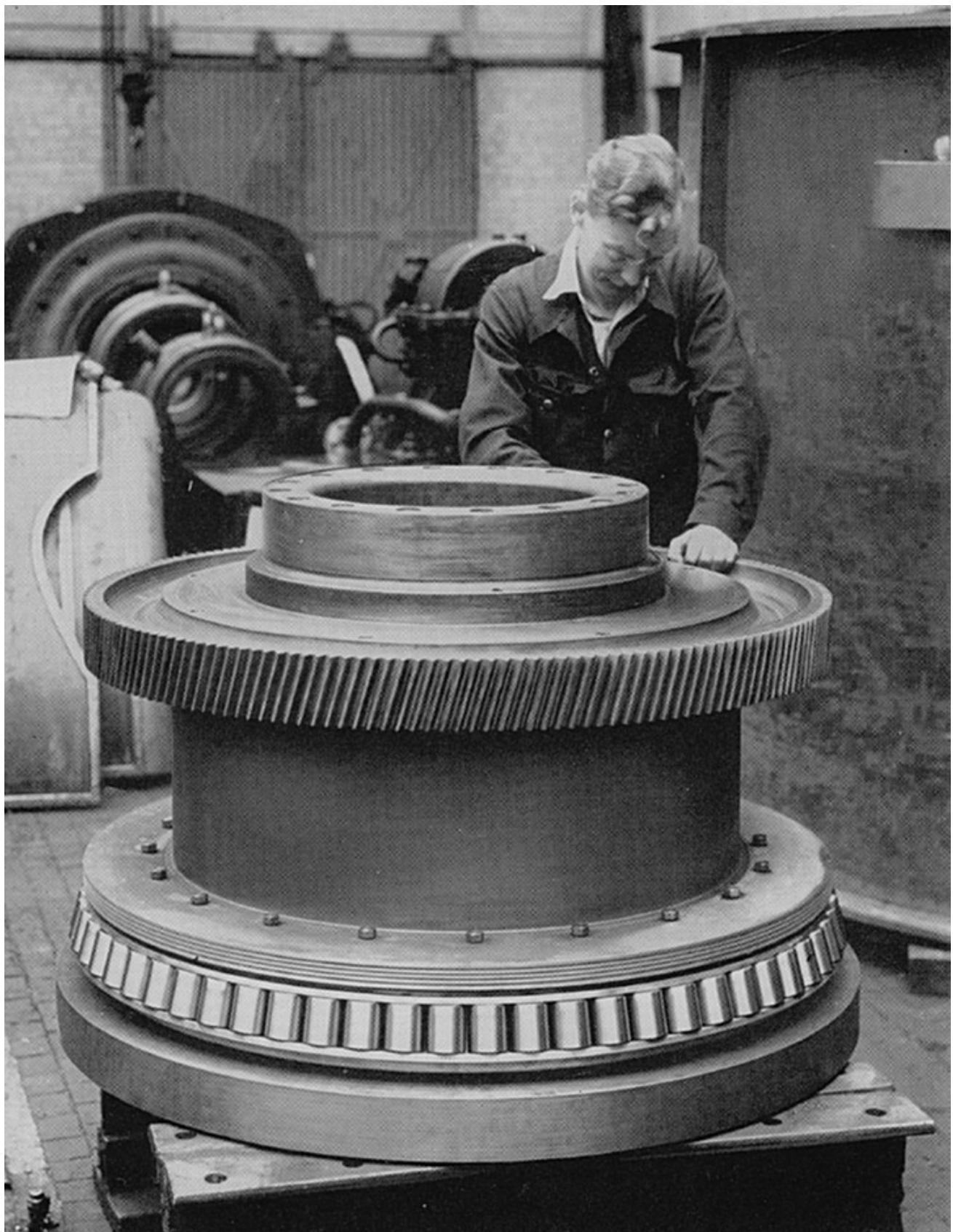
The 7-inch meridian circle for San Fernando Observatory. When I was about the 10 years old I discovered that we lived only 1½ miles from Grubb Parsons. On a sunny day, when the works' doors were open, I could see this instrument from the bus while on my way to school.



In 1953, shortly after starting work at Grubbs, I examined the 98-inch mirror for the Isaac Newton Telescope, using the Foucault test and the wave-shearing interferometer, courtesy of Steve Baker, optical worker. About two thirds of the way from the mirror centre on the optical surface there was a series of cracks about 4 inches long – but they were stable, penetrating by about 2 inches, and represented only a minute loss of area. The man on the right is George Armstrong.



George Armstrong and the 98-inch mirror after the cracks had been brushed out.



