On the 20th May Halley stated to the society that Newton had invented an instrument founded on the same principle, and had communicated an account of it to the society in 1699, but on search being made in the minutes it was only found that Newton had showed a new instru­ment “ for observing the moon and stars for the longitude at sea, being the old instrument mended of some faults,” but nothing whatever was found in the minutes concerning the principle of the construction. Halley had evidently only a very dim recollection of Newton’s plan, and at a meeting of the Royal Society on December 16, 1731, he declared himself satisfied that Hadley’s idea was quite different from Newton’s. The new instrument was already in August 1732 tried on board the “Chatham” yacht by order of the Admiralty, and was found satisfactory, but otherwise it does not seem to have superseded the older instruments for at least twenty years. As constructed by Hadley the instrument could only measure angles up to 90°; but in 1757 Captain Campbell of the navy, one of the first to use it assiduously, proposed to enlarge it so as to measure angles up to 120°, in which form it is now generally employed.

Quite independently of Hadley and Newton the sextant was invented by Thomas Godfrey, a poor glazier in Phila­delphia. In May 1732 Mr James Logan of that city wrote to Halley that Godfrey had about eighteen months previously showed him a common sea quadrant “to which he had fitted two pieces of looking-glass in such a manner as brought two stars at almost any distance to coincide.” The letter gave a full description of the instru­ment ; the principle was the same as that of Hadley’s first octant which had the telescope along a radius. At the meeting of the Royal Society on January 31, 1734, two affidavits sworn before the mayor of Philadelphia were read, proving that Godfrey’s quadrant was made about November 1730, that on the 28th November it was brought by G. Stewart, mate, on board a sloop, the “Truman,” John Cox, master, bound for Jamaica, and that in August 1731 it was used by the same persons on a voyage to Newfoundland. There can thus be no doubt that Godfrey invented the instrument independently ; but the statement of several modern writers that a brother of Godfrey, a captain in the West India trade, sold the quadrant at Jamaica to a Captain or Lieutenant Hadley of the British navy, who brought it to London to his brother, an instrument maker in the Strand, has been proved to be devoid of all foundation. Not only is this totally at variance with all the particulars given in the affidavits, but between 1719 and 1743 there was no officer in the British navy of the name of Hadley, and John Hadley cannot possibly have been in the West Indies at that time, as he was present at many meetings of the Royal Society between November 1730 and May 1731 ; besides, neither Hadley nor his brothers were professional instrument makers. A detailed discussion of this question by Prof. Rigaud is found in the *Nautical Magazine,* vol. ii. No. 21. @@1

The annexed figure gives an idea of the construction of the sextant. ABC is a light framework of brass in the shape of a sector of 60°, the limb AB having a graduated arc of silver (some­times of gold) inlaid in the brass. It is held in the hand by a small handle at the back, either vertically to measure the altitude of an object, or in the plane passing through two objects the angular distance of which is to be found. CD is a radius movable round C, where a small plane mirror of silvered plate-glass is fixed perpendicular to the plane of the sextant and in the line CD. At D is a vernier read through a small lens, also a clamp and a tangent

screw which enable the observer to give the arm CD a very slow motion within certain limits. At E is another mirror “ the horizon glass,” also perpendicular to the plane of the sextant and parallel to CB. F is a small telescope

fixed across CB, parallel to

the plane CAB and pointed

to the mirror E. Dark glasses

can be placed outside E and

between E and C when ob­

serving the sun. As only

the lower half of E issilvered,

the observer can see the hori­

zon in the telescope through

the unsilvered half, while

the light from the sun or a

star S may be reflected from

the “ index glass ” C to the

silvered half of E and thence

through F to the observer’s

eye. If CD has been moved

so as to make the image of a

star or of the limb of the

sun coincide with that of the

horizon, it is easy to see that

the angle SCH (the altitude

of the star or solar limb) is

equal to twice the angle

BCD. The limb AB is al­

ways graduated so as to avoid the necessity of doubling the mea­sured angle, a space marked as a degree on the limb being in reality only 30'. The vernier should point to 0° 0' 0" when the two mirrors are parallel, or in other words, when the direct and reflected images of a very distant object are seen to coincide. For the methods of adjusting the mirrors and finding the index error see Navigation (vol. xvii. p. 268).

If the sextant is employed on land, an artificial horizon has to be used. This is generally a basin of mercury protected from the wind by a roof of plate-glass with perfectly parallel faces ; some­times a glass plate is used (with the lower surface blackened), which can be levelled on three screws by a circular level. The telescope is directed to the image of the celestial object reflected from the artificial horizon, and this image is made to coincide with that reflected from the index-glass. In this case the angle BCD will be double the altitude of the star. Towards the end of last and the beginning of this century the sextant was much used on land for determining latitudes, but, though in the hands of a skilful observer it can give results far superior to what one might expect from a small instrument held in the hand (or attached to a small stand), it has on shore been quite superseded by the portable altazimuth or theodolite, while at sea it continues to be indis­pensable.

The principle of the sextant has been applied to the construc­tion of reflecting circles, on which the index arm is a diameter with a vernier at each end to eliminate the error of eccentricity. The circles constructed by Pistor and Martins of Berlin have a glass prism instead of the horizon glass and are extremely con­venient. (J. L. E. D.)

SEXTUS EMPIRICUS. See Scepticism.

SEYCHELLES, an archipelago of the Indian Ocean, consisting of eighty islands—several of them mere islets— situated between 3° 38' and 5° 45' S. lat. and 52° 55' and 53° 50' E. long., about 1400 miles south-east of Aden and 1000 miles east of Zanzibar. They are the only small tropical oceanic islands of granitic structure, and rise steeply out of the sea, culminating in the island of Mahé, at an elevation of 2998 feet above the sea-level. The most northerly island is Bird, 1/2 by 1/4 mile; the most southerly, Plate; the most easterly, Frégates; the most westerly, Silhouette. Mahé, the largest island of the group, 3 by 1 1/2 miles, is very nearly central, 60 miles south of Bird, and having to the north and north-east of it La Digne, Félicité, Praslin, and Curieuse. Only a few— Mahé, Praslin, La Digne, Denis, and Bird—are inhabited. The total area is about 50,120 acres, of which Mahé alone comprises 34,749. The beaches of glistening calcareous sand are begirt by coral reefs which form a wall round the islands. The valleys and easier slopes are overlaid with a very fertile soil, and vegetation is most luxuriant. Though the climate is tropical, the heat is tempered and rendered uniform by the sea breezes, and probably this accounts for epidemic diseases and endemic fever being of uncommon

@@@1 John Hadley was a country gentleman of independent means, and the fact that he was the first to bring the construction of reflecting telescopes to any perfection has made many authors of astronomical books believe that he was a professional instrument maker. His brother George, who assisted him in his pursuits, was a barrister.