

Memoirs of the Geological Survey.

EXPLANATION

OF

SHEETS 160, 161, 171, AND PART OF 172,

AND OF THE

ENGRAVED SECTION, SHEET NO. 15,

OF THE

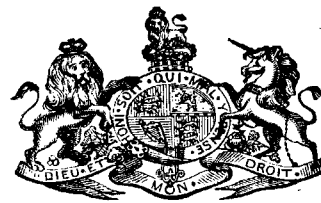
GEOLOGICAL SURVEY OF IRELAND,

ILLUSTRATING PART OF THE

COUNTY OF KERRY.

By J. BEETE JUKES, M.A., F.R.S., AND G. V. DU NOYER, M.R.I.A.

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DIRECTOR-GENERAL OF THE GEOLOGICAL SURVEY OF THE UNITED KINGDOM :

SIR RODERICK IMPEY MURCHISON, K.C.B., G.C.ST.S.,
D.C.L., F.R.S., &c., &c.

Geological Survey Office and Museum of Practical Geology, Jermyn-street, London.

IRISH BRANCH.

Office in the Museum of Irish Industry, 51, Stephen's-green, Dublin.

LOCAL DIRECTOR:

J. BEETE JUKES, M.A., F.R.S., &c.

SENIOR GEOLOGISTS :

G. V. DU NOYER, M.R.I.A.; W. H. BAILY, F.G.S.; G. H. KINAHAN, Esq.
F. J. FOOT, M.A.; J. O'KELLY, M.A.

ASSISTANT GEOLOGISTS :

J. KELLY, Esq.; R. G. SYMES, Esq.

COLLECTORS OF FOSSILS, &c. :

MR. C. GALVAN; MR. A. M'HENRY.

In the year 1853 I accompanied the late Sir Henry De la Beche and Professor Edward Forbes in an examination of the neighbourhood of Dingle, and the coast thence to Sybil Head. In the year 1856 I went over the same ground with Sir R. I. Murchison, Sir Richard Griffith, and Mr. Salter. Mr. G. V. Du Noyer, assisted in the part east of Dingle by Mr. A. B. Wynne, made the detailed survey of the district, and I several times joined them in the examination of different parts of the ground. The fossils collected at different times, formerly by the late Mr. Flanagan and latterly by Mr. C. Galvan, were examined partly by Mr. Salter and partly by Mr. Baily.

The following pages contain the conclusions which have been arrived at respecting the geological structure of the district; the general description having been drawn up by myself, and the detailed description by Mr. Du Noyer.

J. BEETE JUKES.

The observations made in the course of the Geological Survey, are entered, in the first instance, on the Maps of the Ordnance Townland Survey, which are on the scale of six inches to the mile. By means of marks, writing, and colours, the nature, extent, direction, and geological formation of all portions of rock visible at the surface are laid down on these maps, which are preserved as data maps and geological records in the office in Dublin.

The results of the Survey are published by means of coloured copies of the one-inch map of the Ordnance Survey, accompanied by printed explanations.

Longitudinal sections, on the scale of six inches to the mile, and vertical sections of coal-pits, &c., on the scale of forty feet to the inch, are also published, and in preparation.

Condensed memoirs on particular districts will also eventually appear.

The heights mentioned in these explanations are all taken from the Ordnance Maps.

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EXPLANATION

TO ACCOMPANY

SHEETS 160, 161, 171, AND PART OF 172 OF THE MAPS

OF THE

GEOLOGICAL SURVEY OF IRELAND.

[That promontory of Kerry which stretches on the north side of Dingle Bay and south-west of the Bay of Tralee happens to be divided among four of the Sheets of the one-inch Map of Ireland, but can obviously be only described as one district.]

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GENERAL DESCRIPTION.

1. *Form of the Ground.*

THE general form of the ground is that of a broken ridge, traversed by several large valleys, and ending westwards in the precipitous islets and rocks known as the Blaskets.

In the country immediately to the eastward of this promontory a semicircular space of low limestone ground sweeps from the head of Castlemaine Haven round the eastern termination of the ridge out to Tralee Bay.

The ridge rises from the centre of this valley with a gentle slope (*see Explanations 162 and 173*), gradually becoming loftier towards the west, until it attains the height of 2,796 feet in the summit called Baurtregaum. This eminence falls just within the limits of Sheet 161. Its name is said to signify the "Head of Three Coombs," a name which it well deserves. One of these coombs or valleys stretches due E. along what would otherwise be the summit of the ridge, with cliffs that rise to 2,000 feet above the sea on each side of it, till, in about a mile and a-half, it turns abruptly to the north, and cutting deeply through the ridge on that side, runs out to Tralee Bay.

Another less conspicuous coomb, or valley, runs S. from near Baurtregaum towards Dingle Bay; while the third, much deeper and more picturesque, valley runs due north towards Tralee Bay. This is called Derrymore Glen, and it is one of the most striking and interesting features of the neighbourhood. (*See fig. 1.*)

From Baurtregaum the crest of the ridge falls, as it skirts round the head of Derrymore Glen, but then rises again to a height of 2,713 feet in the summit called Caherconree.

Here the ridge, which goes so far by the name of Slievemish, seems to terminate abruptly in a steep slope running N. and S., and looking down towards the west on a deep valley that runs in from

the north and cuts almost entirely across the promontory. So deep is this cut, that the water of the Finglass brook, which drains the valley, is not more than 240 feet above the sea at a point due W. of the top of Caherconree, and about a mile and three-quarters distant from it.

FIG. No. 1.



Head of Derrymore Glen, looking West.

The crevice over the central pool marks an old cliff of Silurian rocks, against which the part of the Old Red sandstone called the Inch conglomerate (see p. 38), has been deposited, and is seen on the left of the sketch, while the upper beds of quartzose conglomerate stretch across from that on to the Silurian rocks, and show that there is no fault there.

A mile or two to the southward of this point, however, the valley is terminated by a ridge which, gently descending from the summit of Caherconree towards the south, gradually sweeps round towards the W.S.W., with a curved escarpment facing towards the N.

This escarpment, after heading the Finglass Valley, runs for eleven miles beyond it, in a nearly straight line, to Minard Head. The road which runs up the Finglass Valley from Tralee Bay to Castlemaine harbour, crosses this escarpment at a height of 920 feet above the sea, and several eminences upon it, both east and west of the road, rise to heights of 1,400 to 1,500 feet.

Immediately to the west of the upper part of the Finglass Valley there is a tract of ground which is not more than about 800 feet above the sea, forming a flat of that altitude covered by deep bog. This lies between the escarpment just described on the south and some detached hills on the north which are over a thousand feet in height. The direct roads, both old and new, from Tralee to Dingle, come between these hills on to this high boggy flat, and then descend as one road into the longitudinal valley of Anascaul. This valley runs about W.S.W. for ten or eleven miles between the escarpment on the south and a continuous ridge which now rises on the north and runs down unbroken towards the west, near the centre of the peninsula, till it joins the ridge of Mount Brandon.

The escarpment which bounds the longitudinal valley of Anascaul on the south, is not so perfectly continuous as the central ridge on the north, since it is cut through by three transverse ravines, the first allowing the escape of the Emlagh River out to Inch; the second due S. of Anascaul, by which the water of three large brooks runs out to the sea; and the third the Gap of Kilmurry, leading out a small brook or two in the same direction. The long Anascaul Valley is thus subdivided by minor, and almost insensible watersheds, into four small river basins.

Nearly due north of the village of Anascaul the central ridge rises to a height of 1,814 feet at the point called Cuchullin's House, and to 2,713 feet in the peak of Benooskee. The ridge is hereabouts deeply eaten into on each side by glens and valleys, which are often bordered by lofty precipices, surrounding small tarns and loughs. Lough Acumeen, on the N. side of Benooskee, and within 300 yards of its summit as measured on the map, lies 700 feet below that summit. Lough Anascaul, which is only 259 feet above the sea, is surrounded on the north by cliffs, the summit of the loftiest rising to a height of 1,200 feet above the lake within one-third of a mile of its shores. There is a pass here sufficient for a footpath, between the Anascaul Valley and that of Glennahoo, which leads out to Fermoy on Brandon Bay, the lowest point of its summit* being 1,109 feet above the sea, with the ground rapidly rising on either hand. The glens, however, are so deep that ground not exceeding 300 feet in height runs to the head of each, with a space between them only measuring two miles on the map.

A mile or two farther west, where the summit of the ridge is nearly level, and flat topped, and about 2,000 feet high, Lough Barnanageeha on the S. side of it is only 836 feet high, and the lower of the three Coumanare lakes, on the north side, is 1,147 feet high, with a horizontal distance of only 1,200 yards between them, while the actual flat on the summit of the ridge is not 180 yards across. A comparatively slight increase of erosion then would have deprived the ridge of half its height hereabouts.

Within a horizontal distance of 300 yards of the water of Lough Barnanageeha, the precipices on its N.E. side rise to a thousand feet above it.

On the north side of the ridge, less than a mile N. of the Coumanare lakes, are several others, equally surrounded, on all sides but one, by grand precipices. Lough Doon, 1,117 feet above the sea, lies close under Slieveanea, which is 2,026 feet high. The shore of Lough Camclaun, 774 feet high, is within a horizontal distance of 500 yards of a summit 2,202 feet high. While the summit called Slievenalecka (1,514 feet), has below it Lough Adoon, which is only 391 feet above the sea, within a distance, as measured on the map, of 450 yards.