Here, Jack Robson is cleaning the declination axis bearings of the 98-inch Isaac Newton Telescope. The axis was broad but quite short. It fitted in the polar axis cube, which had a 4-foot side. Central in the cube was a coudé to send light down the polar axis, through the observatory floor and down to a spectrograph. Thus the declination axis was barely 2 feet long. Jack Robson was a member of the Communist Party, and read his *Daily Worker* every day. He kept his membership throughout the Hungarian Revolution of 1956, but later packed it in, disillusioned. His nickname was 'Gromyko', and even our general manager, George Sisson, sometimes used this name. Jack was a mild, harmless man. (For those of you who are not familiar with the politics of the time: Andrei Gromyko was appointed by Stalin as Soviet ambassador to the United Kingdom in 1952, and later served as Soviet Minister of Foreign Affairs, 1957–85, and as Chairman of the Presidium of the Supreme Soviet, 1985–87.)

An observatory in the Pennines

Martin Cole

When in 2001 I obtained my first modern telescope – a Meade LX90 8-inch SCT, thus initiating a return to practical astronomy after years of the armchair variety – it did not take me very long to wish for a permanent set-up, for carrying even this modest-size instrument outside in the dark and setting it up with just a torch or two was fraught with difficulties – the way out involving the negotiating of several steps and across a drive up into the back garden, where the only suitable flat area was to be had. This became a deterrent, and after the first flush of enthusiasm I found excuses not to bother unless it was a perfect night.

The best view, however, was from much further up the garden where the average slope is about 1 in 8, and this is where I resolved to build my permanent observatory. I live a couple of miles to the east of Keighley on the west side of Ilkley Moor, at an altitude of 215 metres (700 feet). I am fortunate to have no proper street-lamps within about half a mile, but there is a substantial amount of general light pollution from Keighley and the West Yorkshire conurbation to the south. The garden has some large trees at the top to the north, but as I am largely concerned with solar system objects I could tolerate that. However, a fairly large sycamore immediately to the west of the desired position had to go, so I set to work with the chainsaw (no preservation orders involved) and cut it down. Alas, it fell into next door's patch, not where I had planned it to fall; but I was lucky to have a tolerant neighbour, and I cut it up for firewood.

I chose a roll-off roof design, as I like to have a good view of the sky, and it would be easier to construct. Also, having no slit to keep rotating is handier when operating



remote session from the house. The first job was the pier, which is a 2-metre 170-mm diameter ceramic ground drainage tube from a builder's merchant, set into about quarter of a cubic metre of concrete below ground. The tube itself was also filled with concrete. It provides a very rigid non-resonant support. I have had no detectable problems with it moving, but it could probably have done with a larger mass of concrete – though it was very hard work barrowing it all the way up the garden! The top of the tube was set at a height which would result in a height over the observatory floor of 80 cm – which I had to extend by another 30cm when I moved from a fork to a German equatorial. Around the top and bottom of the pier I clamped shaped 50 x 150-mm oak timbers and connected them with four vertical 50 x 75-mm oak struts, providing a very solid 300-mm square platform on which to install the mount. To avoid vibrations transmitting into the pier, the pier does not touch the flooring inside, and the small 1-cm gap is filled with soft foam draughtproofing tape.

The building is almost entirely made of timber, 2.7 x 2.1 metres (9 x 7 feet) – adequate, but I wish I had made it at least another foot bigger all round. Because of the slope, I needed to make a sub-floor frame out of 200 x 50-mm rot-proofed sawn timber. The top member of the frame is obviously level; the bottom member slopes to conform with the ground and sits on small brick piers on a foundation of pre-cast concrete slabs 300 mm square, bedded to the ground on cement. This keeps the timber off the ground, and in the ten years it has existed there has been no rot nor movement. I used a couple of 2 x 30-inch metal spiked fence-post sockets to ensure the structure was tied down to the ground.

Joists were set across the upper frame and floored with flooring-grade chipboard. The walls were framed from 45 x 45-mm planed timber cladded on the outside with shiplap boards and on the inside with 12-mm roofing-grade plywood. I chose a wall height which would be high enough to allow the roof to clear the parked telescope but still allow access to sky altitudes of about 25 degrees; any lower, and there would still be obscuration by trees and shrubs. This gives an internal height of 1.7 metres. Flyscreened vents in the walls help mitigate condensation.

The roof is an apex design framed in 22 x 45-mm planed timber, and initially covered with 12-mm ply and roofing felt. However, this made it rather heavy and thus awkward to open; and roofing felt has a limited life. So when it came to be replaced I removed the plywood and used double-wall polycarbonate glazing panels instead, and as this is obviously transparent and needed sealing on the joints, I covered it with 300-mm wide self-adhesive flashband. Now it is much lighter, and can be opened and closed easily.

The roof runs on 100-mm plastic wheels with 10-mm coach-bolts for axles, six each side, on the top of the walls, which are reinforced each side with a length of planed timber, 45 x 75 mm, that extends 2.7 metres to the rear to

take the weight of the roof while opened. They are supported outside by two rot-proofed 75-mm square fencing posts held in spiked sockets – a cheap and effective solution. A further four wheels run horizontally inside, one at each corner, which prevent the roof running off the wall and obviates the need for rails. Inside I painted the walls with white emulsion which reflects just enough light at night to let me move about safely – it also serves as a 'whiteboard' on which to make notes.

