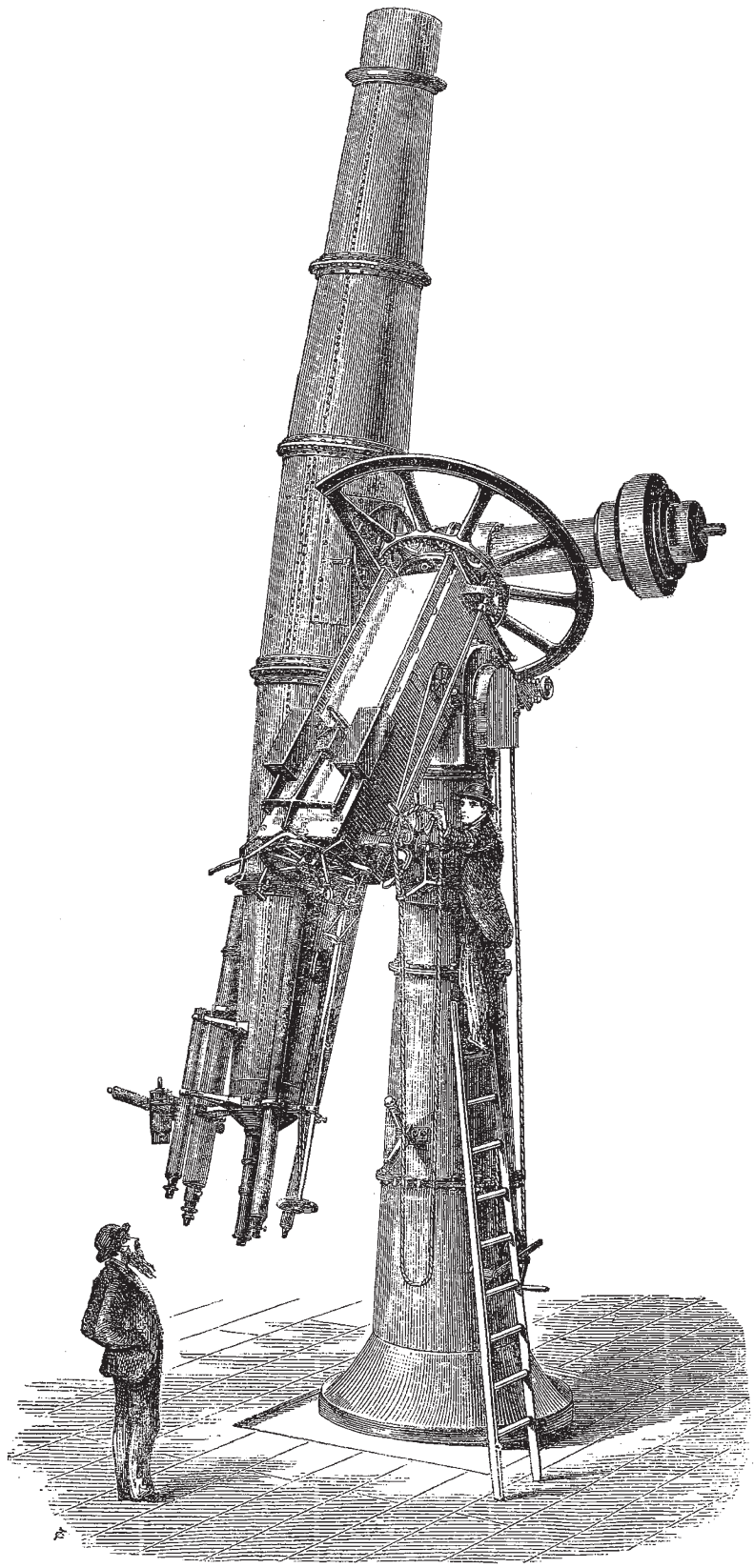
