Figures and plates

(Figure 1) Sketch Map and Section of the Irish Sea Basin. (Prof. W. A. Herdman, Report Brit. Assoc. 1896.)

(Figure 2) Cliff section 700 yards S.S.E. of Maughold Head, showing recumbent fold in striped slates with thin grit bands. Height, about 15 feet. A faint cleavage parallel to the stratification in the limbs of the fold crosses the beds in the upfold, diverging somewhat in the gritty bands.

(Figure 3) Cliff-section in contorted Niarbyl Flags at Ballaquane Strand, near Dalby. Height. about 20 feet. Faint cleavage crossing the folds.

(Figure 4) Map of coast and vicinity north of Fleshwick Bay. Scale 4 inches = 1 mile. B Olivine-dolerite dykes (Tertiary ?). B^D Greenstone dyke with large crushed felspars. B^G Altered greenstone dykes. F Micro-granite dyke (Foxdale Granite type), broken into segments. The grits are represented by stippling. The shading indicates the shape of the ground.

(Figure 5) Idealized sketch of cliff showing pitching of folds, based on structure seen on northern side of St. Ann's Head.

(Figure 6) Crag of Crush-conglomerate at the southern edge of Cronk Sumark, Sulby; showing fragments of grit, fine-grained flag-stone, and hard clay-slate, in a matrix of bluish slaty material. (From Quart Journ. Geol. Soc., vol. li.) A. Block of sheared slightly felspathic grit, about 8 feet long. B. Fragments in which the original bedding is still visible. The arrow indicates the probable direction of the movement during shearing.

(Figure 7) Section across the zone of Crush-conglomerate on the eastern side of Sulby Glen. (From Quart. Journ. Geol. Soc., vol. li.) Scale, horizontal and vertical: 6 inches = 1 mile. The section is not drawn strictly vertically, as it combines all the outcrops of the hill-side which slopes at about 40°.

(Figure 8) Part of a crag in Sulby Glen (100 yards north of "Limekiln", Glen Mooar, of 6-inch map, (Sheet 4)). The fragments in the crush-conglomerate are of pale greyish flagstone or fine grit, up to 3 inches in diameter, the larger of which show an arrangement suggestive of a recumbent fold.

(Figure 9) Sketch of crag of Crush-conglomerate on northern slope above Druidale stream, at junction with Sulby River. (From Quart. Journ. Geol. Soc., vol. li.) Length. about 3 feet. Z–Z. Shear-cleavage planes, developed subsequently to the brecciation, and obliquely to the linear arrangement of the grit-fragments which show a prevalent dip to north-west. The dip of the shear-cleavage is N. 20° E. at 35°, the section being along the strike.

(Figure 10) Enlarged view of Crush-conglomerate in crag adjacent to that shown in the last figure. About one-half natural size. The shear-cleavage planes traversing the shaly ground-mass partly swerve around and partly cross pebble-like fragments of fine-grained grit.

(Figure 11) Passage of banded slate into breccia in crag forming western bank of Sulby River under cottage west of Slieaumonagh. (From Quart. Journ. Geol. Soc., vol. li.) Length, 12 feet. Firm flaggy slates with well-marked blue and grey banding, A, A, A; highly contorted in the centre and left side of the crag, and broken up into fragments, B, B, B, in a slaty matrix on the right and upper part. The thickness of the bedding is exaggerated in this figure. C, C, C, Quartz veins, 2 to 4 inches thick, disturbed and twisted, but not participating in the brecciation. y—y Later shear-cleavage.

(Figure 12) Plan of Crush-conglomerate in floor of a cave south of Gob y Deigan, showing breaking-up of flaggy inclusions. Area, about 9 square feet. A. Portion of a flaggy band with deep cracks filled with the blue slaty matrix. A′. Fragment just separated from A. B. Blocks of flaggy slate showing remains of original bedding.

(Figure 13) Folded flags at margin of Crush-conglomerate at Ballanayre Strand. Cliff capped by glacial drift. Height about 60 feet.

(Figure 14) Coast on northern side of Gob y Skeddan, showing broken and folded greenstone dykes traversing dark slate and Crush-conglomerate. Height of undercliff at * = about 40 feet. S. Dark slate, greatly sheared, but still occasionally showing traces of bedding. Quartz veins abundant. C. Crush-conglomerate. B^G.Palish 'greenstone' dykes; the upper and lower bands of BG in the foreground unite on the farther side of the nearer headland.

(Figure 15) Diagram to illustrate the production of crush-conglomerate where strong lateral pressure has affected a rock-system constituted of strata of different resistant qualities (compare (Figure 7), p. 61). (From Quart. Journ. Geol. Soc., vol. li.). b—b (between dotted lines). Original position of argillaceous beds passing gradually downwards into a—a. a—a (between dotted lines). Original position of sandy beds. B—B. Argillaceous beds (slates) after compression. A—A. Sandy beds (flaggy grits) after compression. C. Zone of shearing and brecciation due to re-adjustment between B and A. The strata are supposed to have been driven in from the side indicated, by the horizontal arrow, which marks the direction of movement.

(Figure 16) Laminated slate with disturbed bedding simulating cross-bedding. From a specimen in the Survey Collection obtained near Ramsey. About two-thirds natural size.

(Figure 17) Section in crag on western side of Sulby Glen, west of bench-mark 137′ 6″ (six-inch map, sheet 4), showing method of production of pseudo-ripple marking by strain-slip faulting. (From Quart. Journ. Geol. Soc., vol. B. Compare (Figure 18)) A A A. Bands of grit 1 to 3 inches thick, cut displaced and lengthened by (y—y) oblique strain-slip planes. Dark slate, much sheared, between the grit-bands.

(Figure 18) Rock-rippling of thin gritty layer in slate by earth-morement. From a specimen in the Survey Collection obtained on the foreshore at Cass-ny-hawin. About half the natural size.

(Figure 19) Rock-rippling affecting thin quartz vein in slate. From a specimen in the Survey Collection obtained on the slope beneath Gob y Volley Slightly reduced.

(Figure 20) Corrugated surface of grit-band in flaggy slate, in west bank of gully south-west of Fistard village near Port St. Mary. Dimensions, 12 inches by 8 inches; the finger-like ridges are from ½ to 1½ inches broad.

(Figure 21) Puckerings on bedding-plane of fine-grained flags (Niarbyl Flags); from specimen in the Survey Collection obtained on the coast near Dalby Point. About one-third natural size.

(Figure 22) Tessellated puckering on bedding-plane of Niarbyl Flags; from specimen in the Survey Collection obtained on the coast near Dalby Point. About one-third natural size.

(Figure 23) Crest of fold in Niarbyl Flags in cliff at northern side of The Ladder, Contrary Head. (From Quart. Journ. Geol. Soc., vol. li.). Length, 4 feet. A, A. Pale band in slaty flags, pulled apart into pebble-like lenticles 1 to 2 inches in length. y, y. Faintly-developed planes of strain-slip.

(Figure 24) Crag of strongly-banded sandy slate in eastern bank of Sulby River below Snaefell, (450 yards north of "Lead-mine" of six-inch map, (Sheet 7)). (From Quart. Journ. Geol. Soc., vol. li.). Length, about 5 feet. A, A. Grit-band, about ½ inch thick, crumpled and partially broken, among puckered slates. B, B, B. Isolated pebble-like fragments of grit, apparently squeezed out from the band A. y, y. Strain-slip planes, cutting and displacing the bedding. z, z. Later 'shear-cleavage', with the same strike as the bedding (N. 40° W.) but a different degree of dip (about 30°).

(Figure 25) Diagram of edges of pale flaggy mudstones (a, a) with thin dark blue slaty partings (b, b). Natural size. x, x. Shear-cleavage, obscure in the mudstones, but strongly developed as an oblique serrated frilling in the slaty partings.

(Figure 26) Section in crag on westernslope of Glen Dhoo, Ballaugh (opposite "T. Mill" of 6 inch map, (Sheet 7)), showing extreme shearing of strata in the crest of a fold. (From Quart. Journ. Geol. Soc., vol. li.) Length, about 3 feet. A, A, Sandy and B, B, slaty bands, fairly well defined in the limbs of the fold, but frayed out into reconstructed schistose material in the crest.

(Figure 27) Belts of strain-slip traversing crumpled slate and producing an appearance resembling stratification. From specimen in the Survey Collection from the Barrule Slates near Snaefell. About half natural size.

(Figure 28) Laminated slate with intersecting planes of shear-cleavage in three directions. Front specimen in the Survey Collection from margin, of Barrule Slates south-east of Snaefell. Nearly natural size.

(Figure 29) Sketch-map of the Isle of Man, showing (a) principal cleavage; (b) position of metamorphosed slates; (c) position of granitic intrusions and of dykes connected therewith; and (d) distribution of crush-conglomerate. The arrows show the direction of dip of the dominant cleavage, and the figures the amount in degrees. The broken line indicates the position of the somewhat interrupted anticline of cleavage. The continuous lines mark the railways.

(Figure 30) Section in Lonan Flags at foot of cliff on north side of the North Pier at Laxey, showing agreement between axial plane of folds and cleavage. x—x. Obscure cleavage in same direction as bedding but at a steeper angle. y—y. Axial plane of small fold.

(Figure 31) Diagram (plan) to illustrate common structure in hard bands, whether dykes or layers of grit, in Mans Slates; showing divergence between strike of segments and strike of band as a whole. B, B. Segments of hard band, pinched at terminations. F, F. Dislocation-lines (I normal or overthrust faults). S- -S.Direction of strike of individual segments. S — -— S. Direction of average strike of hard band.

(Figure 32) Ideal section through synclinorium of Manx Slates. 3. Slates.2. Grits. 1. Flags.

(Figure 33) Section at base of cliff on south side of Gob y Deigan. B^G- Crashed and torn greenstone dyke traversed by quartz strings. Thickness about 4 feet. T. Thrust-plane, with brecciated slate, passing into crumpled slate below.

(Figure 34) Ground-plan of portion of foreshore in Port e Myllin, near Ramsey, showing igneous complex. 14 feet x 10 feet. B^D. 'Newer 'greenstone' dyke, yellowish-brown in colour, uncrushed, 4 feet thick; traversing F and intersecting B. B^G. Older 'greenstone' dyke, spotted yellowish-green, 3 to 6 inches thick, traversing F; greatly sheared and pinched, especially to the east ward of B^D. F. Crushed felsitic mass, pale greenish-gray colour, intensely sheared and full of criss-cross quartz-strings.

(Figure 35) Cliff-section in Lonan Flags on north-eastern side of Traie ny Uainaigue, Maughold. Height 60 feet. B^G Much-sheared 'greenstone' dyke, 8 to 12 feet thick. F. Micro-granite dyke (Dhoon Granite type). F'. Porphyritic dyke, probably connected with the micro-granite, intersecting B at the foot of the cliff.

(Figure 36) Section at foot of cliff under Barony Hill, showing contorted Lonan Flags traversed by dykes of two different ages, viz.: greenstone (older) and micro-granite (newer). B^G. Greatly-sheared greenstone dyke, about 2½ feet thick, broken and faulted by F. F. Micro-granite dyke (Dhoon type), 6 to 10 feet thick, rendered schistose at the margin by shearing.

(Figure 37) Section of grits and slates, showing torsion; in crag on hillside S.E. of Glendltoo Farm, in Glen Dhoo, Ballaugh. (From Quart. Journ. Geol. Soc. vol. li.) Length, about 2 feet. A, A, A. Grit bands in sheared slates, broken by strain-slip (y—y) and each segment partly turned on its axis.

(Figure 38) Granite crag under Ordnance station on shoulder of Slieau Ruy W.S W of Ballelin, exhibiting curved structure (not like concentric weathering) probably due to movement. Height about 8 feet. Q. Small quartz-veins participating in the curved arrangement.

(Figure 39) —Plan of St. Patrick's Isle, Peel, showing position of dykes traversing contorted Niarbyl Flags.

(Figure 40) Diagram of cliff at The Whing, north-east of Port Soderick, showing varying inclination of bedding-planes of gritty flags between summit and base of section. Height about 300 feet. Note.—The tramway cutting is indicated in the upper part of the cliff.

(Figure 41) Plan of irregular outcrops of greenstone south of Barnell, Kirk Patrick. Scale, 6 inches = one mile. The greenstone outcrops are indicated by crosses, and the slate outcrops by horizontal lines.

(Figure 42) Recumbent fold in flaggy grits in cliff on east side of Perwick Bay, Port St. Mary. Height (maximum); about 60 feet.

(Figure 43) Diagrammatic sketch of disturbed greenstone dyke traversing Manx Slates in lower part of precipice at,Slea ny Bery, Spanish Head.

(Figure 44) Section on north side of Horse Gullet, Langness, showing thrust-planes and accompanying plication of thinly-bedded sandy slates. Height about 12 feet. B^D. Greenstone dyke, 2 feet thick. T. Thrust-plane, with Q, quartz-veins.

(Figure 45) Ground-plan in vicinity of Claberry Gullet, Langness, showing plexus of greenstone dykes in contorted sandy slates. Scale, 25 inches = one mile. The numbers indicate the thickness of the dykes in feet: * shows position of section given in (Figure 48)

(Figure 46) Cliff section on south side of Claberry Gullet, Langness, showing small greenstone dykes (B^D) cut and shifted in segments along horizontal planes of dislocation. Height about 35 feet.

(Figure 47) Ground-plan on shore south of Gullet Creagh Moainee, Langness, showing ef fect of shearing upon thickness of small greenstone dyke. Area 35 feet by 15 feet. Where the dyke (B^G) lies between the bedding planes of the Baggy slate, its thickness is from 2 to 4 inches; where it cuts across the bedding, it expands to 12 inches and shows oblique cleavage.

(Figure 48) Diagram of cliff-section on the eastern side of the second recess east of Port Soldrick. Explanation in text. Height about 50 feet.

(Figure 49) Sketch-section of the most northerly of The Arches, Langness, showing unconformability at base of Carboniferous Rocks. Height, about 18 feet. d^1 Carboniferous Basement Conglomerate. a Manx Slates, with red staining. F Small fault.

(Figure 50) Section across foreshore at Langness Point, south of Lighthouse, showing eroded surface of slates beneath Carboniferous Basement Conglomerate. Height about 10 feet. d^1 Carboniferous Basement Conglomerate, filling hollows in the slates: a large block of grit at * measures 4 ft. by 2 ft. a Manx Slates. B^G Pre-Carboniferous greenstone dyke, 8 inches wide, along which a gully 3 feet wide and 2 feet deep has been eroded on the Carboniferous shore. This is prolonged into a similar gully on the present shore.

(Figure 51) Section on shore S.E. of last, showing grit-band (a■) in slates (a) standing up in a small ridge beneath conglomerate (d^1). Height, about 4 feet.

(Figure 52) Section through crest of anticline in dark limestone with thin shaly partings, in low cliff north of Scarlet Point. Height about 8 feet. The thickness of the individual bands of limestone varies as under:

South side		**Centre of dome**		**North side**	
Bed No. 6	43 inches	Bed No. 6	43 inches	Bed No. 6	43 inches
Bed No. 5	5¼ inches	Bed No. 5	8½ inches	Bed No. 5	4¾ inches
Bed No. 4	6 inches	Bed No. 4	8½ inches	Bed No. 4	6 inches
Bed No. 3	10 inches	Bed No. 3	12 inches	Bed No. 3	10½ inches
Bed No. 2	8 inches	Bed No. 2	9½ inches	Bed No. 2	8 inches
Bed No. 1	13½ inches	Bed No. 1	15½ inches	Bed No. 1	14½ inches
Totals	85¾ inches	Totals	97 inches	Totals	83¾ inches

(Figure 53) Sketch-map of foreshore north-west from Poyll Vaaish. (Reduced from 25-inch field map.) A. Volcanic Ash. b^3. Posidonornya-beds (limestone-shale). b^2. Poolvash Limestone, forming knolls. b^1. Lower Limestone. xb. Dolomitized and brecciated limestone (with unaltered patches of b^2) e. Olivine-dolerite dykes.

(Figure 54) Cliff section of Carboniferous Limestone, 400 yards north-west of Poyll Vaaish. Height 16 feet. B. Massive pale limestone; bedding obscure, fossils abundant. B*. Lenticles of limestone similar to B. Bb. Dark flaggy limestone with shaly partings; irregularly bedded in vicinity of B*: fossils abundant. xb. Limestone breccia.

(Figure 55) Top of boss of pale limestone, on beach west of ruins of "Chapel and Burial Ground" (6-inch map, (Sheet 16)) Poyll Vaaish. Length of section, about 10 yards. B. Massive pale limestone (Poolvash Limestone); outer layer full of fossils (encrinites, corals, and shells) with some round pebble-like lumps lumps of limestone up to 6 inches in diameter. Bb. Dark limestone-flags with shale partings (Posidonomya Beds) mantling around the boss of B. xb. Bands of limestone-conglomerate one to two feet thick, made up of more or less rounded fragments of limestone up to one foot diameter; many fossils (corals, encrinites, etc.).

(Figure 56) Section on shore slightly below high-water mark opposite Poyll Vaaish Quarry. Height about 3 feet. Bb. Dark limestone-flags with shale partings (Posidonomya Beds). B. Boss of. paler limestone, 6 feet diameter and 1½ feet thick, crowded with shells, principally Productus. A quartz-pebble, 1½ inches in diameter, was embedded in it at Q.P. BB. Bosses similar to B protruding above the same bedding-plane; not in the line of the section.

(Figure 57) Plan of a dome in dark limestone-flags (Posidonomya Beds) on the foreshore S. W. of Poyll Vaaish Quarry, adjacent to junction of limestone with Volcanic Ash. Length 40 yards; breadth 10 yards. The arrows indicate direction of dip.

(Figure 58) Section across the foreshore on the northern side of Close ny Chollagh Point, Poolvash; showing the rucking up of the Upper Limestone beneath the Volcanic Series. Length of section about 120 yards. (From Quart. Journ. Geol. Soc., vol. lvi.) A Volcanic ash of medium texture, with (b contorted strips and fragments of cherty limestone. B. Dark flaggy limestone (Posidonomya Beds); platy, indurated and pyritous in the uppermost layer, with signs of shearing (= thrust-plane); rucked up into short domes, the crests of which are in places pinched into the ash and brecciated.

(Figure 59) Section across gully on shore at half tide W. S. W. of Poyllvaaish farmstead. Height 10 feet. A. Volcanic Ash, apparently overthrust upon black shale. B. Knoll of pale limestone and limestone-breccia. T. Thrust plane?

(Figure 60) Plan of portion of shore west of Poyllvaaish farmstead. Area about 20 x 20 yards. A. Volcanic Ash, touching limestone knoll at *, but resting on crushed black shale west of the knoll. B. Irregular knoll of pale massive limestone. F.F. Lines of dislocation (?400 normal or overthrust faults). The parts unshaded are hidden by beach-material.

(Figure 61) "Section of dyke and sill in the tuffs west of Scarlet Point, Isle of Man". (Sir A. Geikie.)

(Figure 62) "Section of south side of vesicular sill west of Scarlet Point". (Sir A. Geikie.)

(Figure 63) "Bands 41 vesicles in the same sill". (Sir A. Geikie)

(Figure 64) Section in crag on shore near low-water W.S. W. of Poyllvaaish Farm. Height about 10 feet. A. Volcanic ash. b. Dark cherty limestone and shale, with pyritious fossils; wisps of ash, one to three inches thick, are apparently pinched in between folds of the strip of limestone. T. Curving plane, probably overthrust. A dorsal fish-spine (*Sphenacanthus*) was found in the ash a foot or two below the right-hand lower corner of the section (see p. 236).

(Figure 65) Section at foot of low cliff at Close ny Chollagh Point. "Limestone passing under stratified tuffs" (Sir A. Geikie, "Ancient Volcanoes",: vol. ii., fig. 184).

(Figure 66) Section across the foreshore 250 yards S. of Close ny Chollagh Point, showing the disturbance of bedding in volcanic ash and limestone. Length about 100 yards. (From Quart. Journ. Geol. Soc,, vol lvi.) A Evenly-bedded fine calcareous ash and thin cherty impure limestone-bands (6 feet seen). b. Ash and limestone, like that below, but

crumpled, broken and confused. m. Small thrust-plane separating the broken from the unbroken beds; shifting to higher bands in going eastward. The ash is indurated for 2 or 3 inches beneath this plane.

(Figure 67) Diagram to illustrate supposed structure of Volcanic rocks in vicinity of Cromwell's Walk. (From Quart. Journ. Geol. Soc., vol. lvi.) A. Volcanic Ash, much disturbed, but showing traces of original bedding. xA. Re-arranged Volcanic Ash. 7. Vesicular basalt. xa. Coarse agglomerate of blocks of vesicular lava in ashy matrix. xab.The same, with some limestone blocks. 8. Strips of limestone carried up along thrust-plane. T. Thrust-planes.

(Figure 68) Plan of coast between Cromwell's Walk and Scarlet Point. Length 650 yards. A. Volcanic Ash. a. Dyke-line ridges of vesicular basalt, probably disturbed lavas. a^1. Columnar basalt, forming Stack of Scarlet, with (b^1) included strip of limestone, 2 to 3 inches thick. a^2. "Melaphyre Dyke" (of Hobson). xa. Coarse agglomerate composed principally of basaltic be blocks in a matrix of ash. rah. Coarse agglomerate containing blocks of limestone as well as of basalt. Bb. Dark flaggy limestone (Lower Limestone). b. Strip of dark flaggy limestone entangled among the Volcanic Series. xb. Mass of contorted and brecciated limestone, with few encrinites, etc., and irregular strings of small quartz-pebbles (Q.P.) near western margin. C. Olivine-dolerite dykes (Tertiary 7).

(Figure 69) Section in the brecciated limestone (xb of (Figure 68)) at the northern side of Scarlet Point, showing traces of original bedding. Height about 6 feet, length 10 feet. b. Much disturbed limestone, dolomitised in places; with traces of original bedding here and there, capped by a torn and interrupted strip of black shale 1 to 2 inches thick. xb. Grey limestone-breccia, made up of recemented fragments of all sizes, with bits of encrinites and fragmentary shells. T. ?. Probably a minor thrust-plane.

(Figure 70) Diagrammatic section across Scarlet Point west of the Stack, showing the probable relation of the Volcanic Series to the Carboniferous Limestone. (From Quart. Journ. Geol. Soc., vol. lvi.) Length of section about 150 yards; maximum height about 40 feet. A. Volcanic series; ash, agglomerate and vesicular basalt. a. Dyke-like mass of vesicular basalt. xa. Coarse agglomerate; large blocks of vesicular basalt in ashy matrix. xab. Similar agglomerate, with some limestone blocks. B. Lower Limestone rising into shallow domes. b. Strips of limestone dragged up into the Volcanic series. xb. Mass of contorted and brecciated limestone. C. Olivine-dolerite dyke (Tertiary ?). T. Major thrust-plane. m. Minor thrust-planes.

(Figure 71) a, b, c. *Prolecanites compressus*, J. Sowerby, sp. Lower Limestone. Scarlet, Isle of Mau; a, and b, about ■ nat. size; c about ½ nat. size. (From British Museum Cat. Foss. Cephalopoda", pt. iii., p. 245.)

(Figure 72) a, b, c. *Prolecanites compressus*, J. Sowerby, sp. Lower Limestone. Scarlet, Isle of Mau; a, and b, about ■ nat. size; c about ½ nat. size. (From British Museum Cat. Foss. Cephalopoda", pt. iii., p. 245.)

(Figure 73) *Posidonomya Becheri* Goldf. Carboniferous Limestone Series. Figured from a specimen in the Survey Collection from near Bamburgh, Northumberland.

(Figure 74) Section of crumpled bedding in calcareous sandstone, on beach at north side of White Strand. Depth 2 feet.

(Figure 75) Cliff section in Peel Sandstone at north side of White Strand. Height about 20 feet. Courses of red sandstone, showing curious swellings on under surface in trough of fold. Diagrammatically rendered. Shale partings. F. Fault ?, with crushed rock in vicinity

(Figure 76) Structure in Peel Sandstone at foot of cliff below quarry on south side of Cain's Strand. Two beds of red sandstone, 4 feet thick, with yellow concretions tending in the lower bed to a linear arrangement both horizontally and vertically.

(Figure 77) Cliff-section below the old lime-kiln 200 yards west of Lhoob y Reeast near Peel. 9. Pale nodular gritty limestone; nearly all quarried away — thickness 3 feet. 8. Lenticular pebbly cornstone with palish red limestone concretions — 1½ feet 7. Sandy and gravelly band, with calcareous cement and small fragments of limestone: some corals — 2 feet 6. Lenticular patches of coarse and fine subangular conglomerate with limestone pebbles, and also calcareous concretions and cement; fragments of encrinites and other fossils — 3 feet 5. Pale red nodular limestone

band — 3 to 6 inches. 4. Red sandstone, grit and fine gravelly conglomerate: some fossils — 2½ feet. 3. Pebbly band with pebbles and also concretions of limestone: fossils: among the pebbles are agate, quartzite, vein quartz, sandstone and chert — 1 foot. 2. Red sandstone interbedded with fine gravelly conglomerate, less calcareous than above: fossils, — polyzoa and some detached fragments of corals 3 to 6 feet. 1. Sandstone, etc., not exposed in this section.

(Figure 78) Sketch-map of the valley of the River Neb around Glenfaba Bridge, showing position of outcrops of slate and conglomerate. Scale: 6 inches = 1 mile. Conglomerate indicated by circles. Slate indicated by oblique shading. B. H. Borehole.

(Figure 79) Ground-plan of the northern extremity of the Isle of Man, indicating position of borings and line of section (A—B) shown in (Plate 5).

(Figure 80) *Astarte borealis*. Shells of the Manx Extra-Insular Drift (nat. size). Figure 80 represents a shell from the Post-Pliocene beds of the Clyde, as there was no suitable Manx specimen of this species in our collection; the others are from specimens from the Isle of Man. Drawn by Mr. Gilbert Williams from specimens in the Geological Survey Museum.

(Figure 81) *Nassa serrata*. Shells of the Manx Extra-Insular Drift (nat. size). Drawn by Mr. Gilbert Williams from specimens in the Geological Survey Museum.

(Figure 82) *Nassa monensis*. Shells of the Manx Extra-Insular Drift (nat. size). Drawn by Mr. Gilbert Williams from specimens in the Geological Survey Museum.

(Figure 83) *Nassa Kermodei*. Shells of the Manx Extra-Insular Drift (nat. size). Drawn by Mr. Gilbert Williams from specimens in the Geological Survey Museum.

(Figure 84) *Fusus Forbesi*. Shells of the Manx Extra-Insular Drift (nat. size). Drawn by Mr. Gilbert Williams from specimens in the Geological Survey Museum.

(Figure 85) *Fusus* cf. *longiroster*. Shells of the Manx Extra-Insular Drift (nat. size). Drawn by Mr. Gilbert Williams from specimens in the Geological Survey Museum.

(Figure 86) *Traphon clathratus*. Shells of the Manx Extra-Insular Drift (nat. size). Drawn by Mr. Gilbert Williams from specimens in the Geological Survey Museum.

(Figure 87) *Trophon* (*Fusus*) *Fabrici*, Beck (from E. Forbes, Mem. Geol. Surv., vol. 1., p. 424.)

(Figure 88) Cliff section in glacial drift at Kionlough 2 miles north of Ramsey. Scale:1 inch = 40 feet. 5. Blown sand and gravelly rainwash — Thickness 3 to 5 feet 4. Stratified gravel and sand = Upper Platform Gravel — about 15 feet 3. Reddish warp and clay, more or less stratified rather stony in the upper part; passing downwards into —Thickness 20 feet 2. Well-stratified sand with gravelly layers and streaks of red clay; calcareous concretions in places. Shell-fragments abundant in the finer gravel but absent from the sand and clay Thickness 50 to 60 feet 1. Red warp or clay with a few stones, at foot of cliff Thickness about 5 feet.

(Figure 89) Cliff section in glacial drift at the southern side of Orrisdale Head, 1 mile north of Kirk Michael. Scale: 1 inch = 40 feet. 5. Blown sand about 5 feet. 4. Stratified sand, etc., with band of red clay in places, not well seen 15 feet thickness 3. Stratified sand, warp and fine gravel, contorted in places; a few shell-fragments in the gravel 20 feet thickness 2. Coarse bouldery gravel, cross bedded; thickening northward and there resting on an eroded surface, but here thinning out and apparently passing into — 0 to 10 feet thickness 1. Rudely stratified and contorted sandy boulder clay or loam, containing many boulders and scratched stones of extra-insular origin, especially towards the top; also a few small fragments of slate, possibly Manx, and a few shell-fragments 30 to 40 feet thickness.

(Figure 90) Glaciated Carboniferous Limestone Boulder encrusted with daily sand and afterwards again glaciated. Scale: 1/12. nat. a, a, a, incrustations of shelly sand.

(Figure 91) Cliff-section south of Ballure Glen, Ramsey, showing interbedding of local and foreign drift-material. Scale, horiz. and vert., 1 inch = 100 feet. 11. Rough semi-stratified clayey slate-rubble and gravel: =, Local rubble-drift: capped in places by thin silty wash. 10. Irregular band of red clay with a few pebbles:= Extra-insular drift: appears to thin southward into underlying gravels. 9. Fine slaty gravel and silt, with a few foreign pebbles; thin streaks of red clay in upper part at N.W. part of section. 8. Streaks of red clay among slaty gravel and silt, probably represented by red boulder clay farther north. 7. Cross-bedded sand, loam and fine gravel; pebbles partly of local slate and partly of foreign material thins rapidly southward. 6. Irregular band of stony red clay, fading out in places:= Extra-insular drift. Probably continued southward (6 ?) among local till (4). 5. Dark slaty gravel and sand with a few foreign pebbles. 4. Bluish slaty till:= Local drift. 3. Stratified cross-bedded yellow sand and gravel, contorted in places; pebbles chiefly local but foreigners abundant, including Ailsa Craig riebeckite-rock. 2. Grey slaty till, with an occasional extra-insular stone:= Local drift, with foreign admixture., 1. Coarse rubble of slate-fragments, banked against old cliff and in small hollow on top. *x.* Manx Slate forming pm-glacial cliff. NOTE. — Unshaded portions of section not seen; dotted boundaries obscure.

(Figure 92) Diagram showing replacement of stratified shelly drift by local boulder-clay in the cliff-section near Gob ny Creggan Glassey, Kirk Michael. Scale, for both Figs.: 1 inch = 100 feet, hor. and vert. Explanation (for both sections). 5. Stratified slaty platform-gravel, probably passing into (4) at foot of slope. 4. Upper local rubble-drift. 3. Stratified extra-insular drift; cross-bedded and confused in places; composed of sand, silt, gravel, with a few shell fragments, and thin patches of red clay, 3a, towards the top; the gravel, a mixture of local and foreign material. 2. Dark grey or blue local till, with a few foreign stones. 1. Slaty rubble passing in places into dark slaty till (2). *x* Manx Slates.

(Figure 93) Diagram at right angles to the above, showing general arrangement of the drift deposits on the lower slopes of the hills; based on sections in Glion Thoar and Glion Shellan. Explanation (for both sections). 5. Stratified slaty platform-gravel, probably passing into (4) at foot of slope. 4. Upper local rubble-drift. 3 Stratified extra-insular drift; cross-bedded and confused in places; composed of sand, silt, gravel, with a few shell fragments, and thin patches of red clay, 3a, towards the top; the gravel, a mixture of local and foreign material. 2. Dark grey or blue local till, with a few foreign stones. 1. Slaty rubble passing in places into dark slaty till (2). x Manx Slates.

(Figure 94) Drift-section in the west bank of the Foxdale River, opposite Ballahig, showing interlamination of red (extra-insular) and grey (insular) boulder-clay. Scale: 1 inch = 20 feet. Top not exposed. 2. Slaty clay (local drift) traversed by several narrow contorted strips of red pebbly clay (extra insular), from 1 inch to 4 inches thick, containing foreign pebbles as well as slate fragments: about 10 ft. 1. Slaty rubble in grey clayey matrix (local drift) — 6 ft.

(Figure 95) The Bride Hills, as viewed from a spot 1¼ miles north-east of Kirk Andreas.

(Figure 96) Diagram from Ramsey to Point of Ayre, showing profile of the northern plain and mode of arrangement of Drifts. Scale: Horizontal, 1 inch = 1 mile; vertical, ■ inch = 100 feet. Explanation. a. Manx slates. b. See enlarged section, (Figure 91) c. Alluvial flat, expanding inland into the Curragh. d. Yellow sand and gravel, with some red clay; surface rather moundy e. Thin sand and gravel on red boulder-clay and stratified drift. f. Thin sand and gravel on red stony clay: stratified material below. g. Chiefly stratified material, with a little boulder-clay h. Chiefly red boulder-clay. i. Stratified red clay, sand and boulder-loam k. Shingle and blown-sand.

(Figure 97) Plan of dry valleys near Kirk Bride. The figures denote height above sea-level.

(Figure 98) Sketch-map of the Glacial phenomena of the Isle of Man. The arrows with ovals indicate glacial stria and the direction of ice movement. The dotted area marks the distribution of extra-insular drift-material: the area left plain contains local drift only. D = Dhoon Granite; F = Foxdale Granite; O = Oatland Granitite; with their respective boulder-streams indicated by circlets. The black lines indicate railways.

(Figure 99) Sketch-view of Creg Bedn, on the northern side of Slieau Monagh (Meanagh), near Sulby; looking west: a glaciated crag of vein-quartz, with striae pointing S. 15–25 E.; height of crag about 15 feet; width (N–S) 20 feet; length (E–W) 60 feet.

(Figure 100) Profile in the direction of the strive, from Sulby through Greg Bedn to the head of the Laxey River.

(Figure 101) Diagrammatic ground-plan showing dry watercourse on the hillside east of Bishops Court. Scale: 1 inch = 3 miles. The black lines show the profile of the surface at regular intervals. The numbers give heights above sea-level on highroad.

(Figure 102) Sketch-map showing dry rock-valley near Ballalheigh, Kirk Michael. Scale; 4 inches = 1 mile. The figures are levels in feet above O.D.

(Figure 103) Sketch-map of the Irish Sea shewing glacial striae & probable direction of ice-movement.

(Figure 104) Diagram of the cliffs between Ballakinnag and Glen Trunk, through Orrisdale Head. Length of section, 2¾ miles; height, from 60 to 140 feet. Vertical scale much exaggerated. 5. Blown sand. 3. Sand, laminated clay, and gravel, with an irregular seam of red pebbly clay. 3a. Laminated silt and clay, with sand and fine gravel 2. Current-bedded bouldery gravel and sand 1. Sandy Boulder-clay.

(Figure 105) Cliff on the south side of Glen Balleira, Kirkmichael. heiaht about 75 feet. Soil and sandy loam. 5. Current-bedded slaty platform-gravel, 8 feet thick. 4. Stony red clay, 4 feet thick. 3. Current-bedded sand and gravel. 2. Contorted warp and sand.

(Figure 106) Diagram of the Drifts on the eastern side of Glen Dhoo, north of Ravensdale. Length of section about 600 yards. 4. Late-glacial Flood-gravel. 3. Slaty rubble, with some striated fragments: = rearranged drift. 2. Yellow sand streaked with gravel with foreign pebbles, and with red clay; mixed towards the top with No. 3. 1. Slaty till. a Manx Slates.

(Figure 107) Section at the top of the valley bank, 400 yards south-west of the Purt-ny-shee, near Douglas. 3. Late-glacial flood-gravel; pebbles, chiefly of slate, fairly well rolled, lying flat; about 3 feet seen. 2. Grey loamy layer, with most of the pebbles vertical; 1 to 2 feet. 1. Slaty gravel and wash like No. 1, with the pebbles flat.

(Figure 108) Section in drift-gravel in the cutting for the Marine Drive, between Port Soderick and Keristal. Length, 50 yards; height, 15 to 25 feet. a Contorted sand loam and fine gravel; red loamy clay with stones in hollows 1 to 3 feet deep at top. b Sand and fine gravel. c Well-bedded fine gravel and sand, with a few subangular blocks of local grit; passing into shingly gravel. Pebbles chiefly local, but with a few of extra-insular origin (flint, etc.). F Fault-like break, with contortions immediately to southward.

(Figure 109) Section in cliff west of old Limekilns, Port St. Mary. Length, 100 yards; height, about 20 feet. 3. Gravel, with sandy and clayey seams; stones angular and subangular, and some boulders. 2. Stratified clay, with stony seams and patches of gravel. 1. Till with streaks of gravel, and subangular rubble; boulders chiefly limestone, but with some of distant origin; a few shell-fragments. d^2 Flaggy Carboniferous Limestone. * Edges of limestone glaciated, with till banked against them. ** Edges of limestone shattered and overlain by rubble.

(Figure 110) Diagrammatic plan and section of the Foxdale Lode. Manx slates shown by oblique shading; Foxdale Granite and elvans by small crosses.

Plates

(Plate 1) Geological map of the Isle of Man. By G.W. Lamplugh. Scale 1 inch = 4 miles.

(Plate 2) Sections across the Isle of Man. Scale: Horizontal and Vertical 1½ inches = 1 mile (1"=3520 feet)

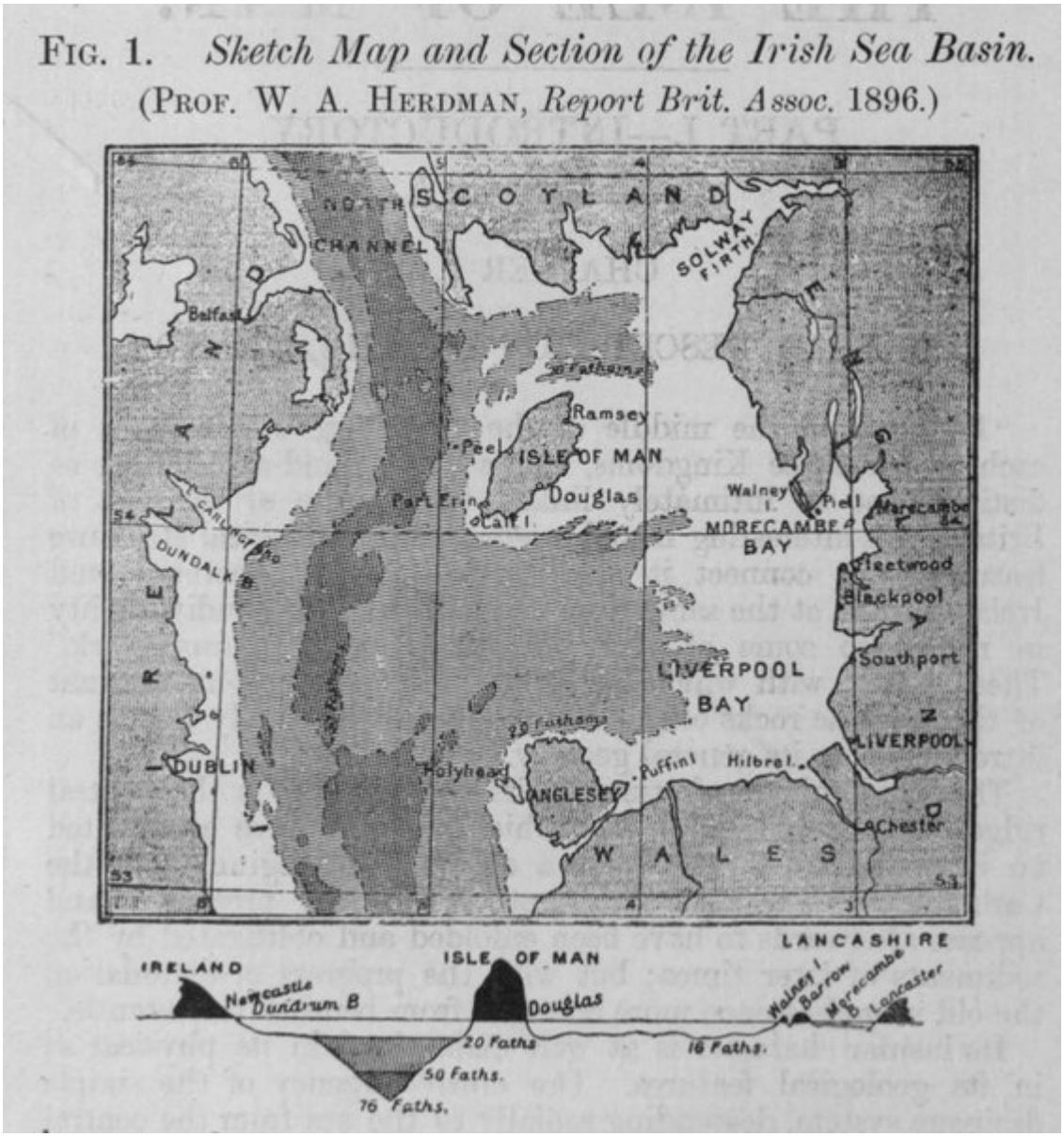
(Plate 3) 1. Coarse agglomerate below Cromwell's Walk, with included mass of Cherty Limestone. 2. Tabular mass of Basalt at Cromwell's Walk, with lower margin fractured, and vesicular bands vertical.

(Plate 4) 1. Enlarged view of Gaps in lower margin of basalt at Cromwell's Walk. 2. Laminated Ash, with close-jointing and step-faulting; 800 yards south of Close ny Chollagh Point.