A mains electricity supply was installed with an RCD for safety. I have been fortunate in not suffering a

power cut while operating – but they are not unknown here, and I have now installed an Uninterruptible Power Supply (UPS). As well as protecting the PC, it also protects the telescope drive transformer, so that I have enough time to park the telescope and not lose my sky alignment. There is a feature on the drive controller which allows automatic parking from an external signal which in theory would allow me to park the telescope remotely, or automatically in the event of a power failure. For the first few years the mains supply also served me as my network connection using ‘homeplug’ powerline adaptors from Devolo. This worked well until I installed my latest telescope, when I found that interference from the drive controller blocked the signal, so I had to install a separate ethernet exterior-grade cable to the house about 60 metres away.

A PC sits under the small desk running Windows XP. It operates my planetarium software (SkyMap Pro), which controls all telescope pointing through the ASCOM platform, and image acquisition. I use AstroArt for the main CCD camera, Imaging Source software for the DMK21 video camera, and K3CCDTools for the Mintron low-light integrating camera for asteroid occultations, which also uses a GPS time-stamp system. There is also filter-wheel control and various supporting applications. There is Internet access via the network to the broadband router: I use Dimension 4 to update the system clock every 30 seconds from the Manchester University atomic-clock server.

The LX90 was duly installed in 2002, and after a short while I made a timber ‘wedge’ to allow equatorial motion. However, I soon felt the need for a bigger instrument with more capability, so in November that year it was replaced with a Celestron Nexstar 11 GPS fork-mount SCT. Once I had upgraded the firmware this gave me excellent service for several years – mainly imaging the Moon and planets, and general viewing. In late 2010 I replaced it with a Celestron 11 ‘Edge HD’ riding on a Gemini G42 German equatorial. This is a high-quality mount capable of unguided exposures of 30 seconds (or more with PEC operating) at the telescope’s native f/10 focal ratio, with no or very small amount of trailing. An 80-mm ED f/6.8 refractor also rides on the mount in guidescope rings. Fitted with an LED-lit cross-hair eyepiece, this is used mainly to check the alignment of the mount without having to remove the camera from the main telescope.

The Gemini G42 is capable of accurate and consistent goto pointing, but I enhance this with ‘MaxPoint’ mount modelling software. Normally

I have no need to realign between observing sessions unless I significantly change the telescope configuration: I just power up the drive controller, unpark the telescope, and everything is ready. A quick ‘recalibration’ is sometimes needed, but typically the target object is within 2 arcminutes of the frame centre.