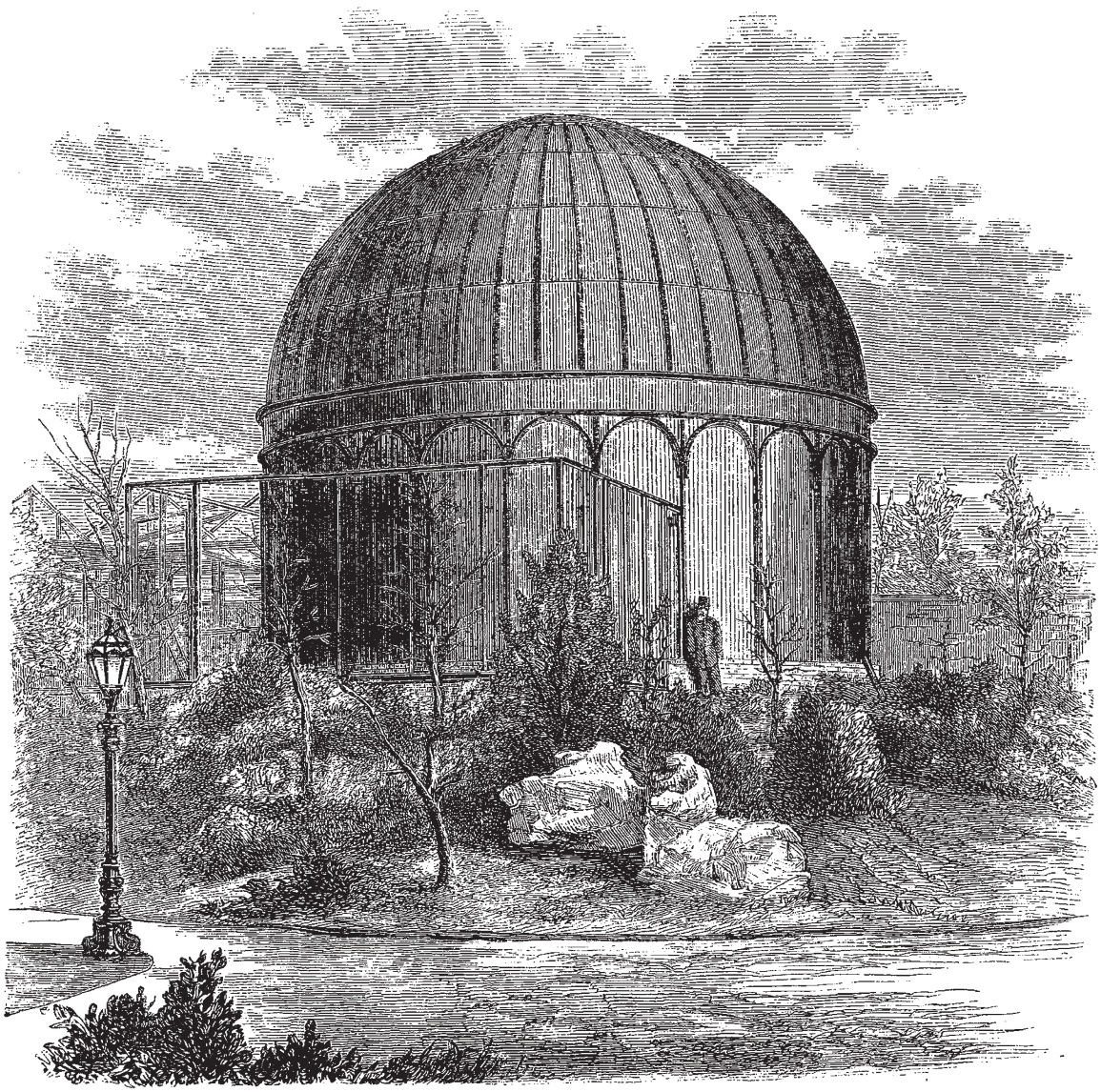