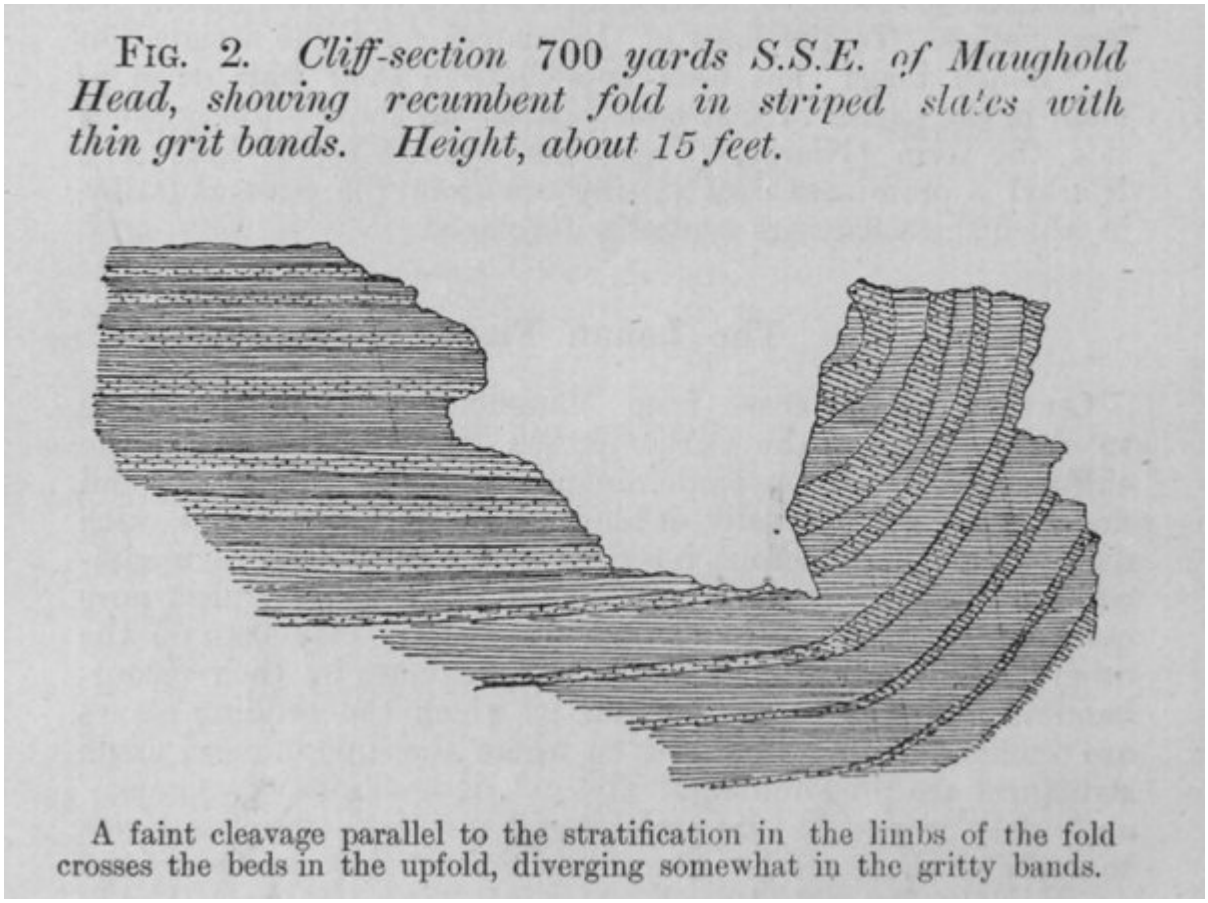
(Plate 5) Section shewing result of deep borings in the north of the Isle of Man, along the line A-B of the ground plan of The Ayre.

(Title page) Title page of The geology of the Isle of Man. By G.W. Lamplugh. 1903.

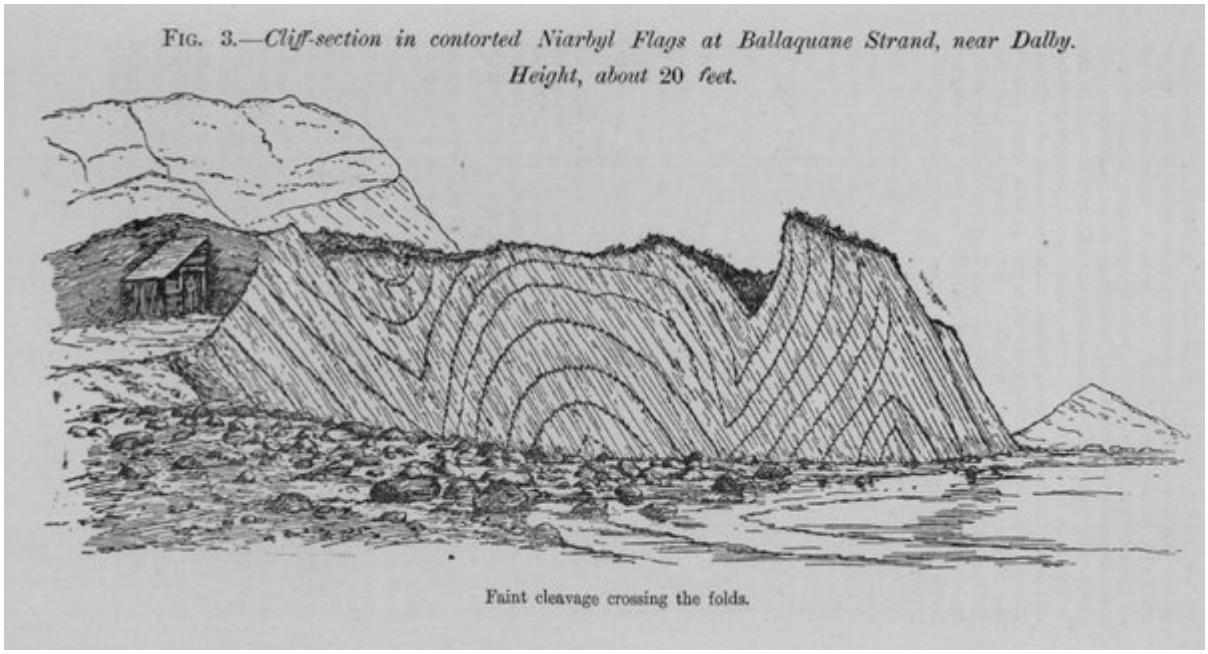
(Front cover) (Front cover) Bay Stacka and Sugarloaf seen from Spanish Head. Flaggy grits in Manx Slates. G. Bingley. BAAS photograph BAAS05115 at BGS. P246782.



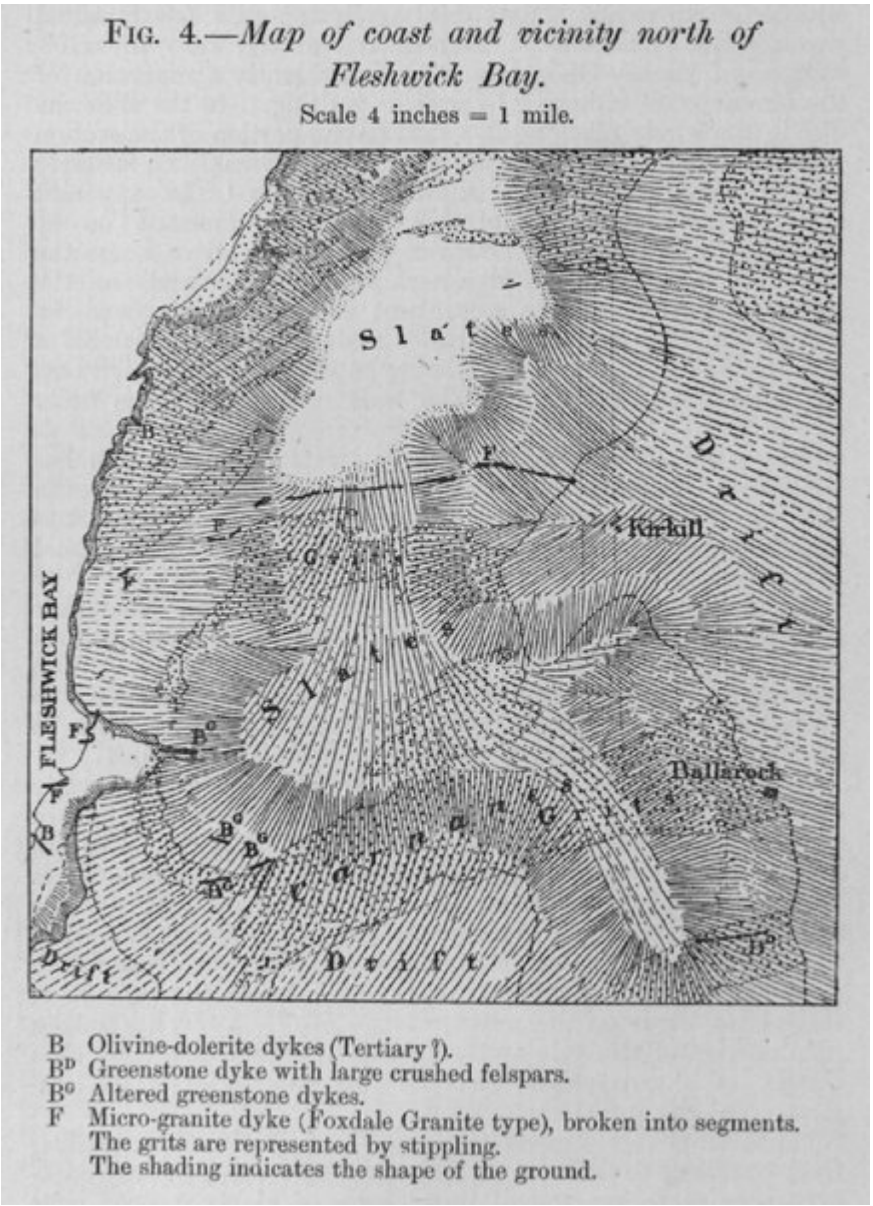
(Figure 1) Sketch Map and Section of the Irish Sea Basin. (Prof. W. A. Herdman, Report Brit. Assoc. 1896.)



(Figure 2) Cliff section 700 yards S.S.E. of Maughold Head, showing recumbent fold in striped slates with thin grit bands. Height, about 15 feet. A faint cleavage parallel to the stratification in the limbs of the fold crosses the beds in the upfold, diverging somewhat in the gritty bands.



(Figure 3) Cliff-section in contorted Niarbyl Flags at Ballaquane Strand, near Dalby. Height. about 20 feet. Faint cleavage crossing the folds.



(Figure 4) Map of coast and vicinity north of Fleshwick Bay. Scale 4 inches = 1 mile. B Olivine-dolerite dykes (Tertiary ?). B^D Greenstone dyke with large crushed felspars. B^G Altered greenstone dykes. F Micro-granite dyke (Foxdale Granite type), broken into segments. The grits are represented by stippling. The shading indicates the shape of the ground.

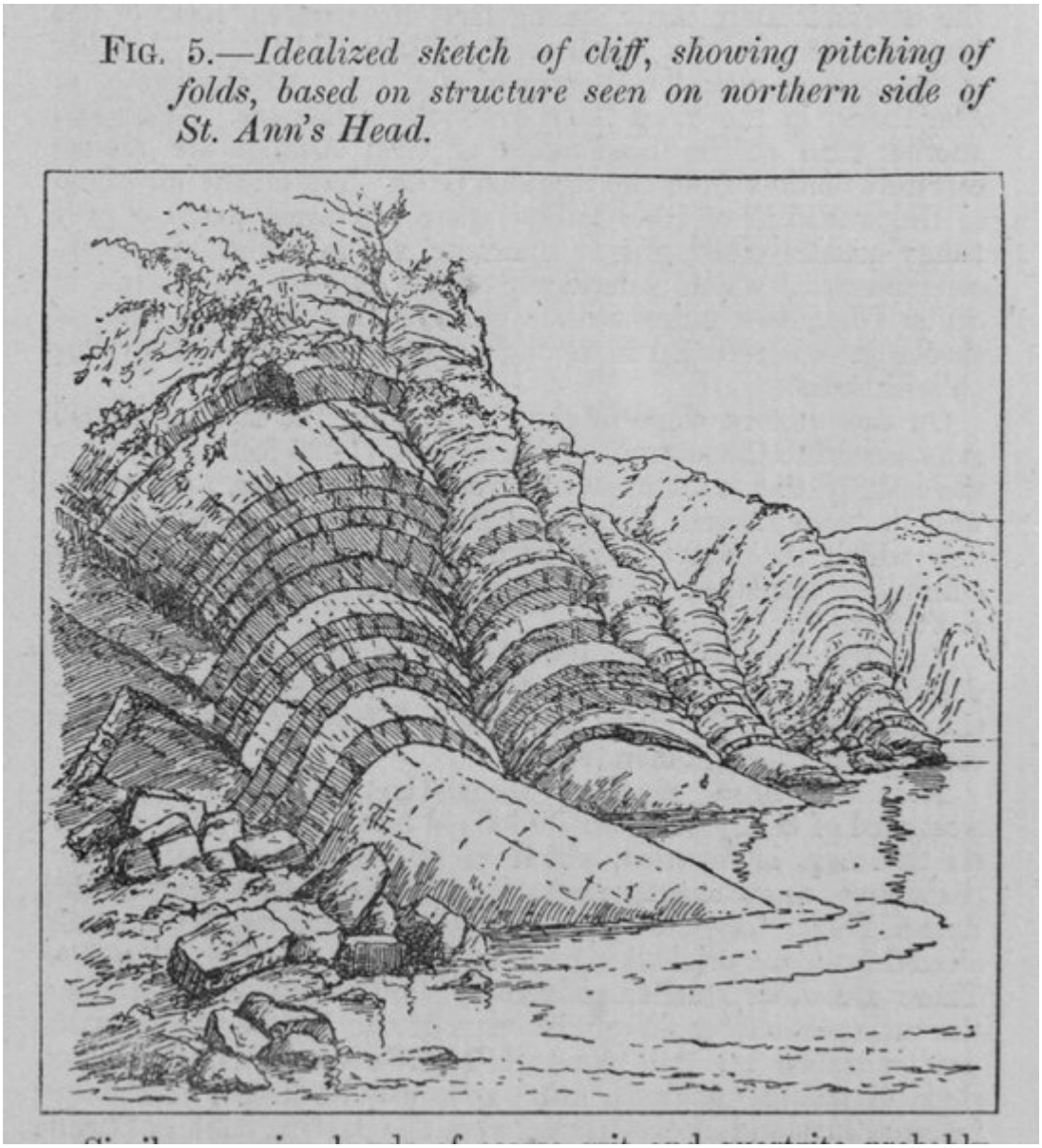
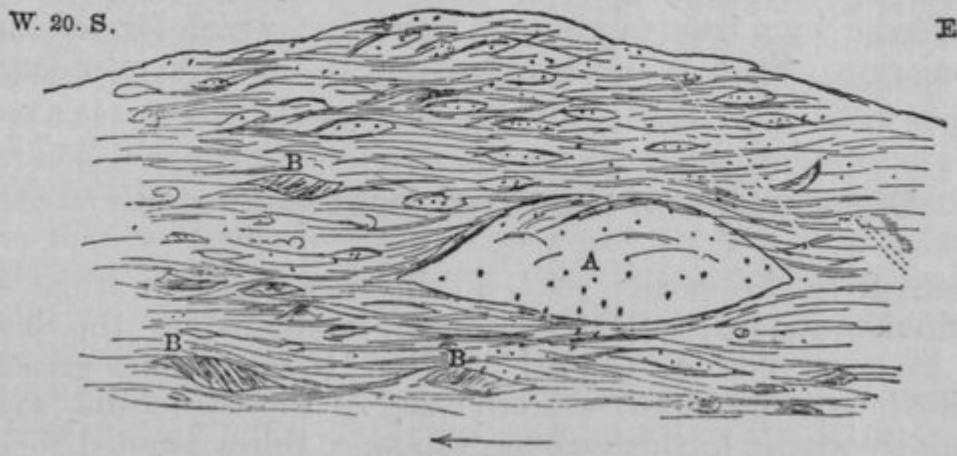


FIG. 5.—*Idealized sketch of cliff, showing pitching of folds, based on structure seen on northern side of St. Ann's Head.*

(Figure 5) Idealized sketch of cliff showing pitching of folds, based on structure seen on northern side of St. Ann's Head.

FIG. 6.—*Crag of Crush-conglomerate at the southern edge of Cronk Sumark, Sulby; showing fragments of grit, fine-grained flag-stone, and hard clay-slate, in a matrix of bluish slaty material.*

(From Quart Journ. Geol. Soc., vol. li.)



A. Block of sheared slightly felspathic grit, about 8 feet long.
B. Fragments in which the original bedding is still visible.
The arrow indicates the probable direction of the movement during shearing.

(Figure 6) Crag of Crush-conglomerate at the southern edge of Cronk Sumark, Sulby; showing fragments of grit, fine-grained flag-stone, and hard clay-slate, in a matrix of bluish slaty material. (From Quart Journ. Geol. Soc., vol. li.) A. Block of sheared slightly felspathic grit, about 8 feet long. B. Fragments in which the original bedding is still visible. The arrow indicates the probable direction of the movement during shearing.

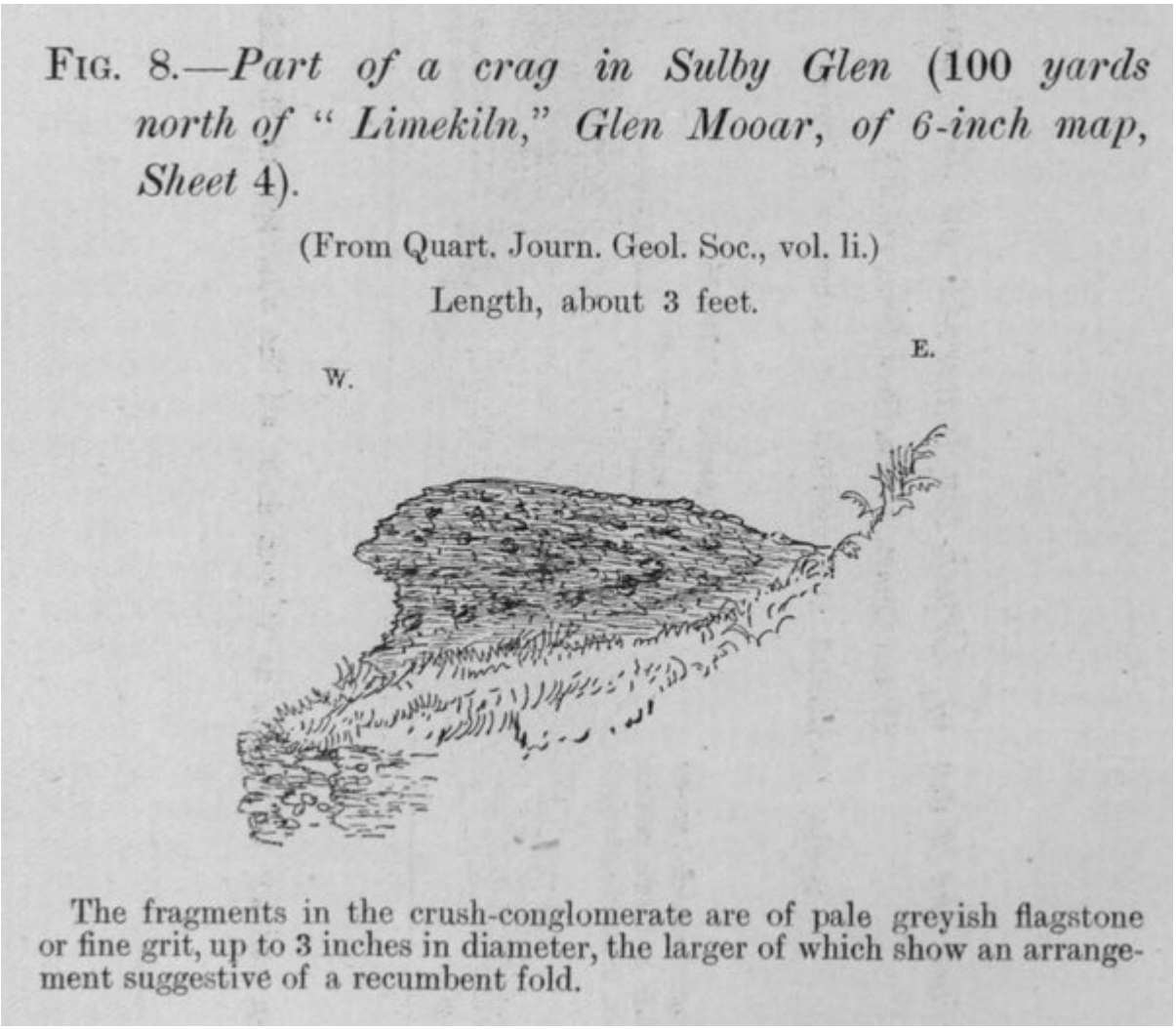
FIG. 7.—*Section across the zone of Crush-conglomerate on the eastern side of Sulby Glen.*

(From Quart. Journ. Geol. Soc., vol. li.)

Scale, horizontal and vertical: 6 inches = 1 mile.

The section is not drawn strictly vertically, as it combines all the outcrops of the hill-side which slopes at about 40°.

(Figure 7) Section across the zone of Crush-conglomerate on the eastern side of Sulby Glen. (From Quart. Journ. Geol. Soc., vol. li.) Scale, horizontal and vertical: 6 inches = 1 mile. The section is not drawn strictly vertically, as it combines all the outcrops of the hill-side which slopes at about 40°.

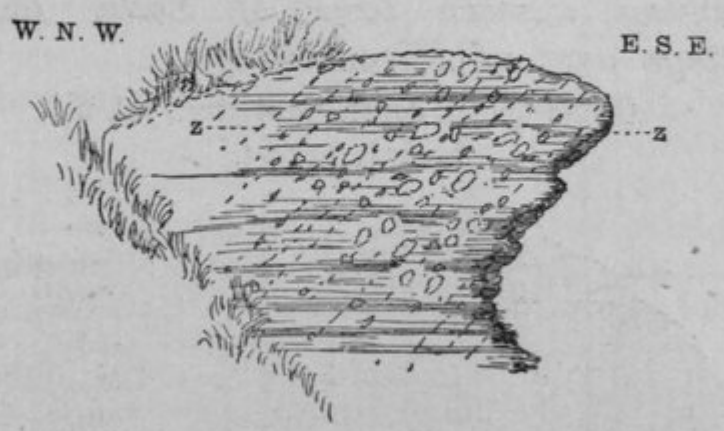


(Figure 8) Part of a crag in Sulby Glen (100 yards north of "Limekiln", Glen Mooar, of 6-inch map, (Sheet 4)). The fragments in the crush-conglomerate are of pale greyish flagstone or fine grit, up to 3 inches in diameter, the larger of which show an arrangement suggestive of a recumbent fold.

FIG. 9.—*Sketch of crag of Crush-conglomerate on northern slope above Druidale stream, at junction with Sulby River.*

(From Quart. Journ. Geol. Soc., vol. li.)

Length, about 3 feet.

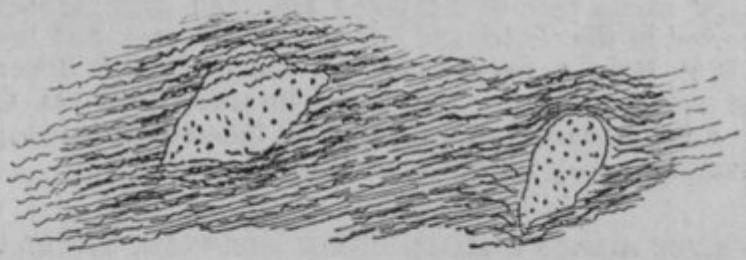


Z—Z. Shear-cleavage planes, developed subsequently to the brecciation, and obliquely to the linear arrangement of the grit-fragments which show a prevalent dip to north-west. The dip of the shear-cleavage is N. 20° E. at 35°, the section being along the strike.

(Figure 9) Sketch of crag of Crush-conglomerate on northern slope above Druidale stream, at junction with Sulby River. (From Quart. Journ. Geol. Soc., vol. li.) Length. about 3 feet. Z–Z. Shear-cleavage planes, developed subsequently to the brecciation, and obliquely to the linear arrangement of the grit-fragments which show a prevalent dip to north-west. The dip of the shear-cleavage is N. 20° E. at 35°, the section being along the strike.

FIG. 10.—*Enlarged view of Crush-conglomerate in crag adjacent to that shown in the last figure.*

About one-half natural size.



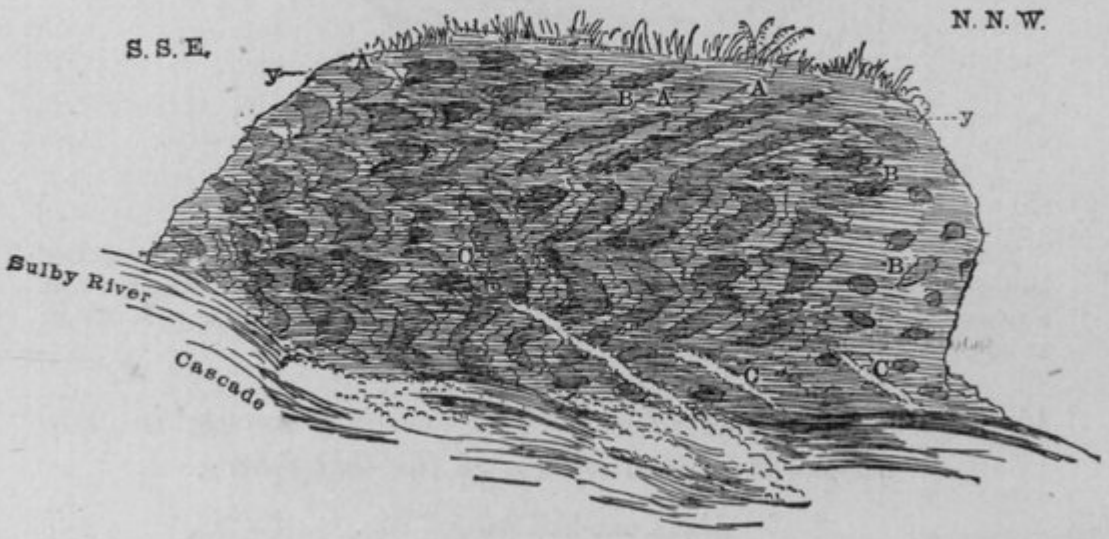
The shear-cleavage planes traversing the shaly ground-mass partly swerve around and partly cross pebble-like fragments of fine-grained grit.

(Figure 10) Enlarged view of Crush-conglomerate in crag adjacent to that shown in the last figure. About one-half natural size. The shear-cleavage planes traversing the shaly ground-mass partly swerve around and partly cross pebble-like fragments of fine-grained grit.

FIG. 11.—*Passage of banded slate into breccia in crag forming western bank of Sulby River under cottage west of Slieaumonagh.*

(From Quart. Journ. Geol. Soc., vol. li.)

Length, 12 feet.

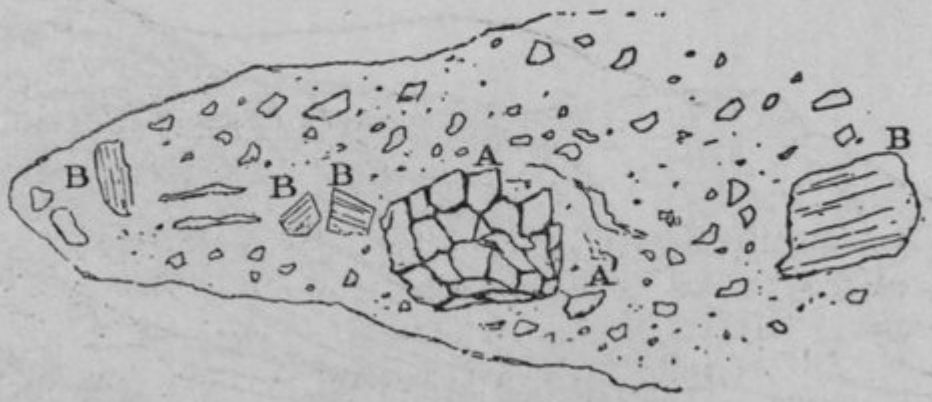


Firm flaggy slates with well-marked blue and grey banding, A, A, A; highly contorted in the centre and left side of the crag, and broken up into fragments, B, B, B, in a slaty matrix on the right and upper part. The thickness of the bedding is exaggerated in this figure. C, C, C, Quartz veins, 2 to 4 inches thick, disturbed and twisted, but not participating in the brecciation. y—y Later shear-cleavage.

(Figure 11) Passage of banded slate into breccia in crag forming western bank of Sulby River under cottage west of Slieaumonagh. (From Quart. Journ. Geol. Soc., vol. li.) Length, 12 feet. Firm flaggy slates with well-marked blue and grey banding, A, A, A; highly contorted in the centre and left side of the crag, and broken up into fragments, B, B, B, in a slaty matrix on the right and upper part. The thickness of the bedding is exaggerated in this figure. C, C, C, Quartz veins, 2 to 4 inches thick, disturbed and twisted, but not participating in the brecciation. y—y Later shear-cleavage.

FIG. 12.—*Plan of Crush-conglomerate in floor of a cave south of Gob y Deigan, showing breaking-up of flaggy inclusions.*

Area, about 9 square feet.

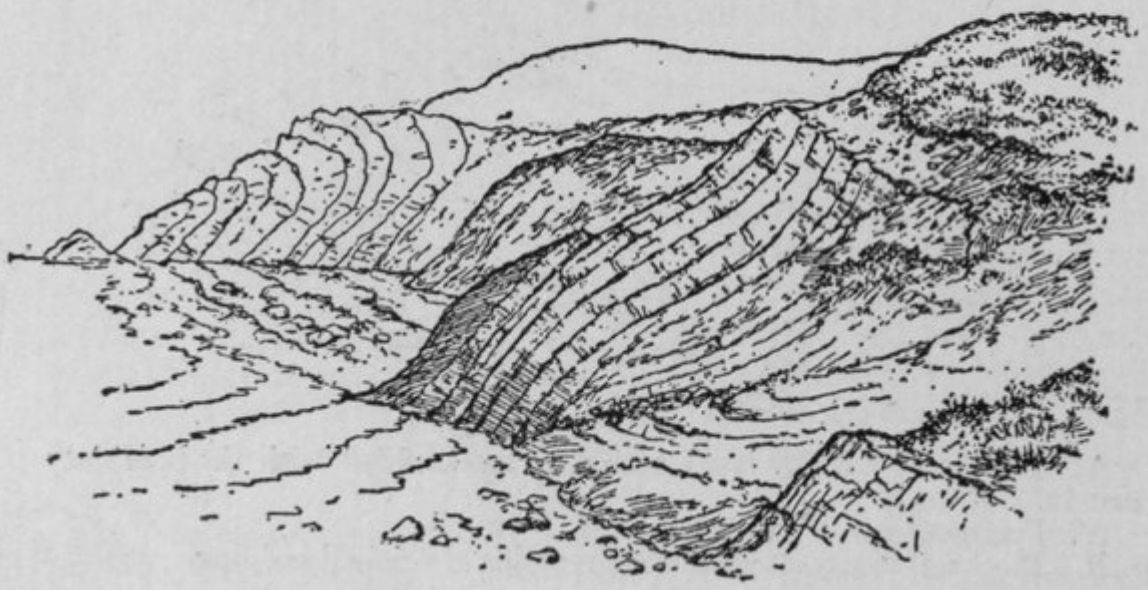


A. Portion of a flaggy band with deep cracks filled with the blue slaty matrix.
A′. Fragment just separated from A.
B. Blocks of flaggy slate showing remains of original bedding.

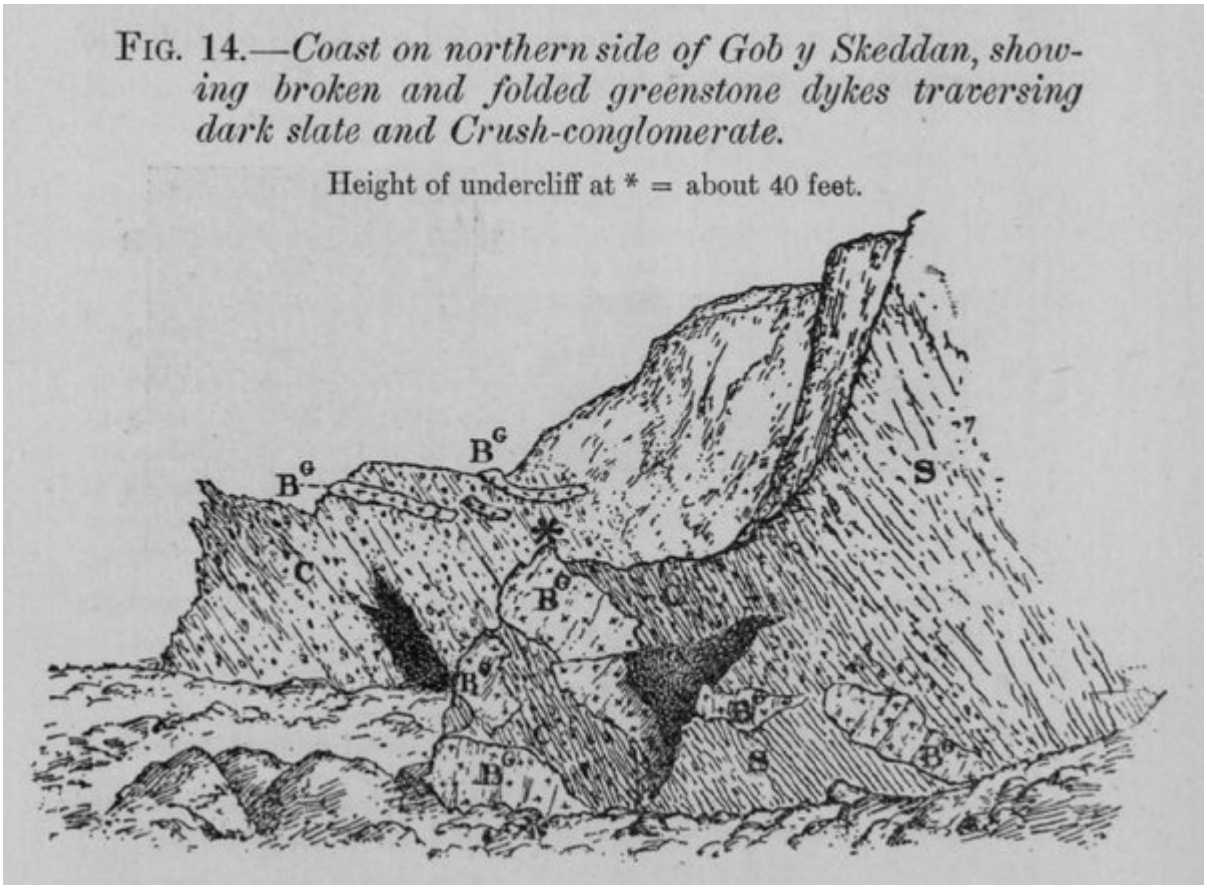
(Figure 12) Plan of Crush-conglomerate in floor of a cave south of Gob y Deigan, showing breaking-up of flaggy inclusions. Area, about 9 square feet. A. Portion of a flaggy band with deep cracks filled with the blue slaty matrix. A′. Fragment just separated from A. B. Blocks of flaggy slate showing remains of original bedding.

FIG. 13.—*Folded flags at margin of Crush-conglomerate at Ballanayre Strand. Cliff capped by glacial drift.*

Height about 60 feet.



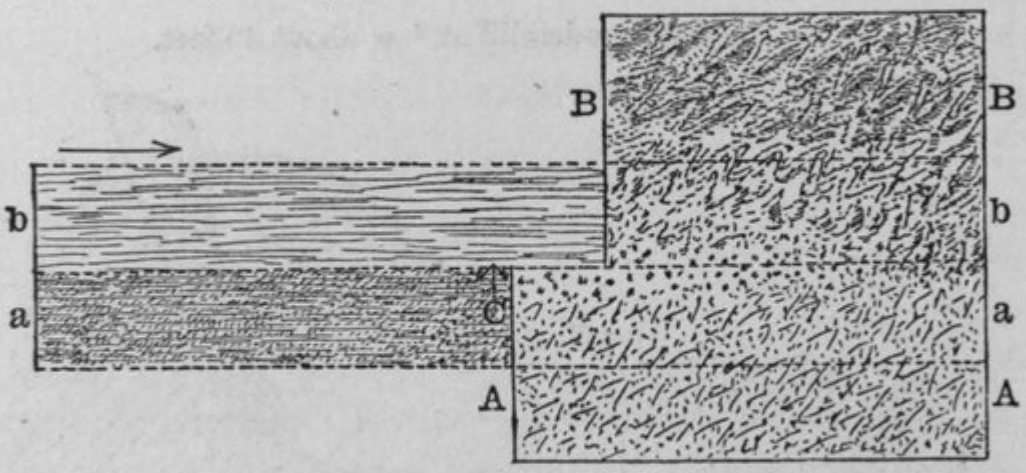
(Figure 13) Folded flags at margin of Crush-conglomerate at Ballanayre Strand. Cliff capped by glacial drift. Height about 60 feet.



*(Figure 14) Coast on northern side of Gob y Skeddan, showing broken and folded greenstone dykes traversing dark slate and Crush-conglomerate. Height of undercliff at * = about 40 feet. S. Dark slate, greatly sheared, but still occasionally showing traces of bedding. Quartz veins abundant. C. Crush-conglomerate. B^G.Palish 'greenstone' dykes; the upper and lower bands of BG in the foreground unite on the farther side of the nearer headland.*

FIG. 15. *Diagram to illustrate the production of crush-conglomerate where strong lateral pressure has affected a rock-system constituted of strata of different resistant qualities* (*compare Fig.* 7, *p.* 61).

(From Quart. Journ. Geol. Soc., vol. li.).

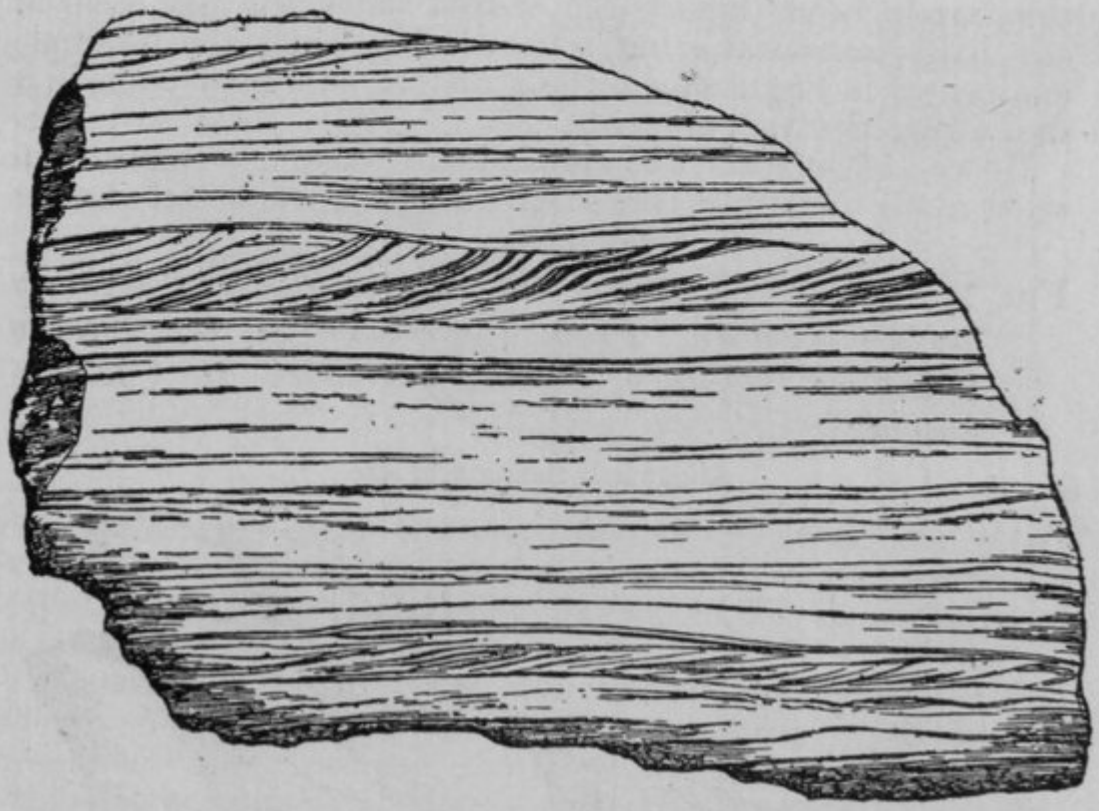


b—b (between dotted lines). Original position of argillaceous beds passing gradually downwards into a—a.
a—a (between dotted lines). Original position of sandy beds.
B—B. Argillaceous beds (slates) after compression.
A—A. Sandy beds (flaggy grits) after compression.
C. Zone of shearing and brecciation due to re-adjustment between B and A.
The strata are supposed to have been driven in from the side indicated by the horizontal arrow, which marks the direction of movement.

(Figure 15) Diagram to illustrate the production of crush-conglomerate where strong lateral pressure has affected a rock-system constituted of strata of different resistant qualities (compare (Figure 7), p. 61). (From Quart. Journ. Geol. Soc., vol. li.). b—b (between dotted lines). Original position of argillaceous beds passing gradually downwards into a—a. a—a (between dotted lines). Original position of sandy beds. B—B. Argillaceous beds (slates) after compression. A—A. Sandy beds (flaggy grits) after compression. C. Zone of shearing and brecciation due to re-adjustment between B and A. The strata are supposed to have been driven in from the side indicated, by the horizontal arrow, which marks the direction of movement.