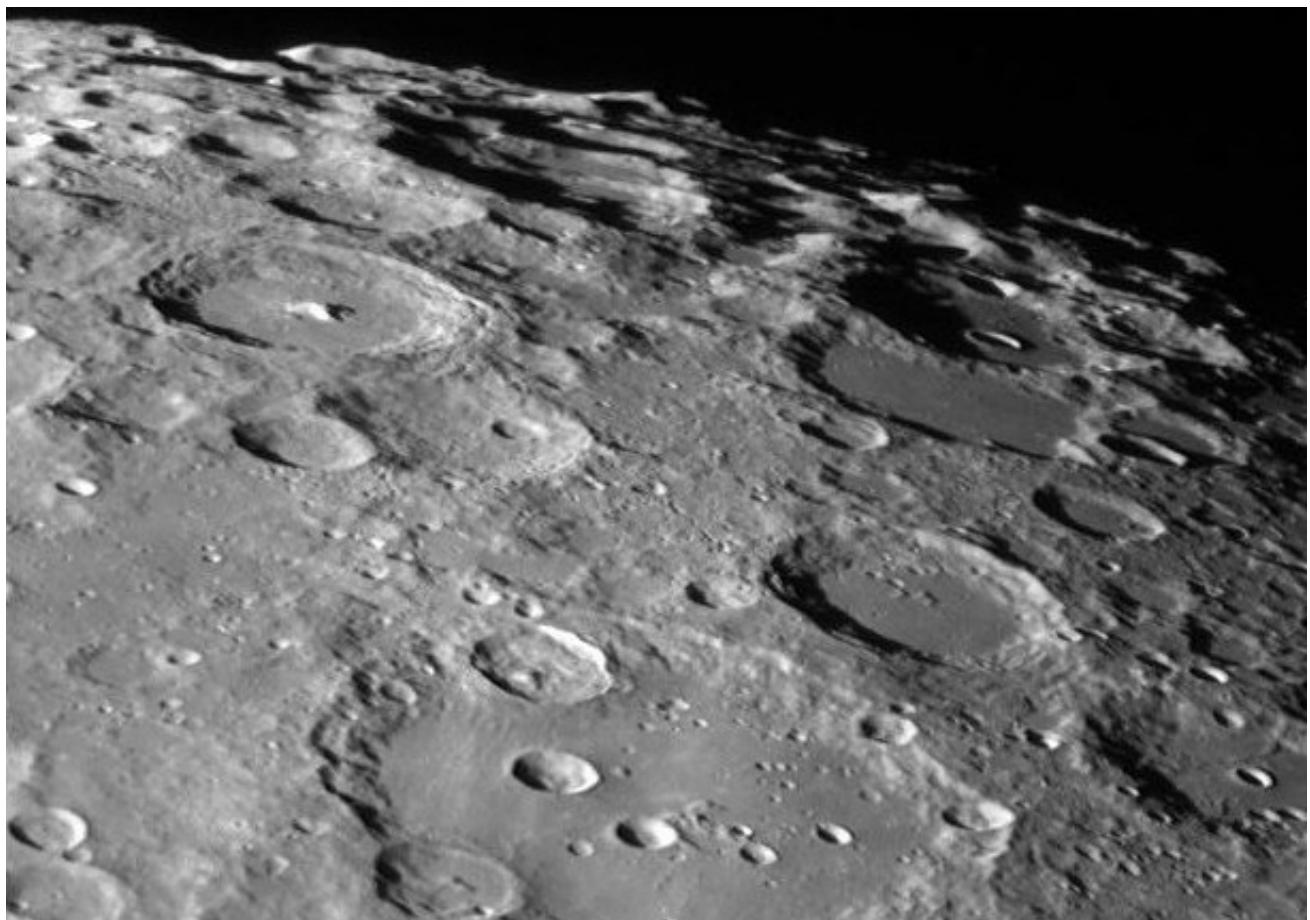
A Starlight Xpress SXVR-H18 CCD camera makes good use of the flatter field of the HD optics with a 22 x 16 arcminute field at f/10, which I sample with 2x2 binning at 0.78 arcseconds per bin. I use it mainly for patrol imaging on asteroids for both astrometric and photometric projects (and soon also for variable stars, which I began with help from Roger Pickard a few years ago, but for which I found the Nexstar with its large PE not very suited, coupled with the much smaller SXV-M7 camera I was using at the time). This year I submitted the necessary astrometric data to obtain an IAU Minor Planets Center observatory code: I80 Rose Cottage Observatory. I occasionally still like to image the planets and the Moon (see the accompanying images) with a DMK21 monochrome camera and RGB filters.

I like to operate from the observatory most of the time, but I can and do work from the house PC with which the observatory PC is networked. I use TightVNC to remotely access the observatory PC. This becomes more and more of a boon as the nights become colder! Images are transferred over the network to the house PC for processing in the warm. But I do confess to a couple of electric heater pads on the observatory chair – one for dorsal warmth, the other for posterior...

West Morton, Yorkshire

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Clavius and Moretus : 2011 February 14, 23:49:45 UT



Rupes Recta and Birt : 2011 February, 22:11:28 UT

A tri-axis counterbalanced accessory system

Kevin Kilburn

In 2006 I took custody of an old 10-inch Meade LX200 Schmidt–Cassegrain Telescope (SCT) originally bought by my good friend, Oxford mathematician and former Lord Mayor of Manchester, Dame Kathleen Ollerenshaw. It features in her description of her observatory in Patrick Moore's 1996 *Yearbook of Astronomy*, and for a few years she used it for deep-sky imaging with a Starlight Xpress CCD.

SCTs are now commonplace; but as most owners know, they are poorly balanced on their equatorial fork mountings and are prone to vibration, and focusing can be sloppy. The best part of the LX200 is the RA drive, which, with its periodic error correction, is very good. However, with some modification to accommodate accessories, an equatorially fork-mounted SCT can serve as a more versatile imaging platform.

I am particularly interested in digital photography of the Sun, Moon and planets. Long-exposure deep-sky imaging through the main instrument is not required – which is perhaps as well, since the Meade hand-controller was fried some years ago, and the go-to and dual axis slow motions do not work. Image-acquisition is compromised by having to slew the telescope manually, but I can avoid vibrating the telescope by using laptop computer control of my Canon 550D or Philips SPC900NC webcam for solar imaging with a piggy-backed Skywatcher ED80, or through the LX200 for lunar and planetary photography. Counterbalancing piggybacked accessories, however, was a challenge.

