glass, so that a luminous object seen through them shall appear in its true place by ordinary refraction, accompanied by a second image produced by extraordinary refraction.

In consequence of the dispersion of colours which occurs in employing different substances, such a combination is not suited for the micrometer invented by Abbé Rochon; but it is not difficult to obtain such a section of rock-crystal as may be substituted for the glass wedge, so that the pencil of light shall be colourless without diminishing the separation of the images. But since the degree to which the double refraction of rock crystal separates the two portions of a beam of light transmitted through it, is sometimes not sufficiently great, it becomes desirable to increase it; and though the means of effecting this have not been described, the author proceeds to explain the method that he has found advantageous, and which he regards the same as that of M. Rochon.

The author then describes three modes of cutting wedges of rock crystal, the axis of crystallization being differently placed in each. In the first, or horizontal wedge, the axis is at right angles to the first surface. In the second, or lateral wedge, the axis is in the first surface and parallel to its acute edge. In the third, or vertical wedge, the axis is also in the first surface, but at right angles to the acute edge. An object seen through the first wedge, in the direction of the axis, does not appear double; but in the others the transmitted rays pass at right angles to the axis, and they each produce two images.

By placing two of these wedges together, with their acute edges in opposite directions, there are obviously three modes in which they may be combined in pairs, represented by LH, VH, and VL. In the two first cases, the separation of the images will be the same, and an object seen through the combination appears double to the amount of 17′; but the third produces a distinct effect; for, by reason of the transverse position of the axes of crystallization, the separation of the two images becomes exactly doubled. The pencil ordinarily refracted by the first wedge is refracted extraordinarily by the second, and *vice versâ*, so that neither of the divided pencils returns to its true place; and since one falls as much short of the mean as the other exceeds the truth, they are ultimately separated twice the usual distance between the ordinary and extraordinary refractions, and thus the images are separated 34′. This, the author says, it can scarcely be doubted is essentially the construction employed by M. Rochon.—This paper is concluded by some further directions respecting the mode of cutting and arranging the prisms for the above purpose.

On a New Principle of constructing Ships in the Mercantile Navy. By *Sir* Robert Seppings, *F.R.S.* Read March 9, 1820. [*Phil. Trans.* 1820, *p.* 133.]

In the present mode of constructing the ribs of English merchant ships, only half the timbers are united, so as to constitute any part

of an arch, every alternate couple only being connected together; the intermediate two timbers being unconnected, and resting upon, instead of supporting, the outer planking. The mode of joining the different pieces of the same rib is also highly objectionable. It is effected by the introduction of a wedge-piece, by which the grain of the rib pieces is much cut, and the general fabric weakened, with a great consumption of materials. The object of the introduction of these *wedge pieces* or *chocks*, is to procure the curvature requisite in forming a ship, when crooked timber is scarce; but the curve may be equally obtained by a different arrangement of materials, and with less consumption of useful timber.

After pointing out several other defects and disadvantages arising out of the present mode of building mercantile ships, Sir Robert proceeds to consider the best means of obviating them. He employs shorter lengths of timber and of less curvature, consequently less grain-cut, and their ends are connected by coaks or dowels, instead of wedge pieces. In the event of a ship grounding, such a construction is much better adapted to give support and strength to the fabric than the former.

The advantages of this new principle in practice appear from a report of the officers of Woolwich Yard to the Navy Board, relating to a comparison of the Talavera, built upon the improved construction, with the Black Prince, constructed in the usual way. Another important circumstance relating to the Talavera is, that her frame consists of small timber, hitherto considered as only applicable to frigates, but which, when properly combined, may, in Sir Robert's opinion, be rendered equal in strength and economy to the large and often grain-cut materials used in the frames of large ships.

Several drawings accompany this paper, the inspection of which is requisite to render the further details which it contains intelligible.

On the Milk Tusks, and Organ of Hearing of the Dugong. *By Sir* Everard Home, *Bart. V.P.R.S.* Read April 13, 1820. [*Phil. Trans.* 1820, *p.* 144.]

The skull upon which the following observations were made, was sent to the author from Sumatra by Sir Thomas Stamford Raffles, and is the only perfect specimen in Europe. The milk tusks were first examined; and as their points only were visible, one of the bony canals in which the tusk is contained was laid open: it was removed from its socket, and cut through longitudinally, when it appeared similar to the milk tusks of the narwhale and elephant, and like them deficient in external smoothness as compared with the permanent tusks.

The milk tusk of the dugong is peculiar in having a shallow cup attached to its base, apparently for the purpose of receiving the point of the permanent tusk as soon as formed; and as the milk tusk advances in the act of being shed, the other may be directed forwards in the same course, which differs from that in which it set out.