Chapter 13 Non-metallic products

Umber and Ochre

The production of these colouring earths in small quantity in the Isle of Man dates back at least from the beginning of the nineteenth century. Macculloch, in 1819, mentions that "yellow ochre has been found in sufficient quantity in some of the mineral veins, to have become at one time a matter of export", but that the mines had long since ceased to be wrought.<ref>"Western Isles", vol. ii., p. 579.</ref> The mines referred to were Probably Bradda and Ballacorkish, as Smyth notes the occurrence of the substance in these lodes.<ref>"List of Manx Minerals?' Isle of Man Nat. Hist. and Antiq. Soc. vol. p. 145.</ref> In the documents relating to the transfer of the mineral rights of the Island to the Crown in 1827–8, Mallew is the Only locality given for Yellow Ochre; at the same time a report of the Crown Agent states that "of this oaker there is great abundance in the Island of excellent quality" but that the lessee had failed to make it pay. From the somewhat incomplete returns given in "Mineral Statistics", as shown in the Tables at pp. 496–8, the production since 1858 seems usually to have ranged between 100 and 200 tons per annum.

Tho substance has been obtained from two distinct sources. One variety, prepared in the village of Ballasalla [SC 28007 70441], is derived from the decomposed black flaggy Carboniferous Limestone (Castletown or Lower Limestone), which is often weathered at the surface and along irregular pipes and veins into brown earth, as may be seen in the dliffs forth of Ronaldsway and in the large quarries west of Ballasalla. This change is especially noticeable where the limestone is dolomitised.<ref>Similar decomposition of dolomitic limestone into umber in Devonshire has been described by R. J. Frecheville in a paper on "The Umber Deposits at Ashburton". Trans. Geol. Soc. Cornwall, vol. x. (1884), p. 217.</ref> During our survey of the district the principal supply was being obtained from shallow pits in the little outlier of Carboniferous rocks east of the fault near Athol Bridge, one mile N.N.W. of Ballasalla, at the place marked U on the geological map. The 6-inch Ordnance map (Sheet 16) shows an "umber pit" near the boundary of the limestone at Billown, 600 yards west of the Ballahot quarries [SC 26338 70403], but this is no longer worked and the section is

obliterated. In preparing the substance, the raw material is pounded, washed and run into settling tanks in which the umber remains as a fine paste and is then dried and ground.

The other source of the material is from decomposed olivine-dolerite dykes and from rotten ferriferous slate adjoining veins, and sometimes apparently from the ferruginous portion of the vein-stuff itself. Near the surface, both the dyke and the country-rock, as well as the vein, are occasionally perished to a brown earth which furnishes the umber. The chief supply of this variety has of late years been drawn from the day-level in the cliff on the southern side of Maughold Head, mentioned on p. 126, which follows the course of an olivine-dolerite dyke that intersects the Drynane hematite-vein. This is known as the Baldroma Mine [SC 49437 91275], and was last in operation between 1887 and 1893. In the upper part of the Silverburn basin, in a gully 250 yards S.W. of Garey Mooar, there is a similarly decomposed dolerite dyke, along which a short level has been driven, but whether for umber or in search of other ores has not been ascertained.

Rotten-Stone

At the umber works at Ballasalla [SC 27790 70746] a small quantity of 'rotten-stone', for use as a polishing agent, has also been prepared, the raw material being a fine argillaceous silt, which has accumulated, apparently by rain-wash, in a boggy depression on the moorland between South Barrule and Cronk Fedjag [SC 24744 75600]. Though used for the same purpose, this is, of course, an entirely different substance from the dun-earth' described below.

Fuller's Earth

Information regarding the fine glacial clay which has been dug for this purpose in Glen Wyllin near Kirk Michael will be found in Chapter 11, pp. 428 and 447 [SC 31581 90159].