The declination and focusing motor (if available) swing the fork westwards, so a couple of diver's weights bolted to the underside of the east fork arm help restore lateral balance. But accessories such as piggybacked cameras, and especially heavier secondary telescopes, cannot easily be balanced on an SCT without the provision of expensive proprietary or custom-engineered counterweights and dovetail accessory bars and adapters. It is much cheaper to make them oneself. I have long believed that local DIY suppliers can provide all that is necessary for building good



telescope add-ons. The first task was to fit a pair of tubular accessory rails above and below the LX200 optical tube assembly (OTA), attached via the existing drilled and tapped holes in the primary mirror cell and corrector-plate ring. (Be careful not to use over-long set-screws for the attachment, as they can touch the corrector plate and damage its edge.) I bought 2 x 1 m of 19-mm O.D. nickel-plated tube from B&Q, and some black plastic end-caps to neaten the job. The top rails carry a sliding plate made from a piece of 200 x 150 x 4-mm aluminium that slides on U-channel aluminium section hooked onto the rails and secured in place with 6-mm stainless steel thumbscrews, once longitudinal balance over the declination axis is achieved.

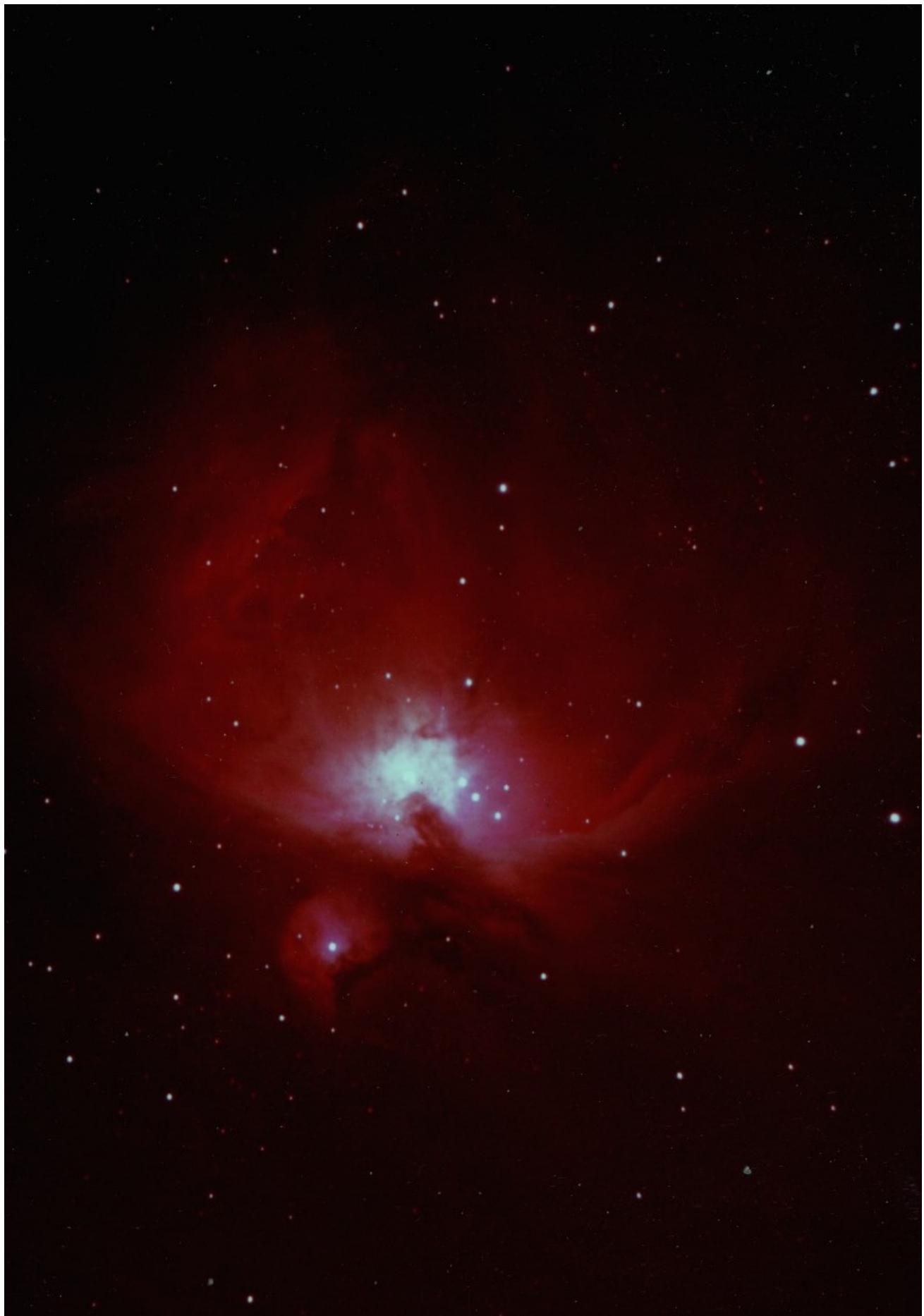


The upper accessory plate carries proprietary tube rings for a 3.5-kg Skywatcher ED80 refractor that I use for whole-disc solar imaging and deep-sky narrow-field photography, or it can hold a 3-kg 300-mm f/4 Pentacon lens for semi-wide-field imaging with a Canon 550 DSLR camera. These heavy instruments make the OTA top heavy, so the rails on the underside carry a sliding unit holding a stainless steel stalk bolted solidly to 50-mm aluminium angle, without any flexure or vibration. A 1.3-kg lead weight slides radially on the stalk, and is positioned with Jubilee clips. I also filled the under-side rails with removable steel rods for additional vertical balance (although lead internal weight would have been better). The system thus allows both longitudinal and vertical counter-balancing. The counter-weight assembly does not impinge on the original, flimsy, Meade counter-weight rail, so I can still use the two weights supplied with the instrument for fine longitudinal balance adjustment to accommodate trailing cables, eyepiece accessories, or cameras of different weight.