These definite measurements will convey to any one accustomed to the measurement of heights and slopes a more precise idea of the broken and precipitous form of the ground than any attempt at mere word-painting. They obviously describe huge hollows cut back so deeply into the sides of the hills as to leave but a narrow and broken wall between them, these hollows having also still deeper holes, which

* The footpath does not go over the lower point, but crosses ground 1,240 feet high.

are now full of water, dug out of the hard rocks at the bottom of them.*

To the westward of the peak called Slieveane, the crest of the ridge first of all descends to a level of 1,354 feet, at the point where it is crossed by the Connor Hill road. The crest of the ridge, however, soon rises again to 2,000 feet and upwards, and at the summit called Ballysitteragh it unites with the transverse ridge of Mount Brandon.

This north and south ridge rises gradually from the sea near the town of Dingle, till, in the course of two or three miles, it attains an altitude of about 2,000 feet. Still farther north it rises to 2,764 feet in Brandon Peak, where it has in some places so narrow a crest that a man may sit down astride of it. A mile still farther north it reaches, with a broader crest, the extreme altitude of 3,127 feet, at the point called Brandon Hill or Mount Brandon. From this point it declines towards the north, but still maintains an altitude of 2,500 feet to within two-thirds of a mile of the sea, and terminates in the grand cliffs of Brandon Head.

The western slopes of the Brandon ridge are comparatively gentle, except about the heads of one or two small valleys that penetrate them from the west, but towards the east the slopes north of Ballysitteragh are a series of precipices. From the Connor Hill road round to Brandon Hill, one great cliff after another faces inwards towards the valley which runs from Brandon Bay and the village of Cloghane, with a flat floor of boggy land, into the heart of the mountains.

Three hundred yards west of the summit of Mount Brandon, but 1,000 feet below it, are several small tarns lying close in at the foot of the precipices and leading down to Lough Cruttia, the shores of which are 1,000 yards due west of Brandon Peak, but 2,126 feet below it; while Lough Avoonane, within the same distance of it, but farther south, is 132 feet lower.

The N. and S. ridge of the Brandon Mountains, like the N. and S. ridge of Caherconree, looks to the west over much lower ground, which is indented by Dingle and Ventry Harbours on the S., and by Smerwick Harbour on the north. Between these there runs an undulating ridge, which rises in some points to a height of 900 or 1,000 feet, and leads up to Mount Eagle, the summit of which is 1,695 feet high. This is within a mile of the sea-shore, and the promontory terminates in Sleah Head, which is 766 feet high, and the lower Dunmore Head, which is the most western point of the mainland (see fig. 3, p. 10).

From the cliffs of Brandon Head, a line of similar but lower cliffs

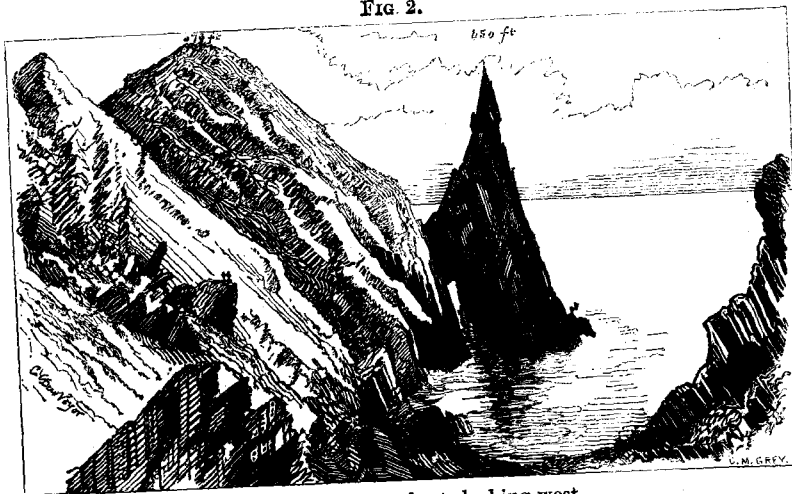
* The explanation proposed by Professor Ramsay, to account for the hollows of the lakes of Switzerland, namely, that they were formed by the ploughing action of the old glaciers, is doubtless applicable to those of Kerry, and to all other similar rock basins. The holes are obviously holes of erosion, and the whole country is even yet universally marked by the smoothing and grooving action of ice. This is so general, that we gradually came to take it for granted that it was, or had been, everywhere glacialized. It did not occur to us, while surveying the country, to apply the action of ice to the formation of these rock basins, but when once suggested, every one must see the difficulty of giving any other explanation of them.

The long escarpments, and the beetling crags and precipices which here and there appear on them, might have been caused by the sweeping action of the sea when the country stood at a lower level. But no marine action could dig the hollows in which the lakes now lie, out of the hard intractable rocks below, nor could any other natural action do it but the fall of water or the descent of ice. River cataracts are obviously impossible here, where there is no extent of ground for the rivers to accumulate, so that glacial action becomes the only explanation open to us.—J. B. J.

is continued along the north coast of the peninsula, broken only by the entrance to Smerwick Harbour. One summit of these cliffs, near the old signal tower of Sybil Point, almost hangs over the sea from a height of 688 feet. Although not so perpendicular, yet the increased height of those nearer Brandon Head, some of them rising to over 1,200 feet as steeply as their jagged and shattered state will allow, makes them perhaps still grander objects. Many of these cliffs consist of a mere heap of ruins, caused by great land slips, huge crags of rock resting discordantly one on the other, with broken gullies and clefts between them.

Standing on some of the highest points of these cliffs, it is curious to mark what a straight line their most striking features preserve along the coast from near Brandon Head to Sybil Point for a distance of twelve miles, and how these features reappear in the same straight line five miles beyond Sybil Point, in the island called Inishtooskert, which rises abruptly from the sea into a jagged peak 573 feet high.

FIG. 2.



View on Inishtooskert, looking west.

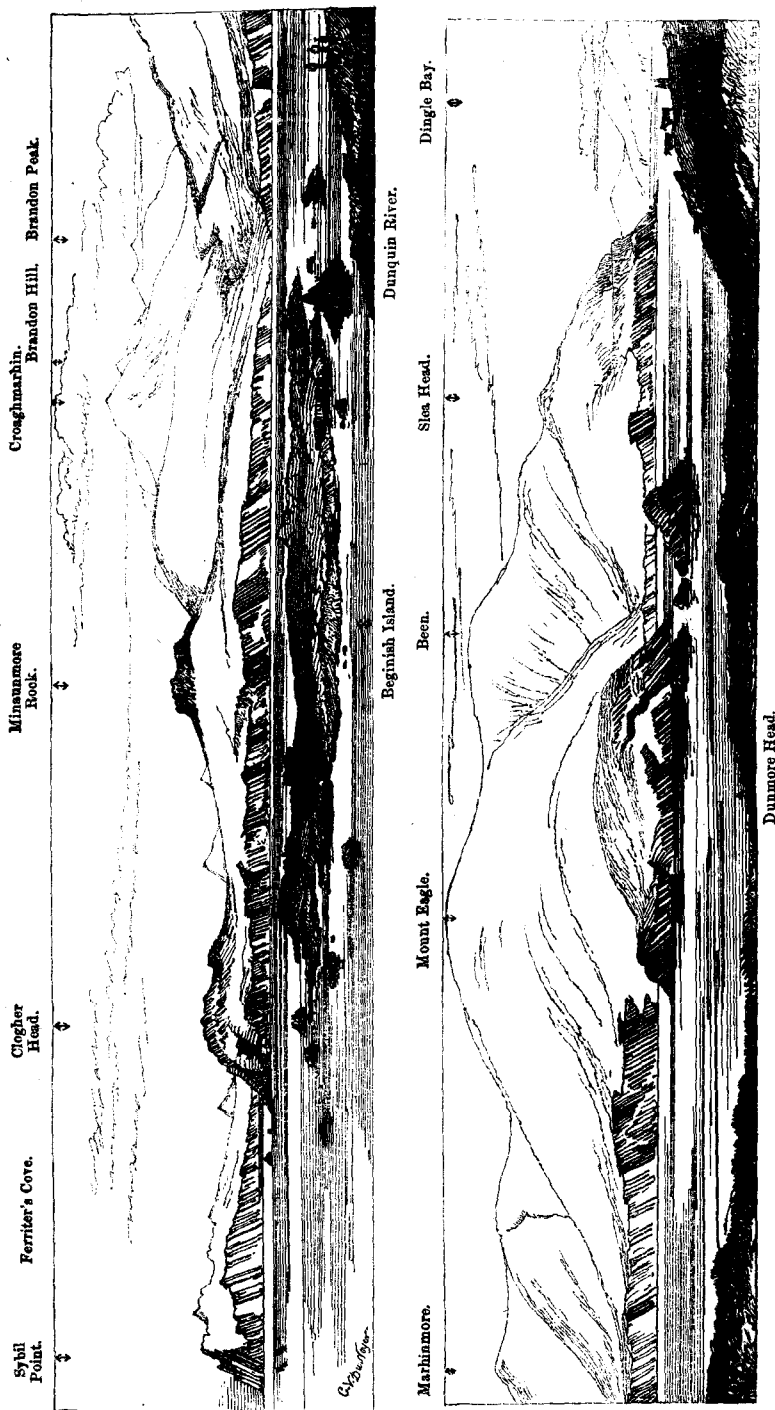
The mass of the island of Inishtooskert is formed of the Smerwick beds, dipping S., or towards the spectator; but that part which rises to the sharp peak of 450 feet, consists of beds of Old Red sandstone, resting unconformably against the Smerwick beds, and plunging northwards into the sea, at an angle of 75°.