'Dun Earth' or 'Asbestos'

[SC 45834 86725] The 'Asbestos' (fibrous tourmaline) which occurs in veins in the Dhoon Granite under conditions described in a previous chapter (p. 143) was mined for a time to a small extent, as a polishing powder, early in the past century. The material was mentioned by Woods, in 1811, as being in local use;<ref>"An Account, etc., of the Isle of Man", p. 17.</ref> and Henslow, in 1821, described it as follows:—"Fibrous Actinolite occurs in a decomposing state near the Dun, in two veins, each about six inches broad, traversing the decomposed portion of the granite and gneiss. It is accompanied by quartz, which it penetrates and frequently colours. It may be taken from the vein in fibrous bundles of three or four inches in length, but it is in general so much decomposed as to have assumed an earthy form On pressing the fibres between the fingers they crumble to a harsh powder capable of taking away the polish from glass, and consequently very unfit to be used in cleaning plate, a purpose to which it has been applied. I found a single specimen in which the fibres were flexible. Specific gravity = 3.03"<ref>Trans. Geol. Soc., vol. v., p. 498.</ref>.

A plan of the workings, dated 1826, is preserved at the Woods and Forests Office, showing three short levels, one on the northern and two on the southern side of the stream, with a note in reference to the northern level that "the mineral substance called Asbestos or polishing powder disappears at the end of the workings". A lease had been granted by the Duke of Athol for the mining of this substance, but the Crown Agent in re-porting on it in 1827–8 remarks, "Mr. S wrought this for a short period and paid 15 guin^{S} of Lordship, but he abandoned the work some years ago, but whether from its being unprofitable or for other reason, I know not".<ref>MSS. Athol papers in Woods and Forests Office.</ref>

Vein-Quartz

The broad vein of this substance quarried on the N.E. side of the Foxdale Granite has been described on p. 166. [SC 28799 77372]. It has been exported on a small scale; and is in favour locally for ornamental rock-work. A smaller quarry has been opened in a similar vein on the north slope of Kerrowgarroo, ½ mile E. of Kennaa, near St. Johns (p. 164). The material occurs in strings and lenticular masses in every part of the Manx Slates, especially in the Barrule Slates (p. 320), but is generally more or less entangled with the country-rock and intermixed with small quantities of mica, chlorite, pyrites, etc.

Coal trials

The search for coal in the Island has been long and obstinate, and as yet fruitless. The earlier trials were foredoomed to failure, being for the most part ignorantly carried on in rocks older than the Coal-measures; while the later researches in the north, beneath the drift-covered plain, where alone some possibility of success existed, have, up to the present time, failed in their main object; though they have revealed a small salt-field which may prove of economic importance.

As previously noted (p. 481), we learn that, as far back as 1669, the ruling Lord of Man (Charles, 8th Earl of Derby) "being by good reasons persuaded that there is plenty of coales " in the Island, ordered a search to be instituted; and Bishop Wilson, early in the 18th century, referred to several unsuccessful attempts having been made to find them.

Dr. Berger discussed the subject at some length in his memoir published in 1814, and gives reference to some older records in Curwen's "Agricultural Report" (Workington, 1810). He says:—"While I was in the Isle (June, 1811), two or three spots in the north-western part were particularly pointed out to me as places where coals did actually appear, or were cropping out. But when the matter was strictly enquired, the reports turned out unfounded.… The only serious attempt, I believe, to find coals in the Isle was made at Derbyhaven [in Carboniferous Limestone] many years ago by a speculator from Cumberland. After having gone to a certain depth, not finding traces of them, he gave up the search as fruitless".<ref>Trans. Geol. Soc., vol. ii., p. 56.</ref> Macculloch, in 1819, mentions, but discredits, the report that coal had been found in the red sandstone near Peel; and he adds that since his visit to the Island he had received fragments of coal said "to have been found under the limestone or in the conglomerate of Derbyhaven where some expensive borings for that purpose were formerly made".<ref>"Western Isles", vol. ii., p. 574.</ref>[SC 28442 67661].

