impulse to the movement for the establishment of ragged schools, but was able to make it more widely beneficial. For forty years he was president of the Ragged School Union. He was also one of the principal founders of reformatory and refuge unions, young men’s Christian associations and working men’s institutes. He took an active interest in foreign missions, and was president of several of the most important philanthropic and religious societies of London. He died on the 1st of October 1885. By his marriage (1830) to Lady Emily (d. 1872), daughter of the 5th earl Cowper, he left a large family, and was succeeded by his eldest son Anthony, who committed suicide in 1886, his son (b. 1869) becoming 9th earl.

See also Hodder's *Life* (1886).

SHAFTESBURY, a market town and municipal borough in the northern parliamentary division of Dorsetshire, England, 103 m. W.S.W. from London by the London & South-Western railway (Semley station). Pop. (1901) 2027. It lies high on a hill above a rich agricultural district. The church of St Peter is Perpendicular; those of Holy Trinity and St James are in the main modern reconstructions. The borough is under a mayor, 4 aldermen and 12 councillors. Area 157 acres.

Although there are traces of both British and Roman occupa­tion in the immediate neighbourhood, the site of Shaftesbury (Cær Palladur, Cær Septon, Seaftonia, Sceafstesbyrig, Shafton) was probably first occupied in Saxon times. Matthew Paris speaks of its foundation by the mythical king Rudhudibras, while Asser ascribes it to Alfred, who made his daughter Ethelgeofu the first abbess. It is probable that a small religious house had existed here before the time of Alfred, and that it and the town were destroyed by the Danes, being both rebuilt about 888. In 980 Dunstan brought St Edward’s body here from Wareham for burial, and here Canute died in 1035. Shaftes­bury was a borough containing 104 houses in the king’s demesne during the reign of Edward the Confessor; in 1086, 38 houses had been destroyed, but it was still the seat of a mint with three mint-masters. In the manor of the abbess of Shaftesbury were 111 houses and 151 burgesses; here 42 houses had been totally destroyed since St Edward’s reign. In 1280 the abbess obtained the royal manor at an annual fee-farm rent of *£1*2 and remained the sole mistress of the borough until it passed at the dissolution of the monasteries to Sir Thomas Arundel, after whose execution it was granted about 1552 to William Herbert, earl of Pembroke. In 1252 the burgesses received their first charter from Henry III. This granted that in all eyres the justices itinerant should come to Shaftesbury and that the burgesses should not answer for aught without the town and might choose for themselves two coroners annually. The reeve of the borough is mentioned in 1313-1317. The office of mayor was created between the years 1350-1352, and an inquisition of 1392 records that the mayor held a court of pie-powder and governed the town in the absence of the steward. The seal of the commonalty is extant for 1350, and that of the mayoralty first occurs in 1428. By 1471 a general assembly of burgesses had acquired power to take part in elections. There is no evidence that Elizabeth granted Shaftesbury a charter, as has been asserted, but she confiscated the common lands in 1585, the town only recovering them by purchase. This probably led to a charter of incorporation being obtained from James I. in 1604. A new charter was granted to the town in 1684, but without the surrender of the old charter confirmed by Charles II. in 1665. Shaftesbury returned two members to parliament from 1294 to 1832, when the representation was reduced to one, and it was lost in 1885. Leland speaks of Shaftesbury as a great market town, and it possessed a market in the time of Edward I. The Martinmas fair was granted in 1604. In the 17th century worsted, buttons and leather were manufactured, but these industries have disappeared.

See Charles Hubert Mayo, *The Municipal Records of the Borough of Shaftesbury* (Sherborne, 1889).

SHAFT-SINKING, an important operation in mining for reaching and working mineral deposits situated at a depth below the surface, whenever the topography does not admit of

driving adits or tunnels. Shafts are often sunk also in connexion with certain civil engineering works, *e.g.* at intervals along the line of a railway tunnel, for starting intermediate headings, thus securing more points of attack than if the entire work were carried on from the end headings only. Sundry modifications of shaft-sinking are adopted in excavating for deep foundations of heavy buildings, bridge piers and other engineering structures.

If in solid rock, carrying but little water, shaft-sinking is a comparatively simple operation. But when much water is encountered or the formation penetrated comprises unstable, watery strata, special forms of lining become necessary and the work is slow and expensive. Mine shafts are often very deep; notably in the Witwatersrand, South Africa; the Michigan copper district; at Bendigo, Australia; and in certain parts of Europe. Many vertical shafts exceed 4000 ft. in depth, and at least two—the Whiting shaft, of the Calumet and Hecla mine and shaft No. 3 of the Tamarack mine (both in Michigan)— are over 5000 ft. deep. The last named at the beginning of 1907 was about 5200 ft., and was then the deepest in the world. Several inclined shafts, in the same district, approximate 6000 ft. in length.

*Shape of Shafts.—*In Europe shafts are generally cylindrical, sometimes of elliptical cross-section, and are lined with masonry, concrete, cast iron or steel; in the United States and elsewhere throughout the mining regions of the world, rectangular cross- sections are the rule for sinking in rock, the shaft walls being supported by timbering, occasionally by steel lining. For sinking in loose, water-bearing soils, the cross-section is almost invariably cylindrical, as this form best resists pressure tending to cause crushing or caving of the shaft walls. The European practice of sinking cylindrical shafts even in rock is based mainly on four considerations:—(1) custom; (2) high cost of timber; (3) apart from questions of first cost, a cylindrical shaft, lined with masonry or iron, is strong and permanent, and its cost of maintenance low; (4) more shafts in difficult formations have been sunk in Europe than elsewhere. The cheaper timber-lined, rectangular shaft, however, is generally appropriate under normal conditions in rocky strata, in view of the temporary character of mining operations. Vertical shafts may be cither rectangular or cylindrical; when inclined they are always rectangular.

The primary purpose of mine shafts is to act as hoisting- and travelling-ways; incidentally they serve for ventilation, for pumping and for. transmitting power underground by steam, compressed air or other means. Rectangular shafts are usually divided longitudinally into compartments. One or more of these are for the cages or skips, which run in guides bolted to the shaft timbering (see Mining). Another is generally provided for a ladder- and pipe-way and for ventilation. When much water is encountered a separate pump compartment is desirable. Cylindrical shafts may be similarly divided by subsidiary timbering, though in many timbering is omitted and the hoisting cages are guided by wire ropes stretched from top to bottom.

*Dimensions.*—The cross-sectional area of shafts depends mainly on the size of the cages or skips—*i.e.* on the hoisting loads. Small rectangular shafts of one or two compartments measure inside of timbers, say 4 by 6 ft. up to. 7 by 12 ft.; larger shafts of three compartments, from 5 by 12 ft. up to 8 or 10 ft. by 2o ft. For four- or five-compartment shafts, sometimes required for large scale work, as in the deep-level mines of the Witwatersrand, the inside dimensions range from 6 by 2o ft. to 6 or 8 by 30 ft., and for some of the Pennsylvania colliery shafts, up to 13 by 52 ft. Cylindrical shafts rarely have more than two hoisting compartments and are commonly from 10 to 16 ft., sometimes 20 or 21 ft. diameter, the segmental areas surrounding the hoisting-ways being utilized for ventilation, piping, &c.

*Sinking in Rock.—*If the rock be overlaid by loose soil carrying little water, excavation is begun by pick and shovel, and after the rock is reached it is continued by drilling and blasting (see Blasting). The sinking plant, usually temporary, comprises a small hoist and boiler, several buckets or sometimes a skip, one or more sinking pumps, according to the quantity of water,