The central ridge of the promontory in like manner shows its submarine continuation in the Great Blasket Island, running off from Dunmore Head, and rising to a height of 960 feet. There is an almost absolutely perpendicular precipice of that height on the north side, which keeps a height of 900 feet for a distance of about a mile.

Still farther out to sea, the Tearaght Island (see fig. 9, p. 47), rises abruptly to 602 feet, the other Blasket Islands being 400 or 500 feet; and finally, the larger of the Foze rocks, eleven miles from the mainland, juts up to 103 feet from water of twice that depth.

These islets, and the deep sounds and stormy straits between them, give us, doubtless, a picture of what every part of the mountains of the mainland have been in their turn in the successive stages of their last slow elevation above the sea.

FIG. 3.—Panoramic View of the Dingle Promontory from the Great Blasket Island.



2. Formations or Groups of Rock entering into the Structure of the District.

The geological structure of some parts of the district is so difficult of comprehension, and so different from that of any other known area, that great doubt still remains as to the classification of some of its rock groups. We are, therefore, obliged to use provisional names for them, merely indicating what are believed to be the contemporary deposits of some of them in other districts. The groups marked on the maps are the following:—

AQUEOUS ROCKS.

| | Name. | Colour on Map. |
|-----------------|---|---|
| | Bog, Alluvium, &c., Drift. | <i>Pale Sepia.</i> <i>Engraved dots.</i> |
| Carboniferous. | d ¹ . Upper Limestone. | <i>Prussian blue (dark).</i> |
| | d ² . Lower Limestone. | <i>Prussian blue (pale).</i> |
| Old Red. | c ³ . Upper Old Red Sandstone. | <i>Indian red (dark).</i> |
| | c ² . Lower Old Red Sandstone. | <i>Indian red (pale).</i> |
| | Dingle beds, | <i>Brownish purple.</i> |
| | b ⁵ . Croaghmarhin beds (supposed to be Ludlow). | <i>Dark purple.</i> |
| Upper Silurian. | b ⁴ . Ferriter's Cove beds (supposed to be Wenlock). | <i>Lighter purple.</i> |
| | Smerwick beds, | <i>Pinkish purple.</i> |
| | Anascaul beds (perhaps Llandovery), | <i>Pale pinkish purple.</i> |

IGNEOUS ROCKS.

| | |
|---------------|-----------------------------|
| Felstone. | <i>Scarlet.</i> |
| Felstone Ash. | <i>Pale scarlet dotted.</i> |
| Greenstone. | <i>Crimson.</i> |

Anascaul Beds.—Black glossy slate, becoming, in some localities, variegated red and green slate, and occasionally containing dark gray flags, may be seen in the cliffs about Bull's Head and Minard Bay, and here and there all along the Anascaul Valley up to the slopes of Caherconree.

From the fossils found in them near Bull's Head,* and on the slope

* The following fossils were found at Coosathorrigh, near Bull's Head, the names having been determined by Messrs. Salter and Bailly.

| | |
|--------------------------------|-------------------------------|
| <i>Corals.</i> | <i>Orthis rustica,</i> |
| <i>Favosites alveolaris,</i> | <i>Spirifera plicatella,</i> |
| <i>Halysites catenularius,</i> | <i>trapezoidalis.</i> |
| <i>Petraia elongata,</i> | <i>Strophomena depressa,</i> |
| subduplicata, | <i>Discina perrugata.</i> |
| <i>Syringopora bifurcata.</i> | <i>Gasteropoda.</i> |
| <i>Brachiopoda.</i> | <i>Euomphalus alatus,</i> |
| <i>Athyris tumida,</i> | <i>funatus.</i> |
| <i>Atrypa hemispherica,</i> | <i>Crustacea.</i> |
| <i>marginalis,</i> | <i>Calymene Blumenbachii,</i> |
| <i>reticularis.</i> | <i>Proetus latifrons.</i> |
| <i>Orthis elegantula,</i> | |

of Caherconree, they are supposed to be the lowest rocks shown in the promontory, and to be possibly of the age of the Llandovery beds.

One or two fossils found in some limestone bands at one part of the slope of Caherconree, would seem to belong to the Bala group, a part of the Lower Silurian series, while those found in some dove-coloured limestone on another part of the same slope may possibly be Llandovery fossils.*

No information as to their age can be gained from their stratigraphical relations (unless that they lie below the Old Red sandstone), for they are only seen at rare intervals, and always appear to be violently contorted, dipping at high angles in different directions.

Some beds of dark gray flaggy shale on the slope of Caherconree, might have been classed with them if they had not contained fossils that appear to be certainly of Upper Silurian, possibly of Ludlow age.

Smerwick beds.—We have given this provisional name to a group of beds which run from the cliffs S. of Sybil Point across Smerwick Harbour towards Brandon Head. They consist of purplish or brownish, and green and yellow sandstones, and flagstones with some bright red shales. They contain no fossils, but they dip under the fossiliferous rocks of Ferriter's Cove, which rest upon them not only conformably, but in apparent sequence. None but an arbitrary boundary, indeed, can be drawn between the two groups depending on the occurrence of fossils in the upper one, accompanied by a certain amount of lithological change in passing from the unfossiliferous to the fossiliferous beds. These Smerwick beds have an apparent thickness of about 2,000 feet.

Ferriter's Cove beds.—About the line of boundary assumed as the division between the Smerwick beds and those next above them, there are some thin bands of conglomerate of a greenish colour. Immediately above one of these bands of conglomerate, fossils begin to make their appearance. Over these are some green sandy shales or slates several hundred feet thick, interstratified in their upper parts with white powdery feldspathic ash, above which are bands of red sandstone and slate. These beds have an aggregate thickness of

* The fossils found in the dove-coloured limestone, believed to belong to the Anascanl slates, on the S.W. slope of Caherconree, were determined by Mr. Bailly to be the following:—

| | |
|-------------------------------|--------------------------------|
| <i>Corals.</i> | <i>Strophomena depressa.</i> |
| <i>Favosites alveolaris.</i> | — <i>applanata?</i> |
| <i>Stenopora fibrosa.</i> | <i>Gasteropoda.</i> |
| <i>Brachiopoda.</i> | <i>Acroculia haliotis.</i> |
| <i>Orthis Actoniae.</i> | <i>Crustacea.</i> |
| <i>Rhynchonella borealis.</i> | <i>Cheirurus bimucronatus.</i> |
| — <i>nucula.</i> | <i>Encrinurus sexcostatus.</i> |
| <i>Spirifera plicatella.</i> | <i>Illænus Bowmanni.</i> |

In some gray crystalline limestone discovered by Mr. C. Galvan, in a gully a mile farther north and a little lower on the slope, a trilobite, apparently *Acidaspis Jamesii*, and some other Lower Silurian forms were met with.

perhaps 2,500 feet, and are full of fossils of those species which are abundant in the Wenlock* rocks of the typical Silurian district.

Croaghmarhin beds.—Above the red sandstones just mentioned, there come in a series of pale greenish gray sandy flags, and some thick hard brown calcareous grits, passing in some places into an impure sandy limestone. These beds contain, occasionally, *Pentamerus Knightii* and other fossils, such as are found in the Ludlow rocks of Siluria.† Their total thickness is perhaps as much as 1,000 feet, but no definite summit of the group can be determined on.

In Derrymore Glen, and on the west slope of Caherconree, are some other rocks which likewise contain fossils, that may show them to be possibly of Ludlow age.‡ These are gray flags, often of a dark colour, and splitting into thin plates. They are so imperfectly seen,

* The following fossils were noted by Mr. Salter in the Ferriter's Cove beds:—

| | |
|----------------------------------|--------------------------------|
| <i>Corals.</i> | <i>Strophomena imbrex.</i> |
| <i>Alveolites Bechei,</i> | — <i>pecten.</i> |
| <i>Favosites cristatus,</i> | <i>Conchifera.</i> |
| — <i>multiporus,</i> | <i>Grammysia cingulata,</i> |
| — <i>polymorphus,</i> | <i>Modiolopsis complanata,</i> |
| <i>Halysites catenularius,</i> | <i>Pterinea retroflexa.</i> |
| <i>Heliolites interstinctus,</i> | <i>Gasteropoda.</i> |
| <i>Stenopora fibrosa,</i> | <i>Euomphalus alatus,</i> |
| <i>Syringopora bifurcata,</i> | — <i>funatus,</i> |
| <i>Zaphrentis turbinata.</i> | — <i>lautus.</i> |
| <i>Brachiopoda.</i> | <i>Annelida.</i> |
| <i>Athyris tumida,</i> | <i>Tentaculites tenuis,</i> |
| <i>Atrypa reticularis,</i> | <i>Trachyderma squamosum.</i> |
| <i>Chonetes lata,</i> | <i>Crustacea.</i> |
| <i>Leptæna transversalis,</i> | <i>Encrinurus variolaris,</i> |
| <i>Orthis calligramma,</i> | <i>Leperditia Baltica,</i> |
| — <i>elegantula,</i> | <i>Lichas Anglicus,</i> |
| <i>Rhynchonella borealis,</i> | — <i>Barrandi,</i> |
| — <i>rotunda,</i> | <i>Phacops caudatus,</i> |
| <i>Spirifera bijugosa,</i> | <i>Proetus latifrons,</i> |
| <i>Strophomena compressa,</i> | <i>Sphærexochus mirus.</i> |
| — <i>euglypha,</i> | |
| — <i>funiculata,</i> | |