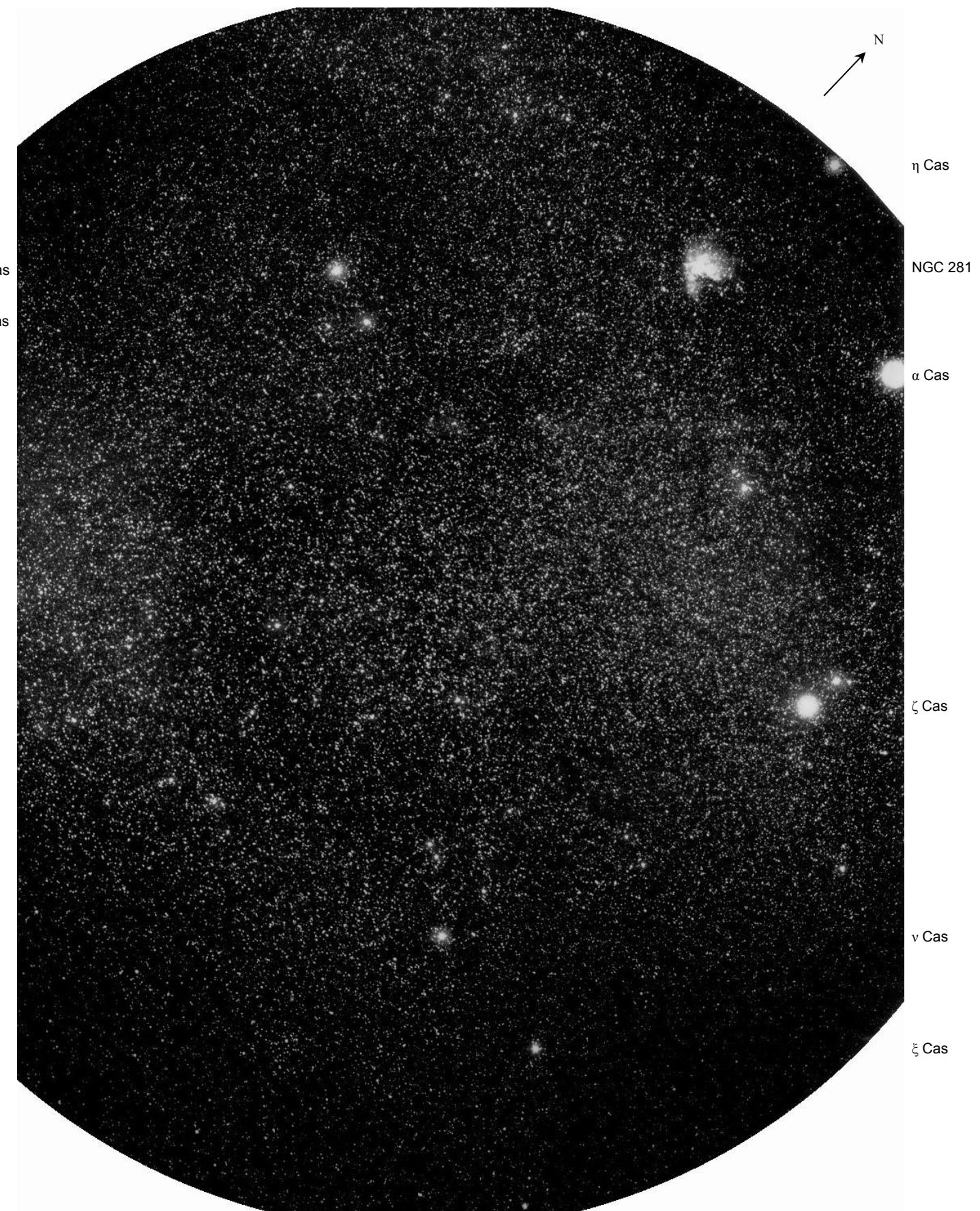
The total cost of the accessory and counterweight rail system was about £60, though this included the cost of various stainless steel fasteners and thumbscrews, a couple of twist drills, and a 6-mm taper tap. I save scrap aluminium for just this sort of project, so had some 50-mm aluminium angle and some U-section with which to fabricate the slider units. The aluminium plate was bought cheaply as off-cuts from a local metal stockist. The finished job looks good, and is very adaptable in balancing different accessories. It is certainly a great improvement on the original set-up. My final purchase was a dual-speed Crayford focuser that has made precision focusing via the live view on the laptop computer so very much easier.