It was no doubt the same supposed discovery which was referred to in the following terms in the "Manx Mercury" of 26th Nov., 1793<ref>Quoted in the Prospectus of the "Isle of Man Coal Co., Ltd". (about the year 1870).</ref>:-"We feel unspeakable pleasure in being able to announce to our readers that a stratum or bed of coal has been discovered near Derbyhaven in this Island, at a depth of about 60 feet from the surface of the earth". This statement was of course unfounded, but is still remembered and repeated in the locality.

From documents preserved in the Office of Woods and Forests it appears that the search was still fitfully continued during the first half of the present century. The resident Crown Agent, in reporting on the matter in 1836, says, "Many trials have been made and considerable sums expended, but always without success", and refers also to his "knowledge of many unsuccessful trials made by the late Duke [of Athol] to find coal". About this time a licence to search for coal was granted to E. Forbes, of Douglas (father of Professor Ed. Forbes)<ref>In an article on Manx Geology contributed by Prof. E. Forbes to Quiggin's "Guide to the Isle of Man", it is stated that in several places, both in the limestone and slate, specimens of anthracite or blind-coal occur, and that these had been mistaken for bituminous coal and led to useless researches (p. 56, 4th ed., 1852).</ref> and others; and it, is mentioned that trials had previously from time to time been permitted on the Waste Lands (of The Ayre ?), but without result. In a "report of the Directors of the Isle of Man Coal Company", dated 22nd February, 1840 (quoted in the prospectus of a later company,) the following details of a boring at Ballasalla are given:—"The measures gone through at Ballasalla are, first, 7 yards white sandstone; secondly, 24 yards of layers of limestone, varied from 2 to 7 feet thick, with intermediate layers of soft blue clay; thirdly, 23 yards of old red sandstone in layers from 3 to 12 yards in thickness, with three layers of clay; fourthly, 5 yards ferruginous bands". It is stated that these explorations "abandoned for a time for the purpose of searching at the north of the Island, were intended to be resumed, but in consequence of the Company breaking and losing the boring rods, they declined to further prosecute the work". The top "sandstone" is probably drift, the lower beds being, of course, the Carboniferous Limestone and its Basement Conglomerate (seep. 196). Tho northern boring alluded to was probably that made at, the Craig [SC 39526 96999] near St. Jude's Church in 1839, described by Cumming in a passage quoted on p. 280. A document in the Woods and Forests Office, dated 18th February, 1843, mentions that upwards of £1,000 had been spent in this search, which had been suspended two years previously.

Another company, with the title of "The Isle of Man Coal Company, Limited", the prospectus of which has been quoted above, was organised about thirty years ago to make further search for anthracite coal in the neighbourhood of Ballasalla [SC 27987 70197] and Derbyhaven [SC 28421 67638], but no information is forthcoming as to its actual operations. In 1873 renewed explorations were also set afoot in the Peel district. All that could be learnt respecting these and the earlier

trials in the same neighbourhood has already been stated (Chapter 6, pp. 278–9). The systematic and thorough investigation in the extreme north of the Island commenced by Messrs. Craine Bros. of Liverpool in 1891, and still in progress, has been fully discussed in a preceding chapter (Chapter 7, pp. 280–95).

Salt

Steps are being taken to make economic use of the salt deposits discovered in Triassic Marls of the Point of Ayre [NX 46466 05105] borings, described on p. 289. It is proposed to pump the brine and convey it in pipes to Ramsey for treatment. In "Mineral Statistics " for 1895, p. 101, a return of 10 tons from this source is recorded—the first in the annals of the Island.

Peat

Information regarding the distribution of peat and the places where it has been dug in the Island has been given in a foregoing chapter (pp. 415–6).

Roofing Slate

Reference has previously been made (Chapter 3, p. 50), to the many costly attempts to find roofing slate in the Island and to the uniform ill-success which has attended them. The unsuitable character of the cleavage and flow-structures (p. 73), as well as the prevalence of shear-planes and quartz-veins, and their combined detrimental effect upon the hardness and compactness of the slate-rocks sufficiently explain the failure of these attempts, and in most cases ought to have been a deterrent before the loss was incurred. These trials have been chiefly made in the Barrule Slates, but a few have taken place in slaty bands in the Niarbyl and Lonan Flags. In the aggregate probably not far short of £100,000 has been expended in this manner in the Island with scarcely any return.