FIG. 16. *Laminated slate with disturbed bedding simulating cross-bedding. From a specimen in the Survey Collection obtained near Ramsey.*

About two-thirds natural size.

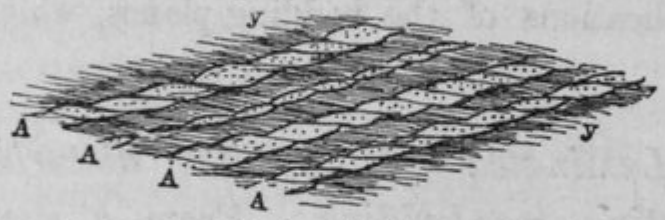


(Figure 16) Laminated slate with disturbed bedding simulating cross-bedding. From a specimen in the Survey Collection obtained near Ramsey. About two-thirds natural size.

FIG. 17. *Section in crag on western side of Sulby Glen, west of bench-mark* 137′ 6″ *(six-inch map, sheet* 4), *showing method of production of pseudo-ripple marking by strain-slip-faulting.*

(From Quart. Journ. Geol. Soc., vol. li. Compare Fig. 18.)

Length, about 2 feet.



A A A. Bands of grit 1 to 3 inches thick, cut displaced and lengthened by (y—y) oblique strain-slip planes. Dark slate, much sheared, between the grit-bands.

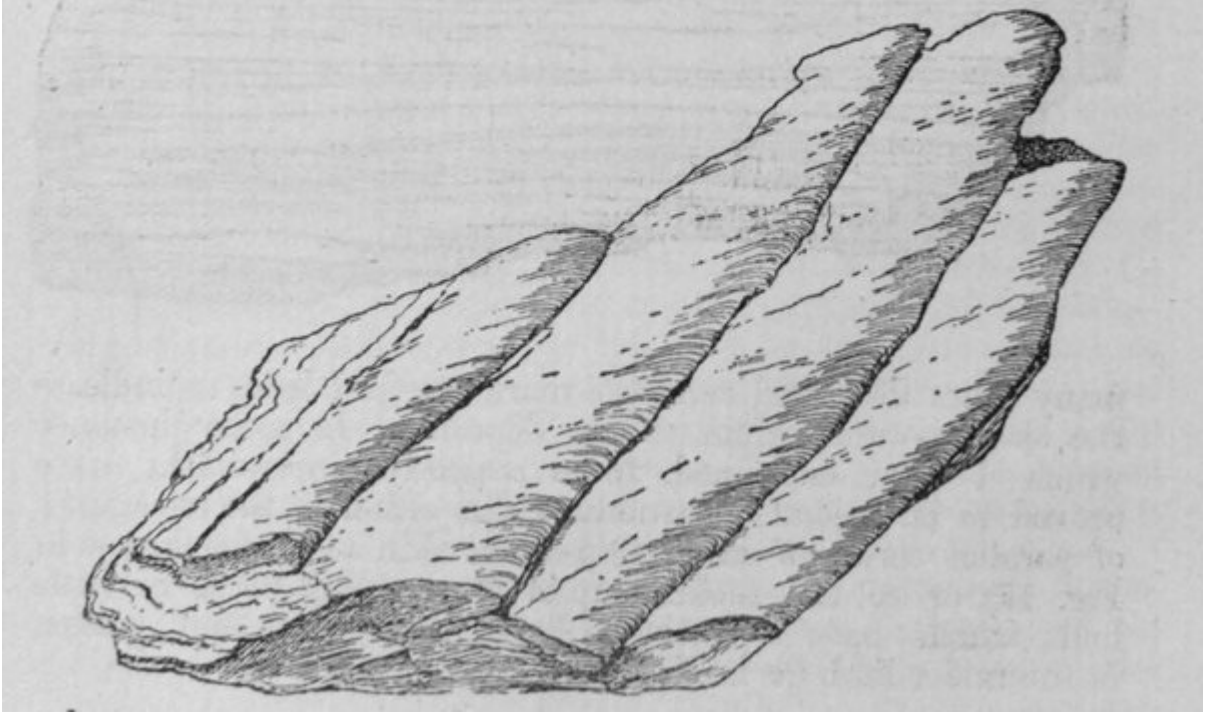
This pseudo-ripple-marking is commonly developed in the thin sandy bands among the striped slates, but may occur in any hard seam traversing softer beds. Thus, the example represented in Fig.19 shows the structure, on a small scale, in a thin segregation-vein of quartz.

Hence, although the rocks are in many places of a character in which ripple-marking may once have existed,it is doubtful whether

(Figure 17) Section in crag on western side of Sulby Glen, west of bench-mark 137′ 6″ (six-inch map, sheet 4), showing method of production of pseudo-ripple marking by strain-slip faulting. (From Quart. Journ. Geol. Soc., vol. B. Compare (Figure 18)) A A A. Bands of grit 1 to 3 inches thick, cut displaced and lengthened by (y—y) oblique strain-slip planes. Dark slate, much sheared, between the grit-bands.

FIG. 18. *Rock-rippling of thin gritty layer in slate by earth-morement. From a specimen in the Survey Collection obtained on the foreshore at Cass-ny-hawin.*

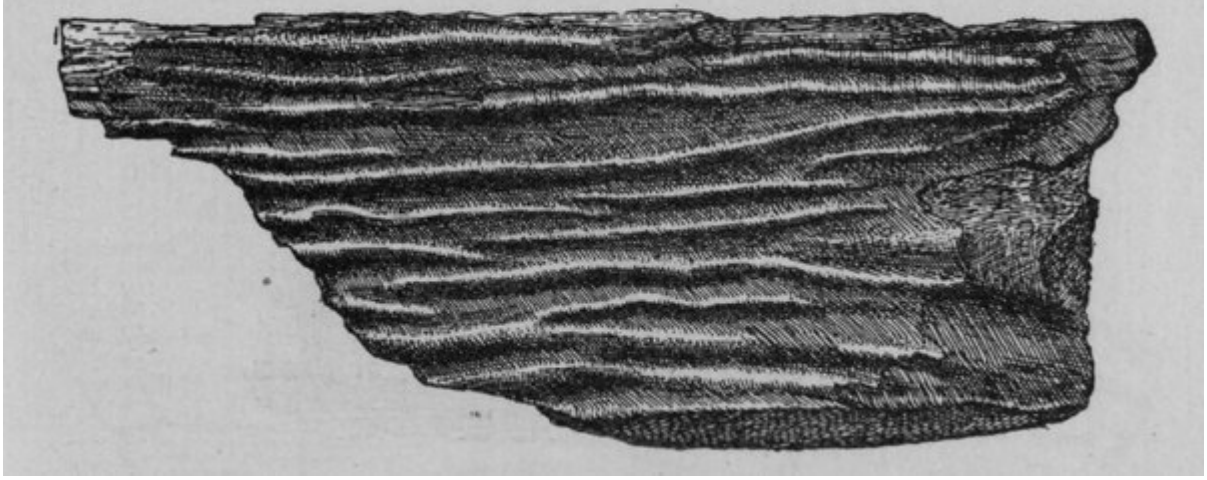
About half the natural size.



(Figure 18) Rock-rippling of thin gritty layer in slate by earth-morement. From a specimen in the Survey Collection obtained on the foreshore at Cass-ny-hawin. About half the natural size.

FIG. 19. *Rock-rippling affecting thin quartz vein in slate. From a specimen in the Survey Collection obtained on the slope beneath Gob y Volley.*

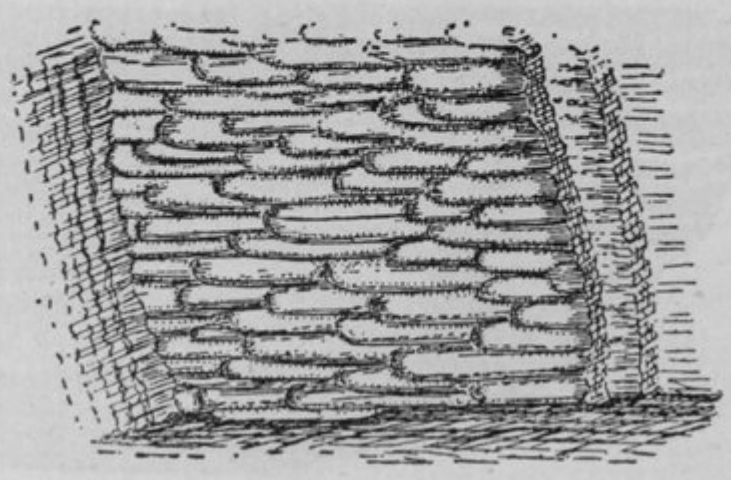
Slightly reduced.



(Figure 19) Rock-rippling affecting thin quartz vein in slate. From a specimen in the Survey Collection obtained on the slope beneath Gob y Volley Slightly reduced.

FIG. 20. *Corrugated surface of grit-band in flaggy slate, in west bank of gully south-west of Fistard village near Port St. Mary.*

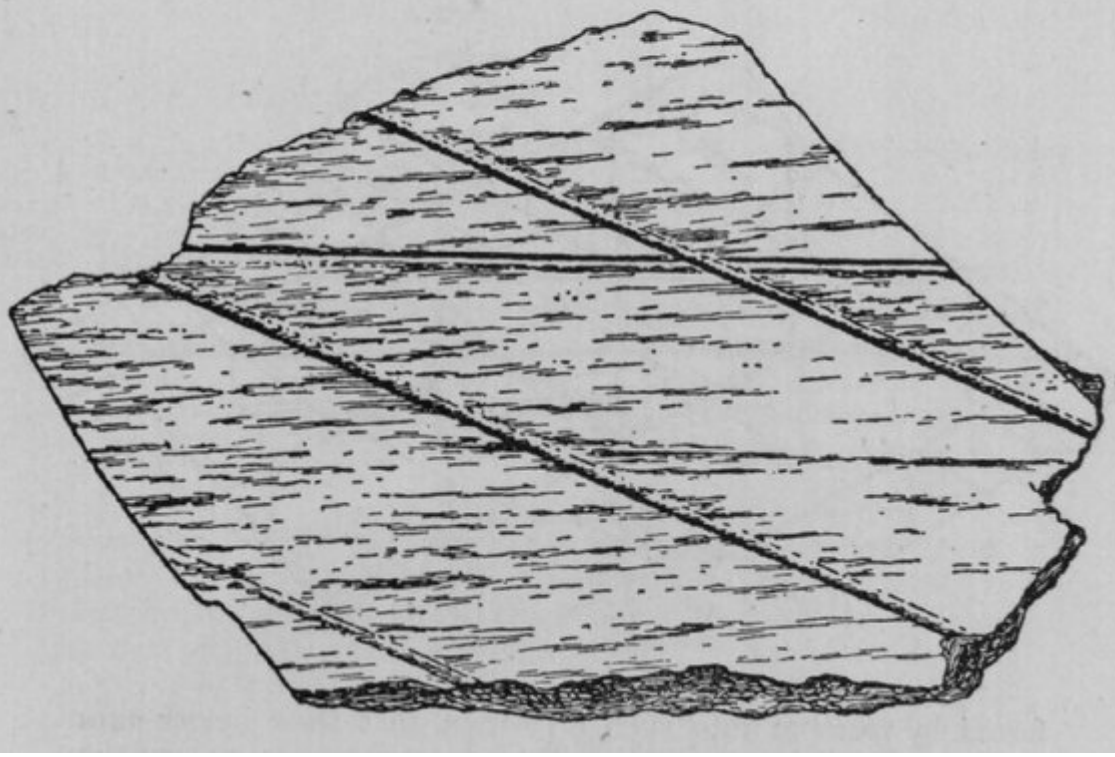
Dimensions, 12 inches by 8 inches; the finger-like ridges are from ½ to 1½ inches broad.



(Figure 20) Corrugated surface of grit-band in flaggy slate, in west bank of gully south-west of Fistard village near Port St. Mary. Dimensions, 12 inches by 8 inches; the finger-like ridges are from ½ to 1½ inches broad.

FIG. 21. *Puckerings on bedding-plane of fine-grained flags (Niarbyl Flags); from specimen in the Survey Collection obtained on the coast near Dalby Point.*

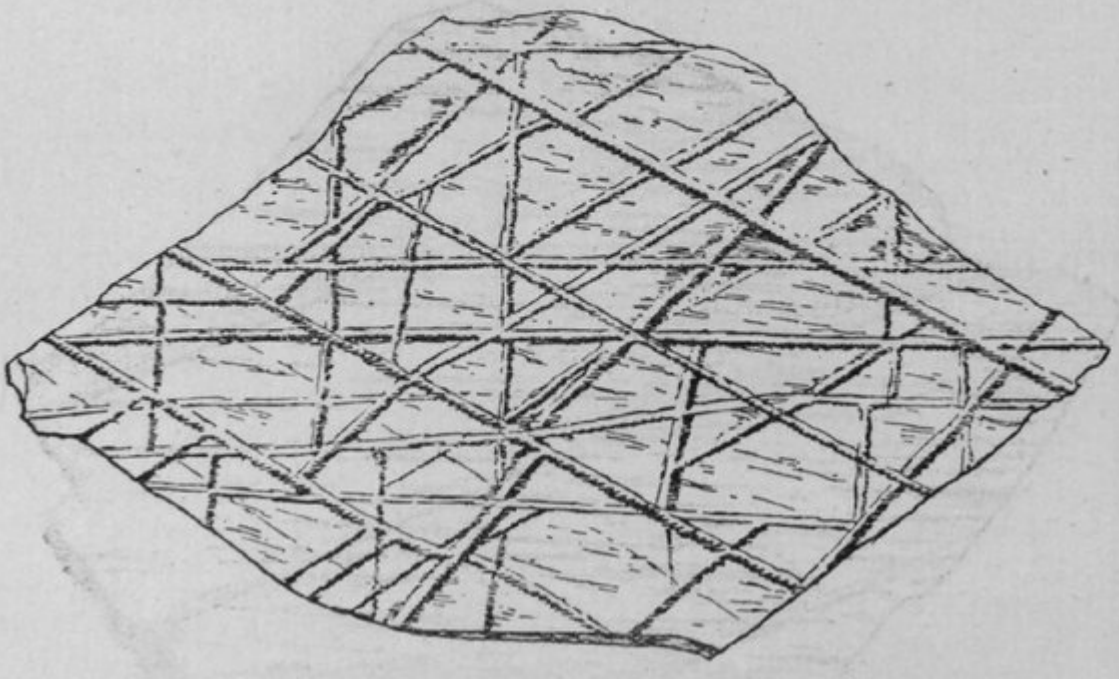
About one-third natural size.



(Figure 21) Puckerings on bedding-plane of fine-grained flags (Niarbyl Flags); from specimen in the Survey Collection obtained on the coast near Dalby Point. About one-third natural size.

FIG. 22. *Tessellated puckering on bedding-plane of Niarbyl Flags; from specimen in the Survey Collection obtained on the coast near Dalby Point.*

About one-third natural size.



(Figure 22) Tessellated puckering on bedding-plane of Niarbyl Flags; from specimen in the Survey Collection obtained on the coast near Dalby Point. About one-third natural size.

FIG. 23. *Crest of fold in Niarbyl Flags in cliff at northern side of The Ladder, Contrary Head.*

(From Quart. Journ. Geol. Soc., vol. li.).

Length, 4 feet.

A, A. Pale band in slaty flags, pulled apart into pebble-like lenticles 1 to 2 inches in length.

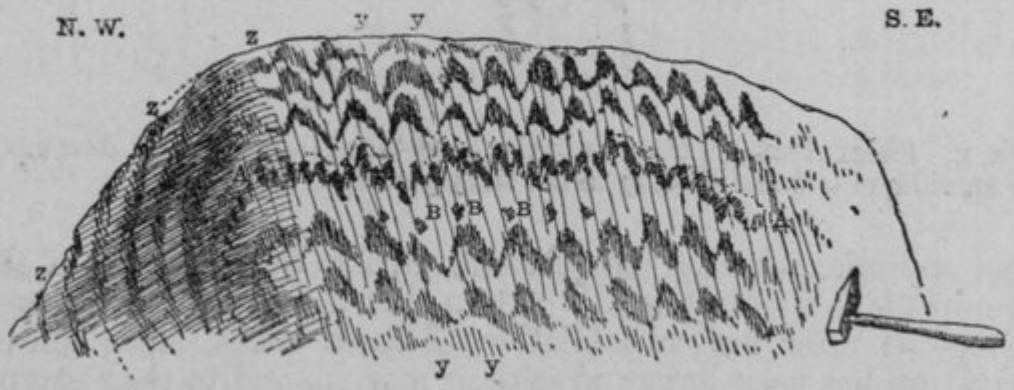
y, y. Faintly-developed planes of strain-slip.

(Figure 23) Crest of fold in Niarbyl Flags in cliff at northern side of The Ladder, Contrary Head. (From Quart. Journ. Geol. Soc., vol. li.). Length, 4 feet. A, A. Pale band in slaty flags, pulled apart into pebble-like lenticles 1 to 2 inches in length. y, y. Faintly-developed planes of strain-slip.

FIG. 24. *Crag of strongly-banded sandy slate in eastern bank of Sulby River below Snaefell, (450 yards north of "Lead-mine" of six-inch map, Sheet 7).*

(From Quart. Journ. Geol. Soc., vol. li.).

Length, about 5 feet.



A, A. Grit-band, about ½ inch thick, crumpled and partially broken, among puckered slates.

B, B, B. Isolated pebble-like fragments of grit, apparently squeezed out from the band A.

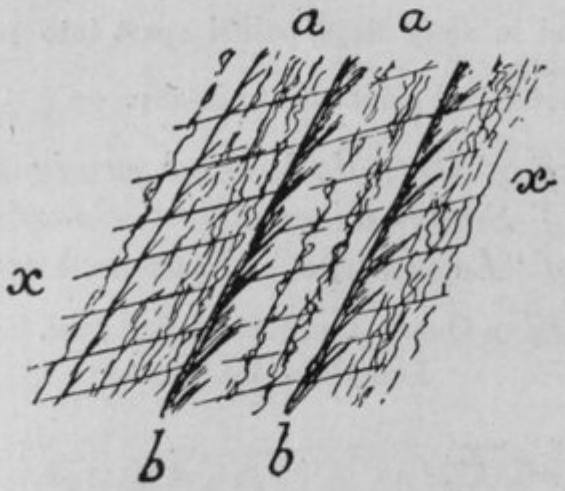
y, y. Strain-slip planes, cutting and displacing the bedding.

z, z. Later 'shear-cleavage,' with the same strike as the bedding (N. 40° W.) but a different degree of dip (about 30°).

(Figure 24) Crag of strongly-banded sandy slate in eastern bank of Sulby River below Snaefell, (450 yards north of "Lead-mine" of six-inch map, (Sheet 7)). (From Quart. Journ. Geol. Soc., vol. li.). Length, about 5 feet. A, A. Grit-band, about ½ inch thick, crumpled and partially broken, among puckered slates. B, B, B. Isolated pebble-like fragments of grit, apparently squeezed out from the band A. y, y. Strain-slip planes, cutting and displacing the bedding. z, z. Later 'shear-cleavage', with the same strike as the bedding (N. 40° W.) but a different degree of dip (about 30°).

FIG. 25. *Diagram of edges of pale flaggy mudstones (a, a) with thin dark blue slaty partings (b, b).*

Natural size.



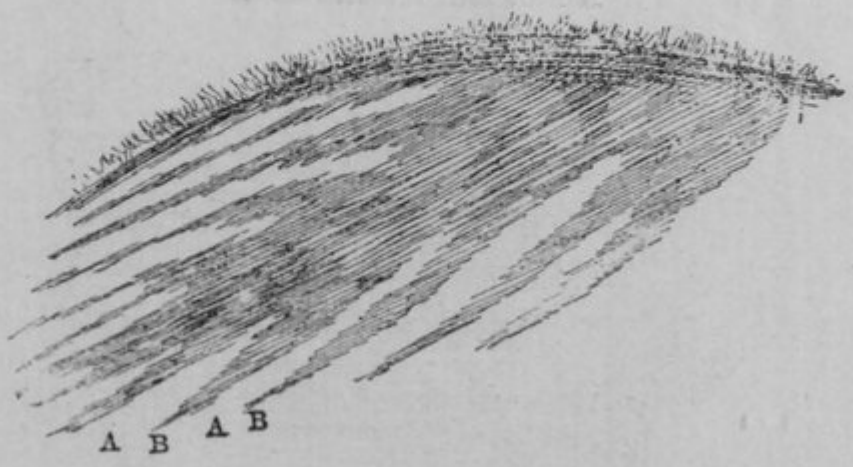
x, x. Shear-cleavage, obscure in the mudstones, but strongly developed as an oblique serrated frilling in the slaty partings.

(Figure 25) Diagram of edges of pale flaggy mudstones (a, a) with thin dark blue slaty partings (b, b). Natural size. x, x. Shear-cleavage, obscure in the mudstones, but strongly developed as an oblique serrated frilling in the slaty partings.

FIG. 26. *Section in crag on western slope of Glen Dhoo, Ballaugh (opposite "T. Mill" of 6 inch map, Sheet 7), showing extreme shearing of strata in the crest of a fold.*

(From Quart. Journ. Geol. Soc., vol. li.)

Length, about 3 feet.



A, A, Sandy and B, B, slaty bands, fairly well defined in the limbs of the fold, but frayed out into reconstructed schistose material in the crest.

(Figure 26) Section in crag on westernslope of Glen Dhoo, Ballaugh (opposite "T. Mill" of 6 inch map, (Sheet 7)), showing extreme shearing of strata in the crest of a fold. (From Quart. Journ. Geol. Soc., vol. li.) Length, about 3 feet. A, A, Sandy and B, B, slaty bands, fairly well defined in the limbs of the fold, but frayed out into reconstructed schistose material in the crest.

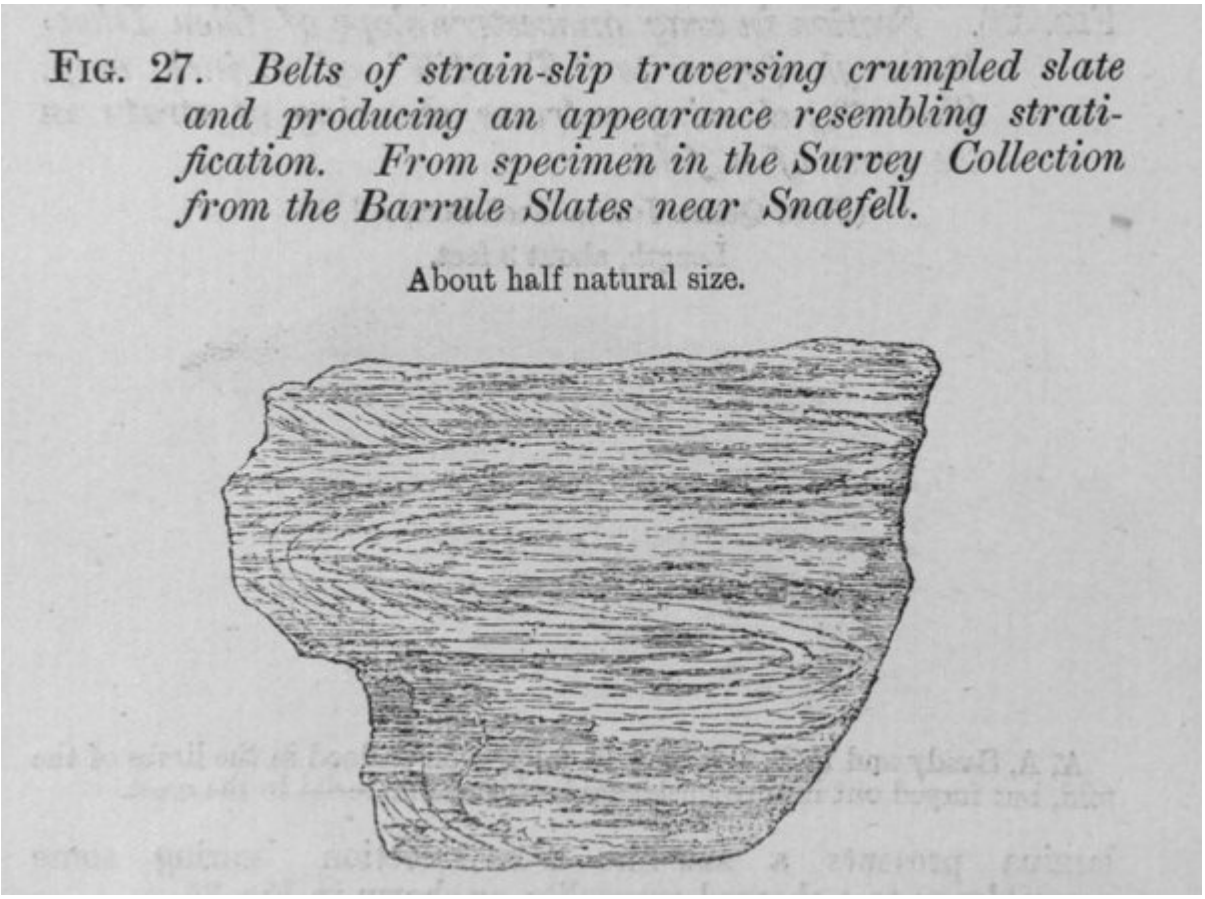
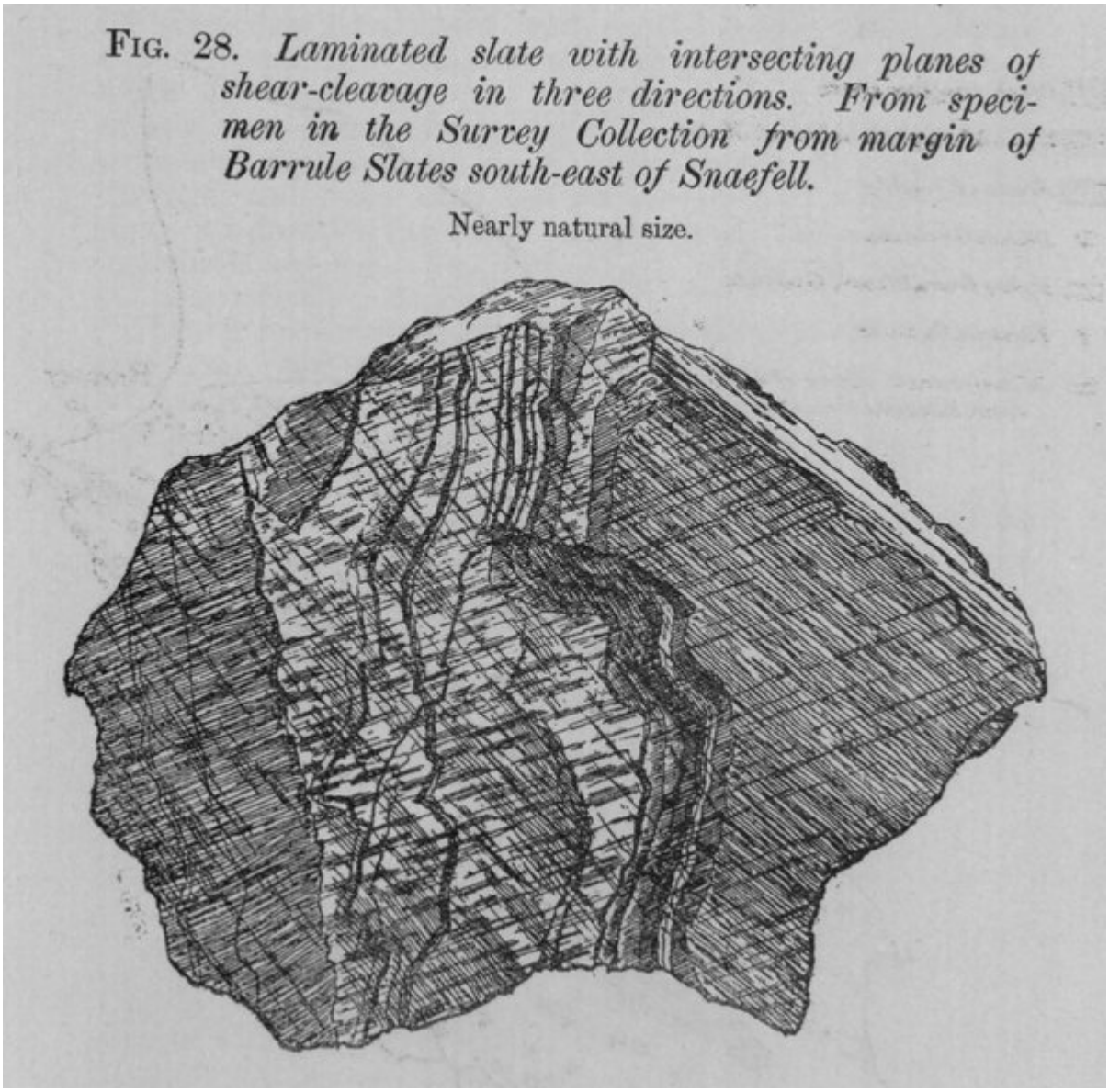


FIG. 27. *Belts of strain-slip traversing crumpled slate and producing an appearance resembling stratification. From specimen in the Survey Collection from the Barrule Slates near Snaefell.*

About half natural size.

(Figure 27) Belts of strain-slip traversing crumpled slate and producing an appearance resembling stratification. From specimen in the Survey Collection from the Barrule Slates near Snaefell. About half natural size.



(Figure 28) Laminated slate with intersecting planes of shear-cleavage in three directions. Front specimen in the Survey Collection from margin, of Barrule Slates south-east of Snaefell. Nearly natural size.

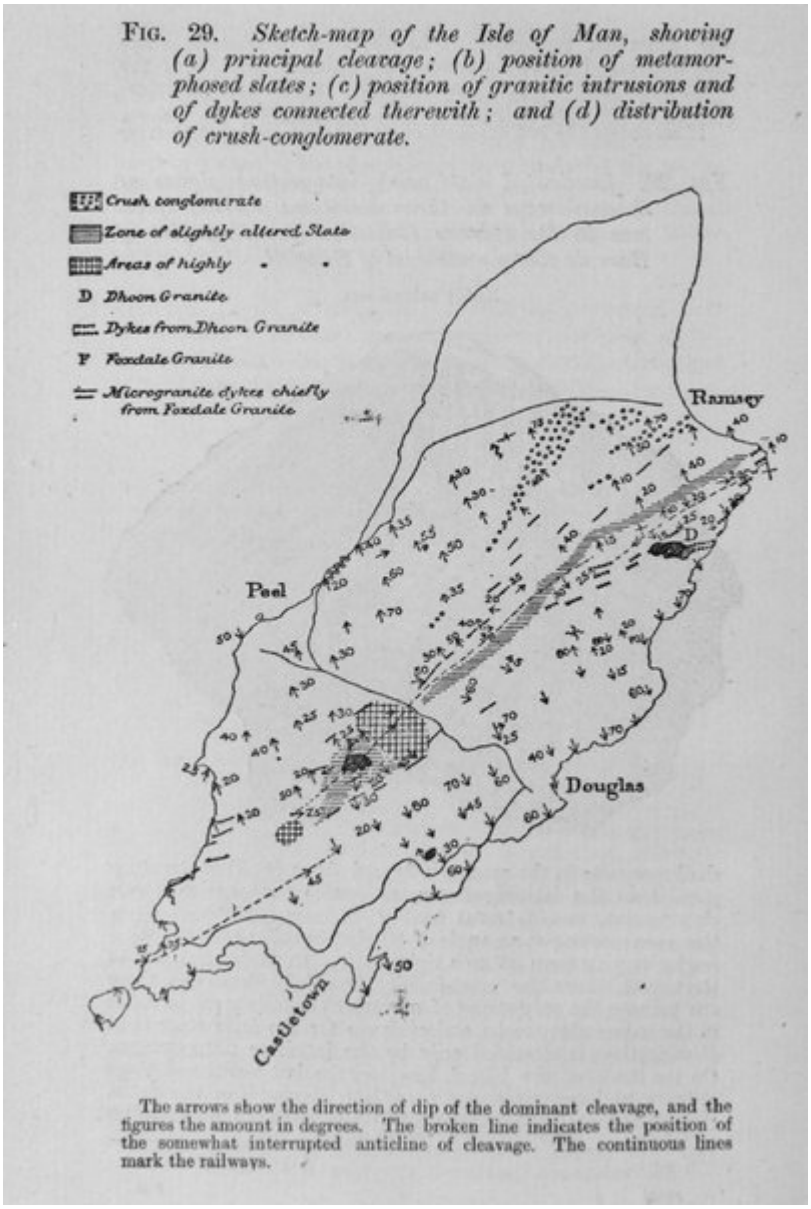
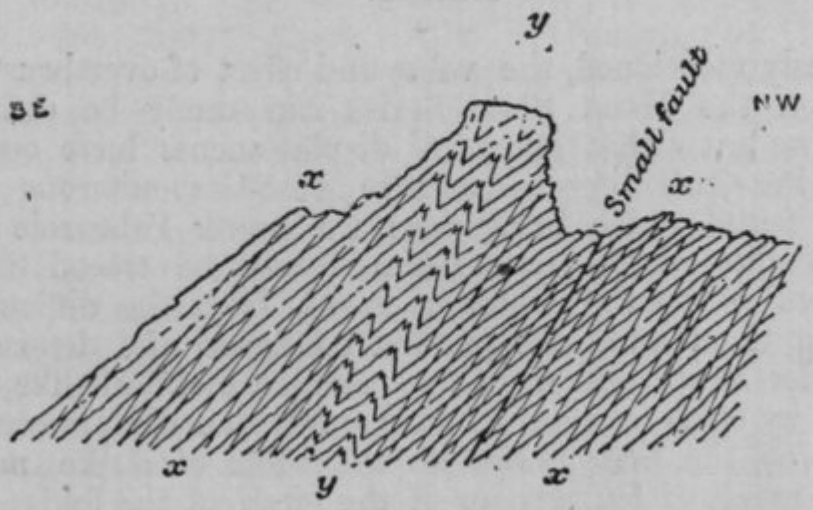


FIG. 29. *Sketch-map of the Isle of Man, showing (a) principal cleavage; (b) position of metamorphosed slates; (c) position of granitic intrusions and of dykes connected therewith; and (d) distribution of crush-conglomerate.*

(Figure 29) Sketch-map of the Isle of Man, showing (a) principal cleavage; (b) position of metamorphosed slates; (c) position of granitic intrusions and of dykes connected therewith; and (d) distribution of crush-conglomerate. The arrows show the direction of dip of the dominant cleavage, and the figures the amount in degrees. The broken line indicates the position of the somewhat interrupted anticline of cleavage. The continuous lines mark the railways.

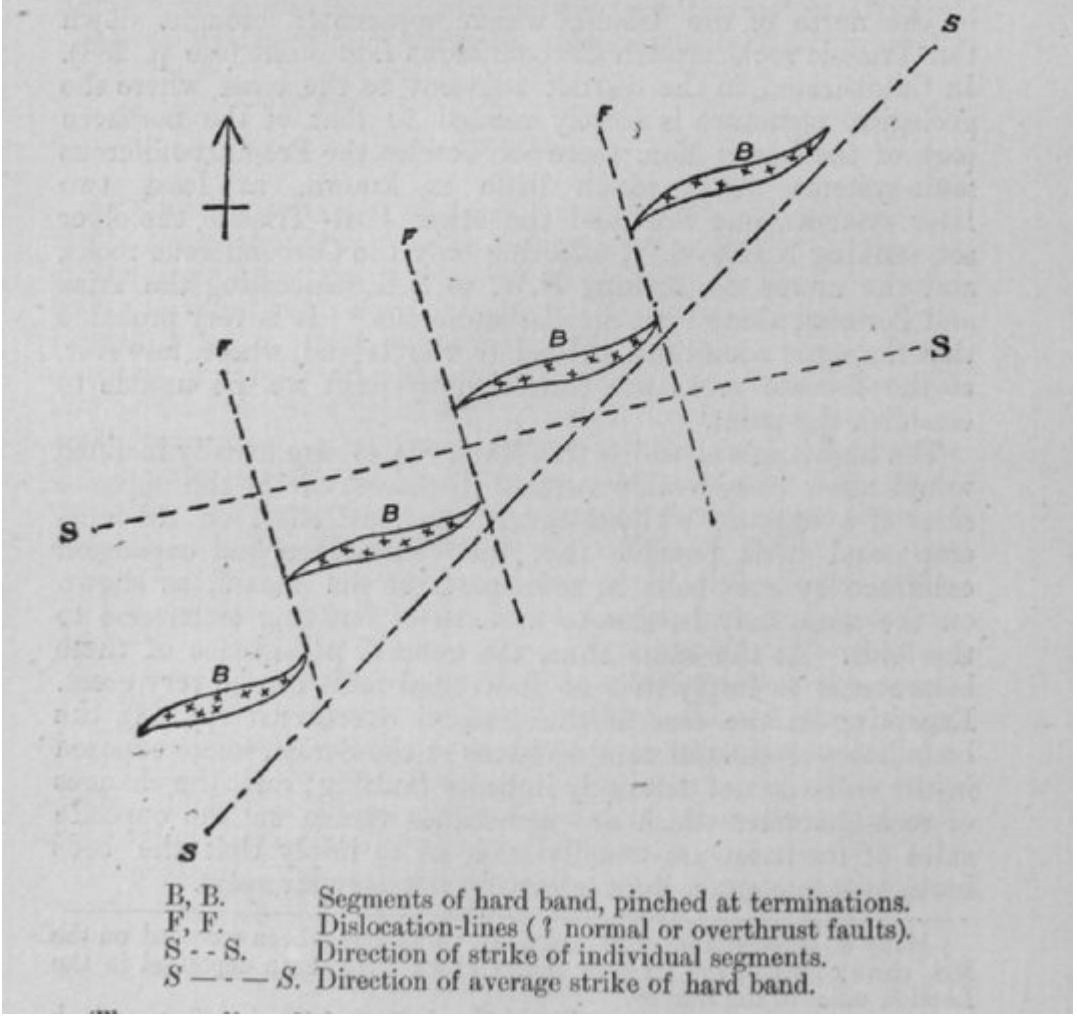
FIG. 30. *Section in Lonan Flags at foot of cliff on north side of the North Pier at Laxey, showing agreement between axial plane of folds and cleavage.*



x—x. Obscure cleavage in same direction as bedding but at a steeper angle.
y—y. Axial plane of small fold

(Figure 30) Section in Lonan Flags at foot of cliff on north side of the North Pier at Laxey, showing agreement between axial plane of folds and cleavage. x—x. Obscure cleavage in same direction as bedding but at a steeper angle. y—y. Axial plane of small fold.

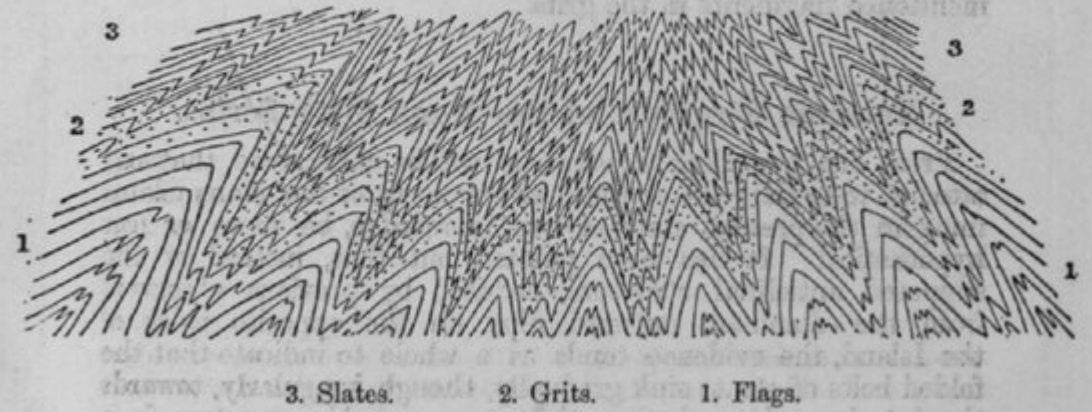
FIG. 31.—*Diagram (plan) to illustrate common structure in hard bands, whether dykes or layers of grit, in Manx Slates; showing divergence between strike of segments and strike of band as a whole.*



B, B. Segments of hard band, pinched at terminations.
F, F. Dislocation-lines (? normal or overthrust faults).
S - - S. Direction of strike of individual segments.
S — - — S. Direction of average strike of hard band.