Tony Pacey



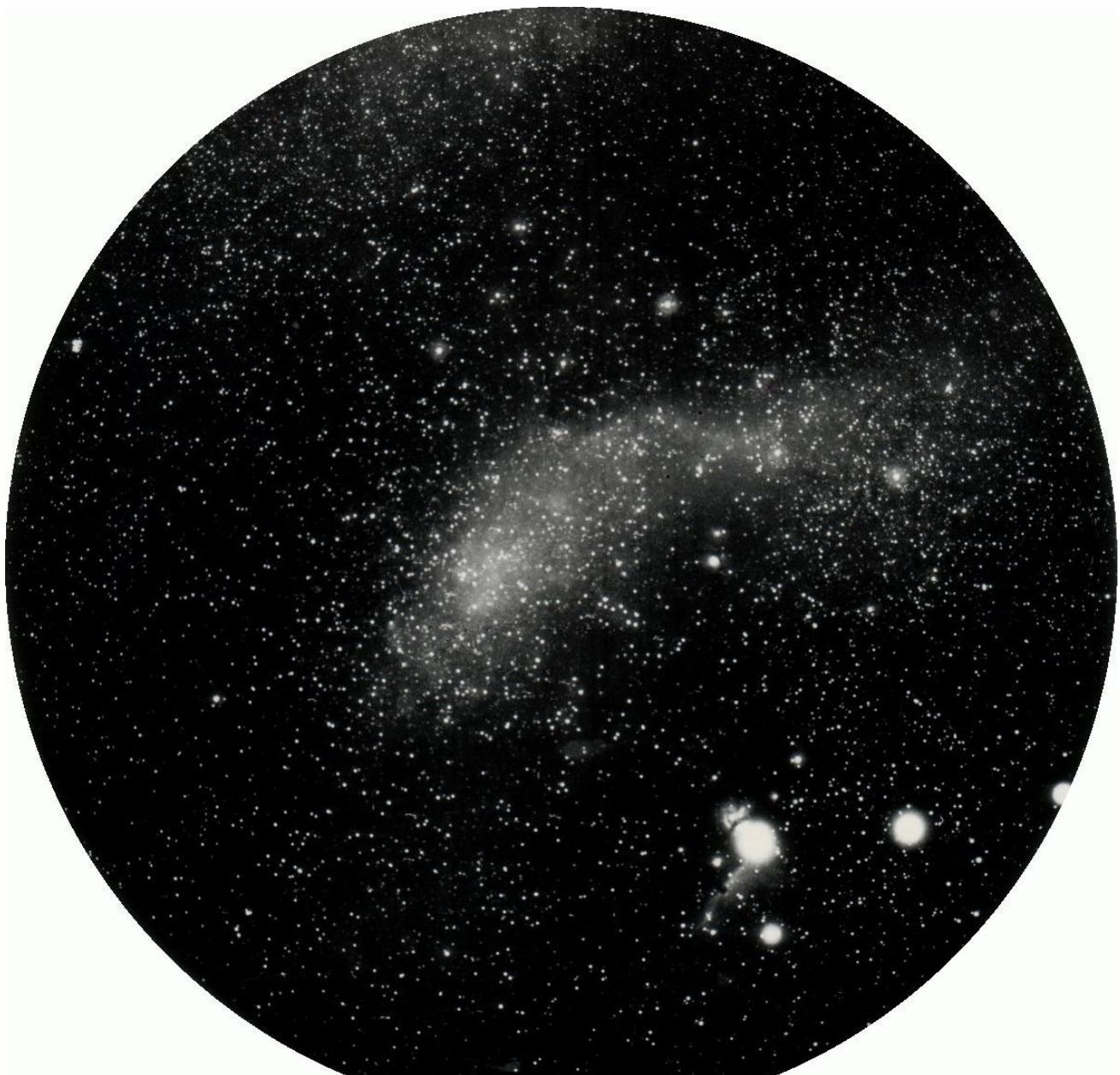
M42: 1991 January 13, 2145–2205 UT (20-m exposure), 10-inch f/5.5 Newtonian, prime focus, light pollution filter, Fujicolour Super HG 400

Joe Young



Southern Cassiopeia
Field: $7^{\circ}5 \times 10^{\circ}$ Centre: RA 00h 55m, Dec $+52^{\circ} 30'$
1990 September 25, 2315–2325 UT (10-m exposure)
8-inch f/1.5 Schmidt camera
Hypered Technical Pan 4415, developed for 4 minutes in D19