Bishop Wilson in the middle of the 18th century referred to blue thin light slate as a matter of export<ref>"History of the Isle of Man" (Cruttwell's ed. of 1786), p. 343.</ref>; and Berger, in 1814, mentioned roofing slate as being obtained at Peel Hill [SC 23853 84001] and Ballagawne.<ref>Trans. Geol. Soc, vol. ii., p. 38.</ref> The oldest of the systematic trials is probably that at the northern end of the ridge of South Barrule [SC 26973 76911], which is included in the schedule of the property transferred from the Duke of Athol to the Crown in 1827–8. At that time the slate-quarries of the Island were under lease to Mr. Knott; but from the report of the Crown Agent it appears that the tenant had met with opposition from the natives " who at their own hand and without the authority or licence of the lord had been accustomed to work the same<ref>MSS. in Woods and Forests Office.</ref>. This custom is referred to by Cumming, who states:—"By the insular laws every person standing in need of limestone or building stone may enter on his neighbour's land and dig and carry away what is requisite for his own use, paying the occupier a reasonable satisfaction, which appears to he interpreted merely surface damage".<ref>"Isle of Man", p. 311.</ref>

Between 1860 and 1870 a very large amount of development work was done upon the South Barrule quarry; and about the same period more or less extensive openings were made, among other places, at the north side of Maughold Head near Port e Myllin [SC 47922 92608] (p. 124); at the head of Ballure Glen [SC 45428 92905], south of Ramsey (p. 136); at several spots in Glen Auldyn [SC 42458 92304]; in Sulby Glen near the mouth of the Block Eary tributary [SC 38102 90286] (p. 133); in Glion Kiark [SC 32990 87956] on the northern slope of Sartfell (p. 138); in the valley of the Neb near the mouth of Glen Helen [SC 29663 84272] and lower down opposite Ballig [SC 28470 82885] (p. 157); on the coastward side of the hill south of Peel [SC 23691 84039]?(p. 147); on the northern slope of Slieau Whuallian near Glenaspet [SC 26828 81345]; on the western side of Foxdale near Ballageay [SC 27915 78710] (p. 162); in the West Baldwin valley west of Awhallan [SC 35725 83049] (p. 157); on the western side of Greeba Mountain [SC 31454 81648]; on the east coast, at Bulgham Bay [SC 45685 85591] and a few other places; in Glen Rushen above Glen Meay [SC 24351 78818] (p. 163); and on Cronk Fedjag [SC 24000 75010] (p. 164). Numerous other localities where work was done on a smaller scale are mentioned among the topographical details in Chapter 4. The workings were mostly open quarries, but in a few cases shafts were sunk and galleries driven. Some produced a small quantity of slates, of inferior quality and in no instance good enough to compete with Welsh slates; the best seem to have been obtained from a narrow slaty band in the Niarbyl Flags south of Peel (see p. 147). For many years all these trials were abandoned, but work was resumed

recently for a short time at the South Barrule quarry.