† The following fossils, found in these beds, were determined by Mr. Salter:—

| | |
|----------------------------------|--------------------------------|
| <i>Corals.</i> | <i>Spirifera elevata,</i> |
| <i>Favosites cristatus,</i> | — <i>plicatella,</i> |
| <i>Heliolites interstinctus,</i> | <i>Strophomena depressa,</i> |
| — <i>megastoma,</i> | — <i>filosa.</i> |
| <i>Petraia bina.</i> | <i>Conchifera.</i> |
| <i>Brachiopoda.</i> | <i>Modiolopsis complanata,</i> |
| <i>Atrypa reticularis,</i> | <i>Pterinea retroflexa.</i> |
| <i>Pentamerus galeatus,</i> | <i>Gasteropoda.</i> |
| — <i>Knightii,</i> | <i>Acroculia haliotis.</i> |
| <i>Rhynchonella furcata,</i> | <i>Cephalopoda.</i> |
| — <i>Wilsoni,</i> | <i>Orthoceras annulatum.</i> |
| <i>Spirifera bijugosa,</i> | |

‡ The following fossils from Derrymore Glen, and the flags on the west slope of Caherconree, were determined by Mr. Bailly:—

| | |
|------------------------------|------------------------------|
| <i>Corals.</i> | <i>Brachiopoda.</i> |
| <i>Aulopora serpens,</i> | <i>Athyris didyma,</i> |
| <i>Zaphrentis turbinata.</i> | <i>Leptæna sericea,</i> |
| <i>Polygoa.</i> | <i>Orthis elegantula,</i> |
| <i>Fenestella prisca,</i> | <i>Rhynchonella furcata,</i> |
| <i>Graptolithus priodon.</i> | — <i>nucula,</i> |
| | <i>Spirifera elevata,</i> |
| | <i>Strophomena filosa.</i> |

and so highly contorted, that it is impossible to determine their thickness, or to come to any decision as to their stratigraphical relation to the rocks about them, except that they are covered unconformably by part of the Old Red sandstone.

Dingle beds.—The Croaghmarhin beds of the Dunquin district dip to the south, and seem certainly to pass under the group we have called the Dingle beds, which likewise dip south from them. No good exposure is to be found of the junction of the two groups, and it cannot therefore be determined exactly whether the Dingle beds rest conformably on the Croaghmarhin beds or not. From the apparent identity of the direction and amount of their dip near Dunquin, it might be assumed that there was a sequence and conformability between them. Other structural facts would be rather in favour of there being a concealed but decided unconformability between the Dingle beds and all those lying below them.

Near Dunquin, the beds which seem to lie next above the Croaghmarhin beds with Ludlow fossils, are some green and purple grits and slates, without fossils. These pass up into beds of coarse thick sandstones and grits of greenish and reddish tints, like those in the neighbourhood of Glengariff, and interstratified with similar purple slates. There are, however, many bright red slates in those rocks, and some liver-coloured bands, and there are also thick beds of conglomerate full of rounded and angular pieces of sandstone and other rocks. Some of the rolled pebbles in these conglomerates contained fossils apparently of Llandovery age; no fossils proper to the group, however, have ever been found in the Dingle beds.

The thickness of these sandstones is enormous, and cannot be estimated at less than 10,000 feet, and even then no definite top to the group is arrived at, as the highest beds seen plunge into the sea, or are unconformably covered by the Old Red sandstone.

Old Red Sandstone.—This consists, as in the neighbouring districts, chiefly of red and brown sandstones, and red and greenish slates, with some beds of conglomerate containing rounded pebbles of white quartz.

In one part, however, a conglomerate of a very peculiar character appears in it, the embedded pieces consisting of rounded pebbles of granite, gneiss and mica schist of a character not existing anywhere *in situ*, within 150 miles at least, together with large square slabs of

Conchifera.

Cardiola interrupta,
Cleidophorus,
Cucullella coarctata,
Mytilus mytilimeris,
Pterinea fimbriata,
—— orbicularis,
—— pleuroptera,
—— retroflexa,
—— Sowerbyi,
—— tenuistriata.

Gasteropoda.

Acroculia haliotis,
Cyclonema corallii,
Euomphalus funatus,
—— sculptus,
Loxonema elegans,
—— sinuosa.

Pteropoda.

Bellerophon Wenlockensis,
Theca Forbesii.

Cephalopoda.

Orthoceras angulatum,
—— subundulatum.

Echinodermata.

Periechocrinus monilliformis.

Annelida.

Serpulites longissimus.

Crustacea.

Beyrichia Klødeni,
Calymene Blumenbachii,
—— tuberculata,
Protæus latifrons.

gritstones and felstones, some of which are eighteen inches or two feet across. This conglomerate is spoken of further on as the "Inch" conglomerate, from the name of a place on the coast of Dingle Bay.

The Old Red sandstone seems in some places (as near Brandon Head), to have a thickness of 3,000 or 4,000 feet.

The upper part of it contains beds of greenish sandy shale and flags, as in the neighbouring district, some of them showing remains of plants, and passing up apparently into the bottom beds of the Carboniferous limestone.

The Lower Limestone shale, doubtless, exists between the top of the Old Red sandstone and the gray limestone, but is nowhere to be seen, its place being always covered by an immense mass of drift materials.

The Lower Limestone consists of a gray fossiliferous limestone, like that to be seen in the neighbouring districts of Tralee or Killarney.

The Drift is chiefly local, and occurs principally along the low ground near Tralee Bay, where it resembles the limestone gravel of other parts.

Large blocks of Carboniferous limestone, however, are to be found in the valley of the Finglass Brook, under Caherconree, at a distance of three or four miles from the nearest piece of Carboniferous limestone *in situ*, and at a height of 400 or 500 feet above any part of the formation *in situ* in the neighbourhood.

3. Relations between the Form of the Ground and its Geological Structure, and general account of the latter.

Any one walking along the summit of Slievemish from near Tralee towards Baurtregau, would see the beds of Old Red sandstone dipping from him at a gentle angle on either hand towards the limestone valley of Castlemaine on the south, and that of Tralee on the north. The ridge is a simple anticlinal curve, the axis of which strikes due E. and W., with a gentle inclination towards the east. As he walked westward, accordingly, he would find that, although the ridge rose in altitude, its summit was occupied by lower and lower beds of Old Red sandstone curving over it, till he came to the conglomerate in Curraheen Glen.

In the next, or Derrymore Glen, he would see the base of the formation and some of the rocks that lie below it, and would see that the beds of Old Red had formerly arched continuously over these rocks in the form of a great irregular tunnel, which these rocks completely filled. Arriving at the summit of Caherconree, he would find the formation entirely cut away and removed from off the centre of the ridge, and the rocks below it also deeply eaten into. The Old Red sandstone thence forms two strips, one running along each coast, with a varied ground between them, formed of the lower rocks. The roof of the Old Red sandstone tunnel is removed, and merely the ruins of its supporting walls left on each side.

The southern wall runs in a straight line about W.S.W. for thirteen miles to Minard Point, two miles beyond which a detached part of the wall, with a portion of the flattening over of the roof, may be seen in Bull's Head.—(See fig. 5, p. 33).

The northern wall of Old Red sandstone is at first, near Camp, worn down to a greater depth than the southern one, but it gradually rises towards the west, until its beds curve over on to the tops of the hills, and a large part of the flatter roof of the old tunnel forms the summit of Benooskee and the hills beyond, which lie due north of Minard and Bull's Head.

Thus far the valley of Anascaul is a regular trench, running W.S.W., exposed by the denudation of the long arch or tunnel of Old Red sandstone which formerly roofed it in, or rather roofed in the rocks, by the still farther erosion of which the lower part of the valley itself was formed.

To the westward of Bull's Head, no trace of the Old Red sandstone remains on the south side or in the centre of the Dingle promontory.

It doubtless once extended over the whole of it, far above what is now the summit of Brandon Mountain, and it seems to have been affected by the action of another anticlinal curve, the axis of which appears to have run through that mountain.

This is apparent from the little synclinal bend of the Old Red sandstone beds in the valley of Cloghane, and their subsequent anticlinal sweep round the headland of Brandon Point. The axis of this anticlinal seems to have been as steady as that running W.S.W. from Caherconree, and to have been strictly parallel to it. The ruins of the northern wall of the arch or tunnel, however, are all that are left, but these are plainly traceable for a distance of eighteen miles in a perfectly straight line from Brandon Head to Sybil Point, and thence to Inishtookert.—(See map and fig. 2). Along the whole of this line the Old Red sandstone dips N.N.W. at 70° with the utmost steadiness, striking through all the projecting points of the coast that protrude beyond its boundary.

So far, nothing can be more plain and simple than the structure of the district. But the case is far otherwise when we come to endeavour to make out the relative positions of the lower rocks that are thus exposed by the denudation of the Old Red sandstone.

In the Derrymore Glen itself the rocks, which are believed from their fossils to be Ludlow rocks, are so singularly and inconsistently contorted, that the only conclusion I could come to was that the exposed cliffs were, many of them, the faces of landslips, great masses of rock having slid past each other down the slope of the excavation.

These rocks undoubtedly terminated in a cliff anterior to the deposition of the Old Red sandstone, a thickness of 300 or 400 feet of the Inch conglomerate resting against the face of that cliff, while the higher quartzose conglomerate of the Old Red sandstone was traced by Mr. Du Noyer in continuous beds over both rocks.—(See fig. 1).