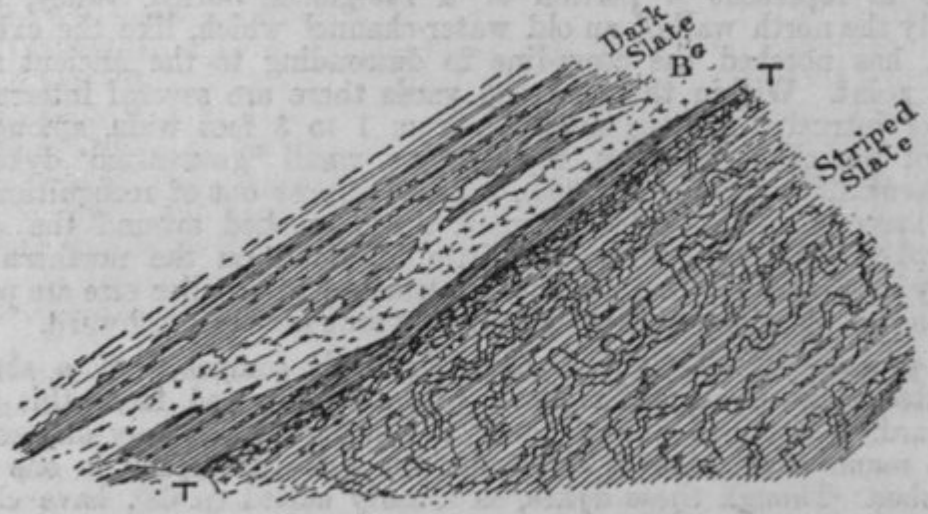
(Figure 31) Diagram (plan) to illustrate common structure in hard bands, whether dykes or layers of grit, in Mans Slates; showing divergence between strike of segments and strike of band as a whole. B, B. Segments of hard band, pinched at terminations. F, F. Dislocation-lines (I normal or overthrust faults). S- -S.Direction of strike of individual segments. S — - — S. Direction of average strike of hard band.

FIG. 32. *Ideal section through synclinorium of Manx Slates.*



(Figure 32) Ideal section through synclinorium of Manx Slates. 3. Slates.2. Grits. 1. Flags.

FIG. 33. *Section at base of cliff on south side of Gob y Deigan.*



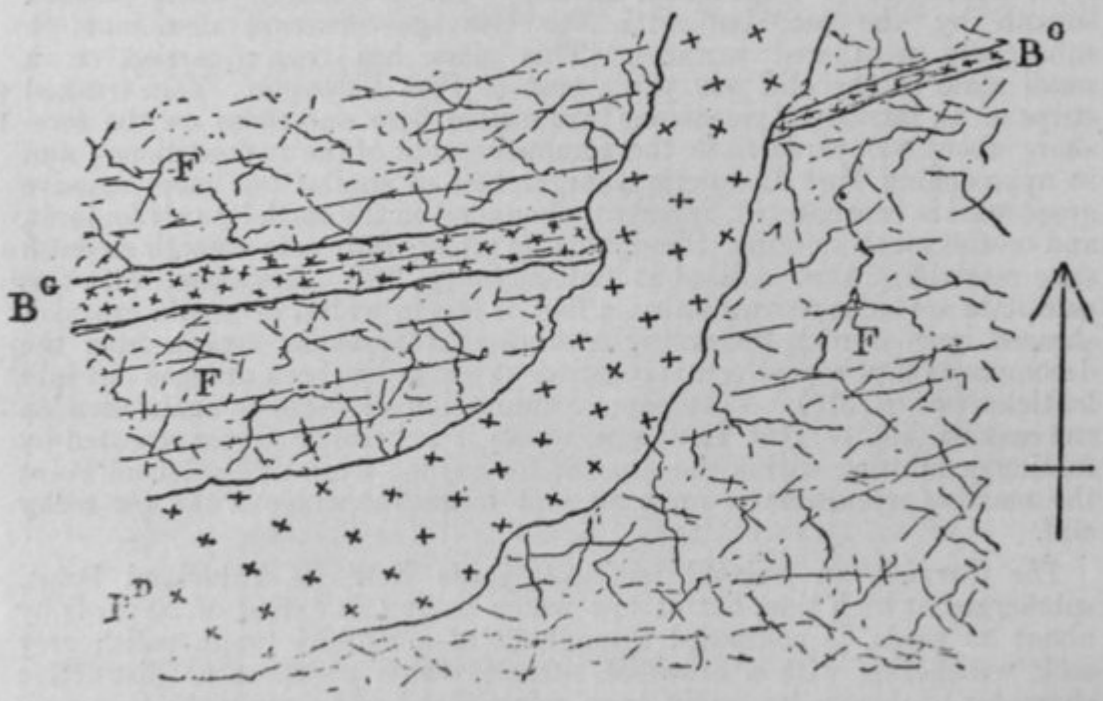
Bᴳ. Crushed and torn greenstone dyke traversed by quartz strings. Thickness about 4 feet.

T. Thrust-plane, with brecciated slate, passing into crumpled slate below.

(Figure 33) Section at base of cliff on south side of Gob y Deigan. B^{G}- Crashed and torn greenstone dyke traversed by quartz strings. Thickness about 4 feet. T. Thrust-plane, with brecciated slate, passing into crumpled slate below.

FIG. 34. *Ground-plan of portion of foreshore in Port e Myllin, near Ramsey, showing igneous complex.*

14 feet × 10 feet.



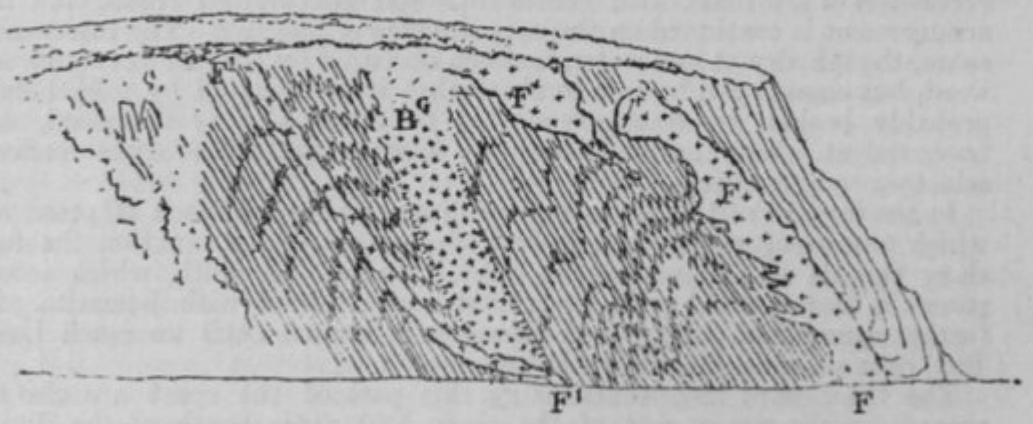
B^D. 'Newer Greenstone' dyke, yellowish-brown in colour, uncrushed, 4 feet thick; traversing F and intersecting B .

B^G. 'Older Greenstone' dyke, spotted yellowish-green, 3 to 6 inches thick, traversing F; greatly sheared and pinched, especially to the east ward of B^D.

F. Crushed felsitic mass, pale greenish-gray colour, intensely sheared and full of criss-cross quartz-strings.

(Figure 34) Ground-plan of portion of foreshore in Port e Myllin, near Ramsey, showing igneous complex. 14 feet x 10 feet. B^D. 'Newer 'greenstone' dyke, yellowish-brown in colour, uncrushed, 4 feet thick; traversing F and intersecting B. B^G. Older 'greenstone' dyke, spotted yellowish-green, 3 to 6 inches thick, traversing F; greatly sheared and pinched, especially to the east ward of B^D. F. Crushed felsitic mass, pale greenish-gray colour, intensely sheared and full of criss-cross quartz-strings.

FIG. 35. *Cliff-section in Lonan Flags on north-eastern side of Traie ny Uainaigue, Maughold. Height* 60 *feet.*



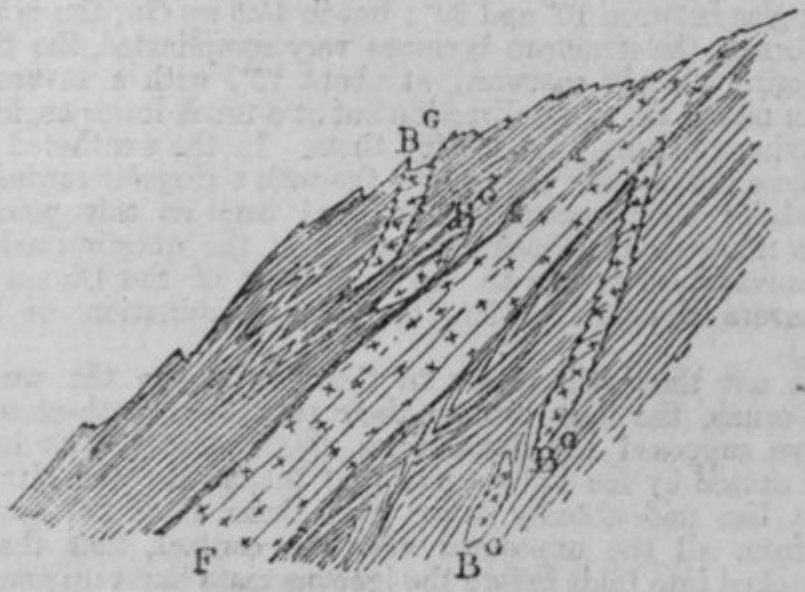
B^G Much-sheared 'greenstone' dyke, 8 to 12 feet thick.

F. Micro-granite dyke (Dhoon Granite type).

F^1. Porphyritic dyke, probably connected with the micro-granite, intersecting B^G at the foot of the cliff.

(Figure 35) Cliff-section in Lonan Flags on north-eastern side of Traie ny Uainaigue, Maughold. Height 60 feet. B^G Much-sheared 'greenstone' dyke, 8 to 12 feet thick. F. Micro-granite dyke (Dhoon Granite type). F'. Porphyritic dyke, probably connected with the micro-granite, intersecting B at the foot of the cliff.

FIG. 36. *Section at foot of cliff under Barony Hill, showing contorted Lonan Flags traversed by dykes of two different ages, viz.:—greenstone (older) and micro-granite (newer).*



B^G. Greatly-sheared greenstone dyke, about 2½ feet thick, broken and faulted by F.

F. Micro-granite dyke (Dhoon type), 6 to 10 feet thick, rendered schistose at the margin by shearing.

(Figure 36) Section at foot of cliff under Barony Hill, showing contorted Lonan Flags traversed by dykes of two different ages, viz.: greenstone (older) and micro-granite (newer). B^G. Greatly-sheared greenstone dyke, about 2½ feet thick, broken and faulted by F. F. Micro-granite dyke (Dhoon type), 6 to 10 feet thick, rendered schistose at the margin by shearing.

FIG. 37. *Section of grits and slates, showing torsion; in crag on hillside S.E. of Glendhoo Farm, in Glen Dhoo, Ballaugh.*

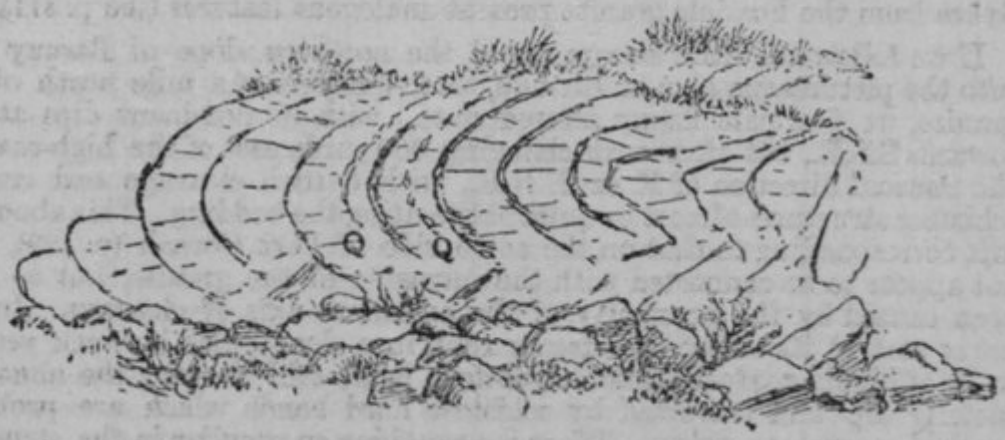
(From Quart. Journ. Geol. Soc. vol. li.)

Length, about 2 feet.

A, A, A. Grit bands in sheared slates, broken by strain-slip (y—y) and each segment partly turned on its axis.

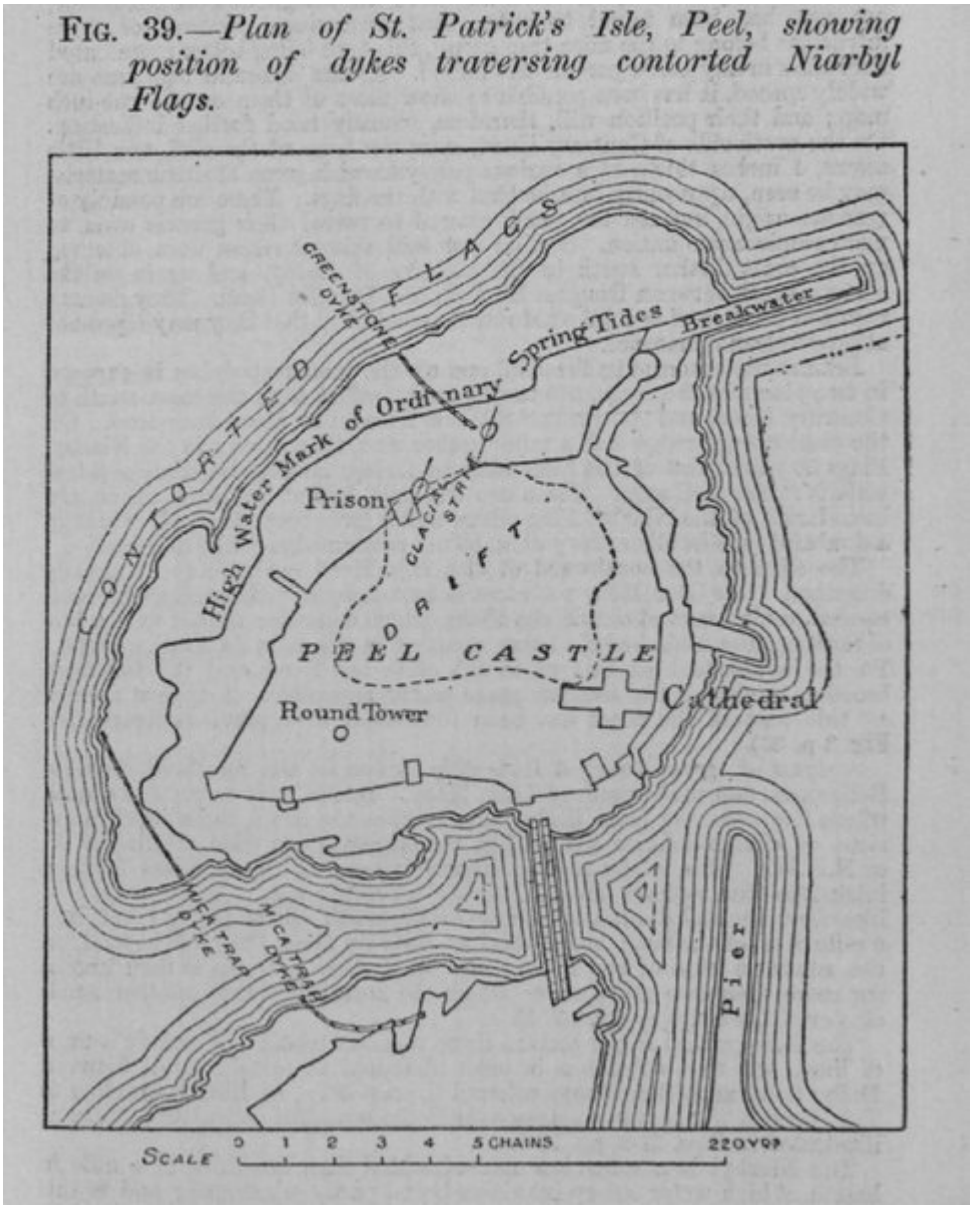
(Figure 37) Section of grits and slates, showing torsion; in crag on hillside S.E. of Glendltoo Farm, in Glen Dhoo, Ballaugh. (From Quart. Journ. Geol. Soc. vol. li.) Length, about 2 feet. A, A, A. Grit bands in sheared slates, broken by strain-slip (y—y) and each segment partly turned on its axis.

FIG. 38. *Granite crag under Ordnance station on shoulder of Slieau Ruy W.S.W of Ballelin, exhibiting curved structure (not like concentric weathering) probably due to movement. Height about 8 feet.*



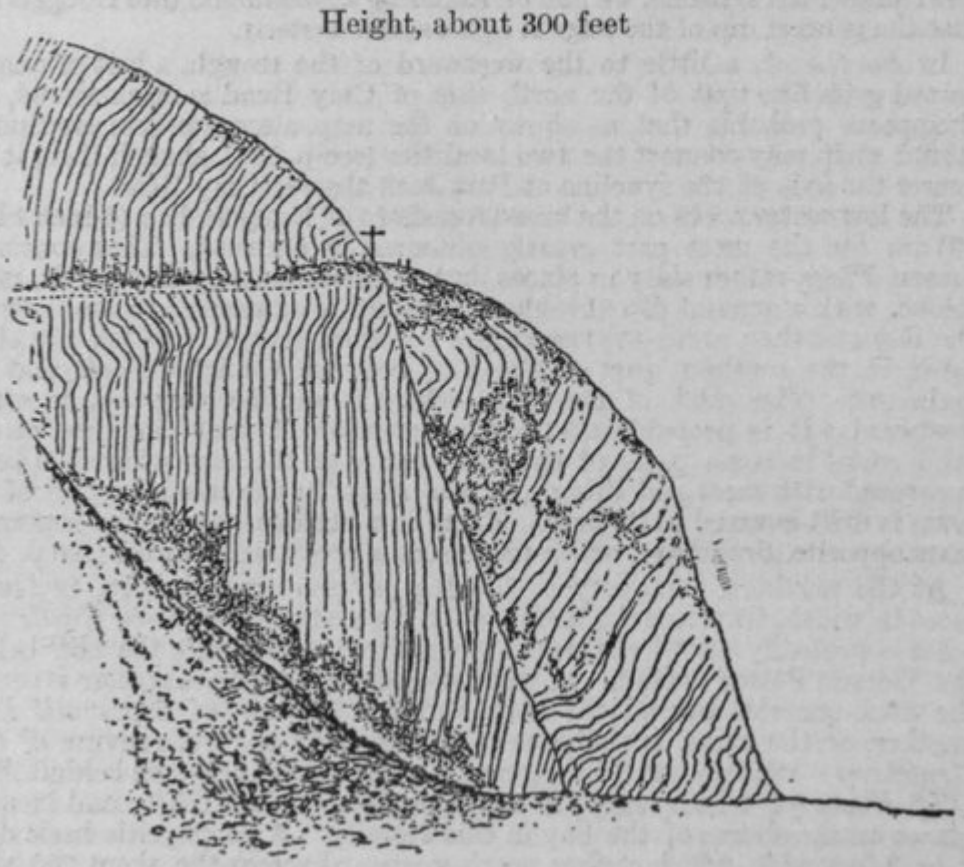
Q. Small quartz-veins participating in the curved arrangement.

(Figure 38) Granite crag under Ordnance station on shoulder of Slieau Ruy W.S W of Ballelin, exhibiting curved structure (not like concentric weathering) probably due to movement. Height about 8 feet. Q. Small quartz-veins participating in the curved arrangement.



(Figure 39) —Plan of St. Patrick's Isle, Peel, showing position of dykes traversing contorted Niarbyl Flags.

FIG. 40. *Diagram of cliff at The Whing, north-east of Port Soderick, showing varying inclination of bedding-planes of gritty flags between summit and base of section.*

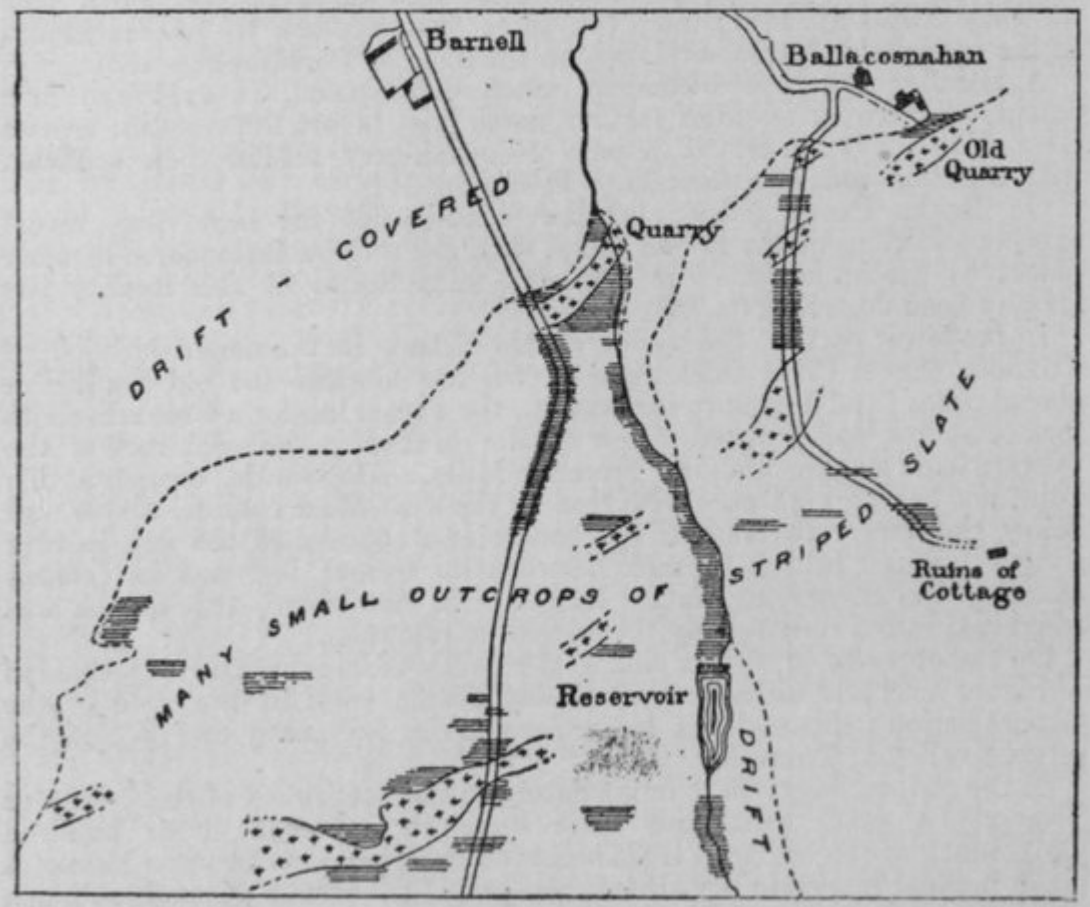


NOTE.—The tramway cutting is indicated in the upper part of the cliff.

(Figure 40) Diagram of cliff at The Whing, north-east of Port Soderick, showing varying inclination of bedding-planes of gritty flags between summit and base of section. Height about 300 feet. Note.—The tramway cutting is indicated in the upper part of the cliff.

FIG. 41. *Plan of irregular outcrops of greenstone south of Barnell, Kirk Patrick.*

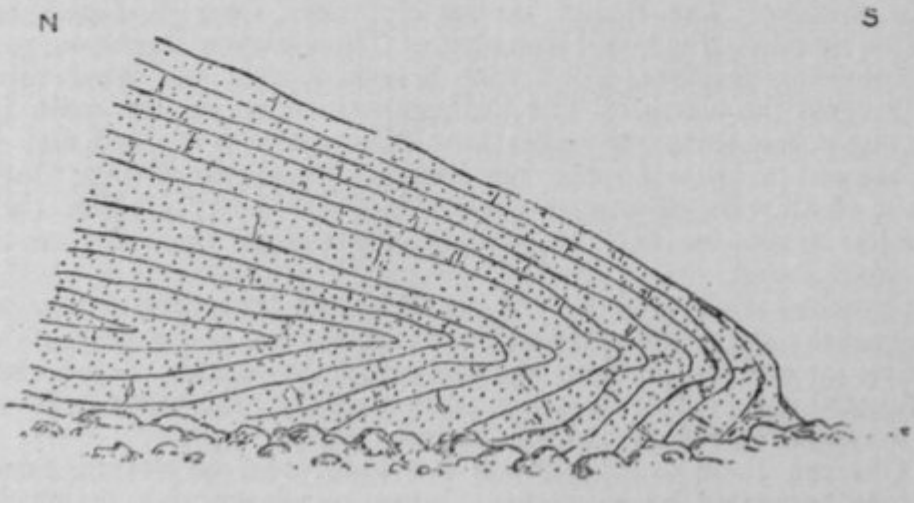
Scale, 6 inches = one mile.



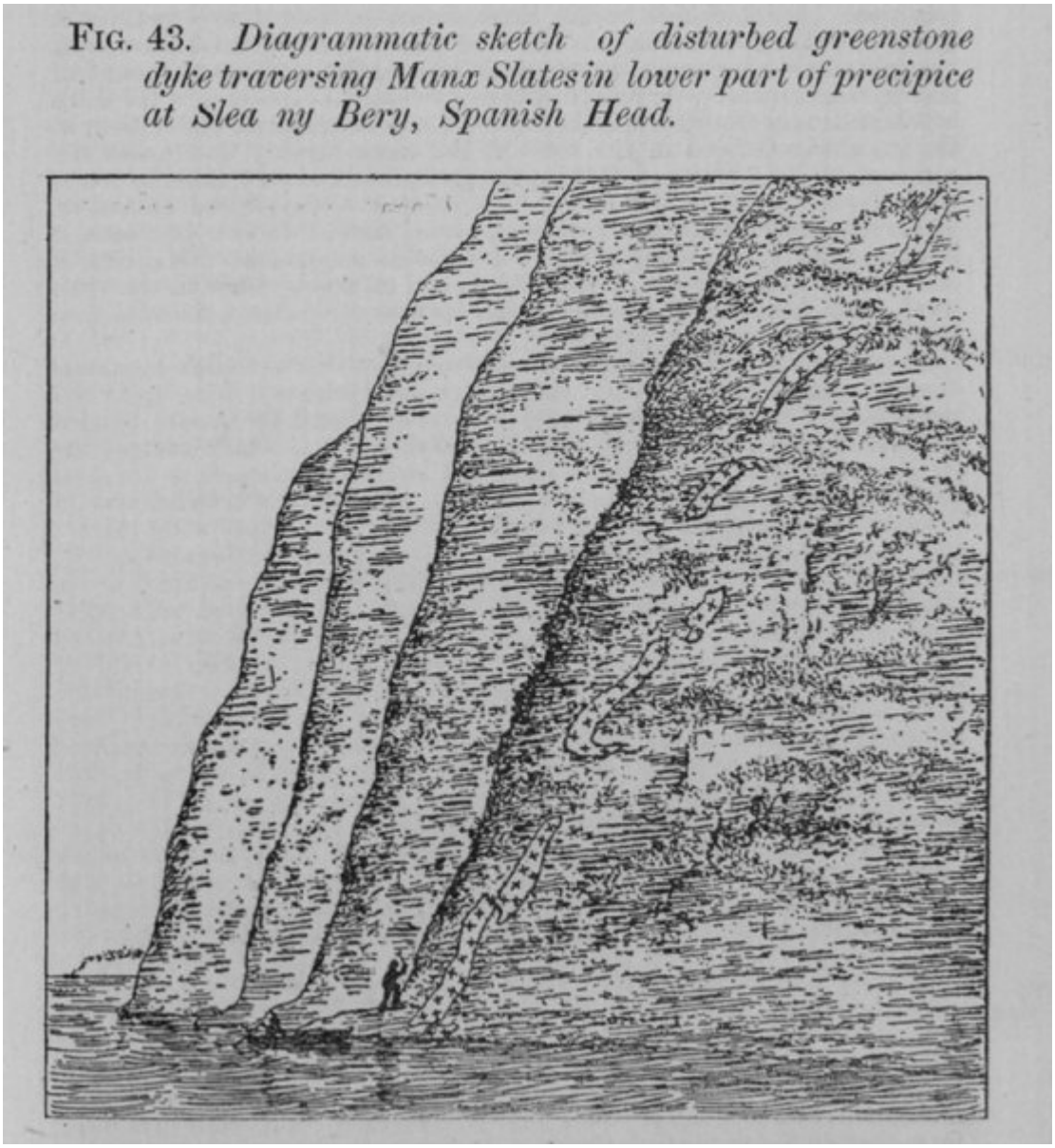
The greenstone outcrops are indicated by crosses, and the slate outcrops by horizontal lines.

(Figure 41) Plan of irregular outcrops of greenstone south of Barnell, Kirk Patrick. Scale, 6 inches = one mile. The greenstone outcrops are indicated by crosses, and the slate outcrops by horizontal lines.

FIG. 42. *Recumbent fold in flaggy grits in cliff on east side of Perwick Bay, Port St. Mary. Height (maximum); about* 60 *feet.*



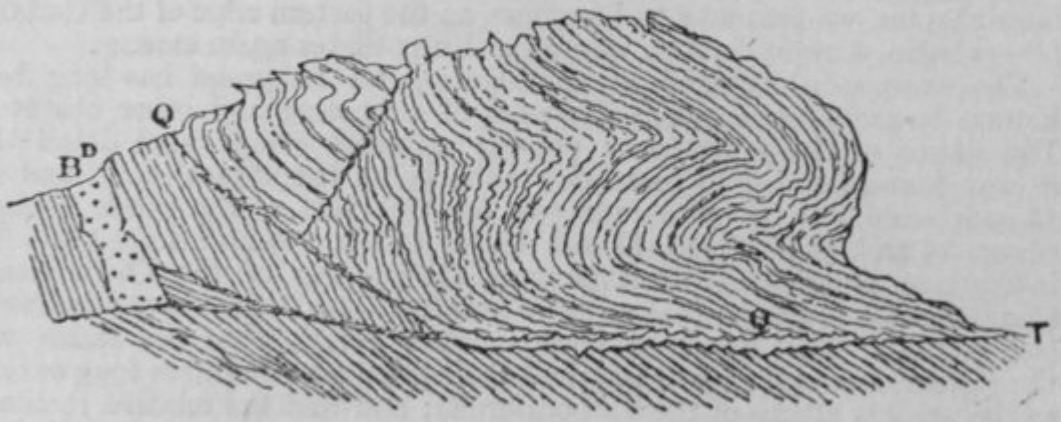
(Figure 42) Recumbent fold in flaggy grits in cliff on east side of Perwick Bay, Port St. Mary. Height (maximum); about 60 feet.



(Figure 43) Diagrammatic sketch of disturbed greenstone dyke traversing Manx Slates in lower part of precipice at,Slea ny Bery, Spanish Head.

FIG. 44. *Section on north side of Horse Gullet, Langness, showing thrust-planes and accompanying plication of thinly-bedded sandy slates.*

Height about 12 feet.

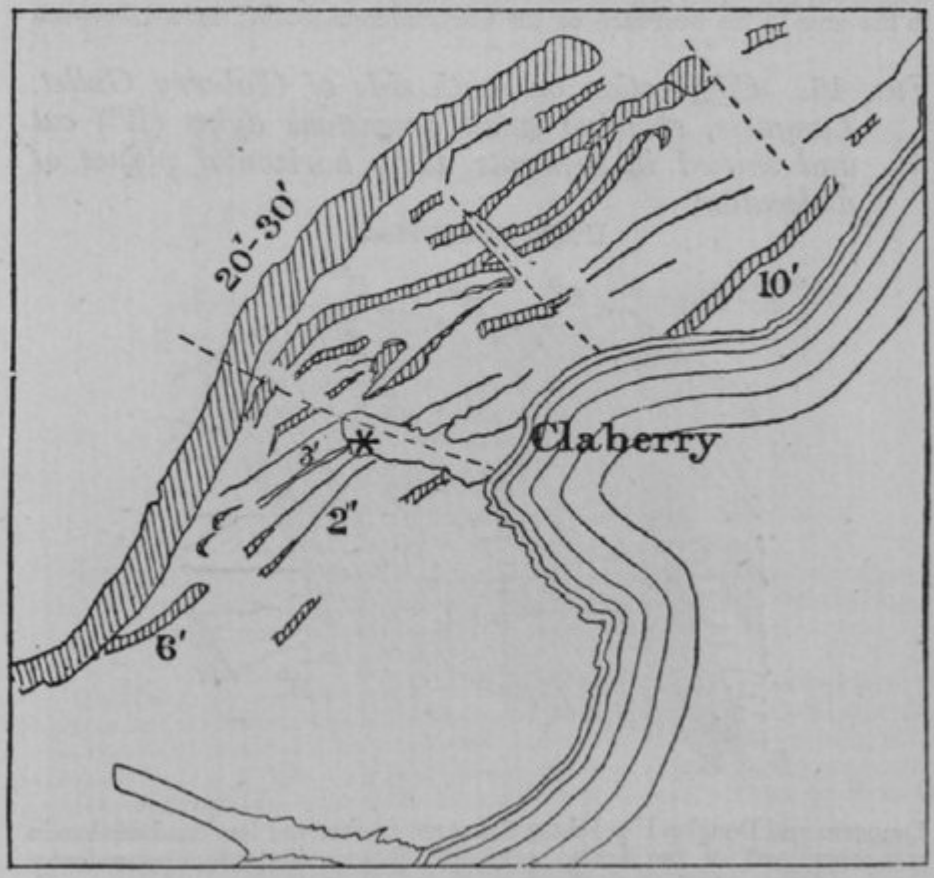


B^D. Greenstone dyke, 2 feet thick.
T. Thrust-plane, with Q, quartz-veins.

(Figure 44) Section on north side of Horse Gullet, Langness, showing thrust-planes and accompanying plication of thinly-bedded sandy slates. Height about 12 feet. B^D. Greenstone dyke, 2 feet thick. T. Thrust-plane, with Q, quartz-veins.

FIG. 45. *Ground-plan in vicinity of Claberry Gullet, Langness, showing plexus of greenstone dykes in contorted sandy slates.*

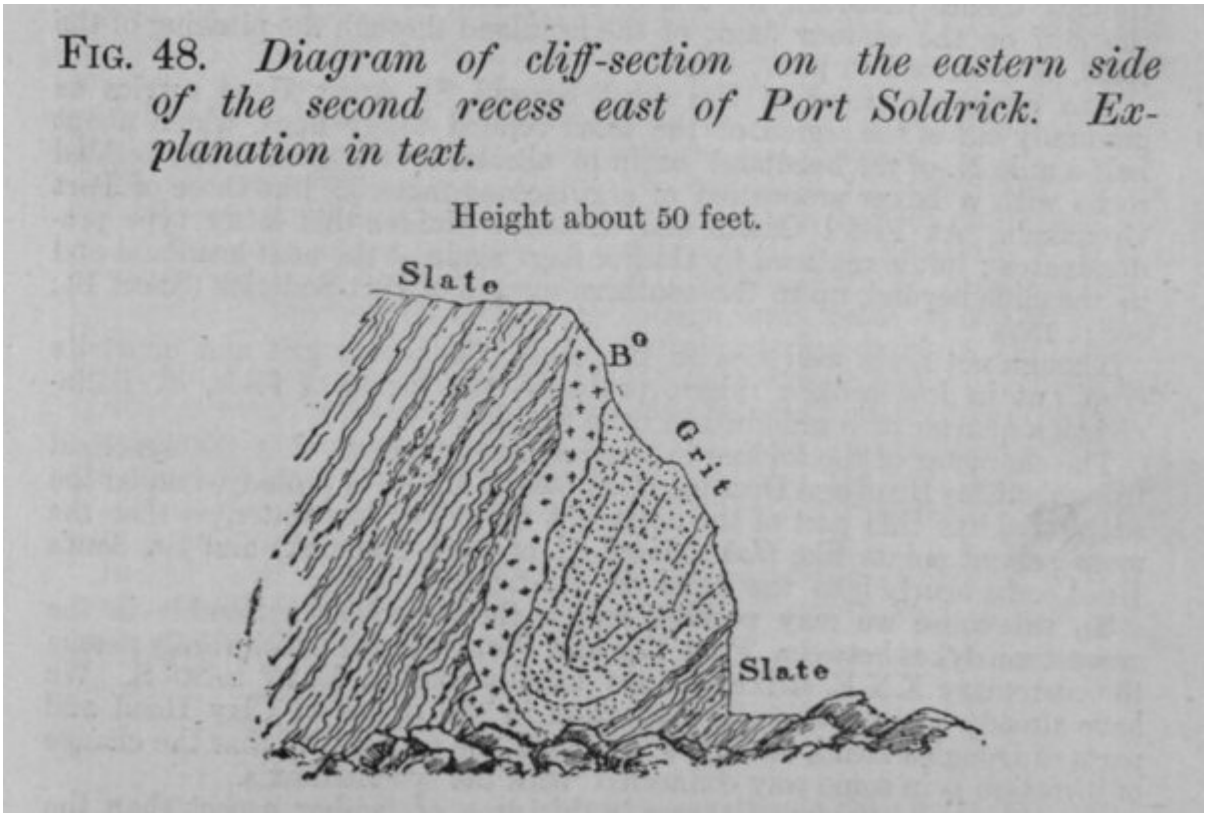
Scale, 25 inches = one mile.



The numbers indicate the thickness of the dykes in feet:
* shows position of section given in Fig. 46.

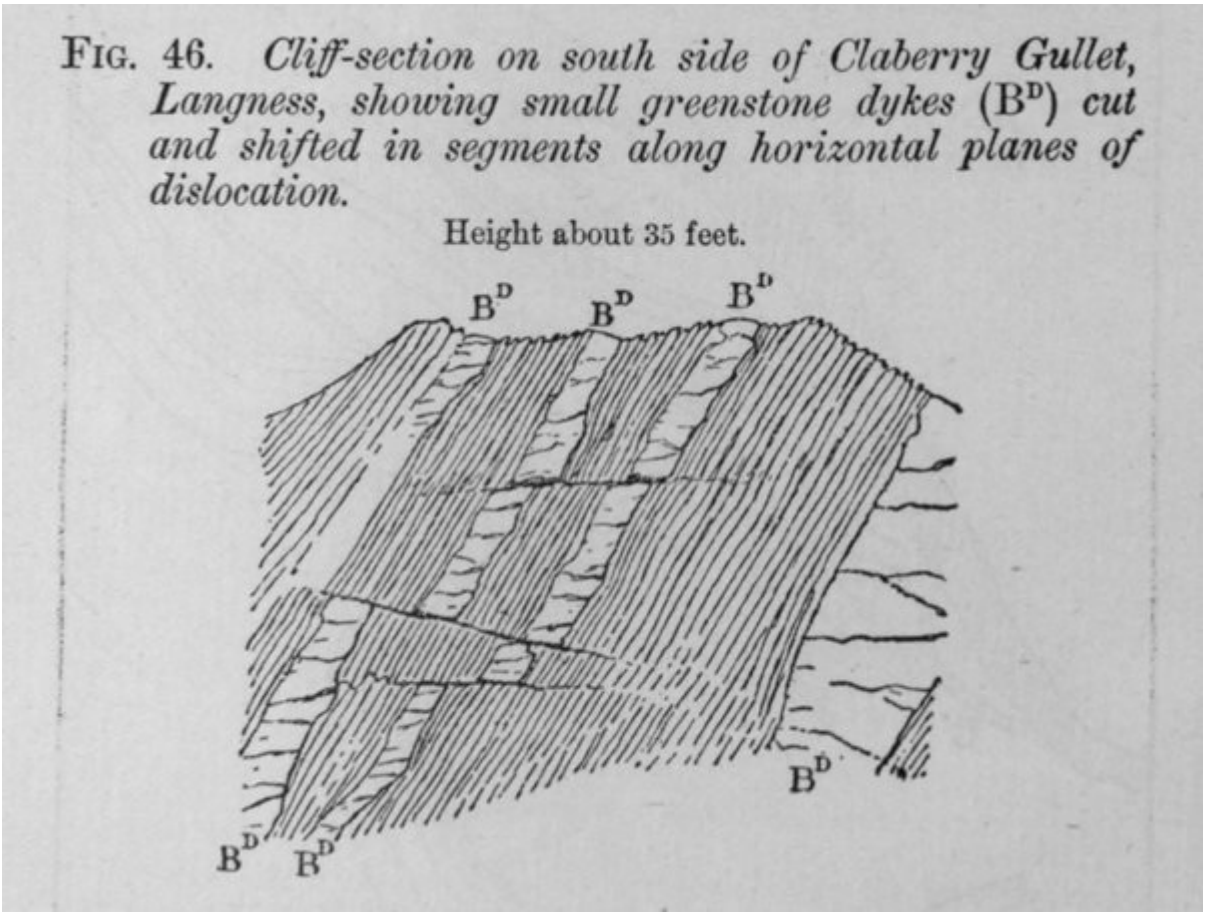
*(Figure 45) Ground-plan in vicinity of Claberry Gullet, Langness, showing plexus of greenstone dykes in contorted sandy slates. Scale, 25 inches = one mile. The numbers indicate the thickness of the dykes in feet: * shows position of section given in (Figure 48)*

FIG. 48. *Diagram of cliff-section on the eastern side of the second recess east of Port Soldrick. Explanation in text.*



(Figure 48) Diagram of cliff-section on the eastern side of the second recess east of Port Soldrick. Explanation in text. Height about 50 feet.