Sir W. W. Smyth's official reports contain many references to these quarries during the years of their activity, and as some of the workings are now filled with water or otherwise inaccessible, a few notes from this source may prove useful. In 1862, after describing several of the quarries, he remarks that he had seen no slate as yet opened in the Island good enough for exportation. In 1863, he notes that 120 men were at work in Glen Rushen on rock of a lamentably poor character; that South Barrule had some rather better slate; and that at Baldwin where twenty men were employed, there was no rock at all like slate. in 1864, at South Barrule, with forty-five men, a fair quantity of material had been raised, and met with a ready local sale but was not good enough for an export trade. In 1865, the most effective trial was being made at Ballamoar [near St. Johns] by sinking a shaft; and in the following year it is noted that at this place a tunnel had been driven a long way into the hill, finding throughout the same even-splitting slate, too soft to be applicable; in the same year, workings at Peel, Sartfell, Sulby Glen, Glen Auldyn and Maughold are also mentioned. In 1867, Smyth remarks that speculation had greatly cooled; that at Maughold some slate had been got, but with too much waste; at Glen Auldyn the lower gallery might do for local consumption; and at South Barrule it was too clear that the middle part of the quarry was too bad to touch, and the north and south ends, which were better, must be worked into the mountain independently, and some good piles of second-class slate had been got from the north end. In the following year we read:—"I regret to record the almost total collapse of this branch of industry, buoyed up as it has been chiefly by ignorant hopes on one side and false representations on the other". Two or three quarries however were still carried on, including that of Rhenass (Neb valley), the rock of which is described in subsequent reports as coarse and full of quartz, fit only for rough local purposes; and that in the Sulby valley, regarding winch it is noted in 1871 that better stone had been found in a cut 8 yards below the chief floor, "but there is much spar all through the quarry still, and the cleavage is so imperfect that the product would certainly not be saleable in England or Wales"; 95 men were employed in this quarry in 1873, but it seems to have been abandoned two years later. The report for 1876 describes a spirited trial near Peel, where twenty men had been at work on a vein, only 32 feet wide, narrowing inshore and with a high cliff above, which rendered difficult any system of economic extraction; " several cargoes amounting to perhaps 100,000 slates have been sent away", but the enterprise was to be abandoned. In 1877, two or three men were at work at South Barrule only, and in 1880 no work was being done, "not even on South Barrule".

Building Stone

Quarry-stone is the common building-material in the Island, and is usually obtained from whatever source is nearest, whether Manx Slate Series, Peel Sandstone, or Carboniferous Limestone, while in the drift-plain of the north glacial boulders are largely used<ref>For special purposes, and for the more elaborate buildings, stone is occasionally imported from the mainland: Wood 3 notes (op. cit., p. 22) that the old Douglas Pier was built of stone from Runcorn, and Mona Castle of sandstone from Arran.</ref>.

Manx Slate Series

From the large area which they occupy, the Manx Slates furnish by far the greater proportion of the ordinary building stone, but the quality is inferior. It was adequately described long ago by Bishop Wilson as a "broken ragstone sometimes rising in coarse uneven flags, or in irregular lumps", which " an Enghsh mason would not know how to handle, or would call their walls, as one merrily did, ' a causey reared up upon an edge."<ref>Bishop T. Wilson's "Description of the Isle of Man (Camden's Britannia ed., 1772), p. 392.</ref> The material cannot be dressed, except very roughly, and is quarried in irregular slabs along whatever happens to be the dominant fracture-plane,—usually the bedding where the rock is somewhat arenaceous, and the shear-cleavage planes where it is argillaceous. The stone is best where the two structures are approximately parallel, but even then there is usually a cross-cleavage or close jointing oblique to the dominant structure, which causes irregular acutely-angled edges to the blocks. All varieties of the slate-series are used, even including the crush-conglomerate (near Ramsey, p. 66), but the best stone is obtained from the Lonan and Niarbyl. Flags and from some of the laminated passage-beds, while the quartz-veined grits are least in favour and are generally set aside for road-metal. In the north-western corner of the massif, north of Glen Wyllin and west of Glen Dhoo, and in a few other more limited tracts, the rock breaks up into faggot-like pieces along the intersecting structural planes (p. 131) and is of little use. In most buildings of rough slate, brick or dressed stone is employed at the angles and around doorways, windows, etc. On St. Michael's Island [SC 29653 67476], Langness, the well-preserved walls of a fort built in

1650 contain many blocks of a schistose greenstone dyke which crops out in the vicinity (p. 181); and this stone, in spite of the exposed situation, has withstood the weather remarkably well — even better than the accompanying slate, which is itself very enduring.