On the western face of Caherconree we find the Anascaul black slates in one part, a dove-coloured limestone which I was fortunate enough to hit on myself one day in another part, and some black slates (apparently Lower Silurian), in a third, bared only in small detached exposures, without the possibility of determining their stratigraphical relations, while the Dingle beds dip at the whole of them at a high angle, as if passing beneath them, in a fourth part of the slope.

Along the whole length of the Anascaul Valley the Dingle beds form the main part of the northern hills, capped occasionally by the unconformable beds of the Old Red sandstone, but dipping steadily

at a high angle towards the S.S.E., or in the direction of the black slates which lie in the bottom of the valley, while those are covered on the south side by the Old Red Sandstone alone, without the intervention of the Dingle beds.

Judging from this valley alone, and even from the section shown north of Bull's Head, we should suppose the Dingle beds to pass below the Anascaul black slates.

This, however, seems impossible, since these black slates contain Llandovery fossils, while the Dingle beds contain pebbles in which there are also Llandovery fossils, and they can be followed continuously from the shore north of Bull's Head right out to Sleah Head, turning round which the next formation that rises from under a thickness of many thousand feet of the Dingle beds, is one containing Ludlow fossils, with another containing Wenlock fossils below that.

The only conclusion I can come to, therefore, is, that there is a complete unconformability between the Dingle and the Anascaul beds, that the former having been originally deposited horizontally against some old eroded surface of the latter, have been so tilted by the movements of disturbance that have affected the district, as at the present moment to dip at a high angle down on to that surface.

From the neighbourhood of Bull's Head, the Dingle beds strike uninterruptedly along the coast, through Dingle and Ventry harbours to Sleah Head, striking nearly with the coast, about W.S.W., and dipping south at high angles. One or two minor flexures here and there do not materially affect this general lie of the rocks.

This prevalent southern dip is observable also over all the district from Bull's Head to the Connor Hill Gap, in the ridge of Ballysitteragh and Gearhane, and thence through Mount Eagle to Dunmore Point, and in the great Blasket Island.

Northward of Gearhane the Dingle beds curve over, so as to dip N., and make a synclinal in Brandon Peak, answering to the synclinal curve in the Old Red Sandstone at Cloghane. In the highest peak, which is called Brandon Hill, the beds are nearly horizontal, but to the north of that again they recover their southern dip, as may be seen at various parts of the ground from Brandon Head to Smerwick harbour.

Coming now to the most interesting part of the district, the western coast, namely, between Sleah Head and Sybil Point, we meet with still further difficulties. All the rocks to be seen south of the Old Red Sandstone of Sybil Point, dip to the S.S.E., at a mean angle of about 60° . The distance, measured directly across the strike, from the signal station on Sybil Point, through Mount Eagle, to the coast near Fahan, is about six miles; which at an angle of 60° would give us a vertical thickness amounting to 27,400 feet. It is obvious, then, that the apparent dip is delusive here.

Careful tracing of the stratified trappean and other rocks from Dunquin to Clogher Head, in the country as well as along the coast, enabled Mr. Du Noyer to detect a synclinal curve, the northern arm of which was inverted on the coast so as to dip S. in the same direction as the southern arm. The same trappean rocks rise again south of Ferriter's Cove, so as to show that the hamlet of Clogher rests on a synclinal hollow of the beds.

The anticlinal and synclinal curves here seem to be the same as those perceptible on the Brandon ridge, but much more sharply pinched up and accompanied by inversion.

The species and position of the fossils, as determined by Mr. Salter, support this hypothesis as to the position of the beds.

It has been even supposed by some authorities that the inversion is repeated on the north, and that what we call the Smerwick beds, which apparently dip under the Wenlock rocks in Ferriter's Cove and Smerwick harbour, are only a part of the same beds, as those we have called the Dingle beds, inverted so as to dip S.

This hypothesis, however, would involve the conclusion that the Dingle beds were widely unconformable to the Croaghmarhin (Ludlow) and Ferriter's Cove (Wenlock rocks); otherwise the Croaghmarhin beds ought to appear to the northward of Ferriter's Cove, as well as to the southward near Dunquin. Moreover, the Smerwick beds, though similar to some of the Dingle beds, are not exactly to be identified with any portion of that series.

I have preferred, therefore, to consider the dip of the Smerwick beds to be the real dip, and that they are a set of beds lying below the Ferriter's Cove beds.

There is, however, another difficulty involved in this supposition. The Ferriter's Cove beds, with their characteristic fossils, reappear in their proper line of strike on the west side of Smerwick harbour, the Smerwick beds dipping S. underneath them, and the Croaghmarhin or Ludlow beds dipping S. above them. The Smerwick beds reappear in their proper strike on the east side of the harbour, and run on for some miles, preserving their S.S.E. dip quite steadily. None of the fossiliferous Silurian beds, however, reappear on the east side of the harbour, but the Dingle beds come in with a southern dip directly upon the Smerwick beds, and it is not very easy here to perceive any marked distinction between the two groups of rocks. All the rocks on the east side of Smerwick harbour, S. of the Old Red Sandstone, consist of red and brown sandstones and conglomerates, with bands of red and purple slates, and they all dip steadily S.S.E. at high angles.

Under any supposition, it is very difficult to understand what has become of the fossiliferous Silurians that lie on the western side of the harbour, above the beds which we have there called the Smerwick beds, and why they are not continued across the harbour, in accordance with their own strike and that of all the other rocks both above and below them.

In the Blasket Islands we get detached portions of rocks similar to those of the mainland, and in similarly disturbed positions.

Inishtookert is formed of the continuation of the Smerwick rocks and Old Red Sandstone that strike towards it at Sybil Point.

Beginish, and the little islands about it, are formed of the traps and other rocks striking from Dunquin.

Fossiliferous Silurian rocks make the northern end of the Great Blasket, dipping S. under the Dingle beds, which strike through the rest of the island and Inishnabro with the same S.S.E. dip at high angles as on the mainland about Sleah Head.

The Tearaght, according to Mr. A. B. Wynne, is made of sand-

stones and conglomerates, like those on the summit of Brandon Hill, lying in the form of a synclinal curve.

Inishvickillane, however, is again made of fossiliferous Silurians and trap rocks, but dipping S. at 65°, as if they lay above the Dingle beds of Inishnabro.

The Foze rocks appear to consist of gray felstone trap, judging from a specimen that was kindly procured for us by Mr. R. Calwell, when examining the lighthouses in the steamer of the Ballast Board of Dublin.

J. B. J.

DETAILED DESCRIPTIONS.

4. Positions and Lie of the Rocks.

The detailed description of the position and lie of the rocks will be given under the following heads:—

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1. *The Coast from Sybil Point to Sleah Head.*—The N.W. face of Sybil Head is formed of a narrow band of Old Red sandstone conglomerate. The dip of the beds is N. 30° W., from 65° to 70°, and they are pervaded by a rude cleavage, which has a strike of E. 28° N., dipping to the southward at 50°. This is very apparent when these sandstones and conglomerates are viewed from the sea to the west of Sybil Point. Along the sea face of the Head, the beds weather out on the cleavage planes, and as the angle which they make with the dip is acute, very prominent and often strangely shaped pinnacles are thus formed. The quartz and grit pebbles, in these conglomerates, are frequently cut cleanly through by the cleavage. The conglomerates can be well examined along the brow of the entire promontory, from Ferriter's Cove to Smerwick Harbour, being plainly seen in section, not only at Sybil Point, but also at many indentations along the coast, the most important of which is that to the west of Three Sisters' Heads, illustrated by fig. 4, p. 20.

The Smerwick to the south of Sybil Head, against which these Old Red sandstones rest, are well exposed along the coast from Sybil Point to Coosglass, a small indentation in the cliffs S.W. of the village of Ballyoughteragh. They consist of brownish and reddish-purple sandstones, with a few fine conglomerates, all dipping to the S.E. at from 50° to 65°.

Just north of Coosglass at Foilatalav, the beds have a tendency to become vertical, and they then suddenly appear to be contorted into sharp flexures. This latter appearance is, however, entirely deceptive, and is due to oblique lamination, on a very extended scale, in beds of enormous thickness. This peculiarity of structure extends for the distance of about 160 or 170 yards, when the beds regain their normal bedded character, and dip to the S.E. at 60° . At the extreme point of the cliff N. of Coosglass, a lenticular shaped bed of dark purple and coarse conglomerate occurs, which in general appearance closely resembles the conglomerates of the Dingle beds at Parkmore Point, W. of Ventry Harbour.

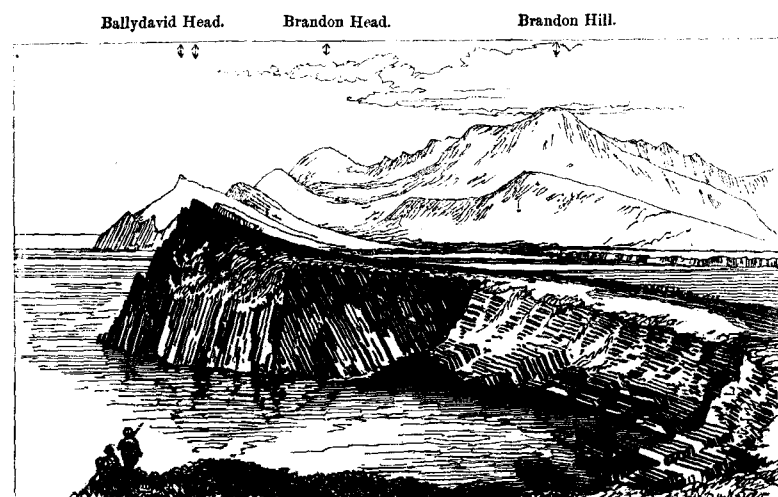


FIG. 4.—Three Sisters' Heads, looking E. across the entrance to Smerwick Harbour, showing the Smerwick beds dipping south, and the Old Red Sandstone resting against them, and dipping at a high angle to the north.