THE GREAT NEWALL TELESCOPE OF 25 INCHES APERTURE, NOW BEING ERECTED AT GATESHEAD



THE OBSERVATORY FOR THE NEWALL TELESCOPE

THE NEWALL TELESCOPE

THE 25-inch Equatorial Telescope, commenced several years ago by T. Cooke and Sons, of York, for R. S. Newall, Esq., of Gateshead, is now so far completed that it has been removed from the works at York into its observatory in Mr. Newall's grounds, at Fern Deal.

The completion of a telescope with an object glass of 25 inches aperture, marks an epoch in astronomy, and its completion in England again places us in the front rank in the matter of the optical art, as we were in Dolland's time.

The history of the progress of the manufacture of telescopes since the time referred to, shows very clearly the long-lasting effects of bad legislation; for it is not too much to say that the duty on glass entirely stifled, if indeed it did not kill, the optical art in England. Hence we depended for many years upon France and Germany for our telescopes to such an extent indeed that the largest object-glasses at Greenwich, Oxford, and Cambridge are all of foreign make. The labours of the Germans culminated in the two magnificent instruments of 15½ inches aperture in the observatories of Pulkowa and Cambridge, U.S. And then for a time America, thanks to the genius of Alvan Clarke, took the lead with the 18½ inch glass now beginning to do good work in the observatory of Chicago. This instrument is at last eclipsed by the magnificent one now being erected at Gateshead.

In what we have said we have purposely omitted to touch upon reflecting telescopes, in the construction of which, since the time of Newton, England has always been pre-eminent, because we shall take occasion to refer to the reflector of four feet aperture, completed last year by Mr. Grubb, of Dublin, and now erected at Melbourne when it is fairly at work.

The general design and appearance of this monster among telescopes, which will be gathered from the accompanying woodcut, is the same as that of the well-known Cooke equatorials; but the extraordinary size of all the parts has necessitated the special arrangement of most of them.

The length of the tube, including dew-cap and eye-end,

is 32 feet, and it is of a cigar shape; the diameter at the object-end being 27 inches, and at the centre of the tube 34 inches. The cast-iron pillar supporting the whole is 29 feet in height from the ground to the centre of the declination axis, when horizontal; and the base of it is 5 feet 9 inches in diameter. The trough for the polar axis alone weighs 24 cwt., the weight of the whole instrument being nearly 9 tons.

The tube is constructed of steel plates rivetted together, and is made in five lengths, screwed together with bolts and flanges. The plates of the central length are one-eighth of an inch thick, and those of each end one-sixteenth thick, so as to reduce the weight of the ends as much as possible, and avoid flexure.

Inside the outer tube are five other tubes of zinc, increasing in diameter from the eye to the object-end: the wide end of each zinc tube overlapping the narrow end of the following tube, and leaving an annular space of about an inch in width round the end of each for the purpose of ventilating the tube, and preventing, as much as possible, all interference by currents of warm air, with the cone of rays. The zinc tubes are also made to act as diaphragms.

The object-glass has an aperture of 25 inches (nearly), and in order as much as possible to avoid flexure from unequal pressure on the cell, it is made to rest upon three fixed points in its cell, and between each of these points are arranged three levers and counterpoises round a counter-cell, which act through the cell direct on to the glass, so that its weight in all positions is equally distributed among the 12 points of support, with a slight excess upon the three fixed ones. The focal length of the lens is 29 feet. A Barlow lens is arranged to slide on a brass framework within the tube. The hand is passed through an opening in the side of the tube, and by means of a handle attached to the cell, the lens may be pushed into or out of the cone of rays.

Attached to the eye-end of the tube are two finders, each 4 inches aperture; they are fixed above and below the eye-end of the main tube, so that one may be readily accessible in all positions of the instrument. It is also supplied with a telescope having an O. G. of $6\frac{1}{2}''$. This is fixed between the two finders, and is for the purpose of assisting in the observations of comets and other objects for which the large instrument is not so suitable. This assistant telescope is provided with a rough position circle and micrometer eye-pieces, and is illuminated by new apparatus lately described in NATURE.

Two reading microscopes for the declination circle are brought down to the eye-end of the main tube; the circle —38 inches in diameter—is divided on its face, and read by means of the microscopes and prisms.