A variety of the slate-rock which was formerly quarried, as described at p. 174, both on the crest and at the foot of Spanish Head was especially valued for its quality of raising in very tough and strong beams, somewhat flexible, and up to 15 or 16 feet in length, which were used for lintels, gate-posts, foot-bridges (e. 132), etc., and in Castle Rushen for flooring (p. 174). As previously mentioned, Macculloch states that a beam of this material 15 feet long and 2 inches thick was forced 5 inches out of the straight line before it broke. The top quarry seems to have been in working as late as 1858 (see "Mineral Statistics " for 1858, pt. ii., p. 269). The slate is of the banded argillaceous type, and its peculiar quality seems to have arisen from the compression of the rock in the trough of a fold, with the resultant intersection of flattish bedding by steeply inclined shear-cleavage. Under similar circumstances, in a quarry on the steep slope between Ballaugh and Gob y Volley, beams of the same kind of stone up to 24 feet in length have been raised, as described on p. 132; and probably these conditions might be likewise found in other places more accessible than Spanish Head. Though not at present worked, the material seems well fitted for various economic uses if it could he got at a reasonable cost<ref>Berger (op. cit., p. 37) and Macculloch (op. cit., p. 532) also mention among the economic products of the Island a "hone slate" occurring "at a place called Montpellier". The latter author describes the stone as "of a whitish colour and soft texture better adapted for the polishing of metallic plates than the uses of the cutler. It has not been exported". This stone is no longer in use, and I have failed to identify the locality referred to.</ref>.

The building-stone quarries in the Slate Series are usually small, being opened as occasion requires, near the place where the material is needed. At Douglas, however, there are large quarries (in the Lonan Flags) on the southern side of the harbour [SC 38096 75100] and near the northern extremity of the Bay [SC 39736 77456]? (p. 153); and openings in the hill-side south of Ramsey have also attained a considerable size. From the quarries working under the Quarries Act and giving returns to the Home Office, the output for 1897 (Mineral Statistics, p. 140) is stated to have been 17,560 tons of the value of £1,056; in 1898 (*ibid.,* p. 248), 21,508 tons, value £1,282; in 1899 (*ibid.,* p. 256), 19,005 tons, value £1,057; and in 1900, 13,524 tons, value £754.

Peel Sandstone

This red sandstone, being the only 'freestone' available in the Island, has been extensively quarried at Creg Malin [SC 25073 84450] and Ballaquane [SC 25387 84511], north of Peel. The characters of the formation have been fully described in Chapter VI., p. 263. Only a small part furnishes building stone, the thin and irregular bedding and the shaly and conglomeratic intercalations being detrimental in the greater portion. The stone is only moderately durable, as may be seen from the condition of part of the ruins at Peel Castle on St. Patrick's Island [SC 24150 84580]. The output for 1897 ("Mineral Statistics", p. 140) is given as 2,800 tons of the value of £166; for 1898, 1,240 tons, value £76; for 1899, 1,827 tons, value £112; and for 1900, 1,218 tons, value £101.

Carboniferous Limestone

Besides affording the chief source of lime for the whole Island and being to some extent used for road-mending, the dark grey flaggy Lower or Castletown Limestone of the southern basin supplies the local building stone, both dressed and in the rough. For the last-mentioned purpose, when carefully selected it is structurally well adapted, though somewhat dingy in colour; the excellent state of preservation of Castle Rushen at Castletown [SC 26544 67522] bears testimony to the durable quality of this stone. The principal quarries at present working are those at Ballahot and Billown, three-quarters of a mile W. of Ballasalla [SC 26907 70055] (p. 206), and that near Scarlet on the W. side of Castletown Bay [SC 25828 66688] (p. 203). The output given in "Mineral Statistics" for 1898 (p. 230) is 12,372 tons, value £2,813: for 1899 (*ibid.,* p. 238), 9,272 tons, value £881; and for 1900, 9,315 tons, value £895.