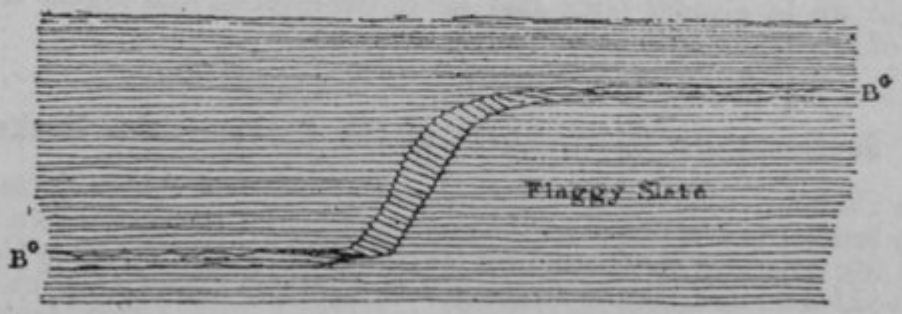
FIG. 46. *Cliff-section on south side of Claberry Gullet, Langness, showing small greenstone dykes* (B^D) *cut and shifted in segments along horizontal planes of dislocation.*



(Figure 46) Cliff section on south side of Claberry Gullet, Langness, showing small greenstone dykes (B^D) cut and shifted in segments along horizontal planes of dislocation. Height about 35 feet.

FIG. 47. *Ground-plan on shore south of Gullet Creagh Moainee, Langness, showing effect of shearing upon thickness of small greenstone dyke.*

Area 35 feet by 15 feet.

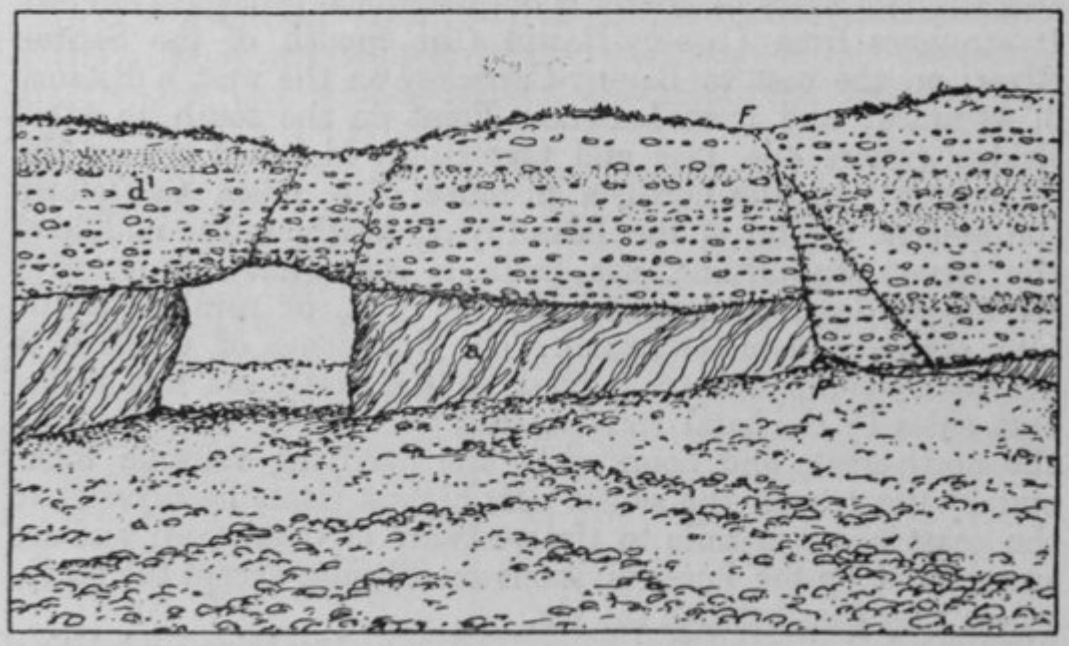


Where the dyke (B^G) lies between the bedding planes of the flaggy slate, its thickness is from 2 to 4 inches; where it cuts across the bedding, it expands to 12 inches and shows oblique cleavage.

(Figure 47) Ground-plan on shore south of Gullet Creagh Moainee, Langness, showing ef fect of shearing upon thickness of small greenstone dyke. Area 35 feet by 15 feet. Where the dyke (B^G) lies between the bedding planes of the Baggy slate, its thickness is from 2 to 4 inches; where it cuts across the bedding, it expands to 12 inches and shows oblique cleavage.

FIG. 49.—*Sketch-section of the most northerly of The Arches, Langness, showing unconformability at base of Carboniferous Rocks.*

Height, about 18 feet.



d¹ Carboniferous Basement Conglomerate.
a Manx Slates, with red staining.
F Small fault.

(Figure 49) Sketch-section of the most northerly of The Arches, Langness, showing unconformability at base of Carboniferous Rocks. Height, about 18 feet. d^1 Carboniferous Basement Conglomerate. a Manx Slates, with red staining. F Small fault.

FIG. 50.—*Section across foreshore at Langness Point, south of Lighthouse, showing eroded surface of slates beneath Carboniferous Basement Conglomerate.*

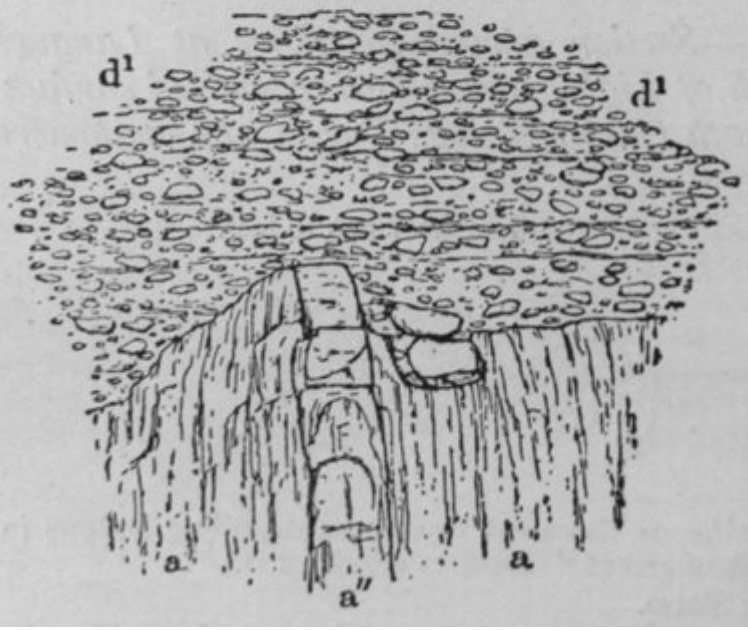
d¹ Carboniferous Basement Conglomerate, filling hollows in the slates: a large block of grit at * measures 4 ft. by 2 ft.

a Manx Slates.

B^G Pre-Carboniferous greenstone dyke, 8 inches wide, along which a gully 3 feet wide and 2 feet deep has been eroded on the Carboniferous shore. This is prolonged into a similar gully on the present shore.

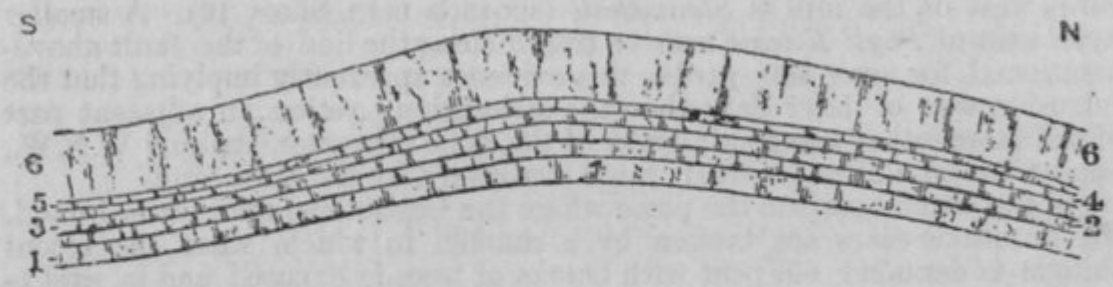
*(Figure 50) Section across foreshore at Langness Point, south of Lighthouse, showing eroded surface of slates beneath Carboniferous Basement Conglomerate. Height about 10 feet. d^1 Carboniferous Basement Conglomerate, filling hollows in the slates: a large block of grit at * measures 4 ft. by 2 ft. a Manx Slates. B^G Pre-Carboniferous greenstone dyke, 8 inches wide, along which a gully 3 feet wide and 2 feet deep has been eroded on the Carboniferous shore. This is prolonged into a similar gully on the present shore.*

FIG. 51.—*Section on shore S.E. of last, showing grit-band* (a″) *in slates* (a) *standing up in a small ridge beneath conglomerate* (d¹).



(Figure 51) Section on shore S.E. of last, showing grit-band (a■) in slates (a) standing up in a small ridge beneath conglomerate (d^1). Height, about 4 feet.

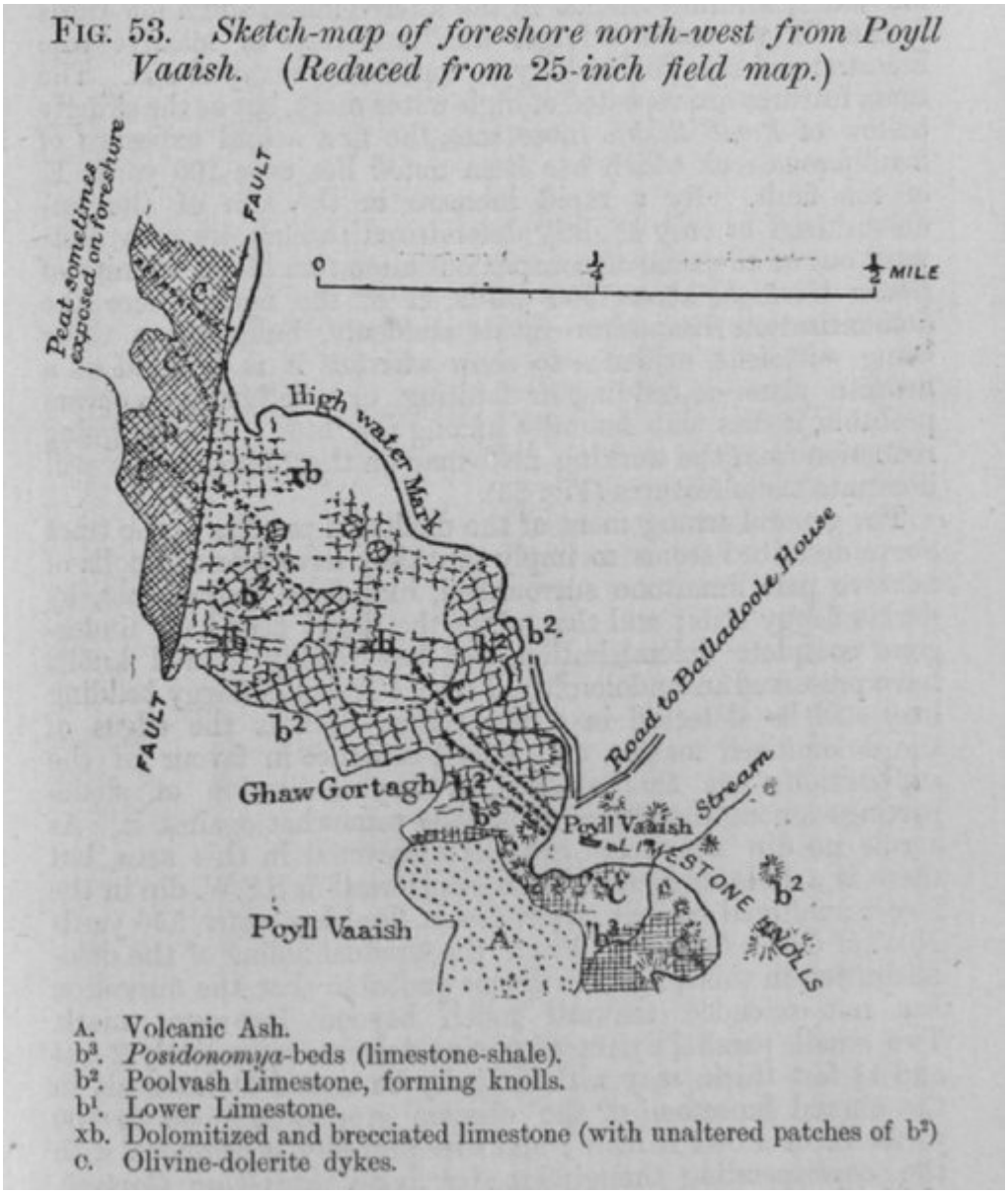
FIG. 52. *Section through crest of anticline in dark limestone with thin shaly partings, in low cliff north of Scarlet Point. Height about 8 feet.*



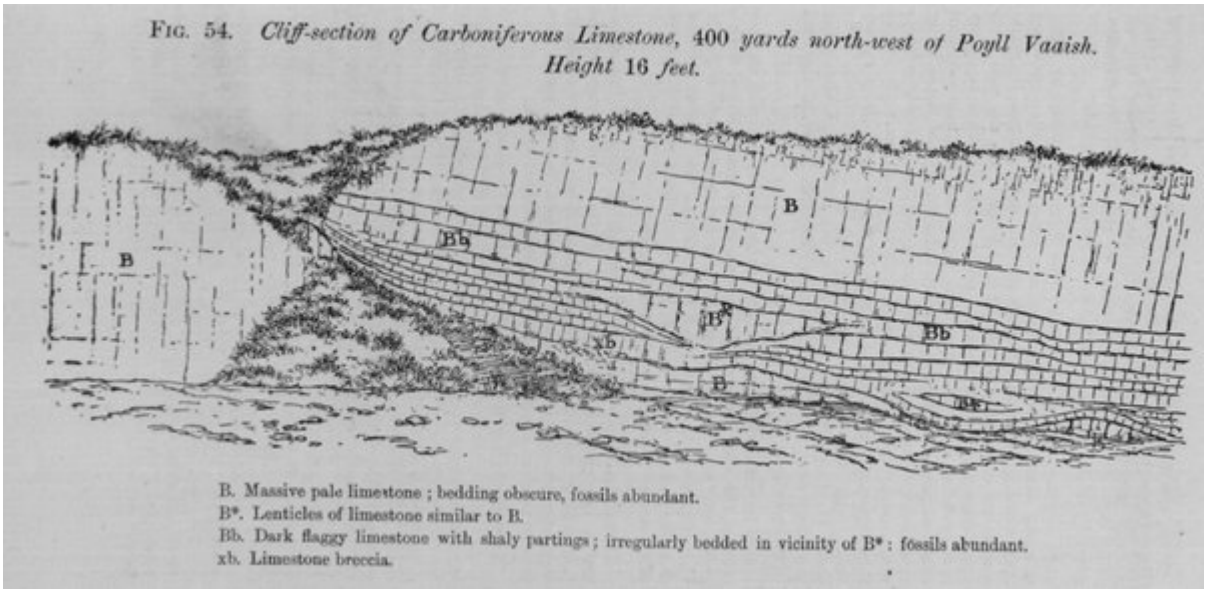
The thickness of the individual bands of limestone varies as under:—

	South side.		*Centre of dome.*		*North side.*
Bed No. 6	... 43 inches	...	43 inches	...	43 inches
„ 5	... 5¼ „	...	8⅛ „	...	4¾ „
„ 4	... 6 „	...	8½ „	...	6 „
„ 3	... 10 „	...	12 „	...	10½ „
„ 2	... 8 „	...	9⅛ „	...	8 „
„ 1	... 13½ „	...	15½ „	...	14½ „
Totals	85¾ „		97 „		83¾ „

(Figure 52) Section through crest of anticline in dark limestone with thin shaly partings, in low cliff north of Scarlet Point. Height about 8 feet. The thickness of the individual bands of limestone varies as under:



(Figure 53) Sketch-map of foreshore north-west from Poyll Vaaish. (Reduced from 25-inch field map.) A. Volcanic Ash. b^3. Posidonornya-beds (limestone-shale). b^2. Poolvash Limestone, forming knolls. b^1. Lower Limestone. xb. Dolomitized and brecciated limestone (with unaltered patches of b^2) e. Olivine-dolerite dykes.



(Figure 54) Cliff section of Carboniferous Limestone, 400 yards north-west of Poyll Vaaish. Height 16 feet. B. Massive pale limestone; bedding obscure, fossils abundant. B. Lenticles of limestone similar to B. Bb. Dark flaggy limestone with*

shaly partings; irregularly bedded in vicinity of B: fossils abundant. xb. Limestone breccia.*

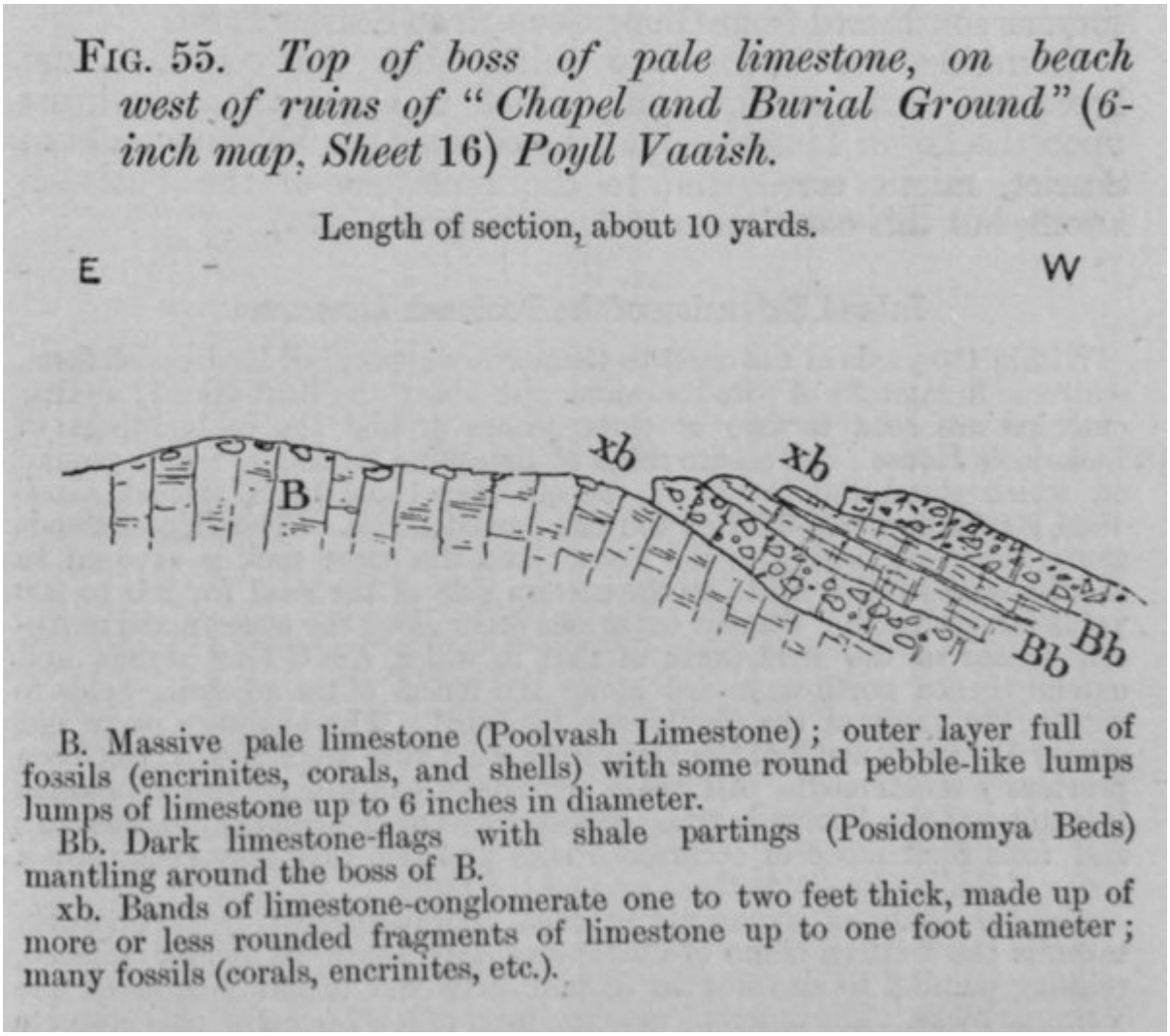
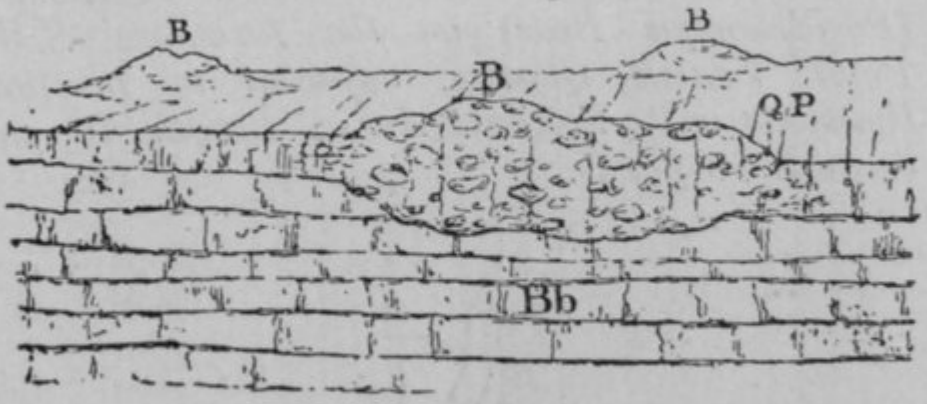


FIG. 55. *Top of boss of pale limestone, on beach west of ruins of "Chapel and Burial Ground" (6-inch map, Sheet 16) Poyll Vaaish.*

(Figure 55) Top of boss of pale limestone, on beach west of ruins of "Chapel and Burial Ground" (6-inch map, (Sheet 16)) Poyll Vaaish. Length of section, about 10 yards. B. Massive pale limestone (Poolvash Limestone); outer layer full of fossils (encrinites, corals, and shells) with some round pebble-like lumps lumps of limestone up to 6 inches in diameter. Bb. Dark limestone-flags with shale partings (Posidonomya Beds) mantling around the boss of B. xb. Bands of limestone-conglomerate one to two feet thick, made up of more or less rounded fragments of limestone up to one foot diameter; many fossils (corals, encrinites, etc.).

FIG. 56. *Section on shore slightly below high-water mark opposite Poyll Vaaish Quarry. Height about 3 feet.*



Bb. Dark limestone-flags with shale partings (Posidonomya Beds).
B. Boss of paler limestone, 6 feet diameter and 1½ feet thick, crowded with shells, principally *Productus*. A quartz-pebble, 1½ inches in diameter, was embedded in it at Q.P.
BB. Bosses similar to B protruding above the same bedding-plane ; not in the line of the section.

(Figure 56) Section on shore slightly below high-water mark opposite Poyll Vaaish Quarry. Height about 3 feet. Bb. Dark limestone-flags with shale partings (Posidonomya Beds). B. Boss of. paler limestone, 6 feet diameter and 1½ feet thick, crowded with shells, principally Productus. A quartz-pebble, 1½ inches in diameter, was embedded in it at Q.P. BB. Bosses similar to B protruding above the same bedding-plane; not in the line of the section.

FIG. 57. *Plan of a dome in dark limestone-flags (Posidonomya Beds) on the foreshore S.W. of Poyll Vaaish Quarry, adjacent to junction of limestone with Volcanic Ash. Length 40 yards ; breadth 10 yards.*

The arrows indicate direction of dip.

(Figure 57) Plan of a dome in dark limestone-flags (Posidonomya Beds) on the foreshore S. W. of Poyll Vaaish Quarry, adjacent to junction of limestone with Volcanic Ash. Length 40 yards; breadth 10 yards. The arrows indicate direction of dip.

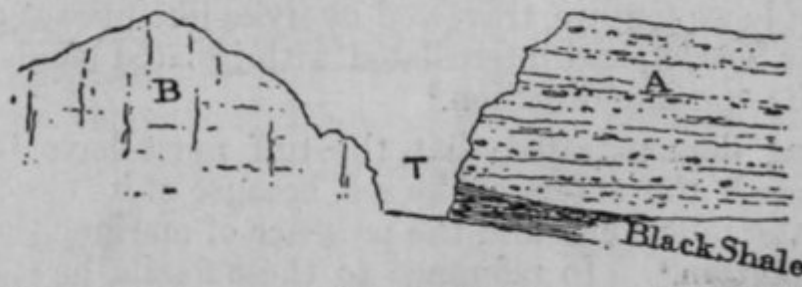
FIG. 58. *Section across the foreshore on the northern side of Close ny Chollagh Point, Poolvash; showing the rucking up of the Upper Limestone beneath the Volcanic Series. Length of section about* 120 *yards.*

(From Quart. Journ. Geol. Soc., vol. lvi.)

A. Volcanic ash of medium texture, with (b) contorted strips and fragments of cherty limestone.
B. Dark flaggy limestone (Posidonomya Beds); platy, indurated and pyritous in the uppermost layer, with signs of shearing (= thrust-plane); rucked up into short domes, the crests of which are in places pinched into the ash and brecciated.

(Figure 58) Section across the foreshore on the northern side of Close ny Chollagh Point, Poolvash; showing the rucking up of the Upper Limestone beneath the Volcanic Series. Length of section about 120 yards. (From Quart. Journ. Geol. Soc., vol. lvi.) A Volcanic ash of medium texture, with (b contorted strips and fragments of cherty limestone. B. Dark flaggy limestone (Posidonomya Beds); platy, indurated and pyritous in the uppermost layer, with signs of shearing (= thrust-plane); rucked up into short domes, the crests of which are in places pinched into the ash and brecciated.

FIG. 59. *Section across gully on shore at half tide W.S.W. of Poyllvaaish farmstead. Height* 10 *feet.*



A. Volcanic Ash, apparently overthrust upon black shale. B. Knoll of pale limestone and limestone-breccia. T. Thrust plane?

(Figure 59) Section across gully on shore at half tide W. S. W. of Poyllvaaish farmstead. Height 10 feet. A. Volcanic Ash, apparently overthrust upon black shale. B. Knoll of pale limestone and limestone-breccia. T. Thrust plane?

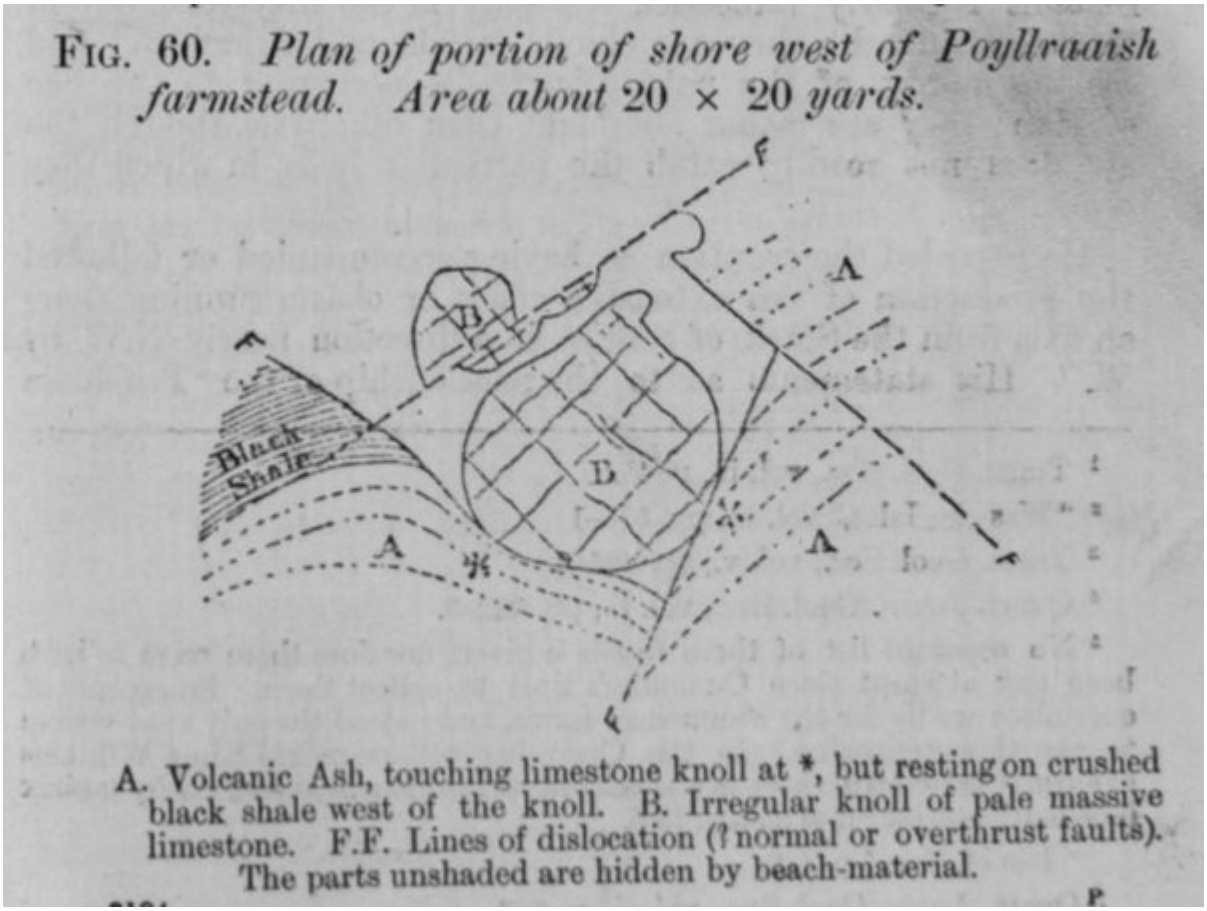


FIG. 60. *Plan of portion of shore west of Poyllraaish farmstead. Area about 20 × 20 yards.*

A. Volcanic Ash, touching limestone knoll at *, but resting on crushed black shale west of the knoll. B. Irregular knoll of pale massive limestone. F.F. Lines of dislocation (? normal or overthrust faults). The parts unshaded are hidden by beach-material.

*(Figure 60) Plan of portion of shore west of Poyllvaaish farmstead. Area about 20 x 20 yards. A. Volcanic Ash, touching limestone knoll at *, but resting on crushed black shale west of the knoll. B. Irregular knoll of pale massive limestone. F.F. Lines of dislocation (?400 normal or overthrust faults). The parts unshaded are hidden by beach-material.*

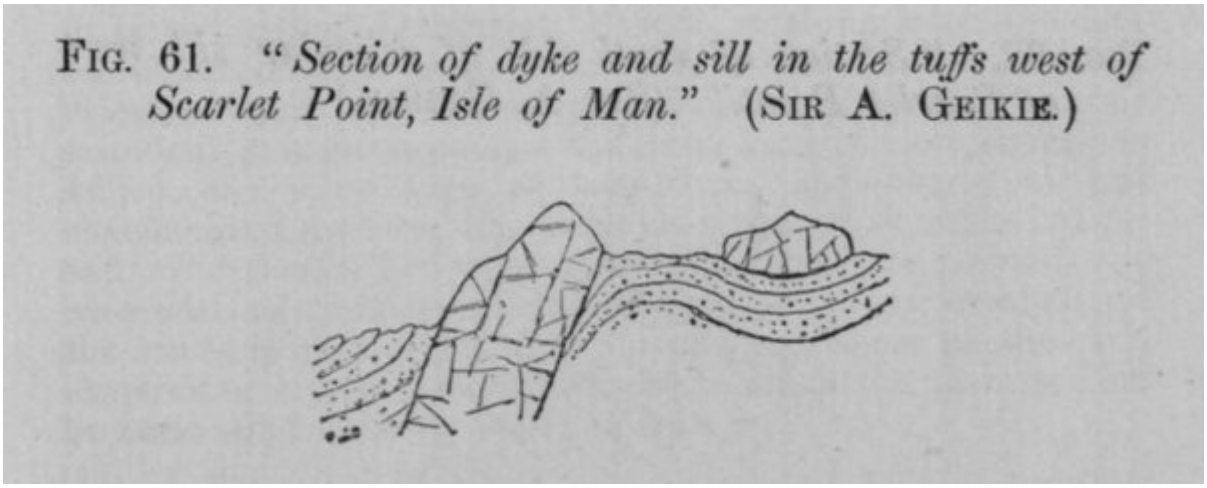


FIG. 61. *"Section of dyke and sill in the tuffs west of Scarlet Point, Isle of Man."* (SIR A. GEIKIE.)

(Figure 61) "Section of dyke and sill in the tuffs west of Scarlet Point, Isle of Man". (Sir A. Geikie.)

FIG. 62. "*Section of south side of vesicular sill west of Scarlet Point.*" (SIR A. GEIKIE.)

(Figure 62) "Section of south side of vesicular sill west of Scarlet Point". (Sir A. Geikie.)

FIG. 63. "*Bands of vesicles in the same sill.*" (SIR A. GEIKIE.)

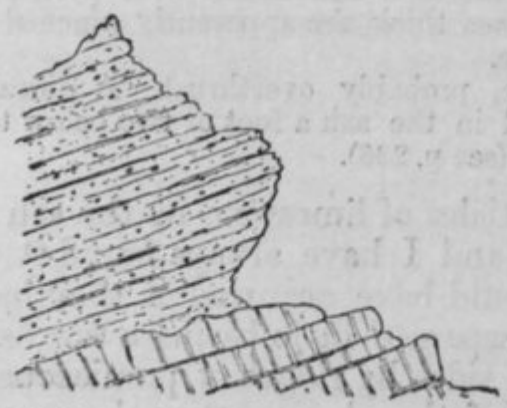
(Figure 63) "Bands 41 vesicles in the same sill". (Sir A. Geikie)

FIG. 64. *Section in crag on shore near low-water W.S.W. of Poyllvaaish Farm. Height about 10 feet.*

A. Volcanic ash.
b. Dark cherty limestone and shale, with pyritious fossils; wisps of ash, one to three inches thick, are apparently pinched in between folds of the strip of limestone.
T. Curving plane, probably overthrust. A dorsal fish-spine (*Sphenacanthus*) was found in the ash a foot or two below the right-hand lower corner of the section (see p. 236).

(Figure 64) Section in crag on shore near low-water W.S. W. of Poyllvaaish Farm. Height about 10 feet. A. Volcanic ash. b. Dark cherty limestone and shale, with pyritious fossils; wisps of ash, one to three inches thick, are apparently pinched in between folds of the strip of limestone. T. Curving plane, probably overthrust. A dorsal fish-spine (Sphenacanthus) was found in the ash a foot or two below the right-hand lower corner of the section (see p. 236).

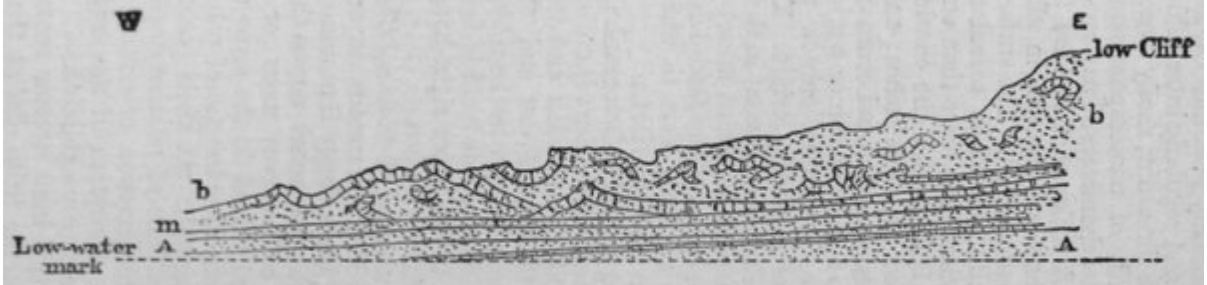
FIG. 65. *Section at foot of low cliff at Close ny Chollagh Point. "Limestone passing under stratified tuffs"* (SIR A. GEIKIE, "*Ancient Volcanoes*,": *vol. ii., Fig.* 184).



(Figure 65) Section at foot of low cliff at Close ny Chollagh Point. "Limestone passing under stratified tuffs" (Sir A. Geikie, "Ancient Volcanoes",: vol. ii., fig. 184).

FIG. 66. *Section across the foreshore 250 yards S. of Close ny Chollagh Point, showing the disturbance of bedding in volcanic ash and limestone. Length about 100 yards.*

(From Quart. Journ. Geol. Soc,, vol lvi.)

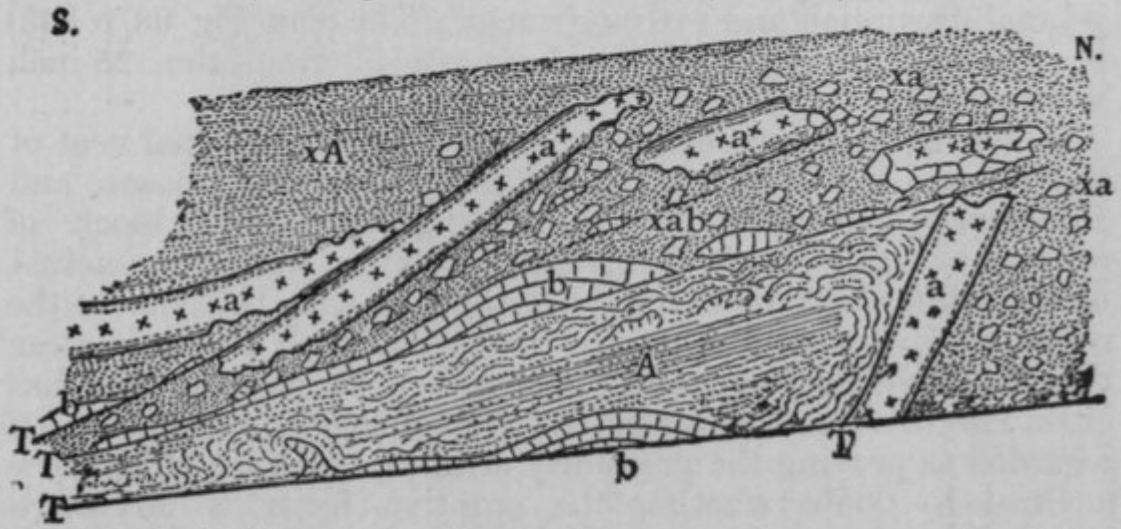


A. Evenly-bedded fine calcareous ash and thin cherty impure limestone-bands (6 feet seen).
b. Ash and limestone, like that below, but crumpled, broken and confused.
m. Small thrust-plane separating the broken from the unbroken beds; shifting to higher bands in going eastward. The ash is indurated for 2 or 3 inches beneath this plane.

(Figure 66) Section across the foreshore 250 yards S. of Close ny Chollagh Point, showing the disturbance of bedding in volcanic ash and limestone. Length about 100 yards. (From Quart. Journ. Geol. Soc,, vol lvi.) A Evenly-bedded fine calcareous ash and thin cherty impure limestone-bands (6 feet seen). b. Ash and limestone, like that below, but crumpled, broken and confused. m. Small thrust-plane separating the broken from the unbroken beds; shifting to higher bands in going eastward. The ash is indurated for 2 or 3 inches beneath this plane.

FIG. 67. *Diagram to illustrate supposed structure of Volcanic rocks in vicinity of Cromwell's Walk.*

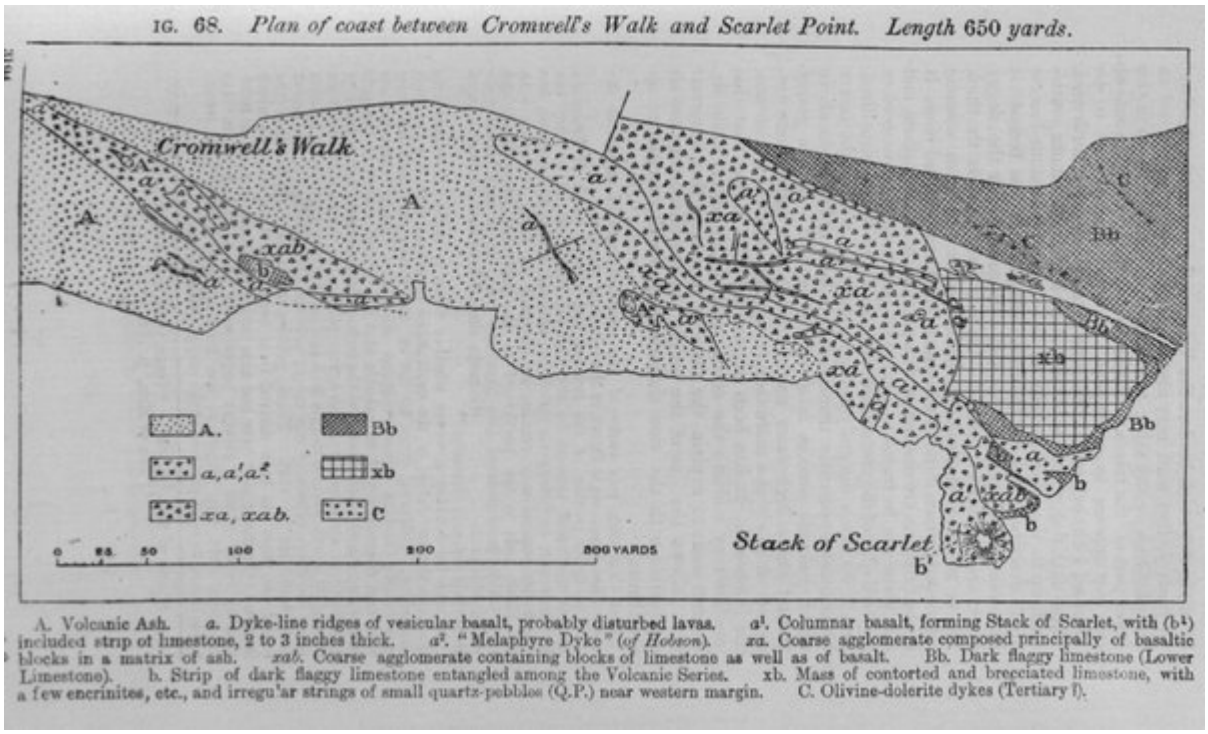
(From Quart. Journ. Geol. Soc., vol. lvi.)