The slow motions in declination and R. A. are given by means of tangent screws, carrying grooved pulleys, over which pass endless cords brought to the eye-end.

The declination clamping handle is also at the eye-end.

The clock for driving this monster telescope is in the upper part of the pillar, and is of comparatively small proportions, the instrument being so nicely counterpoised that a very slight power is required to be exerted by the clock, through the tangent screw, on the driving wheel (seven feet diameter), in order to give the necessary equatorial motion.

The declination axis is of peculiar construction, necessitated by the weight of the tubes and their fittings, and corresponding counterpoises on the other end, tending to cause flexure of the axis. This difficulty is entirely overcome by making the axis hollow, and passing a strong iron lever through it, having its fulcrum immediately over the bearing of the axis near the main tube, and acting upon a strong iron plate rigidly fixed as near the centre of the tube as possible, clear of the cone of rays. This lever, taking nearly the whole weight of the tubes, &c., off the axis, frees it from all liability to bend.

The weight of the polar axis on its upper bearing is relieved by friction rollers and weighted levers; the lower end of the axis is conical, and there is a corresponding conical surface on the lower end of the trough; between these two surfaces are three conical rollers carried by a loose or "live" ring, which adjust themselves to equalise the pressure.

The hour circle on the bottom of the polar axis is 26 inches in diameter, and is divided on the edge,* and read roughly from the floor by means of a small diagonal telescope attached to the pillar; a rough motion in R.A. by hand is also arranged for by a system of cog-wheels moved by a grooved wheel and endless cord at the lower end of the polar axis, so as to enable the observer to set the instrument roughly in R.A. by the aid of the diagonal telescope.

The declination and hour circles will probably be illuminated by means of Geissler tubes, and the dark and bright field illuminations for the micrometers will be effected by the same means.

Mr. Newall, after the preliminary testing of this magnificent instrument at his own residence, purposes to erect it in some climate favourable for astronomical observation. It is very unfortunate that this means in other words that the telescope cannot remain in England. It is or should be among the things generally known that every increase in the size of an object-glass or mirror increases the perturbating effects of the atmosphere, so that the larger the telescope, the purer must be the air. In the absence of this latter condition, a "big" telescope is a "big evil," and skilled observers, mindful of this, reduce the apertures of their instruments when the air is not good.

We may regard this telescope as a clear gain to English science, for Mr. Newall with princely liberality has expressed his intention of allowing observers with a special research on hand to have the use of the instrument during certain regulated hours.

The observatory, of which we also give a sketch, is nearly 50 feet in diameter, and notwithstanding the enormous weight of the dome, like the telescope, it is easily moved into any required position.

When complete it will have attached to it a transit-room and the observer's dwelling. And this reminds us that Mr. Marth, so well known for his good work done at Malta with the Lassell Reflector and elsewhere will have charge of this noble instrument of research.

NOTES

THE anniversary meeting of the Geological Society takes place to-morrow, when Professor Huxley will deliver his address, which, it is expected, will be of great scientific interest. The Wollaston Medal of the society has this year been awarded to the eminent French Malacologist, M. Deshayes, professor at the Musée d' Histoire Naturelle, and the proceeds of the Wollaston fund have been awarded to M. Marie Roualt, who, though in humble circumstances, has contributed largely to the advance of the palæontology of France. The choice of president for the coming year has fallen on Mr. J. Prestwich—a choice which will be hailed on all sides with the liveliest satisfaction.

IN reply to an address of last Session, Her Majesty has made known to the House of Commons that she will give directions for the carrying out of the arrangements necessary for observing the transit of Venus, which will take place in the year 1874.

THE Rev. Charles Pritchard, of St. John's College, Cambridge, has been elected to the Savilian Professorship of Astronomy, as successor of the late Professor Donkin. Astronomers may congratulate themselves on this appointment, as Mr. Pritchard's teaching powers are of the first order, the interest he takes in

* The hour circle is also divided on its face, and read by micrometer microscopes.