The so-called 'black marble' of Poolvash was obtained from the harder courses in the black flaggy and shaly "Posidonomya Beds "on the eastern shore of Poyll Vaaish [SC 24564 67590], as described on p. 224, but is not at present worked. The best stone seems to have been found immediately underlying the volcanic ash, where the rock has been indurated, probably by a slight over-thrust of the Volcanic Series (p. 224). Among other uses, it was wrought into

chimney-pieces, -tombstones and steps. Being too soft to take a natural polish, it was covered with a kind of black varnish, and in this way objects wrought out of it were "made to look not much inferior to the best Derbyshire "black marble".<ref>Cumming, "Isle of Man", p. 132.</ref> The tombstones made from it show rapid weathering. The "steps of St. Paul's Cathedral in London", so often mentioned in Manx topographical literature as having been supplied from this locality, seem to be no longer in existence (p. 220). The total extent of the black marble' quarrying has not been great.

Granite

In the district S. and S.W. of the Foxdale Granite, where glacially transported boulders of this rock are numerous, they have been largely used in building, but have shown themselves subject to very unequal weathering. A quarry was opened some years ago on the northern slope of the granite outcrop [SC 28545 77199], but was not worked to any great extent; the operations have however been recently resumed. The rock is massive and not too hard, but is somewhat liable to crumble after exposure. The granite was formerly raised in long beams and shaped into rollers for agricultural purposes, and it is worth mentioning that fragments of these broken rollers may readily be mistaken for boulders in parts of the island when there are no true boulders of this rock.

The Dhoon Granite [SC 45508 86971], being much harder and closer in texture, has been quarried for road-mending and for making paving setts; the latter industry was revived recently on an extensive scale for a short time, but has now again flagged. The following note respecting the quality of the granite is quoted from the Journal of the Isle of Man Nat. Hist. and Antiq. Soc. for 1898 (Yn Lioar Manninagh, vol. iii., pt. x., p. 488). "The granite of the Dhoon has been tested for road setts and other purposes. The results under compression, such as percussion and attrition tests, show that it is a most excellent stone for all road purposes, and most durable as a building stone. If basalt average 6 or 7.2, Dhoon is 7.3: Aberdeen granite… . showing… much… below Dhoon".

The Oatland Granitite [SC 32255 72511] is at present used only for road material, for which purpose it is extensively quarried.

Boulders

In the northern drift-plain the absence of solid rock has led to the extensive use of glacial boulders both for road-mending and building. For the latter purpose the chief rock is the abundant Criffel Granite, the larger blocks of which are blasted into pieces and trimmed into shape; a good example of its use may be seen in Bride Church. Besides those found inland, large numbers of boulders are obtained from the shore, where they accumulate from the waste of the cliffs. Some have done duty over and over again in successive buildings, and the walls of old cottages in this tract are often interesting to the glacialist from the medley which they exhibit; but there is a striking rarity of limestone, this rock having been set aside for burning into lime.

In parts of the Island where the drift contains only ocal blocks these are sometimes also put to economic use.

Road material

Though subject to a brisk stream of carriage and waggonette traffic in the summer-time, the Manx high-roads are not often called on to bear heavy crushing loads, the vehicles used in agriculture being chiefly one- or two-horse carts and not heavy waggons. Consequently good results are obtained from stone of a quality unsuitable for more ponderous traffic, and a supply is usually got without much difficulty from a local source. Among the rocks thus laid under contribution are the quartz-veined grits and other hard beds of the Manx Slate Series, the Carboniferous Limestone, the Dhoon Granite [SC 45508 86971] and the Oatland Granitite [SC 32255 72511]. But the toughest and best material is furnished by some of the dykes, especially those of the newer 'greenstone' type (p. 297), intrusive into the Manx Slates: the only drawback being that these are usually narrow and discontinuous, and sometimes spoilt by shearing. These dykes, locally known as pot-metal,' have been quarried on a small scale here and there all over the slate area (for details see Chapter 4); and at Poortown [SC 26812 83140], 1 miles east of Peel, a coarsely porphyritic boss of diabase is extensively worked (see p. 156). As a general rule the dykes lettered D and B1) on the map are, where thick enough, suitable for road-metal unless deeply decomposed; while those lettered BGF are usually too much altered by shearing to

afford durable material.