Resting on this conglomerate are some green earthy beds, in which Encrinite fragments are occasionally found, and these pass up into pale gray and purplish slates, the former soapy to the feel. This short section terminates on the south side of Coosglass in purple slates and grits, in which is a massive dyke of purple porphyry. The fact of the fossils just mentioned being observed in these beds, rather confirms the belief that they are the lower part of the Wenlock series which are so well exposed to the south along the shores of Ferriter's Cove.

Along the northern shore of Doon Point, reddish purple slates are exposed, all dipping to the S.E. at from 55° to 60° , and passing up into purple ash beds, the exposed section terminating in a bed of coarse gray conglomerate, containing pebbles of quartz and grits.

In the small indentation of the coast just under Ferriter's Castle, a fault was observed, having a strike of N.N.E. and S.S.W., and causing a slight downthrow to the west. On the east side of this are light yellowish brown sandy slates and thin gritty layers, which contain well known Wenlock fossils. In these there are a few beds of light brown flaky ash, and a thick bed of gray conglomerate, the pebbles of which are of gray grit, well rounded, the entire series terminating in pale brown gray and greenish gray slates and sandy flags, all more or less fossiliferous.

Along the shore at the head of Ferriter's Cove, there are gray gritty slates and flags with coral layers, and these pass up into bluish gray slates

with impure limestones, the former containing abundant fragments of Trilobites. The last beds seen along this shore are very dark gray slates.

At the extreme S.E. corner of the bay, north of the village of Ballinacolla, we find a thick band of purple pisolitic ash, unlike any of the Trappean beds before noticed; and if we now follow the coast section northwards towards the point opposite to Carriganoon Rock, we pass over the beds in ascending order, having the same dip and strike as the others on the opposite or northern side of the bay, and find that they present a remarkable similarity to them, both as to general aspect and fossils. Three beds of pale gray sandy ash occur at tolerably regular intervals along this shore, and at the point we find green and purple slates with three interstratified gray ash beds. In the first indentation of the coast south of Carriganoon, amongst other fossiliferous layers, we find one containing graptolites, and above it some gray shales full of corallines.

We now reach the small hollow in the coast, called Coolalea, and here we find that a fault, having the direction of E.N.E. and W.S.W., displaces the beds by a downthrow to the south, without, however, altering their general bearing, though the vertical displacement is probably as much as 200 yards. To the south of this the section shows pale gray slates and flags, with coralline shales and slates. Some of these beds exhibit well defined current marks. In the indentation close to, and north of, Poulakeeragh, the purple pisolitic ash, first observed at the S.E. corner of Ferriter's Cove, again comes to view, whence we have a datum line whereby to determine the amount of displacement caused by the fault at Coolalea.

To the south of Poulakeeragh and close to it, is the small hollow in the coast called Coosaneal, and here again we have clear evidence of another fault, the direction of which is about N.W. and S.E., with a downthrow to the southwards of probably 250 yards. At the extreme N.E. corner of Coosaneal, the ends of some of the pale gray ash beds, the same as those first described on the shore at the southern end of Ferriter's Cove, are seen abutting against the fault, and changed to a dark purple and green colour, possibly from the presence of a dyke of bright green vesicular greenstone which has come up alongside of the fault, and appears at the extreme end of the Coose. This greenstone, which is clearly intrusive, is in places very vesicular and amygdaloidal, the vesicles and larger cavities being filled with chalcedony. This rock weathers rusty and soft, as it contains numerous small crystals of iron pyrites, which rapidly decompose.

The blunt promontory lying to the S.W. of Coosaneal, which terminates in the point called Foilwee, opposite to Doonycovaun Island, is formed entirely of the ash beds which first appear on the south shore of Ferriter's Cove. As these beds are here remarkably well exposed, their detailed description was reserved till now. They dip to the S.E. at 45° , like the slate beds with which these ashes are associated; and the section of Foilwee promontory, as it may be called, is as follows, commencing from the topmost bed. A light green vesicular trap dyke first makes its appearance, weathering soft and rusty, its cavities filled with chalcedony, and in every respect closely resembling the intruded trap described as occurring at the bottom of Coosaneal, and it is not improbable that it may be an offset from it, squeezed into the ashes and following the direction of their bedding; beneath this is white feldspathic ash, very friable and pisolitic; the small pea-like segregations are semi-transparent, and on the weathered surface come away freely from the white feldspathic paste; we here find another thin greenstone dyke similar to the first. We next come on a bed of purple ashy grit, in which are numerous minute frag-

mentary crystals of pale yellow feldspar, which give it a porphyritic look. This, when weathered, so nearly resembles an ordinary sandstone, that its trappean character is not apparent till the rock is freshly fractured. Beneath this are dark purple ashy sandstones, with another bed of the porphyritic grit. The section terminates in beds of light green feldspathic ash, weathering pale yellow; hard purple ashy grits; and lastly pale purple ashy conglomerate, weathering white. The total superficial width of this ashy series is not quite 200 yards, and as all the beds dip at an angle of 45° , they must have a stratigraphical thickness of about 400 feet. The limit of these beds northwards, is clearly defined by the occurrence of Doonycoovaun Rock, which lies just off the point of the promontory, and is formed entirely of the gray fossiliferous flags and slates previously described at Poulakeeragh.

The ash series, just described, is overlaid by reddish purple flags, sandy shales, and slates, which form the coast line to the S.W. of Foilwee, for the distance of about 500 yards. At the point just north of Drom Head, we find three thin beds of purple pisolitic ash, interstratified with thin red slates, and the whole terminates in a pale green ashy conglomerate and sandy grit, forming a group of four beds, measuring six feet in thickness. This band of purple rocks is assumed as marking the top of the Wenlock series.

The beds shown at the promontory of Drom, which forms the northern side of Clogher Bay, called Trabane-clogher, are supposed to form the base of the Ludlow series. They consist of pale gray sandy flags and slates, passing up into impure limestones. Organic bodies, which have been called fucoids, are the most characteristic fossils to these layers, being both abundant and well developed. At the head of the bay, and in a small gully formed by a stream, we find more light gray and greenish fucoid flags and highly calcareous beds, and similar beds are well exposed along the cliff on the southern side of the bay, their dip being to the S.E. at 45° .

It is remarkable that all the fossil impressions are only seen here on the under surface of the beds; and this fact confirms the belief that we have here an inversion of the strata as shown in the engraved section, sheet 15. There is not, however, any marked difference in the amount of the dip, though the strike of the beds is now more nearly E. and W.

As we approach Coosmore, which is a small though deep indentation in the coast, half a mile due east of Clogher Head, we suddenly come on a mass of dark liver-coloured coarse conglomerate, dipping to the S.S.E. at from 20° to 25° , and resting on the upturned edges of the Ludlow beds. This fact is clearly seen when standing on the western cliff at Coosmore and looking to the N.E. It is supposed to be an outlying patch of the Dingle beds which, in that case, must be unconformable to the Ludlow rocks.

The cliffs at either side of Coosmore afford a good section through this conglomerate and the underlying slates; and exhibit a fault having an E. and W. direction, causing a downthrow to the north, as shown in the section. The slate beds which lie to the south of the fault, quite resemble those described at Drom Head and the shore of Trabane-clogher, and the prevailing fossils are fucoids. Near the fault these beds are very much crushed, and bent into a series of sharp zig-zag folds.

To the west of Coosmore and north of the extreme point of Clogher Head, the slates are sharply curved round, so as to dip to the westward at angles of 50° to 60° ; and beneath them we find the same thin bed of pale green ash conglomerate, with the underlying reddish purple slates and flags observed along the coast to the north of Drom Head, and which were assumed to be the top beds of the Wenlock series; they also are

bent round so as to dip to the westward as they both pass round the point of the Clogher Bay anticlinal.

From this point southwards over Clogher Head for the distance of more than half a mile, the beds are all inverted as shown in the section.

Clogher Head is formed entirely of the trappean ash series, first described as appearing at the promontory of Foilwee, west of Coosaneal; but they have increased in thickness from 400 to 870 feet. They are overlaid as before by a bed or dyke of light green vesicular and finely crystalline greenstone. Beneath this is a layer of purple ash conglomerate, resting on purple gritty ash. This is succeeded by a thick deposit of white feldspathic pisolitic ash, the nodules being often of large size; and the series terminates in a thick deposit of purple ash grit, containing so many fragmentary crystals of feldspar as to give the rock a finely porphyritic look. This massive band of trappean rocks is broken, as we proceed inland from the Head, by six north and south faults, in the distance of one mile, the amount of each local displacement being, however, inconsiderable. As these faults are all indicated on the map, their position need not here be more definitely described. Their existence is proved by the mode of occurrence of the greenstone bed or dyke, and the overlying reddish purple flags and slates which are distinctly traceable along the northern flank of Clogher Head and the western base of Croaghmarhin Mountain. I may remark, however, that the two most westerly of these faults unite towards the south, and strike the coast at the cliffs of the small hollow called "Owen," south of Clogher Head; and the four other more eastern faults unite in like manner, and form the single fault which passes close to the villages of Carhoo and Dunquin, where it appears to die out on the western flank of Mount Eagle.