A. Volcanic Ash, much disturbed, but showing traces of original bedding.
xA. Re-arranged Volcanic Ash.
a. Vesicular basalt.
xa. Coarse agglomerate of blocks of vesicular lava in ashy matrix.
xab. The same, with some limestone blocks.
b. Strips of limestone carried up along thrust-plane.
T. Thrust-planes.

(Figure 67) Diagram to illustrate supposed structure of Volcanic rocks in vicinity of Cromwell's Walk. (From Quart. Journ. Geol. Soc., vol. lvi.) A. Volcanic Ash, much disturbed, but showing traces of original bedding. xA. Re-arranged Volcanic Ash. 7. Vesicular basalt. xa. Coarse agglomerate of blocks of vesicular lava in ashy matrix. xab.The same, with some

limestone blocks. 8. Strips of limestone carried up along thrust-plane. T. Thrust-planes.



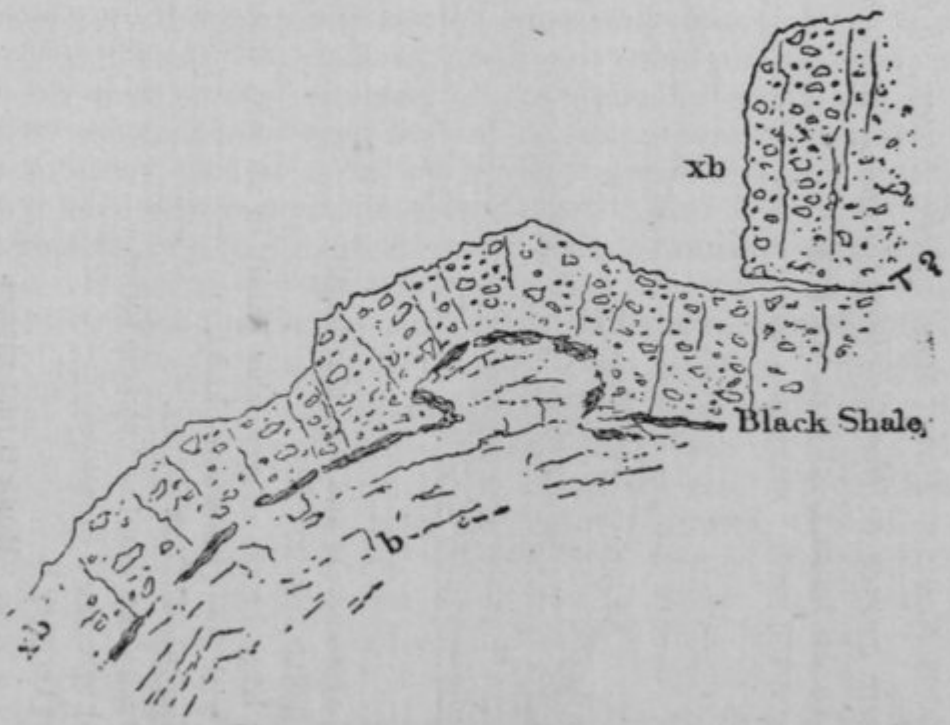
IG. 68. *Plan of coast between Cromwell's Walk and Scarlet Point. Length* 650 *yards.*

A. Volcanic Ash. a. Dyke-line ridges of vesicular basalt, probably disturbed lavas. a^1. Columnar basalt, forming Stack of Scarlet, with (b^1) included strip of limestone, 2 to 3 inches thick. a^2. "Melaphyre Dyke" (*of Hobson*). *xa*. Coarse agglomerate composed principally of basaltic blocks in a matrix of ash. *xab*. Coarse agglomerate containing blocks of limestone as well as of basalt. Bb. Dark flaggy limestone (Lower Limestone). b. Strip of dark flaggy limestone entangled among the Volcanic Series. xb. Mass of contorted and brecciated limestone, with a few encrinites, etc., and irregular strings of small quartz-pebbles (Q.P.) near western margin. C. Olivine-dolerite dykes (Tertiary ?).

(Figure 68) Plan of coast between Cromwell's Walk and Scarlet Point. Length 650 yards. A. Volcanic Ash. a. Dyke-line ridges of vesicular basalt, probably disturbed lavas. a^1. Columnar basalt, forming Stack of Scarlet, with (b^1) included strip of limestone, 2 to 3 inches thick. a^2. "Melaphyre Dyke" (of Hobson). xa. Coarse agglomerate composed principally of basaltic be blocks in a matrix of ash. rah. Coarse agglomerate containing blocks of limestone as well as of basalt. Bb. Dark flaggy limestone (Lower Limestone). b. Strip of dark flaggy limestone entangled among the Volcanic Series. xb. Mass of contorted and brecciated limestone, with few encrinites, etc., and irregular strings of small quartz-pebbles (Q.P.) near western margin. C. Olivine-dolerite dykes (Tertiary 7).

FIG. 69. *Section in the brecciated limestone (xb of Fig. 68) at the northern side of Scarlet Point, showing traces of original bedding.*

Height about 6 feet, length 10 feet.



b. Much disturbed limestone, dolomitised in places; with traces of original bedding here and there, capped by a torn and interrupted strip of black shale 1 to 2 inches thick.

xb. Grey limestone-breccia, made up of recemented fragments of all sizes, with bits of encrinites and fragmentary shells.

T. ?. Probably a minor thrust-plane.

(Figure 69) Section in the brecciated limestone (xb of (Figure 68)) at the northern side of Scarlet Point, showing traces of original bedding. Height about 6 feet, length 10 feet. b. Much disturbed limestone, dolomitised in places; with traces of original bedding here and there, capped by a torn and interrupted strip of black shale 1 to 2 inches thick. xb. Grey limestone-breccia, made up of recemented fragments of all sizes, with bits of encrinites and fragmentary shells. T. ?. Probably a minor thrust-plane.

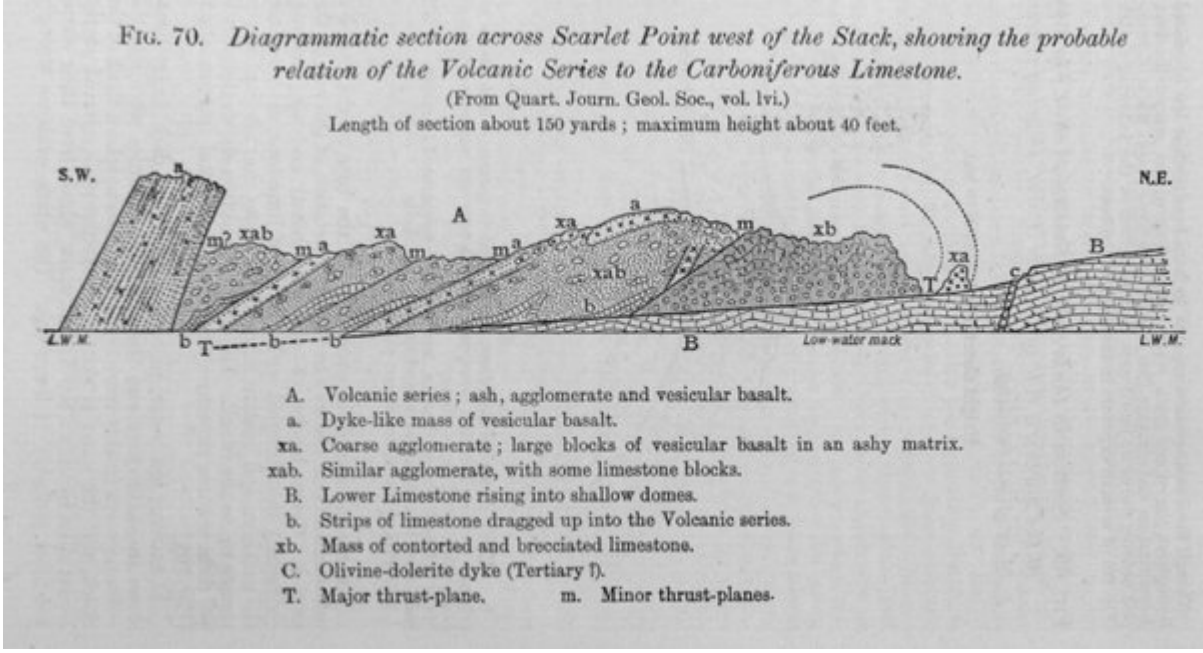
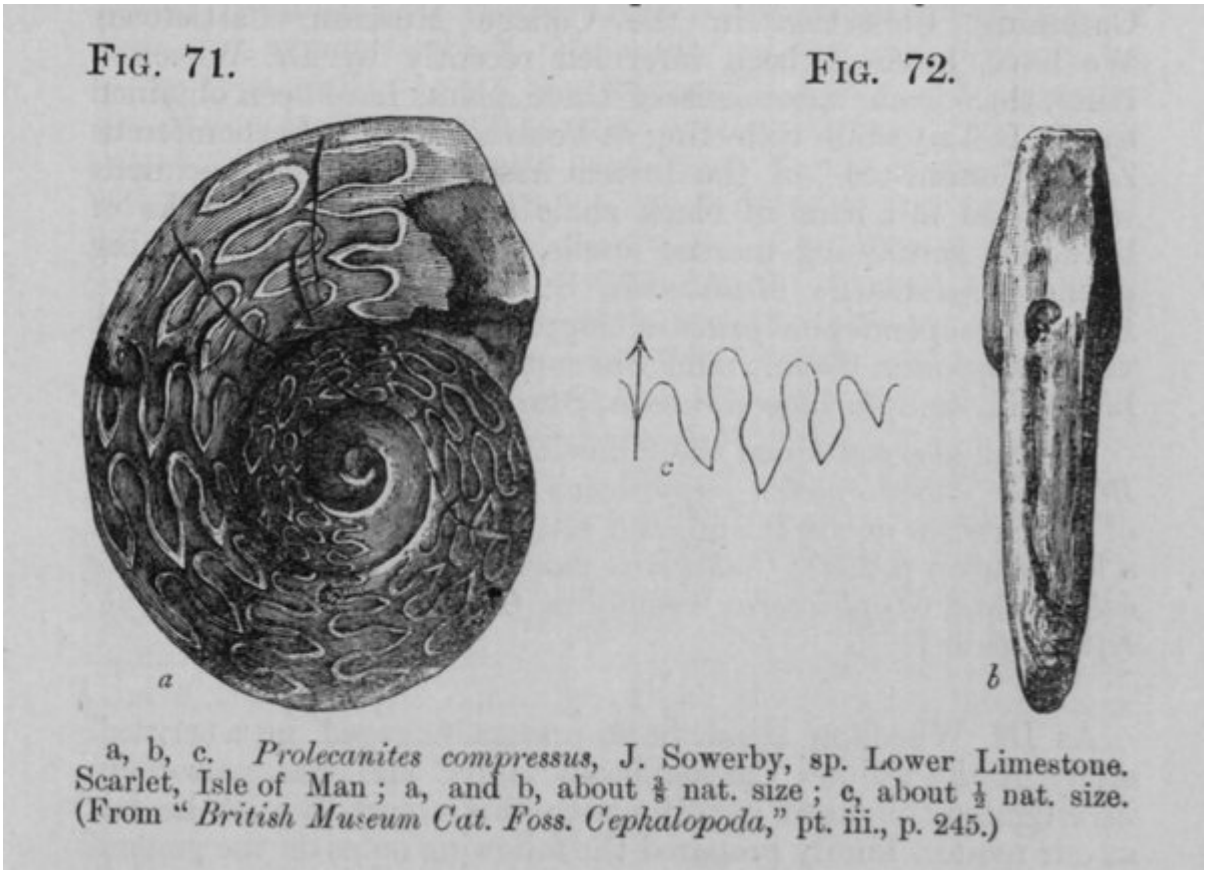


FIG. 70. *Diagrammatic section across Scarlet Point west of the Stack, showing the probable relation of the Volcanic Series to the Carboniferous Limestone.*
(From Quart. Journ. Geol. Soc., vol. lvi.)
Length of section about 150 yards; maximum height about 40 feet.

A. Volcanic series; ash, agglomerate and vesicular basalt.
a. Dyke-like mass of vesicular basalt.
xa. Coarse agglomerate; large blocks of vesicular basalt in an ashy matrix.
xab. Similar agglomerate, with some limestone blocks.
B. Lower Limestone rising into shallow domes.
b. Strips of limestone dragged up into the Volcanic series.
xb. Mass of contorted and brecciated limestone.
C. Olivine-dolerite dyke (Tertiary ?).
T. Major thrust-plane. m. Minor thrust-planes.

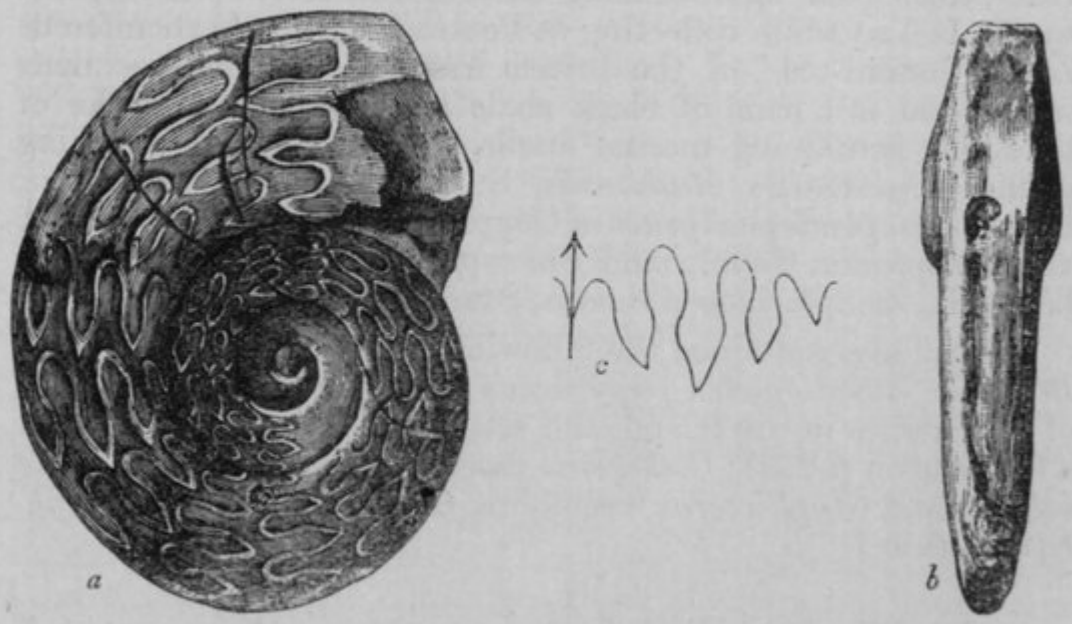
(Figure 70) Diagrammatic section across Scarlet Point west of the Stack, showing the probable relation of the Volcanic Series to the Carboniferous Limestone. (From Quart. Journ. Geol. Soc., vol. lvi.) Length of section about 150 yards; maximum height about 40 feet. A. Volcanic series; ash, agglomerate and vesicular basalt. a. Dyke-like mass of vesicular basalt. xa. Coarse agglomerate; large blocks of vesicular basalt in ashy matrix. xab. Similar agglomerate, with some limestone blocks. B. Lower Limestone rising into shallow domes. b. Strips of limestone dragged up into the Volcanic series. xb. Mass of contorted and brecciated limestone. C. Olivine-dolerite dyke (Tertiary ?). T. Major thrust-plane. m. Minor thrust-planes.



a, b, c. *Prolecanites compressus*, J. Sowerby, sp. Lower Limestone. Scarlet, Isle of Man; a, and b, about ⅔ nat. size; c, about ½ nat. size. (From "*British Museum Cat. Foss. Cephalopoda*," pt. iii., p. 245.)

(Figure 71) a, b, c. Prolecanites compressus, J. Sowerby, sp. Lower Limestone. Scarlet, Isle of Mau; a, and b, about ■ nat. size; c about ½ nat. size. (From British Museum Cat. Foss. Cephalopoda", pt. iii., p. 245.)

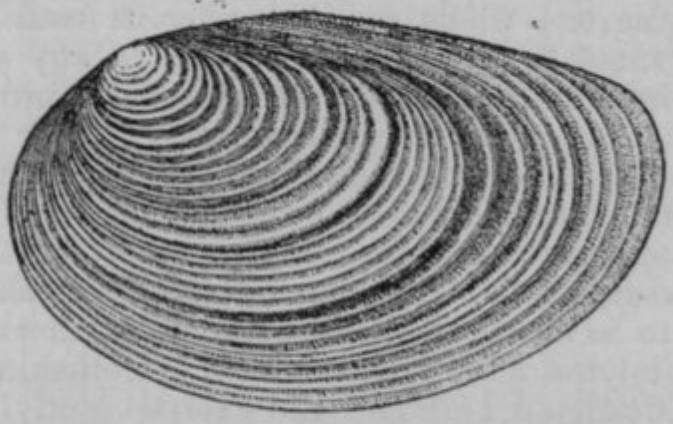
FIG. 71. FIG. 72.



a, b, c. *Prolecanites compressus*, J. Sowerby, sp. Lower Limestone. Scarlet, Isle of Man; a, and b, about ⅜ nat. size; c, about ½ nat. size. (From "*British Museum Cat. Foss. Cephalopoda*," pt. iii., p. 245.)

(Figure 72) a, b, c. Prolecanites compressus, J. Sowerby, sp. Lower Limestone. Scarlet, Isle of Mau; a, and b, about ■ nat. size; c about ½ nat. size. (From British Museum Cat. Foss. Cephalopoda", pt. iii., p. 245.)

FIG. 73.



Posidonomya Becheri, Goldf. Carboniferous Limestone Series. Figured from a specimen in the Survey Collection from near Bamburgh, Northumberland.

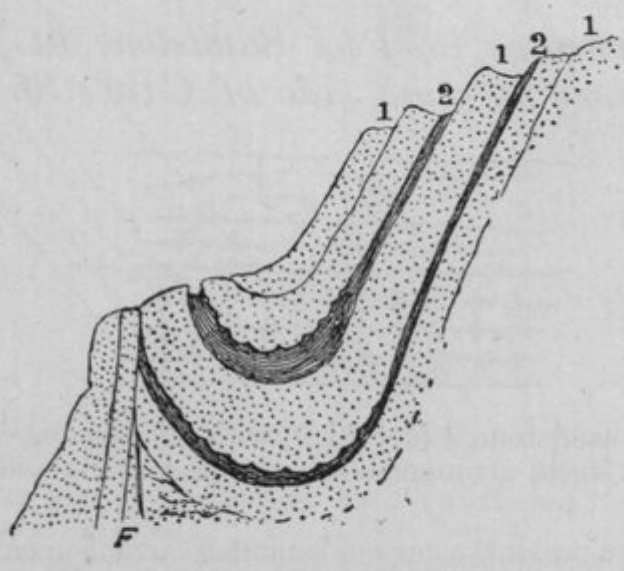
(Figure 73) Posidonomya Becheri Goldf. Carboniferous Limestone Series. Figured from a specimen in the Survey Collection from near Bamburgh, Northumberland.

FIG. 74. *Section of crumpled bedding in calcareous sandstone, on beach at north side of White Strand.*

Depth 2 feet.

(Figure 74) Section of crumpled bedding in calcareous sandstone, on beach at north side of White Strand. Depth 2 feet.

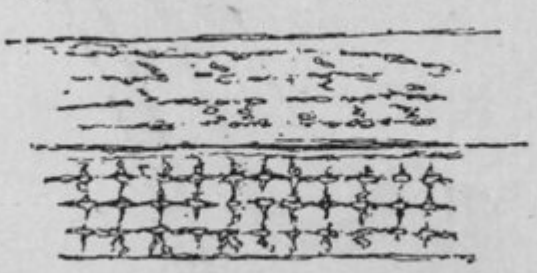
FIG. 75. *Cliff-section in Peel Sandstone at north side of White Strand. Height about 20 feet.*



1. Courses of red sandstone, showing curious swellings on under surface in trough of fold. Diagrammatically rendered.
2. Shale partings.
F. Fault ?, with crushed rock in vicinity

(Figure 75) Cliff section in Peel Sandstone at north side of White Strand. Height about 20 feet. Courses of red sandstone, showing curious swellings on under surface in trough of fold. Diagrammatically rendered. Shale partings. F. Fault ?, with crushed rock in vicinity

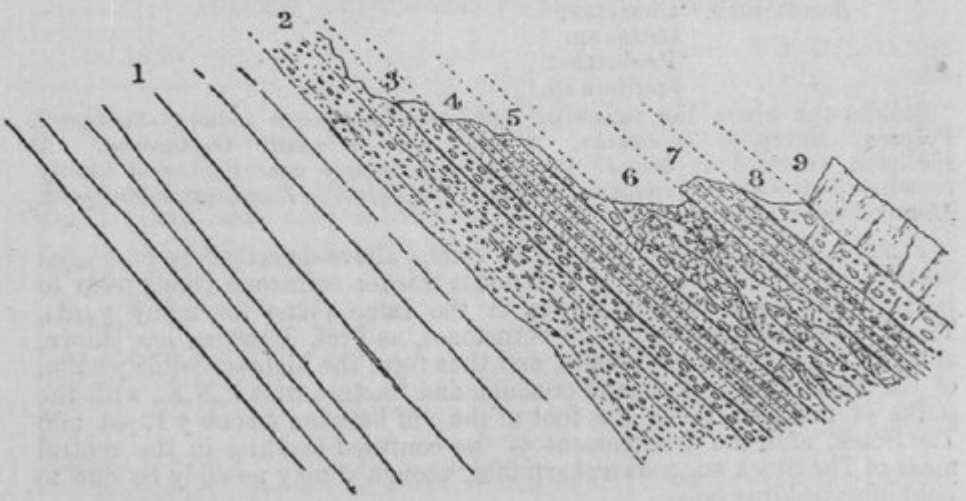
FIG. 76. *Structure in Peel Sandstone at foot of cliff below quarry on south side of Cain's Strand.*



Two beds of red sandstone, 4 feet thick, with yellow concretions tending in the lower bed to a linear arrangement both horizontally and vertically.

(Figure 76) Structure in Peel Sandstone at foot of cliff below quarry on south side of Cain's Strand. Two beds of red sandstone, 4 feet thick, with yellow concretions tending in the lower bed to a linear arrangement both horizontally and vertically.

FIG. 77. *Cliff-section below the old lime-kiln* 200 *yards west of Lhoob y Reeast near Peel.*

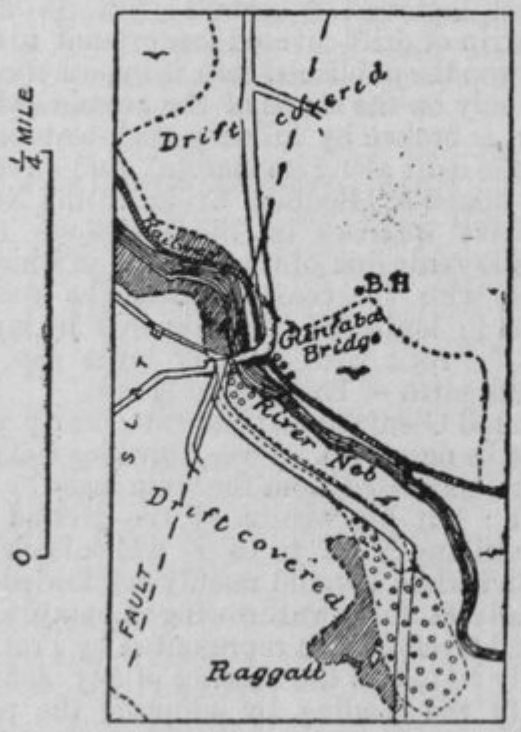


9.	Pale nodular gritty limestone ; nearly all quarried away - - - - - - - - thickness	3 feet.
8.	Lenticular pebbly cornstone with palish red limestone concretions - - - - - - -	1½ „
7.	Sandy and gravelly band, with calcareous cement and small fragments of limestone : some corals -	2 „
6.	Lenticular patches of coarse and fine subangular conglomerate with limestone pebbles, and also calcareous concretions and cement ; fragments of encrinites and other fossils - - - - -	3 „
5.	Pale red nodular limestone band - - - - -	3 to 6 inches.
4.	Red sandstone, grit and fine gravelly conglomerate : some fossils - - - - - - - - -	2½ feet.
3.	Pebbly band with pebbles and also concretions of limestone : fossils : among the pebbles are agate, quartzite, vein quartz, sandstone and chert - -	1 foot.
2.	Red sandstone interbedded with fine gravelly conglomerate, less calcareous than above : fossils,— polyzoa and some detached fragments of corals -	3 to 6 feet.
1.	Sandstone, etc., not exposed in this section.	

(Figure 77) Cliff-section below the old lime-kiln 200 yards west of Lhoob y Reeast near Peel. 9. Pale nodular gritty limestone; nearly all quarried away — thickness 3 feet. 8. Lenticular pebbly cornstone with palish red limestone concretions — 1½ feet 7. Sandy and gravelly band, with calcareous cement and small fragments of limestone: some corals — 2 feet 6. Lenticular patches of coarse and fine subangular conglomerate with limestone pebbles, and also

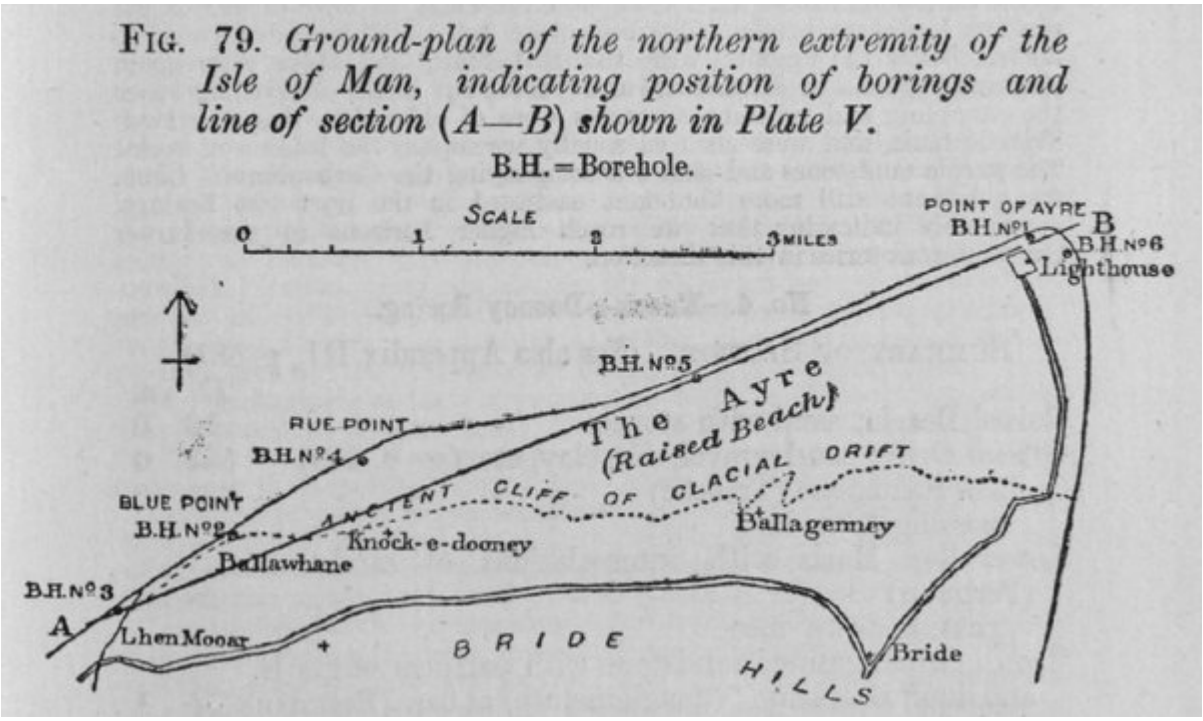
calcareous concretions and cement; fragments of encrinites and other fossils — 3 feet 5. Pale red nodular limestone band — 3 to 6 inches. 4. Red sandstone, grit and fine gravelly conglomerate: some fossils — 2½ feet. 3. Pebbly band with pebbles and also concretions of limestone: fossils: among the pebbles are agate, quartzite, vein quartz, sandstone and chert — 1 foot. 2. Red sandstone interbedded with fine gravelly conglomerate, less calcareous than above: fossils, — polyzoa and some detached fragments of corals 3 to 6 feet. 1. Sandstone, etc., not exposed in this section.

FIG. 78. *Sketch-map of the valley of the River Neb around Glenfaba Bridge, showing position of outcrops of slate and conglomerate. Scale: 6 inches = 1 mile.*

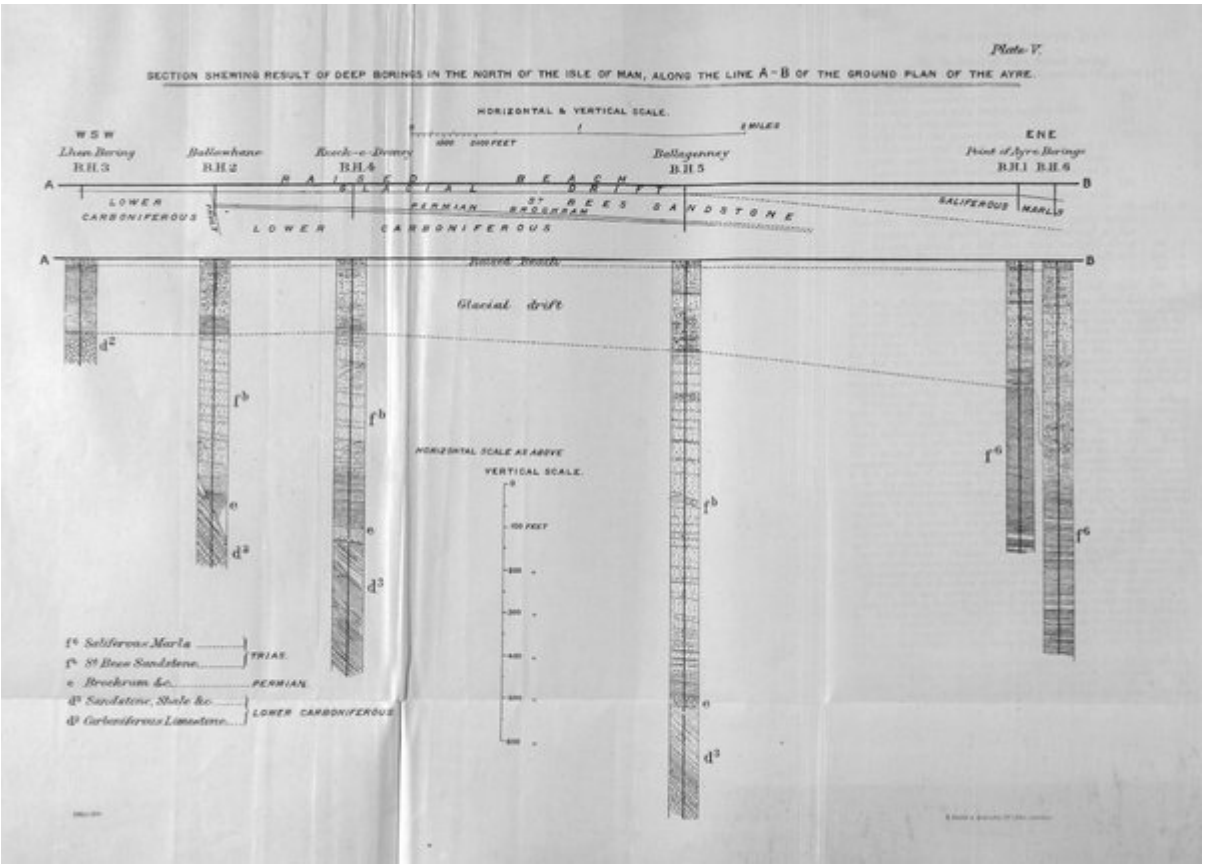


Conglomerate indicated by circles.
Slate indicated by oblique shading.
B. H. Borehole.

(Figure 78) Sketch-map of the valley of the River Neb around Glenfaba Bridge, showing position of outcrops of slate and conglomerate. Scale: 6 inches = 1 mile. Conglomerate indicated by circles. Slate indicated by oblique shading. B. H. Borehole.



(Figure 79) Ground-plan of the northern extremity of the Isle of Man, indicating position of borings and line of section (A—B) shown in (Plate 5).



(Plate 5) Section shewing result of deep borings in the north of the Isle of Man, along the line A-B of the ground plan of The Ayre.

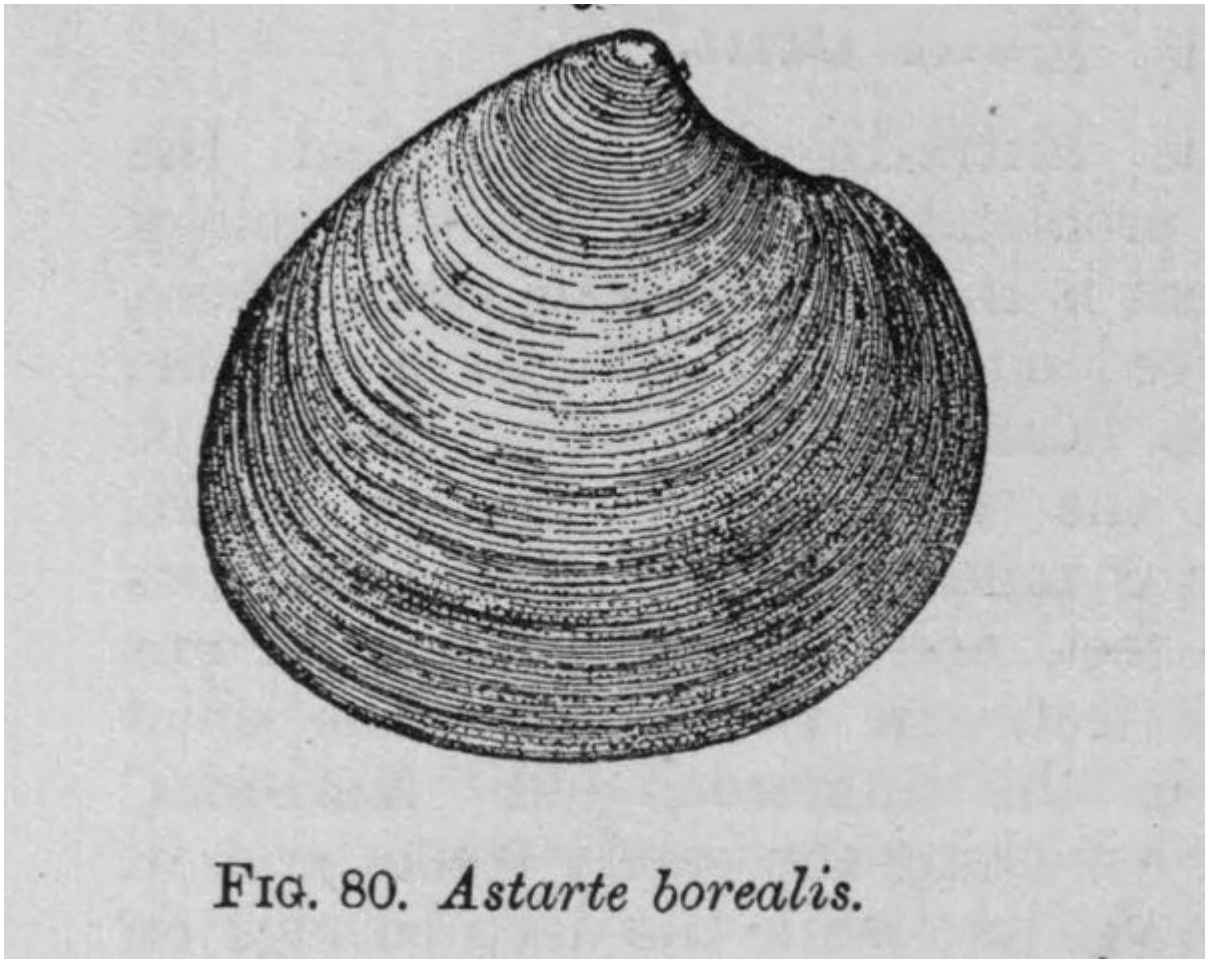


FIG. 80. *Astarte borealis.*

(Figure 80) Astarte borealis. Shells of the Manx Extra-Insular Drift (nat. size). Figure 80 represents a shell from the Post-Pliocene beds of the Clyde, as there was no suitable Manx specimen of this species in our collection; the others are from specimens from the Isle of Man. Drawn by Mr. Gilbert Williams from specimens in the Geological Survey Museum.

FIG. 81. *Nassa serrata.*

(Figure 81) Nassa serrata. Shells of the Manx Extra-Insular Drift (nat. size). Drawn by Mr. Gilbert Williams from specimens in the Geological Survey Museum.

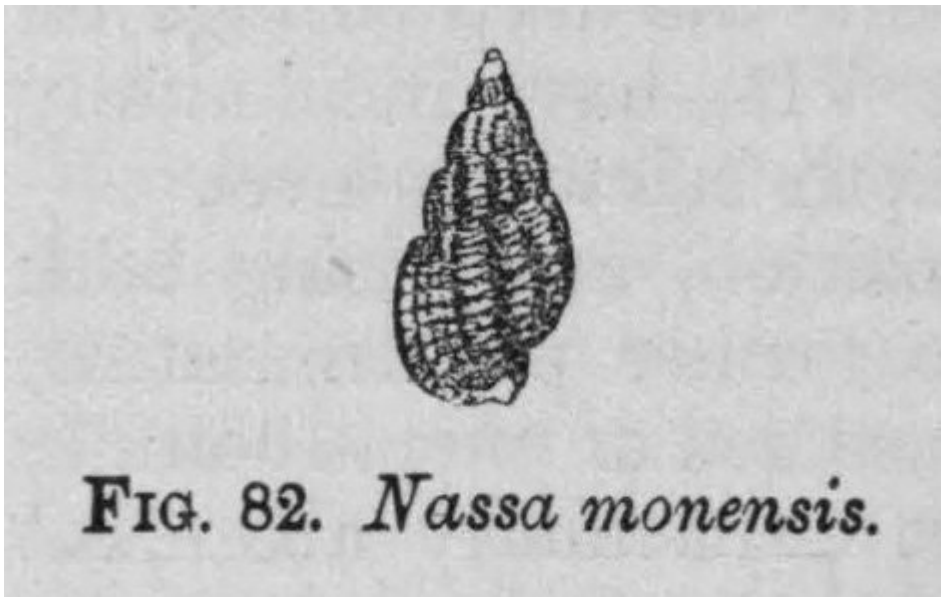


FIG. 82. *Nassa monensis.*

(Figure 82) Nassa monensis. Shells of the Manx Extra-Insular Drift (nat. size). Drawn by Mr. Gilbert Williams from specimens in the Geological Survey Museum.

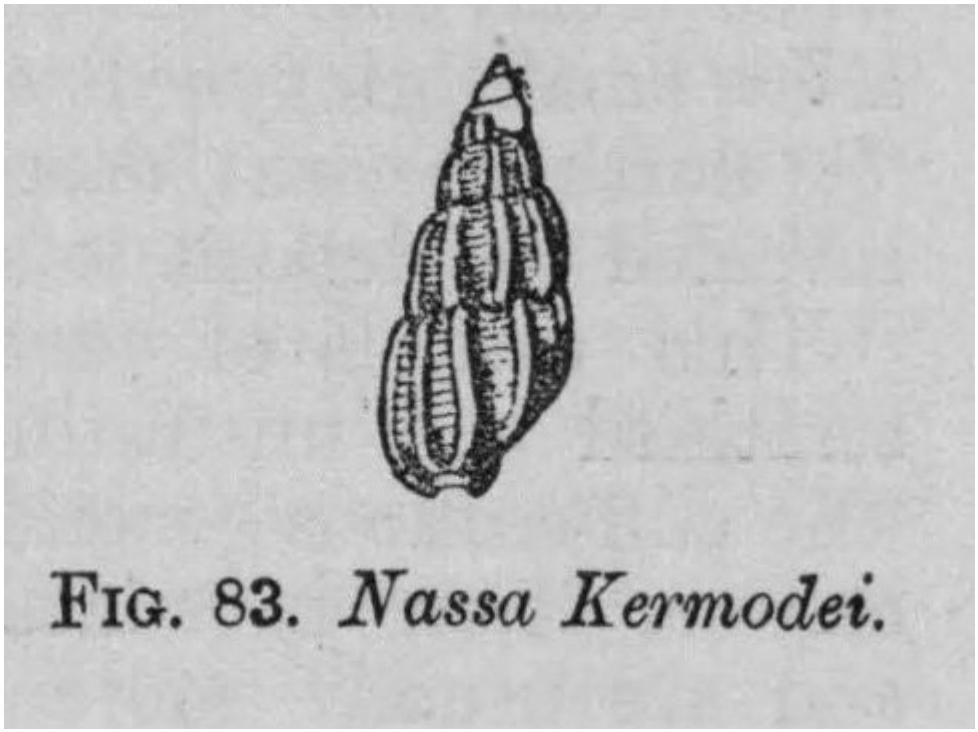


FIG. 83. *Nassa Kermodei.*

(Figure 83) Nassa Kermodei. Shells of the Manx Extra-Insular Drift (nat. size). Drawn by Mr. Gilbert Williams from specimens in the Geological Survey Museum.

FIG. 84.
Fusus Forbesi.

(Figure 84) Fusus Forbesi. Shells of the Manx Extra-Insular Drift (nat. size). Drawn by Mr. Gilbert Williams from specimens in the Geological Survey Museum.