Joe Young



Part of Barnard's Loop, and the Horsehead Nebula
Field: 10° Centre: RA 05h 54m, Dec ±00° 00'
1991 January 8, 2045–2100 UT (15-m exposure)
8-inch f/1.5 Schmidt camera

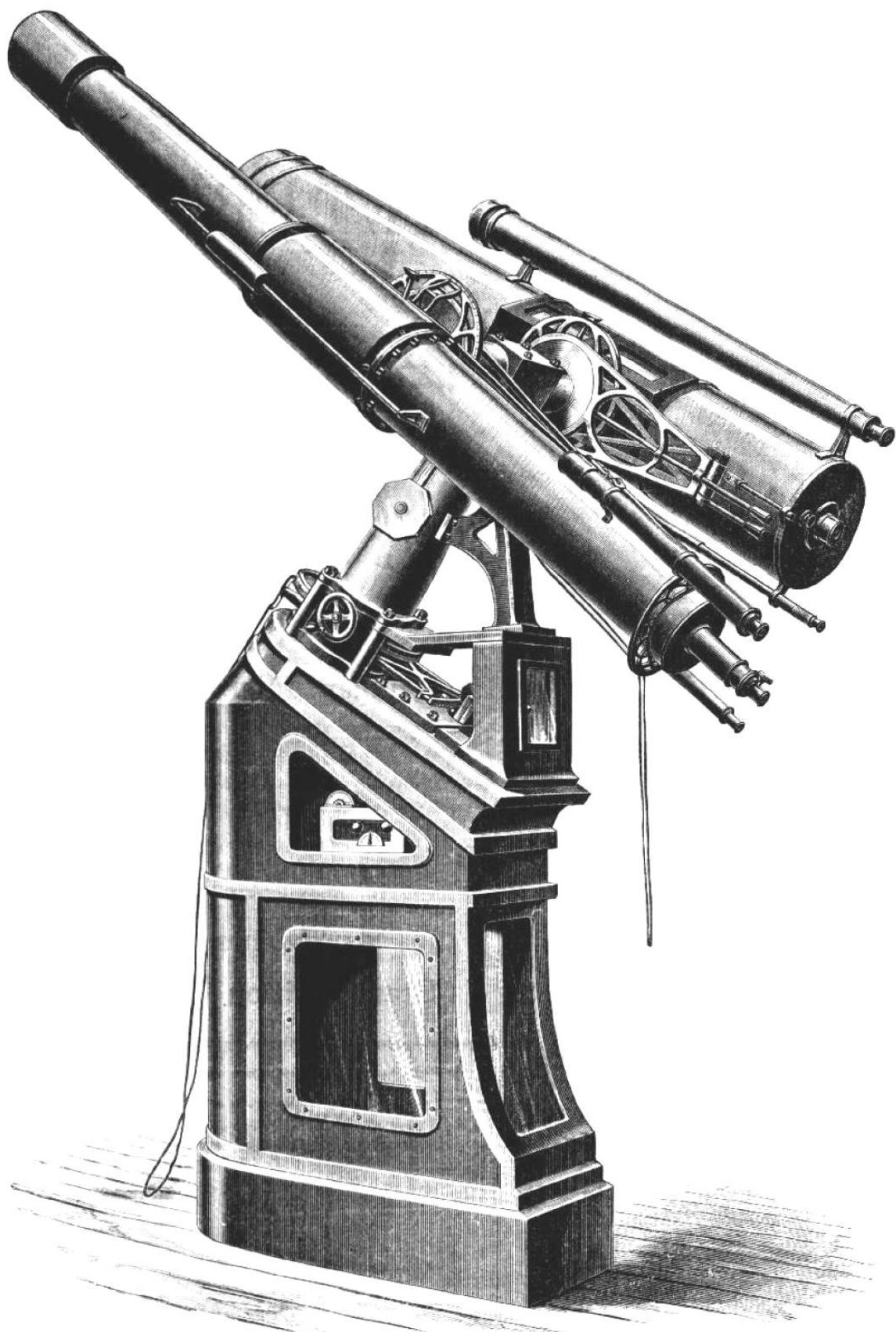
Hypered Technical Pan 4415, developed for 4 minutes in D19



Tony Pacey

M51

1991 April 15, 2230–2315 UT (45-min exposure)
10-inch f/5.5 Newtonian, prime focus
Hypered Technical Pan 2415



'For the convenience of some who desire to use two Telescopes of different sizes or different forms, SIR HOWARD GRUBB has constructed the 'Twin' form of Equatorial, as used by Dr. Huggins and Mr. Roberts, and as exhibited in the late Manchester Exhibition. The motion of each Telescope is quite independent of the other. This construction is fully described in 'Engineering' of Dec. 16, 1887.'

*An Illustrated Catalogue of Astronomical Instruments, Observatories, etc.,
Manufactured by Sir Howard Grubb, Astronomical Instrument Works, Rathmines, Dublin.*

1888