The only marked difference between the rocks along the southern cliffs of Clogher Head, and those identical with them, appearing on the south side of Ferriter's Cove, is the thickness of the ash beds and their tendency to become pisolitic. Thus, at the hollow called "Owen," and just north of it, the ash is dark purple in colour, and occasionally finely porphyritic, while, in its upper portion, its pisolitic character is very apparent, and it weathers out freely into small nodules. This bed, which is beneath the great ash series, and separated from it by a thick band of greenish gray flags and slates, is represented in the Ferriter's Cove section by a bed of only a few feet in thickness, while here it is fully 330 feet thick. This fact, however, is no bar to the identification of the ash, as such a deposit, from the nature of its formation, would be liable to sudden variations in its thickness.

In the deep "coose," or small rocky indentation of the coast, to the south of "Owen," from which starts the boundary of the parishes of Dunquin and Dunurlin, I believe that the beds are bent anticlinally; and they then regain their original order of succession and deposition, as was observed at Ferriter's Cove. From this point southwards to Dunquin, a distance of more than one mile, we find a succession of thick bands of gray slates and flags, alternating with equally thick deposits of dark purple ash grit and purple ash finely porphyritic and often pisolitic. At Redcliff Cove, 650 yards N. of Mill Cove, these are penetrated by a massive dyke of very hard fine-grained green trap, weathering pale brown from the presence of minute crystals of iron pyrites. We then reach the representative of the Clogher Head ash beds, which form the coast for the distance of 500 yards northwards from Mill Cove; their apparent width being the result of their low inclination as hereabouts; the beds dip to the E.S.E. at angles sometimes as low as 15° , and never exceeding 35° . The Clogher Head ash, as it may be called, terminates in a massive bed or dyke of

close-grained, very hard, green greenstone, which, however, weathers rusty and soft. There is a thickness of 350 feet of it exposed on the coast on the north side of Mill Cove. Directly south of this greenstone, and resting against it, by the intervention of a small fault, we find the purple slates and sandstones of Drom Head, the top beds of the Wenlock series, dipping southwards at from 10° to 30° , and having the same stratigraphical thickness here as at the former locality. They are devoid of the interstratified ash layers; but they terminate, as before, in a thin bed of gray ash, quite similar to that observed at Drom Head.

At the indentation of the coast called Foilelea, close to the village of Dunquin, these purple beds are overlaid conformably by pale gray sandy flags and slates, all weathering yellow and soft. These beds would, therefore, correspond to those at the east shore of Trabanclogher, or the highest part of those assigned to the Ludlow series. These pale gray flags and slates are often found to be very fossiliferous; but as at Drom, the characteristic fossils are fucoids. The thickness of this series, as seen in the coast section, cannot be less than 750 feet.

At Cooshaun, south of Yellow Cove, we reach the base of the Dingle beds, apparently resting conformably on the gray slaty beds just passed over. We now find coarse purple, pale salmon-coloured, and sometimes pale green grits and slates, with occasional conglomerate layers, and beds of a similar aspect form the cliffs along the coast southwards for the distance of over half a mile, when a few purple cornstones appear. These are very distinctly seen on the north bank of the stream, in the extreme S.E. corner of the Townland of Commons North, over Dunquin; and at the northern end of the cliff, over Mount Eagle Lough. The universal dip of all these beds is to the S.S.E. at 60° .

Proceeding still further to the south, similar rocks form Dunmore Head, on the south side of which promontory they become more massive, coarser in their texture, and conglomeritic, though in many instances they are thin and evenly bedded, and exhibit current marks or ripples on their surfaces. Eventually they pass up into thick dull purple and greenish conglomeritic grits, successive beds of which come in one over another till we reach Sleah Head, which forms the N.W. extremity of Dingle Bay.

From Cooshaun to Sleah Head the distance is two miles; and as we have throughout a clear coast section, showing the beds dipping to the S.S.E., at angles from 40° to 65° , if we allow 50° as an average dip, we have in this distance an aggregate thickness of rock above the admitted Upper Silurian, of not less than 8,000 feet, with no appearance of our having reached the top of the series.

2. *The Coast from Sleah Head to Dingle Harbour.*—These Dingle beds, when traced easterly along the coast from Sleah Head, as far as the cliff on the west side of Fahan Point, were observed at that locality to be bent synclinally, and hence, from this place as far as the entrance to Ventry Harbour, a distance of three and a-half miles, the Sleah Head beds were presumed to be repeated and brought to view in inverted succession, though the dip and strike of all the rocks is precisely the same as before. This synclinal curve is again apparent on the west side of Ventry Harbour at the distance of 450 yards south of the point near the quay; and again, on the opposite coast of the harbour, just north of Ballymore Point. Massive groups of conglomerate of a very marked character, appear along the southern shore of the townland of Kilfarnoge, half a mile west of Parkmore Point, on the south side of Ventry Harbour. These conglomerates are of a dark liver colour, the pebbles large, well-rounded, and formed of various kinds of grit, quartz, hornstone, fragments of purple slate, white feldspar ash, vesicular greenstone, and gray fossiliferous limestone, or

highly calcareous grit. From some pebbles and rounded blocks of the last-named rock the following Silurian fossils were determined by Mr. Salter, on the occasion of my taking him to the spot:—

| | |
|-----------------------------------|-------------------------|
| Encrinites, both large and small. | Turbinolopsis, } bina. |
| Strophomena depressa. | Petraia, } |
| Pentamerus oblongus. | Cyclolites lenticulata. |
| Stenopora fibrosa. | Encrinurus punctatus. |
| Favosites alveolaris. | Encrinitic limestone. |

If the synclinal which was first observed at Fahan Point is really of importance, as I think it is,* and the beds retain their inverted position for any considerable distance, we can only suppose that these conglomerates are local, and hence do not appear in their proper horizon to the north of Sleah Head. There is nothing unlikely in such a supposition, but on the contrary, it is strongly supported by the mode of occurrence of a conglomerate, to be described presently, which first appears at Minard, to the east of Dingle Harbour, as a single bed, and in the distance of a few miles attains a thickness of several hundreds of feet.

The conglomerates observed at Parkmore Point cross the entrance to Ventry Harbour and appear on the eastern side at Paddock Point. Here, as before, their strike is E.N.E. with a dip of 80° to the S.S.E., and the same beds, or others quite similar to them, are cut through by the narrow precipitous channel forming the entrance to Dingle Harbour, at a farther distance of two and three-quarter miles to the east. Just north of Beenbane Point, which forms the eastern side of the entrance to Dingle Harbour, a thick band of these dark liver-coloured conglomerates appear, dipping as usual to the S.S.E. at 70° to 80° ; and here also many of the enclosed pebbles had been derived from fossiliferous Silurian limestones and calcareous grits.

On the western side of the entrance to Trabeg Creek, which lies at the distance of one mile and a-half east of the entrance to Dingle Harbour we find the same purple conglomerates, with fossiliferous pebbles, which, however, are represented by only a few thin beds. These, then, like all other conglomerates, have a tendency to become thin, and to disappear in short distances; for, on the opposite shore of the creek they are totally absent, though the distance is only half-a-mile. To the south of this, however, along the coast of Kinard Head, we find three bands of this conglomerate, containing, as usual, pebbles derived from fossiliferous Silurian rocks; these can be closely examined at low water to the N. and S. of the small hollow called Foilnascadda, and this is the most southern locality on this side of the Dingle promontory where these conglomerates were observed.

These beds are here overlaid by a series of purple grits and slaty layers, dipping southwards at 75° to 80° , and extending in that direction for the distance of 750 yards, or nearly half a mile, to the point west of Coosatorrig, near Bull's Head, where their denuded edges are overlaid unconformably by horizontal beds of red conglomerate and grit, which in their extension easterly, pass into the Old Red Sandstone which underlies the black shales at the base of the Carboniferous limestone of Castlemaine.

It will now be necessary to return to the Ferriter's Cove district, and describe the rocks which appear to the east of it.

3. *Sybil Point to Smerwick Harbour.*—The Old Red conglomerate of Sybil Head, and the Three Sisters' Heads to the east of it, extends in a nar-

* My impression was that this curve was only a small crumple in the beds and did not mark the axis of a great inversion.—J. B. J.

row band along the sea face of the whole of this blunt peninsula, from Sybil Point to Beendernot Head, at the western side of Smerwick Harbour, a distance of nearly three and a-half miles, being, however, cut through by the sea to the south of Beenhenry Point, as shown in the illustration, fig. 4, p. 20. At Sybil Head the maximum exposed thickness of the Old Red is 190 yards, and at Beendernot Point, 230 yards.

The cleavage which traverses these beds is well seen in the sandy layers, being, of course, less marked in the conglomerates.

The brownish purple sandstones, which were described as underlying the Old Red conglomerate of Sybil Point, and to which the name of Smerwick beds has been applied, extend across the peninsula to the west shore of Smerwick Harbour with the same regularity as the Old Red sandstone itself. On the shore below the village of Smerwick these beds appear to be contorted; but as this is here mainly determined from variations in their colour, it is more than probable that this apparent irregularity is merely the result of oblique lamination on a grand scale, such as we observed in the same beds where they appear to the north of Ferriter's Castle. Here, also, as at the other locality on the west, this series terminates in a bed of dark liver-coloured conglomerate.