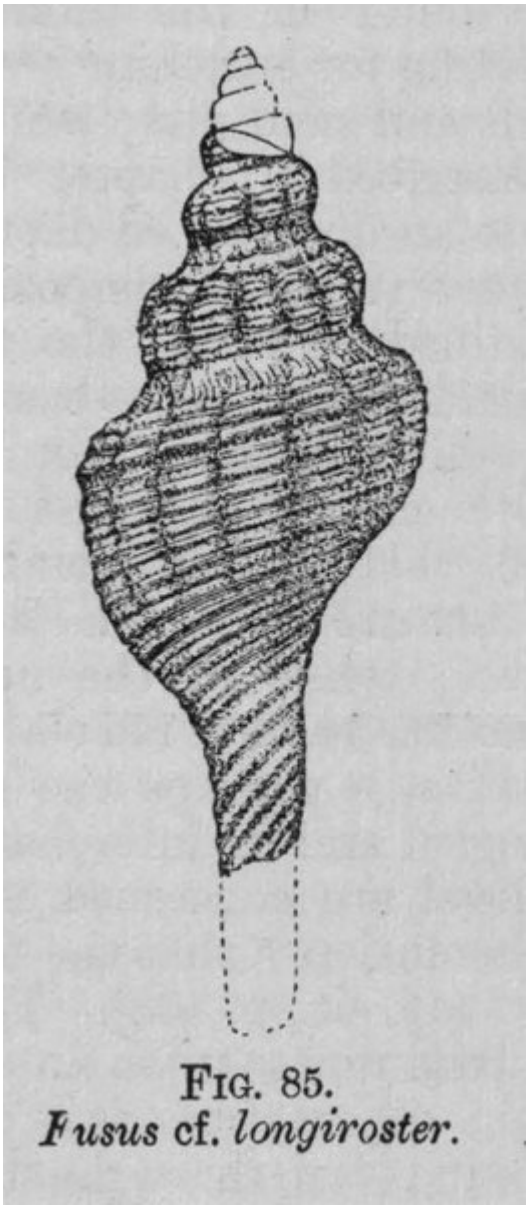


FIG. 85.
Fusus cf. *longiroster.*

(Figure 85) Fusus cf. longiroster. Shells of the Manx Extra-Insular Drift (nat. size). Drawn by Mr. Gilbert Williams from specimens in the Geological Survey Museum.

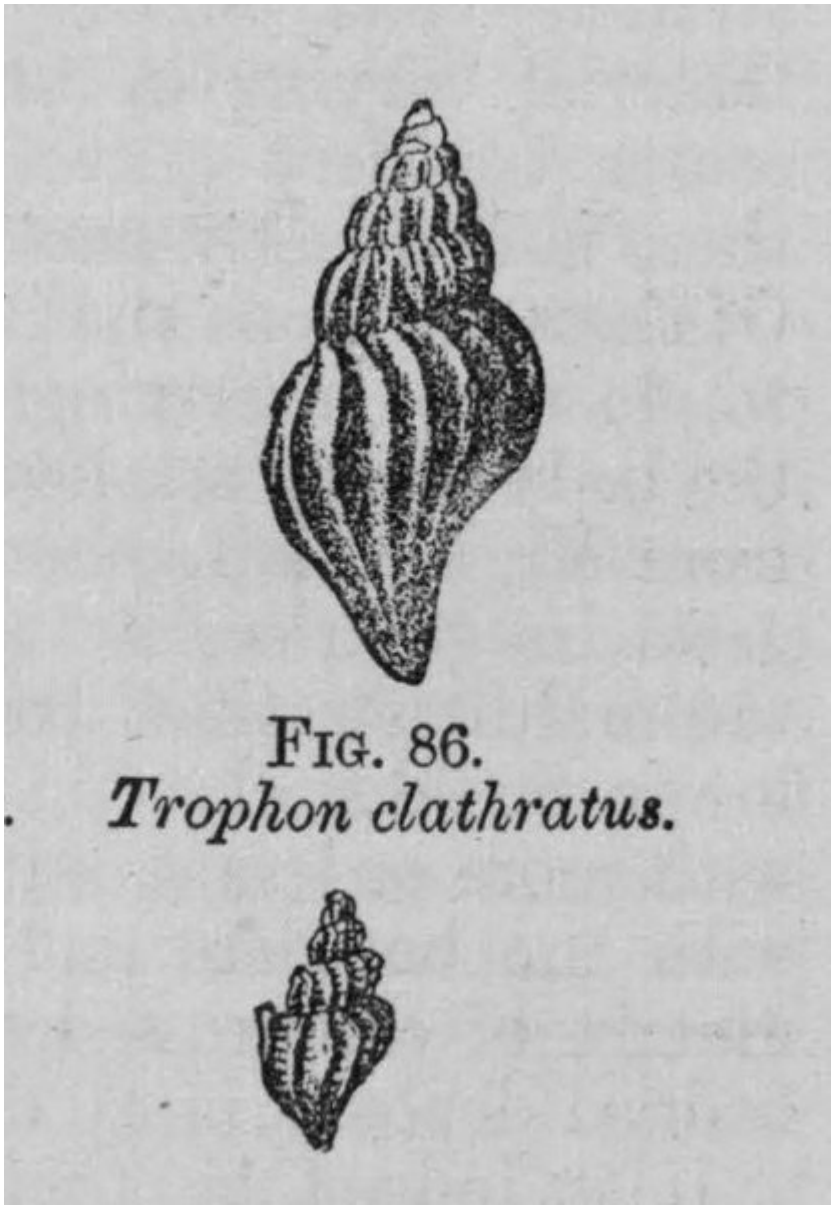


FIG. 86.
Trophon clathratus.

(Figure 86) Traphon clathratus. Shells of the Manx Extra-Insular Drift (nat. size). Drawn by Mr. Gilbert Williams from specimens in the Geological Survey Museum.

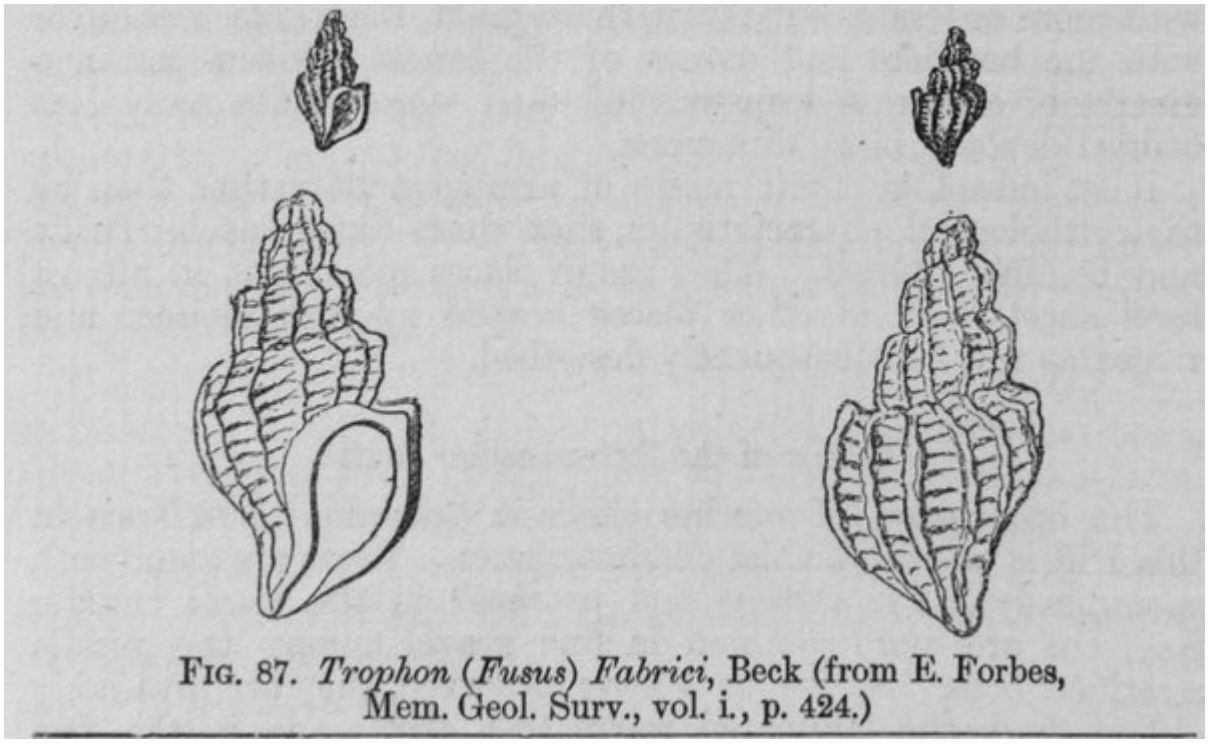


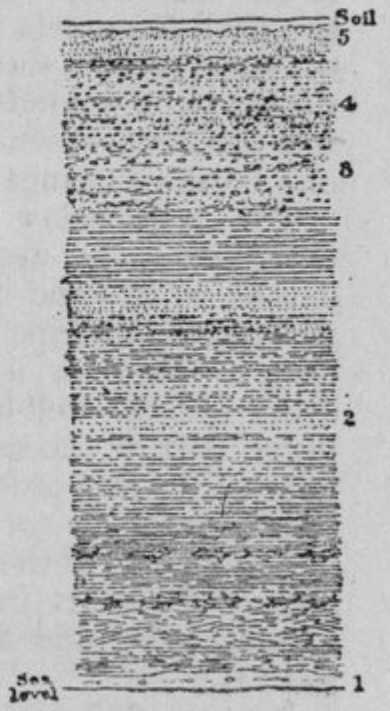
FIG. 87. *Trophon* (*Fusus*) *Fabrici*, Beck (from E. Forbes, Mem. Geol. Surv., vol. i., p. 424.)

(Figure 87) Trophon (Fusus) Fabrici, Beck (from E. Forbes, Mem. Geol. Surv., vol. 1., p. 424.)

FIG. 88. *Cliff-section in glacial drift at Kionlough 2 miles north of Ramsey.*

Scale : 1 inch = 40 feet.

		Thickness
5	Blown sand and gravelly rainwash	3 to 5 feet
4	Stratified gravel and sand = Upper Platform Gravel - - -	about 15 „
3	Reddish warp and clay, more or less stratified; rather stony in the upper part; passing downwards into— - - -	„ 20 „
2	Well-stratified sand with gravelly layers and streaks of red clay; calcareous concretions in places. Shell-fragments abundant in the finer gravel but absent from the sand and clay - - - -	50 to 60 „
1	Red warp or clay with a few stones, at foot of cliff - -	about 5 „.



(Figure 88) Cliff section in glacial drift at Kionlough 2 miles north of Ramsey. Scale:1 inch = 40 feet. 5. Blown sand and gravelly rainwash — Thickness 3 to 5 feet 4. Stratified gravel and sand = Upper Platform Gravel — about 15 feet 3. Reddish warp and clay, more or less stratified rather stony in the upper part; passing downwards into —Thickness 20 feet 2. Well-stratified sand with gravelly layers and streaks of red clay; calcareous concretions in places. Shell-fragments abundant in the finer gravel but absent from the sand and clay Thickness 50 to 60 feet 1. Red warp or clay with a few stones, at foot of cliff Thickness about 5 feet.

FIG. 89. *Cliff-section in glacial drift at the southern side of Orrisdale Head, 1 mile north of Kirk Michael.*

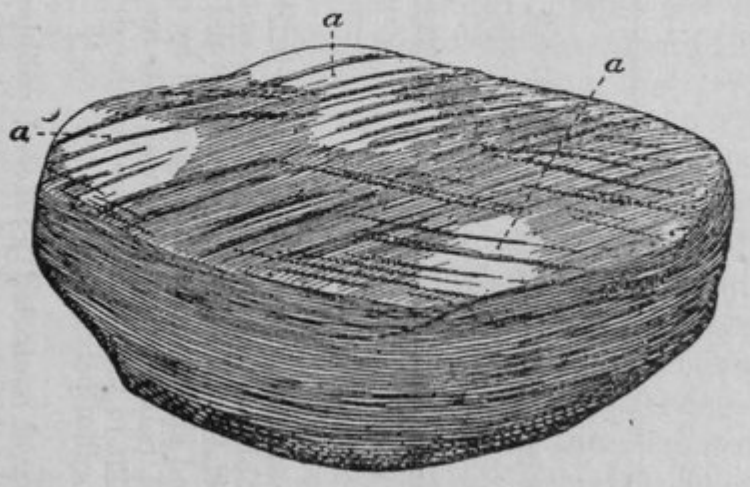
Scale : 1 inch = 40 feet.

	Thickness.
5 Blown sand - - - -	about 5 feet.
4 Stratified sand, etc., with band of red clay in places, not well seen	„ 15 „
3 Stratified sand, warp and fine gravel, contorted in places ; a few shell-fragments in the gravel	„ 20 „
2 Coarse bouldery gravel, cross-bedded ; thickening northward and there resting on an eroded surface, but here thinning out and apparently passing into— -	0 to 10 „
1 Rudely stratified and contorted sandy boulder - clay or loam, containing many boulders and scratched stones of extra-insular origin, especially towards the top ; also a few small fragments of slate, possibly Manx, and a few shell-fragments - - -	30 to 40 „

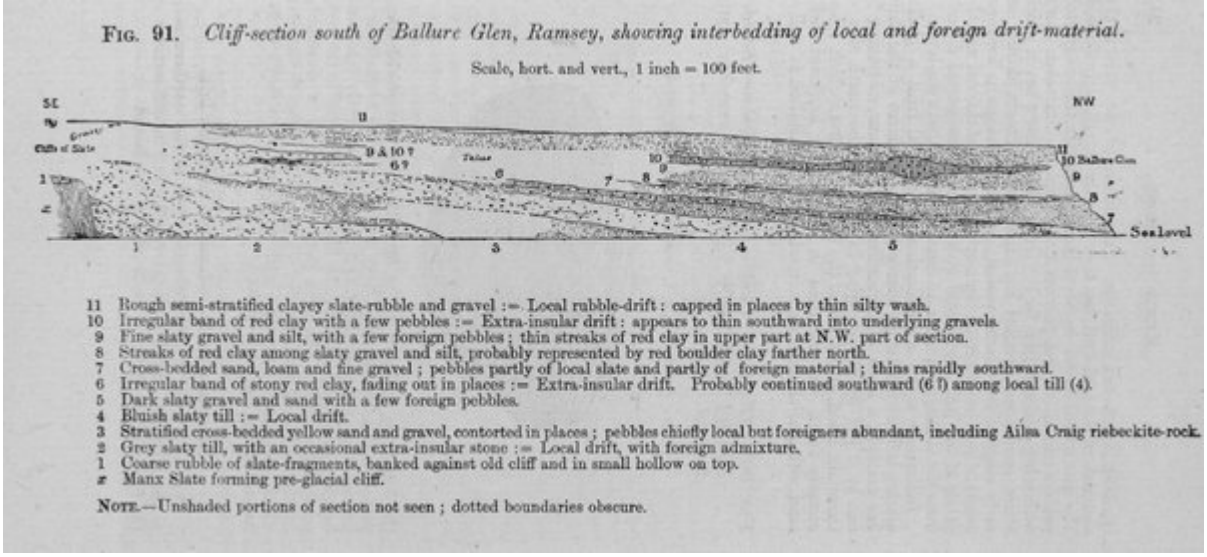
(Figure 89) Cliff section in glacial drift at the southern side of Orrisdale Head, 1 mile north of Kirk Michael. Scale: 1 inch = 40 feet. 5. Blown sand about 5 feet. 4. Stratified sand, etc., with band of red clay in places, not well seen 15 feet thickness 3. Stratified sand, warp and fine gravel, contorted in places; a few shell-fragments in the gravel 20 feet thickness 2. Coarse bouldery gravel, cross bedded; thickening northward and there resting on an eroded surface, but here thinning out and apparently passing into — 0 to 10 feet thickness 1. Rudely stratified and contorted sandy boulder clay or loam, containing many boulders and scratched stones of extra-insular origin, especially towards the top; also a few small fragments of slate, possibly Manx, and a few shell-fragments 30 to 40 feet thickness.

FIG. 90. *Glaciated Carboniferous Limestone Boulder encrusted with shelly sand and afterwards again glaciated.*

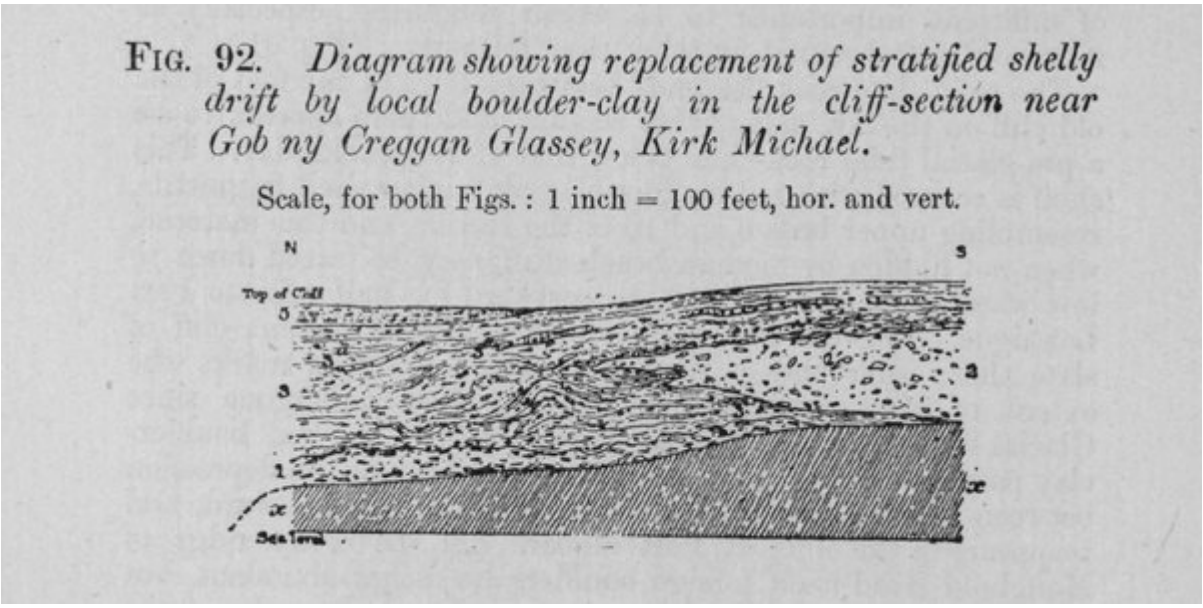
Scale : $\frac{1}{12}$ nat. *a, a, a,* incrustations of shelly sand.



(Figure 90) Glaciated Carboniferous Limestone Boulder encrusted with daily sand and afterwards again glaciated. Scale: 1/12. nat. a, a, a, incrustations of shelly sand.

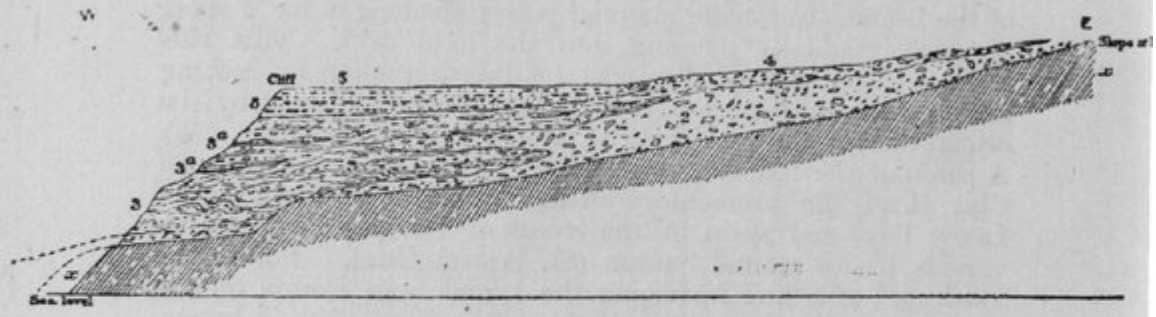


(Figure 91) Cliff-section south of Ballure Glen, Ramsey, showing interbedding of local and foreign drift-material. Scale, horiz. and vert., 1 inch = 100 feet. 11. Rough semi-stratified clayey slate-rubble and gravel: =, Local rubble-drift: capped in places by thin silty wash. 10. Irregular band of red clay with a few pebbles:= Extra-insular drift: appears to thin southward into underlying gravels. 9. Fine slaty gravel and silt, with a few foreign pebbles; thin streaks of red clay in upper part at N.W. part of section. 8. Streaks of red clay among slaty gravel and silt, probably represented by red boulder clay farther north. 7. Cross-bedded sand, loam and fine gravel; pebbles partly of local slate and partly of foreign material thins rapidly southward. 6. Irregular band of stony red clay, fading out in places:= Extra-insular drift. Probably continued southward (6 ?) among local till (4). 5. Dark slaty gravel and sand with a few foreign pebbles. 4. Bluish slaty till:= Local drift. 3. Stratified cross-bedded yellow sand and gravel, contorted in places; pebbles chiefly local but foreigners abundant, including Ailsa Craig riebeckite-rock. 2. Grey slaty till, with an occasional extra-insular stone:= Local drift, with foreign admixture., 1. Coarse rubble of slate-fragments, banked against old cliff and in small hollow on top. x. Manx Slate forming pm-glacial cliff. NOTE. — Unshaded portions of section not seen; dotted boundaries obscure.



(Figure 92) Diagram showing replacement of stratified shelly drift by local boulder-clay in the cliff-section near Gob ny Creggan Glassey, Kirk Michael. Scale, for both Figs.: 1 inch = 100 feet, hor. and vert. Explanation (for both sections). 5. Stratified slaty platform-gravel, probably passing into (4) at foot of slope. 4. Upper local rubble-drift. 3. Stratified extra-insular drift; cross-bedded and confused in places; composed of sand, silt, gravel, with a few shell fragments, and thin patches of red clay, 3a, towards the top; the gravel, a mixture of local and foreign material. 2. Dark grey or blue local till, with a few foreign stones. 1. Slaty rubble passing in places into dark slaty till (2). x Manx Slates.

FIG. 93. *Diagram at right angles to the above, showing general arrangement of the drift deposits on the lower slopes of the hills; based on sections in Glion Thoar and Glion Shellan.*



EXPLANATION (for both sections).

5 Stratified slaty platform-gravel, probably passing into (4) at foot of slope.

4 Upper local rubble-drift.

3 Stratified extra-insular drift; cross-bedded and confused in places; composed of sand, silt, gravel, with a few shell fragments, and thin patches of red clay, 3a, towards the top; the gravel, a mixture of local and foreign material.

2 Dark grey or blue local till, with a few foreign stones.

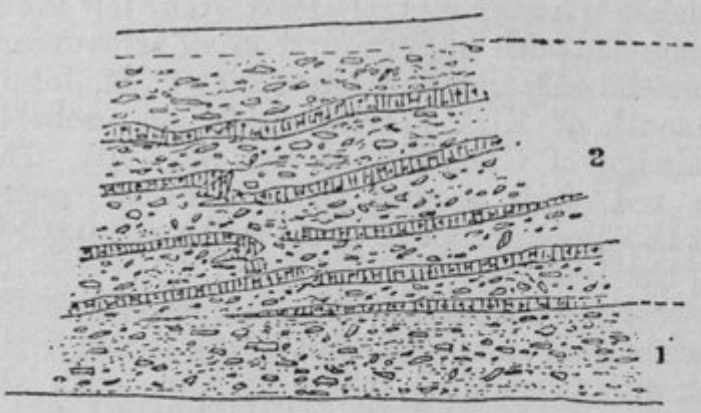
1 Slaty rubble passing in places into dark slaty till (2).

x Manx Slates.

(Figure 93) Diagram at right angles to the above, showing general arrangement of the drift deposits on the lower slopes of the hills; based on sections in Glion Thoar and Glion Shellan. Explanation (for both sections). 5. Stratified slaty platform-gravel, probably passing into (4) at foot of slope. 4. Upper local rubble-drift. 3 Stratified extra-insular drift; cross-bedded and confused in places; composed of sand, silt, gravel, with a few shell fragments, and thin patches of red clay, 3a, towards the top; the gravel, a mixture of local and foreign material. 2. Dark grey or blue local till, with a few foreign stones. 1. Slaty rubble passing in places into dark slaty till (2). x Manx Slates.

FIG. 94. *Drift-section in the west bank of the Foxdale River, opposite Ballahig, showing interlamination of red (extra-insular) and grey (insular) boulder-clay.*

Scale: 1 inch = 20 feet.



Top not exposed.

2 Slaty clay (local drift) traversed by several narrow contorted strips of red pebbly clay (extra-insular), from 1 inch to 4 inches thick, containing foreign pebbles as well as slate fragments: about - 10 ft.

1 Slaty rubble in grey clayey matrix (local drift)- 6 ft.

(Figure 94) Drift-section in the west bank of the Foxdale River, opposite Ballahig, showing interlamination of red (extra-insular) and grey (insular) boulder-clay. Scale: 1 inch = 20 feet. Top not exposed. 2. Slaty clay (local drift) traversed by several narrow contorted strips of red pebbly clay (extra insular), from 1 inch to 4 inches thick, containing foreign pebbles as well as slate fragments: about 10 ft. 1. Slaty rubble in grey clayey matrix (local drift) — 6 ft.

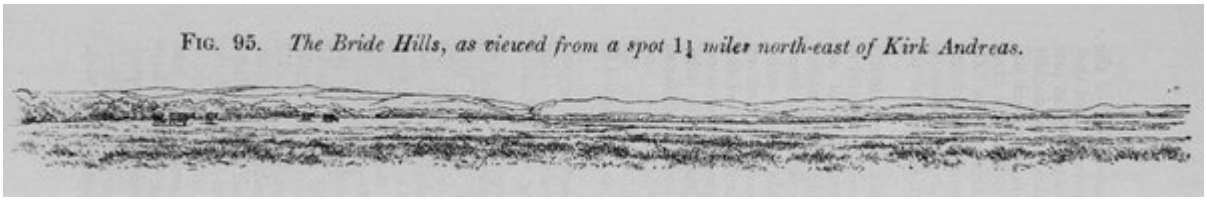


FIG. 95. *The Bride Hills, as viewed from a spot 1¼ miles north-east of Kirk Andreas.*

(Figure 95) The Bride Hills, as viewed from a spot 1¼ miles north-east of Kirk Andreas.

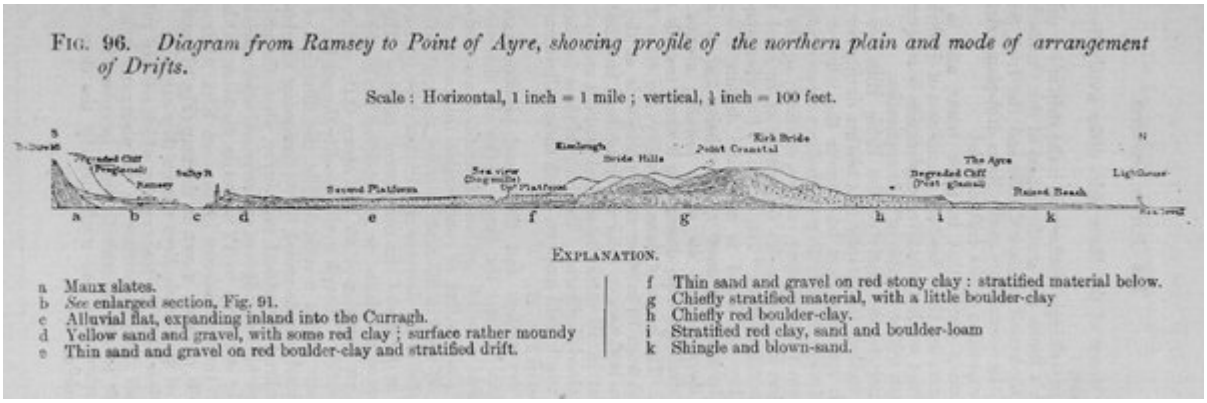


FIG. 96. *Diagram from Ramsey to Point of Ayre, showing profile of the northern plain and mode of arrangement of Drifts.*

Scale: Horizontal, 1 inch = 1 mile; vertical, ¼ inch = 100 feet.

EXPLANATION.

a Manx slates.
b *See* enlarged section, Fig. 91.
c Alluvial flat, expanding inland into the Curragh.
d Yellow sand and gravel, with some red clay; surface rather moundy
e Thin sand and gravel on red boulder-clay and stratified drift.
f Thin sand and gravel on red stony clay: stratified material below.
g Chiefly stratified material, with a little boulder-clay
h Chiefly red boulder-clay.
i Stratified red clay, sand and boulder-loam
k Shingle and blown-sand.

(Figure 96) Diagram from Ramsey to Point of Ayre, showing profile of the northern plain and mode of arrangement of Drifts. Scale: Horizontal, 1 inch = 1 mile; vertical, ■ inch = 100 feet. Explanation. a. Manx slates. b. See enlarged section, (Figure 91) c. Alluvial flat, expanding inland into the Curragh. d. Yellow sand and gravel, with some red clay; surface rather moundy e. Thin sand and gravel on red boulder-clay and stratified drift. f. Thin sand and gravel on red stony clay: stratified material below. g. Chiefly stratified material, with a little boulder-clay h. Chiefly red boulder-clay. i. Stratified red clay, sand and boulder-loam k. Shingle and blown-sand.

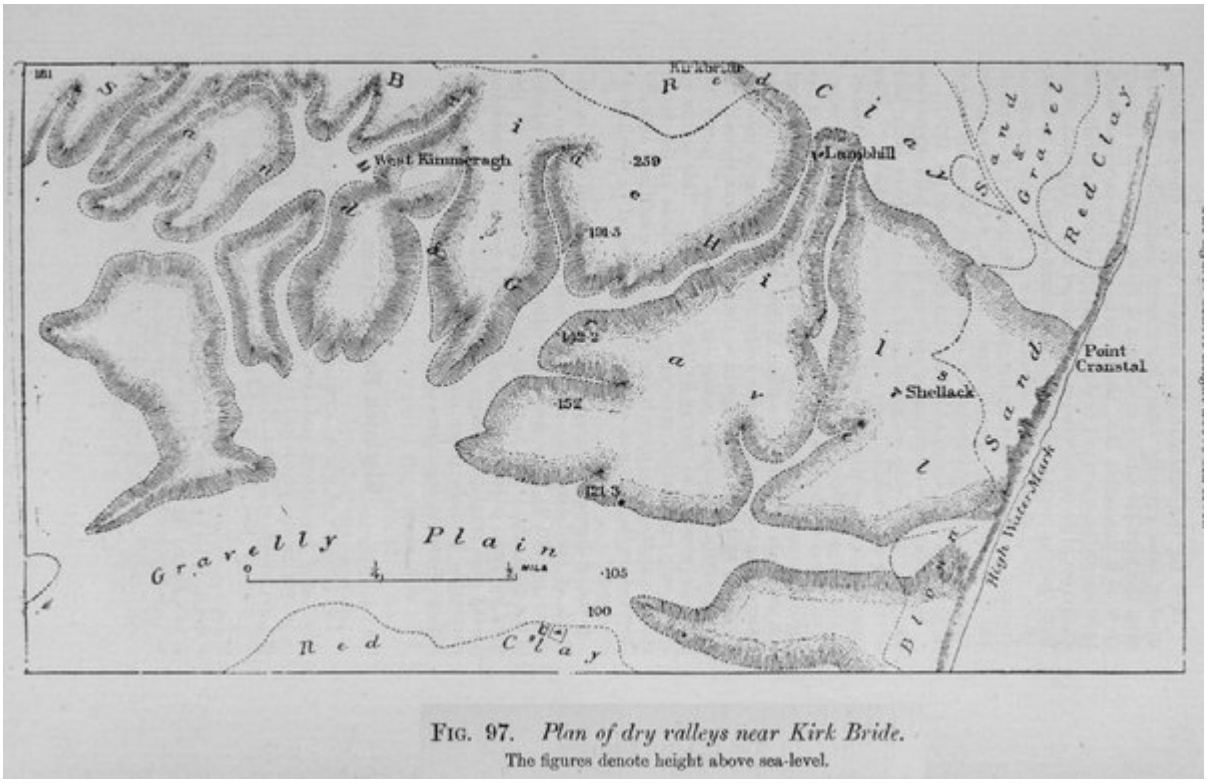


FIG. 97. *Plan of dry valleys near Kirk Bride.*
The figures denote height above sea-level.

(Figure 97) Plan of dry valleys near Kirk Bride. The figures denote height above sea-level.

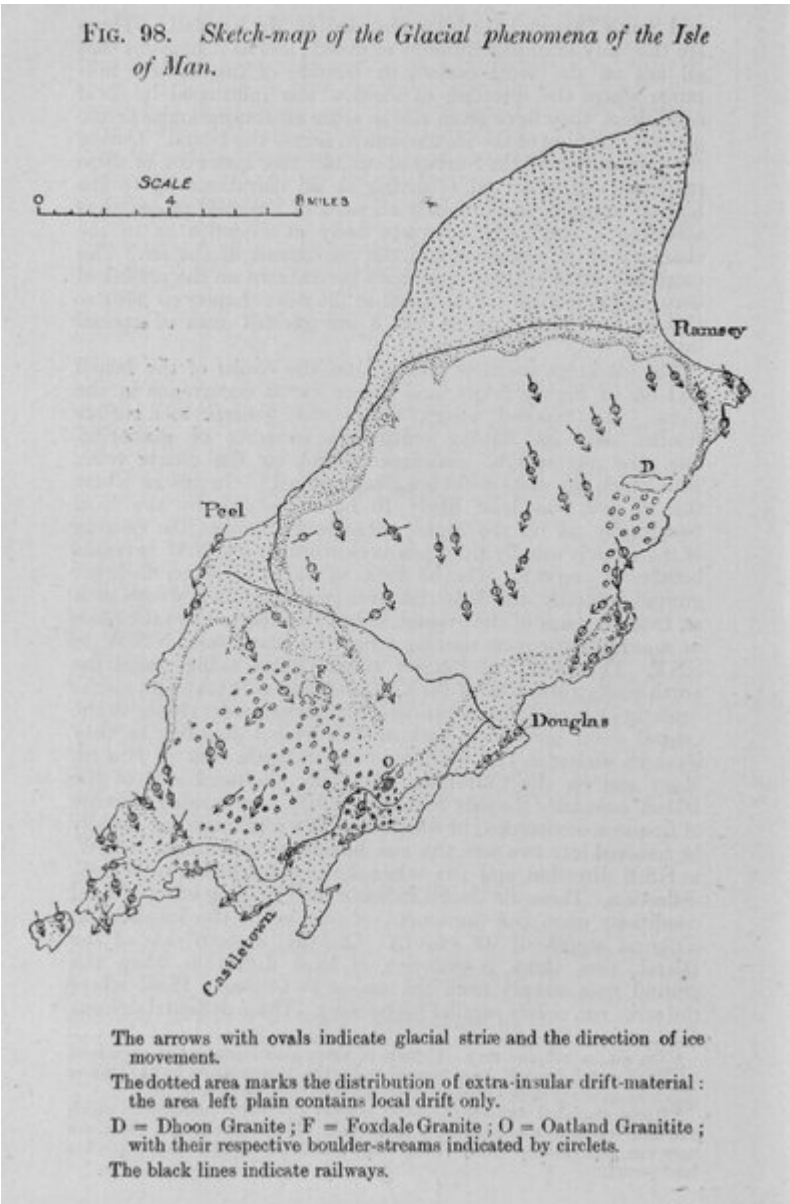


FIG. 98. *Sketch-map of the Glacial phenomena of the Isle of Man.*

The arrows with ovals indicate glacial striæ and the direction of ice movement.

The dotted area marks the distribution of extra-insular drift-material: the area left plain contains local drift only.

D = Dhoon Granite; F = Foxdale Granite; O = Oatland Granitite; with their respective boulder-streams indicated by circlets.

The black lines indicate railways.

(Figure 98) Sketch-map of the Glacial phenomena of the Isle of Man. The arrows with ovals indicate glacial stria and the direction of ice movement. The dotted area marks the distribution of extra-insular drift-material: the area left plain contains local drift only. D = Dhoon Granite; F = Foxdale Granite; O = Oatland Granitite; with their respective boulder-streams indicated by circlets. The black lines indicate railways.