At Crosby [SC 32469 79128] a broad dyke of microgranite of the Foxdale type furnishes much road-material of fair quality (p. 168). Accessible exposures of this kind of dyke-rock also occur in the West Baldwin valley (p. 158); at the side of the road between Foxdale and Castletown (p. 167); and at other places shown on the map; but have not yet been tested. These elvans, like the older 'greenstones', are, however, sometimes spoilt by the platy structure developed by earth-movement.

The dykes associated with the Dhoon Granite [SC 45508 86971] (pp. 144–61 have not been quarried in the interior, as their chief outcrops are rather inaccessible, but would probably supply material as good or better than the Foxdale elvans. The use of the granite itself for paving setts has already been mentioned.

Another dyke-rock which though not hitherto tested would probably yield tough and durable stone, is the mica-diorite of Port Groudle (p. 152); this could be conveniently excavated at its outcrop on the north side of Banks Howe [SC 41449 78309]; it occurs in a district where there is a comparative dearth of suitable stone.

The olivine-dolerites even where not too small are usually too much decomposed to be serviceable.

Boulders and gravel from the beach are made use of in many places near the coast, especially in the north of the Island where drift-material of this kind affords the only local supply.

Lime

At present lime is prepared only in the Carboniferous Limestone tract of the south of the Island; but it was formerly burnt locally from a cornstone band in the Peel Sandstone near The Stack [SC 25395 84977] (p. 275); and at many places, especially in the north, from glacially-transported limestone boulders collected on the shore, the ruins of old kilns which one finds in unlikely places having generally been thus supplied. Berger, who quotes statistics showing that 84,992 barrels of lime had been sold from kilns in the south-eastern part of the island between the years 1807 and 1811, mentions that the northern farmers preferred the lime from the boulders to that from the southern limestone for manuring the land. The Manx Slates are essentially non-calcareous, the only portion possessing more than a mere trace of lime being certain fine-grained bands in the Niarbyl Flags, which contain up to 4·4 per cent. (p. 36), and a few sparingly calcareous nodules in the Lonan Flags (p. 34). The ruins of the ancient chapel on St. Michael's Island, Langness [SC 29579 67415], show a very enduring mortar prepared from burnt sea-shells.

Brickearth

At the time of the Survey, brick-making was being carried out only at three places in the Island — one in the N., on a very limited scale, at Regaby Beg [SC 42522 97386] (section described on p. 437); one in the W., in the valley of the Neb at Peel [SC 23896 83437]?(described on p. 457); and one in the E., at Highton [SC 37619 78475], one mile W. of Douglas (p. 455). The material in the first is weathered red boulder-clay; in the second, decomposed slate; and in the third, mixed slaty drift.

Disused brick-yards were noticed at West Craig [SC 39302 96772], near St. Judes (p. 437); at Ballacoarey, 1¼ miles E.S.E. of Andreas [SC 41168 97703]; near Ballakelly [SC 40280 99926], 1 mile W.N.W. of Andreas; at the northern end of the Mooragh at Ramsey [SC 45100 95687]; and at Port Lewaigue, 1 mile S. of Ramsey [SC 46813 92974] (p. 443), all in red boulder-clay: at Ballawyllin [SC 25857 81777], a mile W. of St. Johns, in similar material (p. 458); and in the valley of the Neb nearly a mile north of St. Johns [SC 28711 83673], in slaty till (p. 453). Except near the surface, where it has been thoroughly leached, the red boulder-clay appears to contain too much lime to make good bricks. The decomposed slate used at Peel furnishes a dense hard brick of a dullish colour. The operations in the Neb valley N. of St. Johns proved a costly failure, but whether from the nature of the material or from want of care in burning is not apparent.

In "Mineral Statistics " the Manx output of clay for brick for 1895 is given as 6,793 tons, valve £339; for 1896 6,000 tons, £275; for 1897, 8,914 tons, £360; for 1898, 10,100 tons, £460; for 1899, 7,000 tons, £175; and for 1900, 8,000 tons, £500.

Sand and Gravel

These materials are obtained from the glacial deposits of the extra-insular type (p. 335) on the flanks of the Island, where they are abundant, but are not found of serviceable quality where the drifts are entirely of the local type.