use of an overhanging polar axis the difficulty can be overcome; it has been successfully adopted by Repsolds for their astrographic equatorials of 13-in. aperture and n∙25-ft. focus, and on a much smaller scale by Warner & Swasey for the Bruce telescope of 10-in. aperture and 50-in. focus, made for the Yerkes Observatory. The

latter is shown in fig. 19. Stability in this method of mounting can only be secured by excessive weight and rigidity in the support of the overhanging axis. In the case of the Victoria telescope (24-in. aperture and 22⅛-ft. focus) mounted at the Cape of Good Hope on this plan, it has been found necessary to add supporting stays where great rigidity is required, and thus to sacrifice continuous circum-meridian motion for stars between the zenith and the elevated pole.

*Type D.—*The first important equatorial of type D was the 4-ft. reflecting telescope of Lassell (*Mem. R.A.S.,* xxxvi. 1-4), and later Lord Rosse's 36-in. reflecting telescope at Birr Castle *{Phil. Trans.,* clxxi. 153), and A. Common's 36-in. reflecting telescope mounted by him at Ealing *{Mem. R.A.S.,* xlvi. 173-182). In LasselΓs instrument (a reflector of the Newtonian type) the observer is mounted in the open air on a supplementär}· tower capable of motion in any azimuth about the centre of motion of the telescope, whilst an observing platform can be raised and lowered on the side of the tower. In Lord Rosse’s instrument (also of the Newtonian type) the observer is suspended in a cape near the eye-piece, and the instrument is used in the open air. Common’s telescope presents many ingenious features, especially the relief-friction by flotation of the polar axis in mercury, and in the arrangements of the observatory for giving ready access to the eye-piece of the telescope.

Type C seems indeed to be the type of mounting most suitable for reflecting telescopes, and this form, has been adopted for the 60-in. reflector completed by G. W. Ritchey, under the direction of Professor G. E. Hale, for the Mount Wilson Solar Observatory. The instrument is shown in fig. 20, and its design is unquestion­

ably the most perfect yet proposed for modem astrophysical re­search.

The declination axis is here represented by what are practically the trunnions or pivots of the tube, resting in bearings which are supported by the arms of a very massive cast-iron fork bolted to the upper end of the polar axis. This axis is a hollow forging of nickel steel, of which the accurately turned pivots rest on bearings attached to cast-iron uprights bolted upon a massive cast-iron base plate. The base plate rests upon levelling screws which permit the adjustment of the polar axis to be made with great precision. The combined overhanging weight of the cast-iron fork, tne mirror and tube is so great, that without a very perfect relief-friction system the instrument could not be moved in right ascension with any approach to practical ease. But a hollow steel float, 10 ft. in diameter, is bolted to the upper end of the polar axis just below the fork. This float dips into a tank filled with mercury so that practically, the entire instrument is floated by the mercury, leaving only sufficient pressure on the bearings to ensure that the pivots will remain in contact with them. The 60-in. silver-on-glass mirror (weighing about one ton) rests at the lower end of the tube on a support-system consisting of a large number of weighted levers which press against the back of the glass and distribute the load. Similar weighted levers around the circumference of the mirror provide the edge support. The telescope is moved in right ascension and. declination by electric motors controlled from positions con­venient for the observer. The driving clock moves the telescope in right ascension by means of a worm-gear wheel, 10 ft. in diameter, mounted on the polar axis.

The 60-in. mirror is of 25-ft. focus, but for certain classes of work it is desirable to have the advantage of greater focal length. For this purpose the telescope can be used in the four different ways shown in fig. 21.

(1) As a Newtonian reflector, fig. 21 (a), the converging rays from the 60-in. mirror being reflected to the side of the tube where the image is formed, and where it may be photographed or viewed with an eye-piece. In this case the image is formed without second­ary magnification and the focal length is 25 ft.

(2) As a Cassegrain reflector, fig. 21 (*b*), in which case the upper sec­tion of the tube bearing the plane mirror is removed and a shorter section substituted for it. This latter carries a hyperboloidal