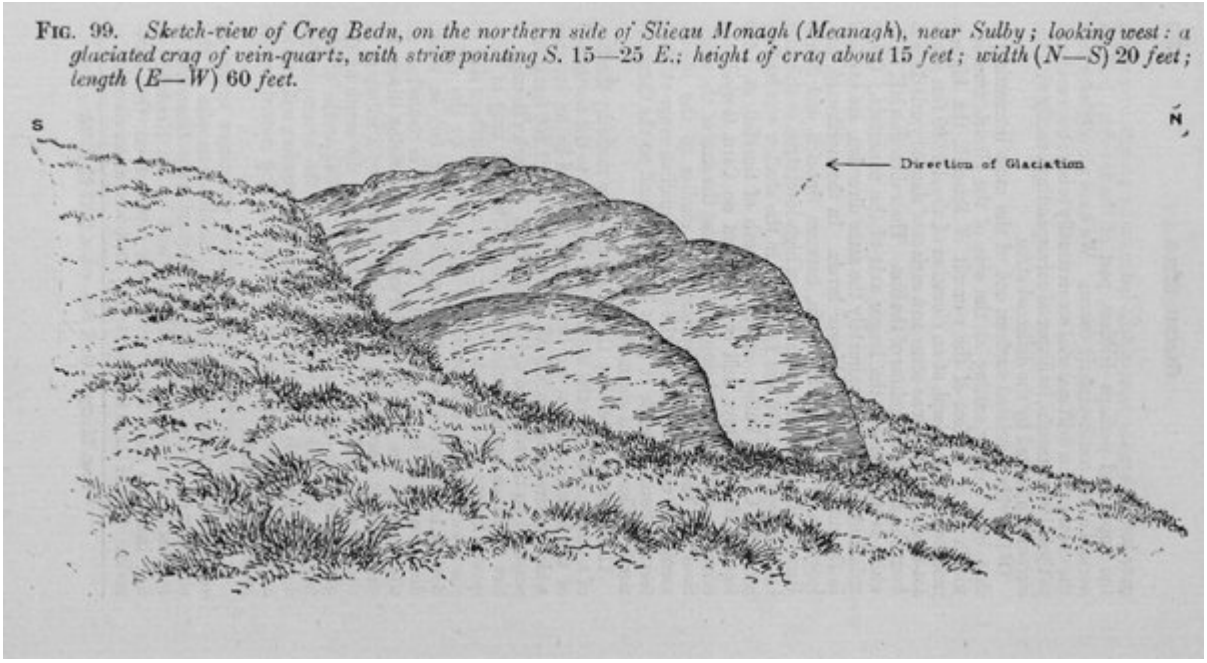
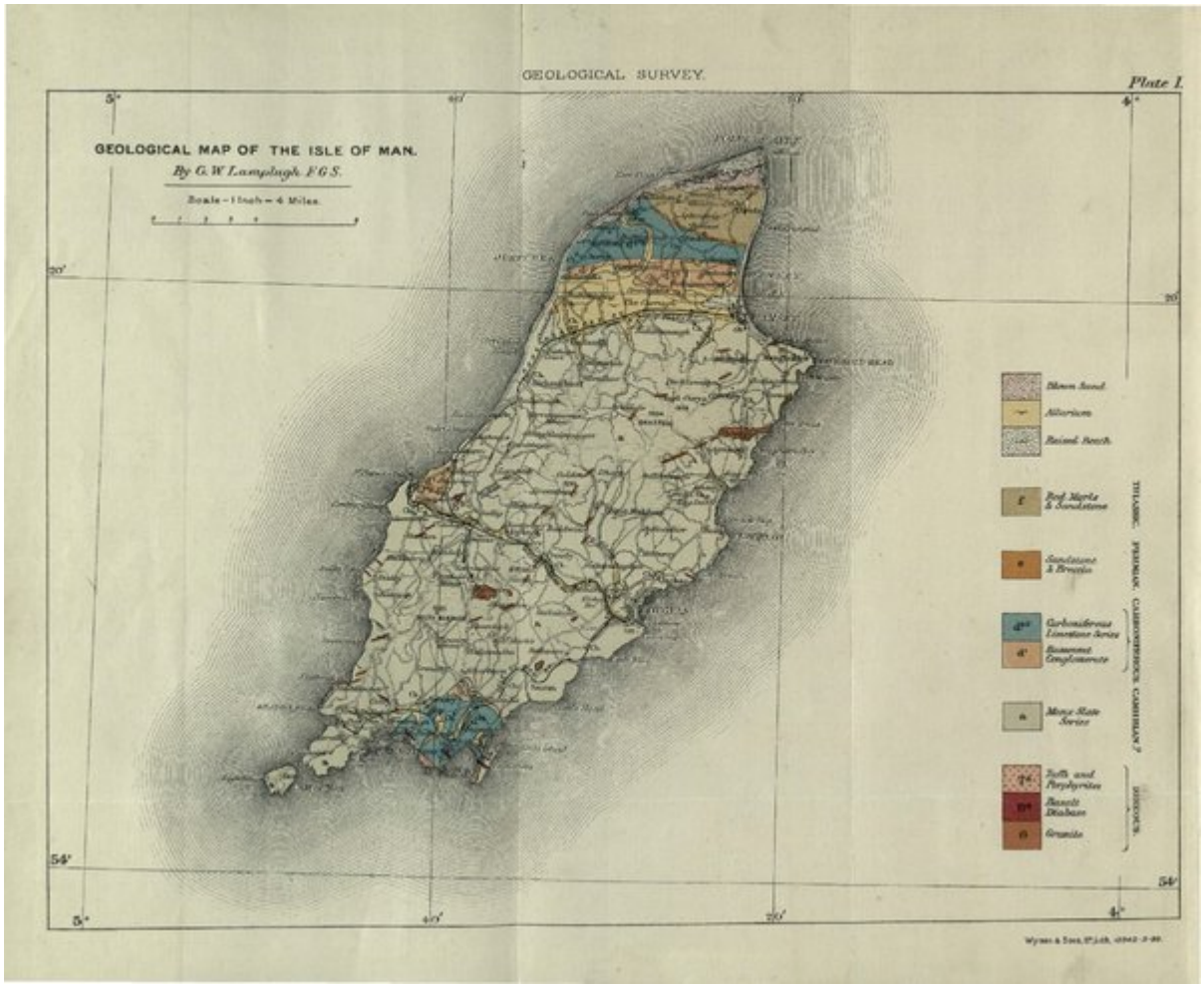
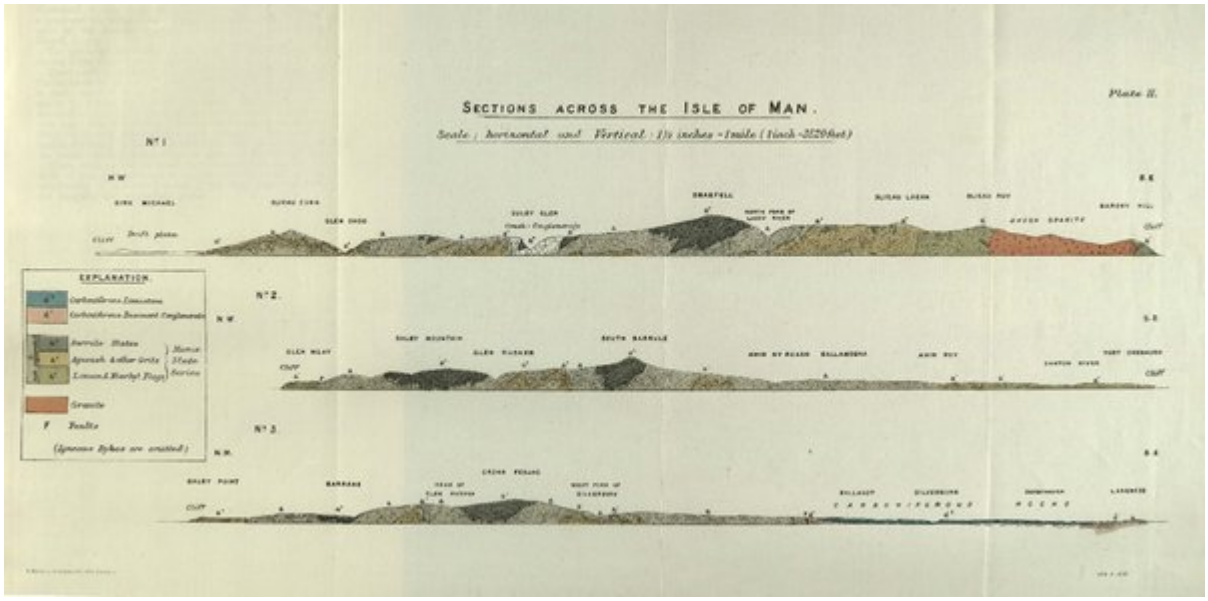


FIG. 99. *Sketch-view of Creg Bedn, on the northern side of Slieau Monagh (Meanagh), near Sulby; looking west: a glaciated crag of vein-quartz, with striæ pointing S. 15—25 E.; height of crag about 15 feet; width (N—S) 20 feet; length (E—W) 60 feet.*

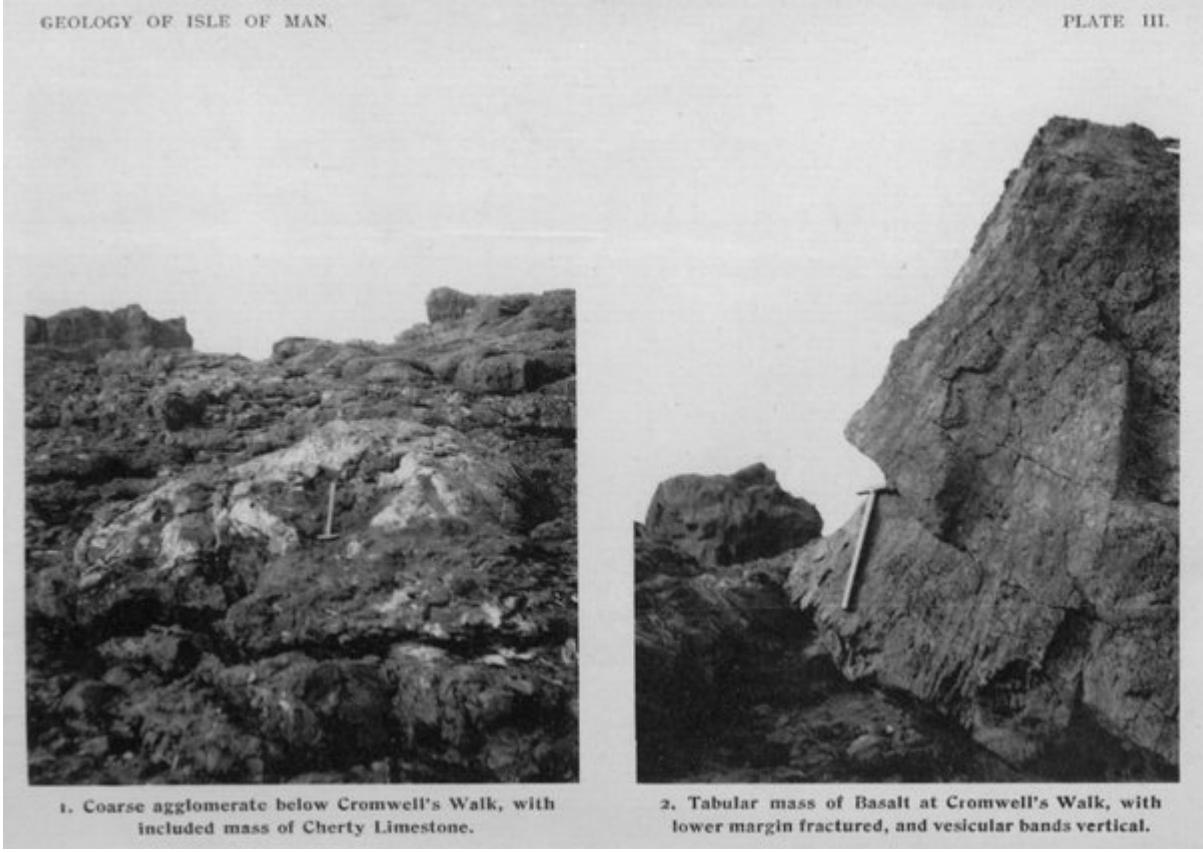
(Figure 99) Sketch-view of Creg Bedn, on the northern side of Slieau Monagh (Meanagh), near Sulby; looking west: a glaciated crag of vein-quartz, with striae pointing S. 15–25 E.; height of crag about 15 feet; width (N–S) 20 feet; length (E–W) 60 feet.



(Plate 1) Geological map of the Isle of Man. By G.W. Lamplugh. Scale 1 inch = 4 miles.



(Plate 2) Sections across the Isle of Man. Scale: Horizontal and Vertical 1½ inches = 1 mile (1"=3520 feet)

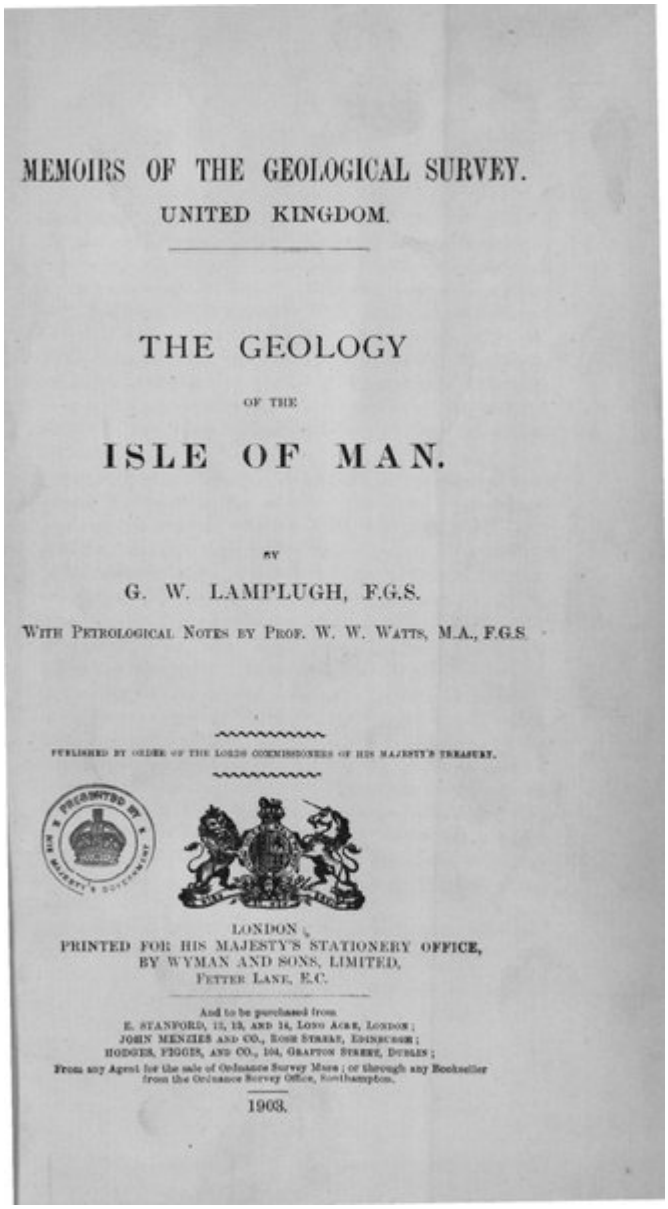


(Plate 3) 1. Coarse agglomerate below Cromwell's Walk, with included mass of Cherty Limestone. 2. Tabular mass of Basalt at Cromwell's Walk, with lower margin fractured, and vesicular bands vertical.

1. Enlarged View of Gaps in lower margin of Basalt at Cromwell's Walk.

2. Laminated Ash, with close-jointing and step-faulting; 800 yards south of Close ny Chollagh Point.

(Plate 4) 1. Enlarged view of Gaps in lower margin of basalt at Cromwell's Walk. 2. Laminated Ash, with close-jointing and step-faulting; 800 yards south of Close ny Chollagh Point.



MEMOIRS OF THE GEOLOGICAL SURVEY.
UNITED KINGDOM.

THE GEOLOGY
OF THE
ISLE OF MAN.

BY
G. W. LAMPLUGH, F.G.S.
WITH PETROLOGICAL NOTES BY PROF. W. W. WATTS, M.A., F.G.S.

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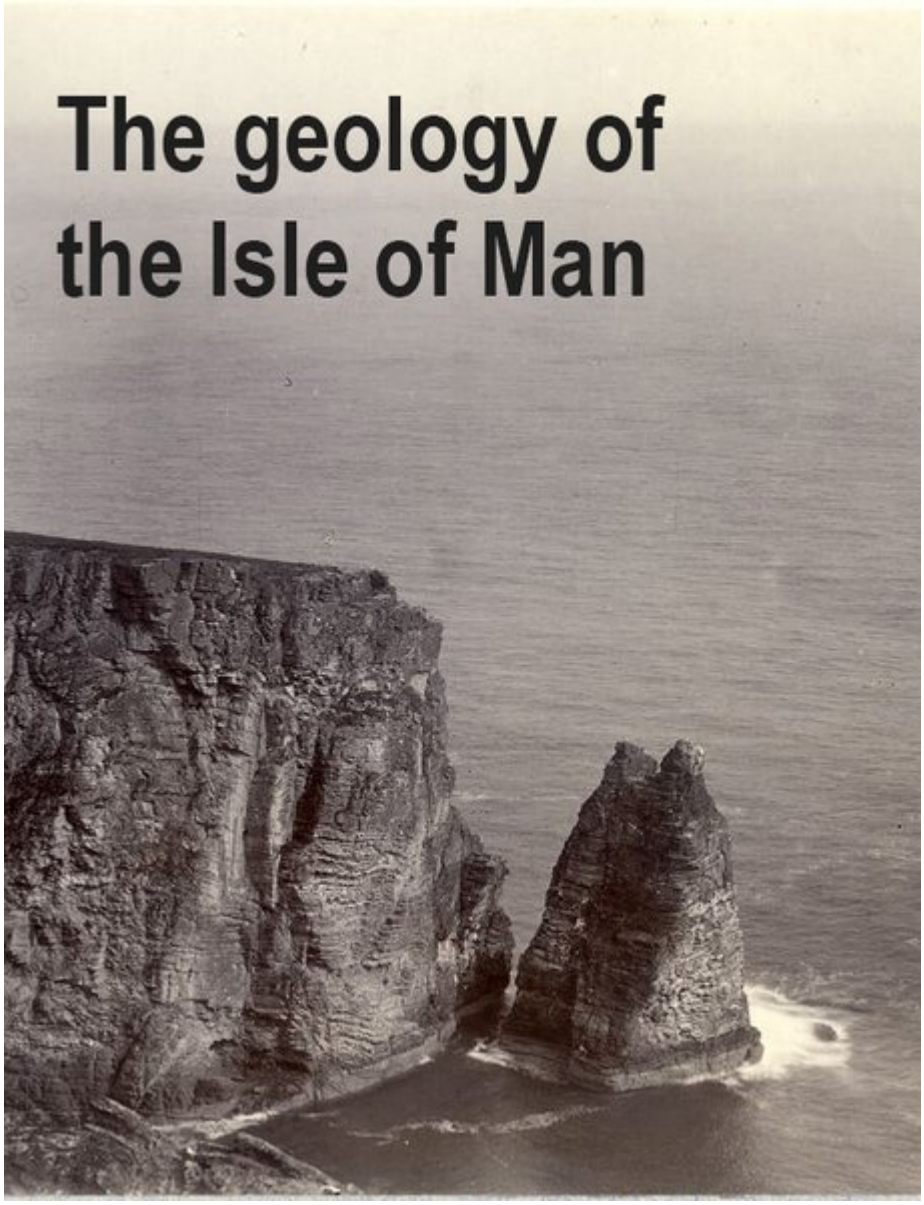
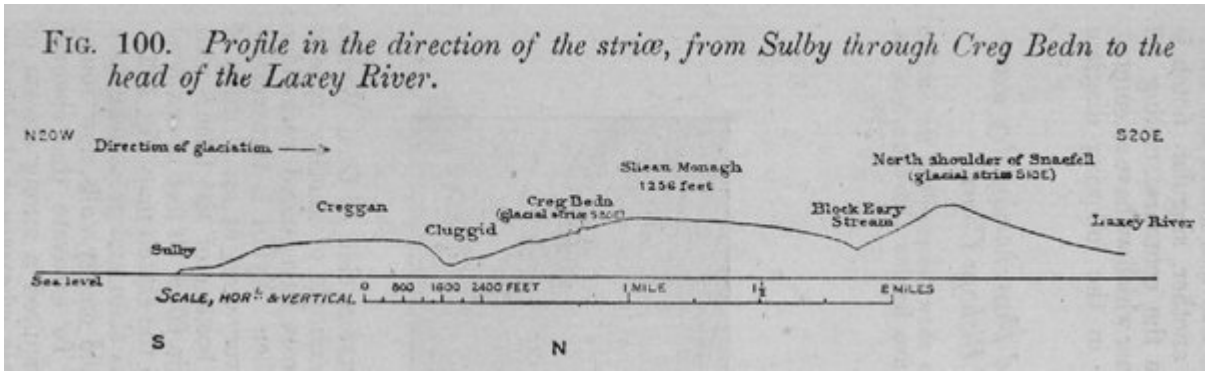
(Title page) Title page of The geology of the Isle of Man by G.W. Lamplugh. 1903.



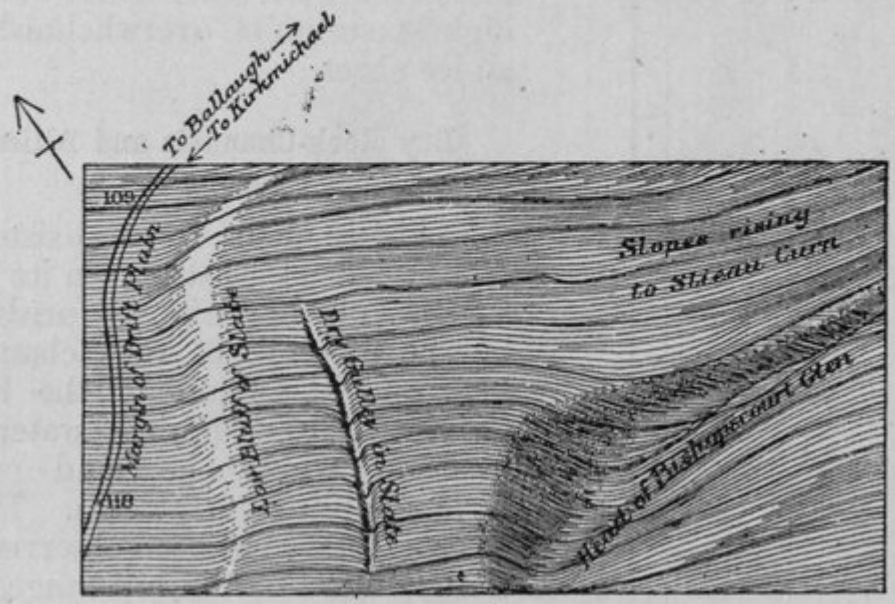
(Front cover) Bay Stacka and Sugarloaf seen from Spanish Head. Flaggy grits in Manx Slates. G. Bingley. BAAS photograph BAAS05115 at BGS. P246782.



(Figure 100) Profile in the direction of the strive, from Sulby through Greg Bedn to the head of the Laxey River.

FIG. 101. *Diagrammatic ground-plan showing dry watercourse on the hillside east of Bishops Court.*

Scale : 1 inch = 3 miles. The black lines show the profile of the surface at regular intervals. The numbers give heights above sea-level on highroad.



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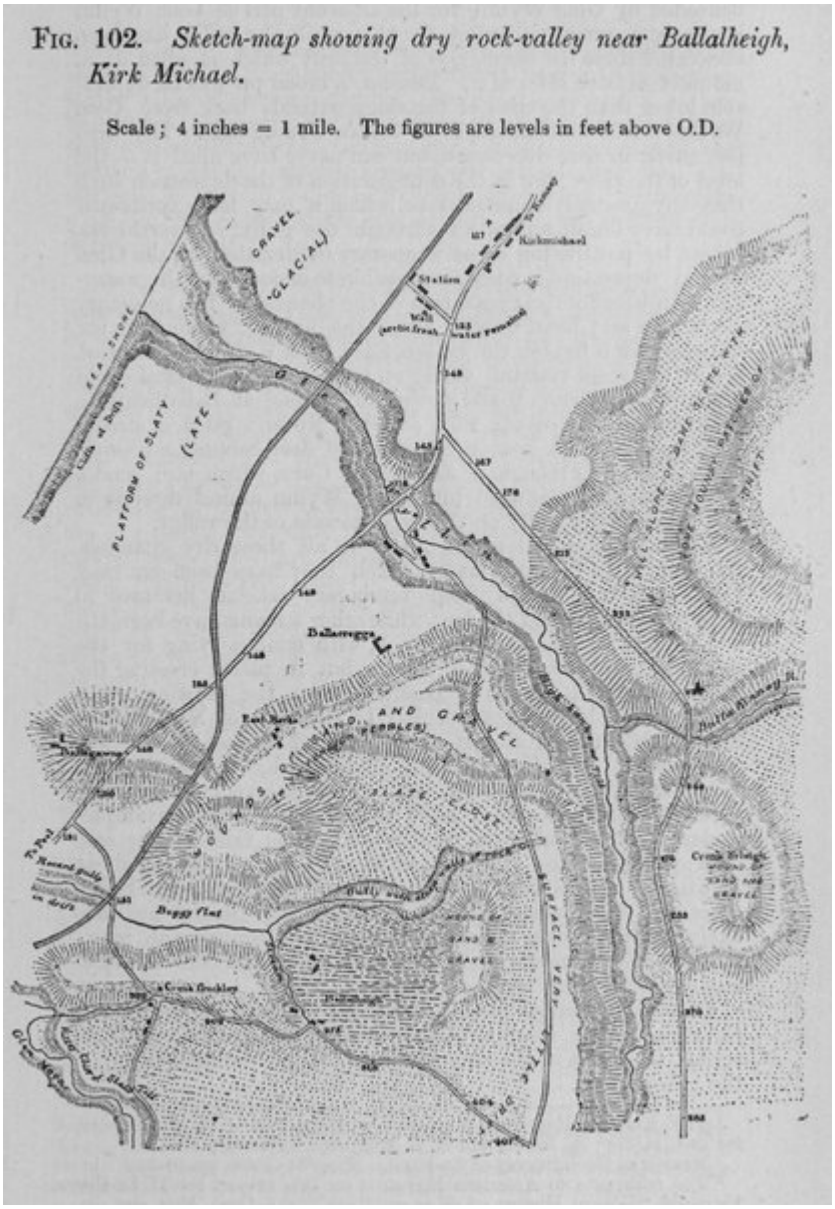
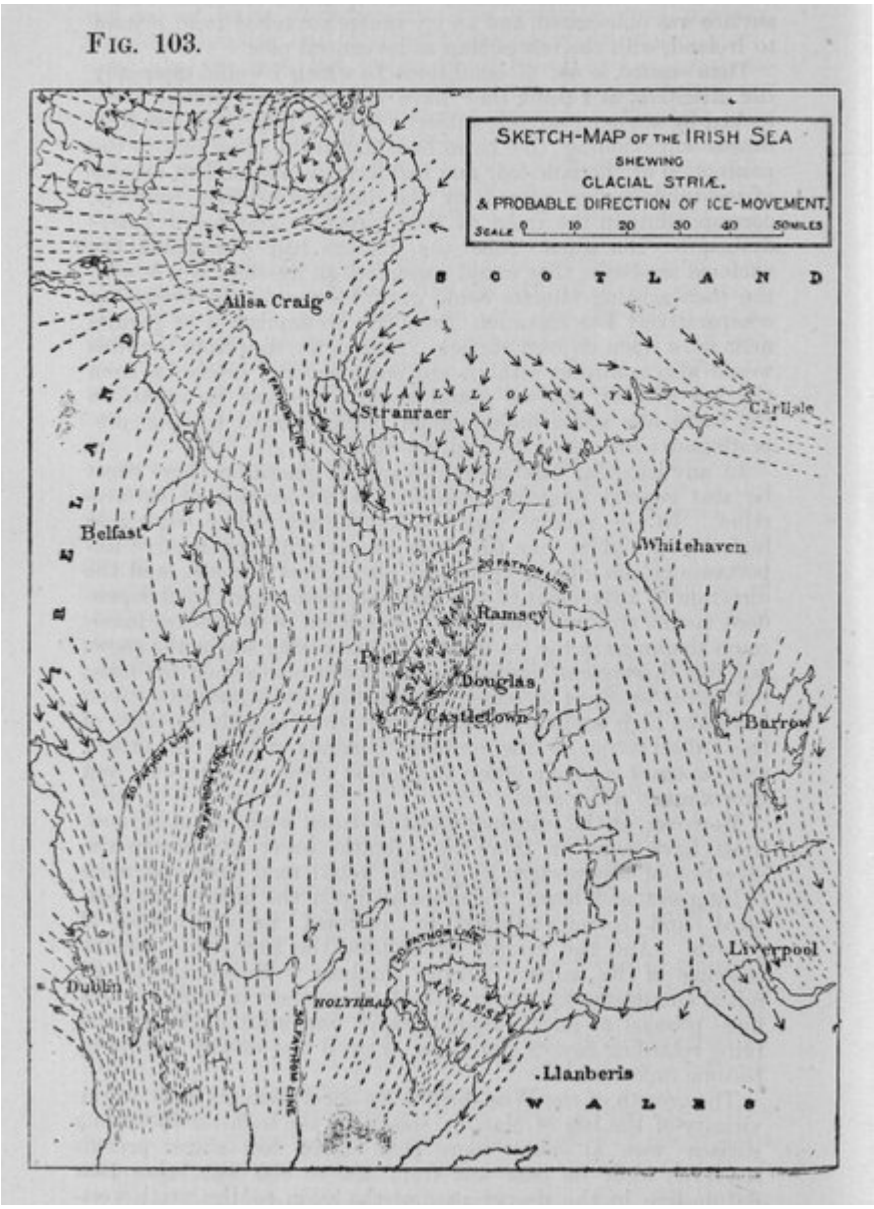
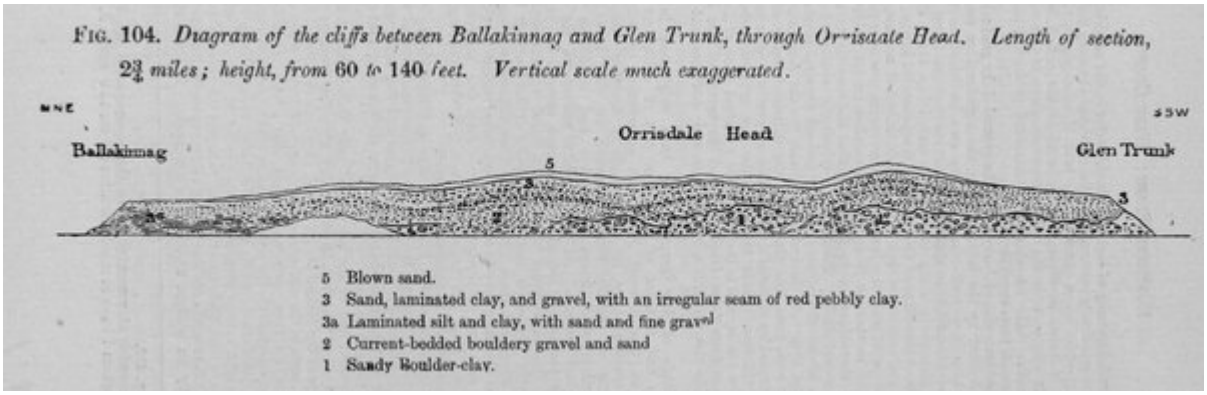


(Figure 102) Sketch-map showing dry rock-valley near Ballalheigh, Kirk Michael. Scale; 4 inches = 1 mile. The figures are levels in feet above O.D.

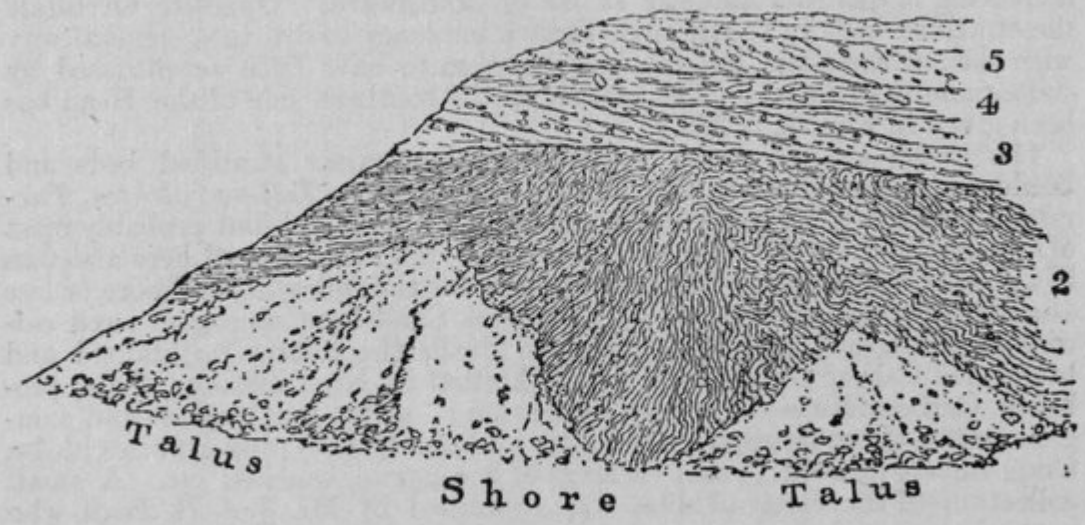


(Figure 103) Sketch-map of the Irish Sea shewing glacial striae & probable direction of ice-movement.



(Figure 104) Diagram of the cliffs between Ballakinnag and Glen Trunk, through Orrisdale Head. Length of section, 2¾ miles; height, from 60 to 140 feet. Vertical scale much exaggerated. 5. Blown sand. 3. Sand, laminated clay, and gravel, with an irregular seam of red pebbly clay. 3a. Laminated silt and clay, with sand and fine gravel 2. Current-bedded bouldery gravel and sand 1. Sandy Boulder-clay.

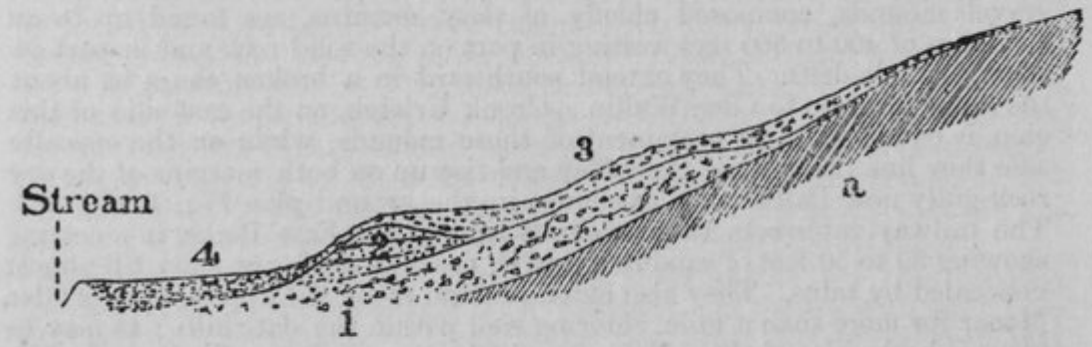
FIG. 105. *Cliff on the south side of Glen Balleira, Kirkmichael, height about 75 feet.*



Soil and sandy loam.
5 Current-bedded slaty platform-gravel, 8 feet thick.
4 Stony red clay, 4 feet thick.
3 Current-bedded sand and gravel.
2 Contorted warp and sand.

(Figure 105) Cliff on the south side of Glen Balleira, Kirkmichael. heiaht about 75 feet. Soil and sandy loam. 5. Current-bedded slaty platform-gravel, 8 feet thick. 4. Stony red clay, 4 feet thick. 3. Current-bedded sand and gravel. 2. Contorted warp and sand.

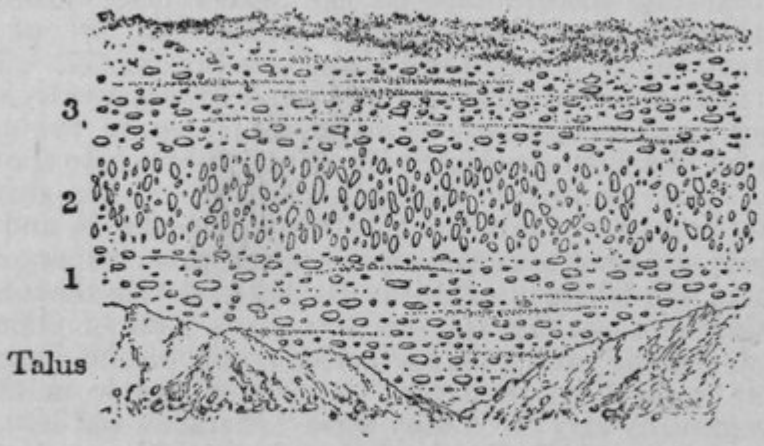
FIG. 106. *Diagram of the Drifts on the eastern side of Glen Dhoo, north of Ravensdale. Length of section about 600 yards.*



4 Late-glacial Flood-gravel.
3 Slaty rubble, with some striated fragments : = rearranged drift.
2 Yellow sand streaked with gravel with foreign pebbles, and with red clay; mixed towards the top with No. 3.
1 Slaty till.
a Manx Slates.

(Figure 106) Diagram of the Drifts on the eastern side of Glen Dhoo, north of Ravensdale. Length of section about 600 yards. 4. Late-glacial Flood-gravel. 3. Slaty rubble, with some striated fragments: = rearranged drift. 2. Yellow sand streaked with gravel with foreign pebbles, and with red clay; mixed towards the top with No. 3. 1. Slaty till. a Manx Slates.

FIG. 107. *Section at the top of the valley bank, 400 yards south-west of the Purt-ny-shee, near Douglas.*



3 Late-glacial flood-gravel ; pebbles, chiefly of slate, fairly well rolled, lying flat ; about 3 feet seen.
2 Grey loamy layer, with most of the pebbles vertical ; 1 to 2 feet.
1 Slaty gravel and wash like No. 1, with the pebbles flat.

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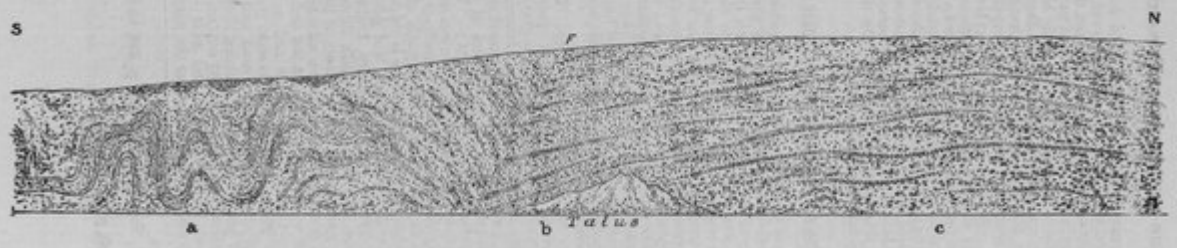
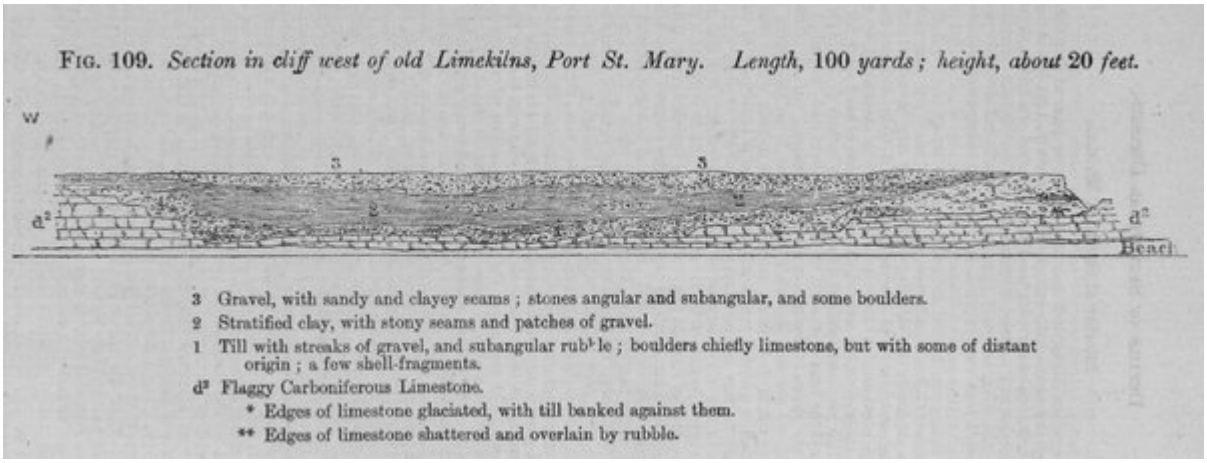
FIG. 108. *Section in drift-gravel in the cutting for the Marine Drive, between Port Soderick and Keristal. Length, 50 yards ; height, 15 to 25 feet.*

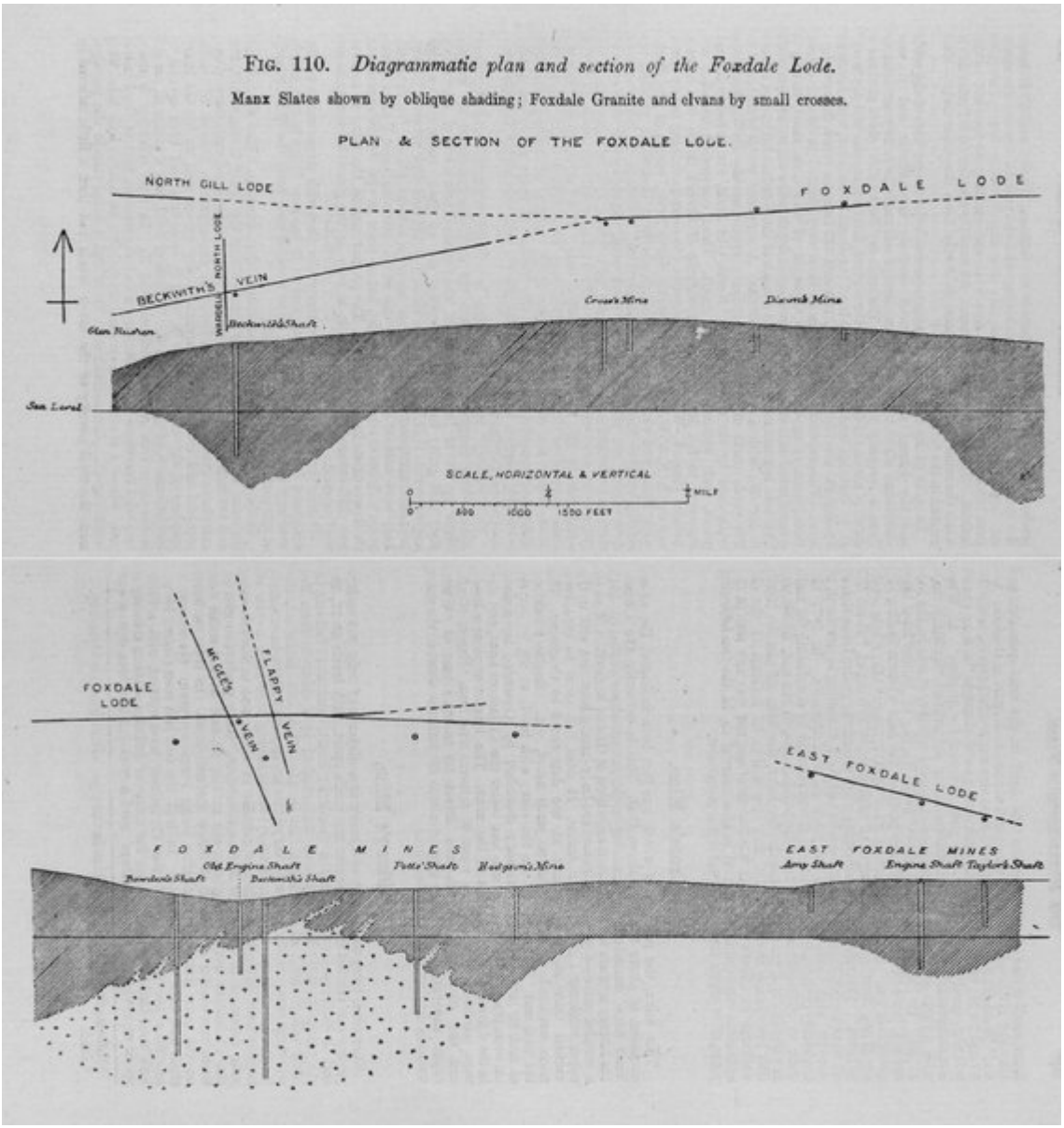


a Contorted sand loam and fine gravel ; red loamy clay with stones in hollows 1 to 3 feet deep at top.
b Sand and fine gravel.
c Well-bedded fine gravel and sand, with a few subangular blocks of local grit ; passing into coarser shingly gravel. Pebbles chiefly local, but with a few of extra-insular origin (flint, etc.).
F Fault-like break, with contortions immediately to southward.

(Figure 108) Section in drift-gravel in the cutting for the Marine Drive, between Port Soderick and Keristal. Length, 50 yards; height, 15 to 25 feet. a Contorted sand loam and fine gravel; red loamy clay with stones in hollows 1 to 3 feet deep at top. b Sand and fine gravel. c Well-bedded fine gravel and sand, with a few subangular blocks of local grit; passing into shingly gravel. Pebbles chiefly local, but with a few of extra-insular origin (flint, etc.). F Fault-like break, with contortions immediately to southward.



*(Figure 109) Section in cliff west of old Limekilns, Port St. Mary. Length, 100 yards; height, about 20 feet. 3. Gravel, with sandy and clayey seams; stones angular and subangular, and some boulders. 2. Stratified clay, with stony seams and patches of gravel. 1. Till with streaks of gravel, and subangular rubble; boulders chiefly limestone, but with some of distant origin; a few shell-fragments. d^2 Flaggy Carboniferous Limestone. * Edges of limestone glaciated, with till banked against them. ** Edges of limestone shattered and overlain by rubble.*



(Figure 110) Diagrammatic plan and section of the Foxdale Lode. Manx slates shown by oblique shading; Foxdale Granite and elvans by small crosses.