The Upper Silurian rocks of Ferriter's Cove extend across the peninsula, and appear along the coast to the S.E. of the village of Smerwick from Fortdolore* on the north to Gortnagan Point on the south, a distance of only 600 yards. No doubt they are present to the south of this, and probably occupy a further space of half a mile, as indicated on the Map, but they are concealed by sand and alluvium. In general aspect these beds agree accurately with those of Ferriter's Cove; and to the south of Fortdolore, near Foilavaddin Point, we find a massive bed of pale yellow and white pisolitic ash, which we must suppose is the representative of the great ash series of Clogher Head. To the south of Foilavaddin, near Coosavaud, there is a thin band of purple slates, which, doubtless, is on the same geological horizon as the purple beds described as appearing to the north of Drom, in the Clogher Bay section, and hence we have here the same guide in determining the top of the Wenlock series as we had before.

To the south of this we find the same pale greenish gray flags and slates, with fucoid impressions and impure limestone layers, similar to those observed on the shore of Trabaneeclogher, and hence we have here the basal beds of the Ludlow series. In the low alluvial ground between Ferriter's Cove and Smerwick Harbour, all the rocks are concealed, with the exception of a few detached bosses of hard, pale gray, calcareous grits, supposed to belong to the Ludlow beds, which appear between the villages of Gortadoo and Ballyaglisha. These beds dip either to the E. or S.E. at 25° to 45°, and they frequently weather to a brown sand. They are fossiliferous, and when sound, are traversed by a cleavage, the planes of which strike 30° N. of E. and S. of W., with a dip of 75° to the southwards.

4. *The Hill of Croaghmarhin.*—The great ash series of Clogher Head, in its extension inland, forms a very prominent rugged boss on the southern side of the townland of Graigue, close to the boundary of the parishes of Dunurlin and Dunquin, called Minnaunmore rock, and on the northern slope of this we find the purple sandy flags and slates which were before alluded to, as the uppermost beds of the Wenlock series. These form

* This spot, according to the local traditions, is that fortified by the Spaniards in the year 1680, when they were taken and executed by Lord Gray de Wilton, with whom Raleigh served. (See Kingsley's "Westward Ho," and Lingard's "Hist. of England," vol. 6, c. 4.)

a portion of the same beds described as appearing along the northern slope of Clogher Head, but thrown out of the true line of strike by being on the upcast side of one of the small branch faults on the eastern side of the Coosemore and Carhoo faults; the apparent dip of the beds is to the S.S.W. To the east of this, and on the western base of Croaghmarhin Mountain, the same purple sandstones and slates again appear, but dipping to the N.E. at 50°, and curving round as they are followed to the southwards into the townland of Ferriter's Quarter, close to the village of Carhoo, so as to dip to the S.E. at 45°, in this manner forming what may be described as the terminal arch of the inverted anticlinal first described as occurring on the southern side of Clogher Head, and being so distinctly seen in the coose to the south of Owen. Above these purple layers, we find the thin bed of pale greenish-gray ash which was before observed to overlie them to the north of Drom Head. We have now reached the western base of Croaghmarhin Mountain, the summit of which is two miles due east of Clogher Head. This well-marked feature in the landscape is formed throughout of pale gray sandy calcareous flags and thin slaty layers; fossils are often very abundant in the former, and they are characteristic of the Ludlow series. The most comprehensive and best exposed section in these rocks is seen along the boundary of the parishes of Dunurlin and Dunquin, which traverses the mountain down its western side. At first the dip of the beds is to the E.N.E. from 35° to 60°, but as we ascend the hill they flatten to 20°, and dip due east. They here become more flaggy, and are traversed by a decided cleavage, the planes of which strike E.N.E. and W.S.W., being inclined at 70° to the S.S.E. On the eastern side of Croaghmarhin summit, the gray sandy flags are curved so as to dip to the south at 20° to 40°; but as we descend the hill they again dip to the S.E., and eventually to the E. at 5° to 20°.

In the various stream-courses which traverse the southern slopes of Croaghmarhin, and along the banks of the Dunquin River, many short though excellent sections are obtained through the basal beds of Croaghmarhin, and in the western portion of the townland of Glanmore some of these are made up entirely of coral masses. From the peculiar way in which the beds are observed to dip on either bank of the Dunquin River, between the old church of Dunquin and the group of farmhouses in the western end of Glanmore townland, it is presumed that a small fault, having a direction of N.E. and S.W., cuts through them there.

The uppermost beds of the Ludlow series are well exposed in the stream-cuttings to the N.E. of the village of Dunquin, in the townland of Ballynarahane North, and in that of Glanlack to the east of it.

In the upper portion of these natural sections, as well as in the glen of the small stream which has its rise on the northern flank of Mount Eagle, forming the boundary of the townlands of Vicarstown and Glebe, the basal portion of the Dingle beds is clearly seen, and we have here a more accessible exposure through these rocks than that afforded by the coast between Dunquin and Dunmore Head.

In the section at the head of the Glanlack stream, the Dingle beds, according to their dips, appear to rest conformably on the Upper Silurian rocks; yet on the brow of the hill in the townland of Commons, certain dark purple slates and sandstones of the former, if prolonged in the line of their strike, which is E. and W. with a dip of 45° to the south, would certainly be unconformable to the gray sandy flags and slates of the Silurian series appearing lower down the hill, in the stream-courses traversing the townland of Glanlack.

If we now follow the Dingle beds in their extension to the east, we find that they are again exposed in the western part of the townland of Kil-

durrihy West, and as before, consist of purple flags, reddish purple calcareous slates, pale green slates, and frequently hard green grits; the dip of all the beds being to the S.S.E. at 45° to 65° .

In the Gap of Coumalleague, through which the road from Dunquin to Dingle passes, and to the north of Kildurrihy, the light purple and green earthy layers of the base of the Dingle beds, are superficially exposed; and if we follow their apparent boundary to the northwards, we find that they again show in the stream-cuttings on the eastern flank of Croaghmarhin Mountain, but especially in that north of and close to the village of Marhinmore. In the upper part of this section, the beds are not so decidedly purple as elsewhere, but they retain their other characteristics of massiveness and general coarseness of composition, as compared to the Upper Silurian rocks, which enables the observer to distinguish them at a glance.

The north-eastern base of Croaghmarhin forms a well defined ridge to the southwards of the village of Ballyferriter, and is made up entirely of the Dingle beds, which, near their junction with the Silurians, dip to the S. at 80° . This is very apparent at the east base of the peak of Croaghmarhin, in the N. corner of the townland of Marhinmore. No reliance can, however, be placed on this dip, as indicating superposition, because, if so, the Dingle beds would underlie the Upper Silurians forming the summit of the hill. We have here, therefore, another instance of inversion of the beds, and if we bear in mind that this portion of the district lies in the direct line of strike of the Clogher Bay and Clogher Head contortions, we need not feel surprised that here we have evidence of these disturbances being prolonged, and affecting the apparent superposition of the beds.

As we descend the ridge along its crest towards Ballincarrig Castle, we find the reddish purple calcareous slates and dark purple grits to roll to the north-east, south, and south-east, at various angles of dip, from 10° to 70° ; and at the summit called Bartineanig Hill, 468 feet in elevation, which is directly over Dunurlin Church, they consist of purple conglomerates, which have an apparent dip to the north of 55° to 65° . Lower down the hill these beds become more sandy, and the conglomerates are in thin layers, the dip being to the eastward at 20° to 25° . From this point in a N.E. direction over the low ground skirting the head of Smerwick Harbour, the purple conglomerates belonging, as we must suppose, to the Dingle beds, appear in detached bosses. All the Dingle beds to the eastward of Croaghmarhin are cleaved in the usual direction of E. 30° N. and W. 30° S., the cleavage planes having an average inclination of 65° to the S.E.

The last seen of the Dingle beds in this locality is along the southern shore of Smerwick Harbour, in the townlands of Caherquin and Ballinrannig. At the former locality they are nearly horizontal, and consist of coarse dark purple conglomerates, resting on dull brownish purple cleaved sandstone. At the latter, they form the small rocky point which extends northwards into the harbour, and are of similar composition; they are here also nearly horizontal, having a wavy dip to the eastward of 10° to 20° , being cleaved in the direction before noted.

The beds which overlie these conglomerates consist of reddish purple slates and grits, having conglomerate layers through them, all likewise cleaved, and on the western shore of the small sandy bay on the east side of the point, they are traversed obliquely, or in the direction of N. 20° W., by a dyke of dark bluish gray crystalline greenstone, thirty feet thick. At the cliff end, this greenstone is amygdaloidal, having some of the vesicles coated with a zeolitic mineral, enclosing a nucleus resembling steatite; the larger cavities are lined with chalcedony, and have a nucleus similar to the former, while the smaller vesicles are filled entirely with this steatitic

mineral. The greenstone weathers to a brown colour and becomes soft, owing to the decomposition of numerous minute crystals of iron pyrites which are disseminated throughout its mass, and it has a tendency to break up into spheroids. The sandstones in contact with this dyke on its western side are very much hardened for the distance of eighteen inches from its wall, and all trace of their bedding is here quite obliterated.

5. *The East side of Smerwick Harbour.*—The Dingle beds which are seen on the coast opposite to that just described, and which extend from the shore near Murreagh cottage past the village of Ballynagall northwards, along the eastern shore of Smerwick Harbour, as far as the mouth of the Feohanagh River, are, as a mass, very similar in aspect to those we have passed over on the shore near Ballynagall. Some of the conglomerates here are strikingly similar in their aspect and composition to those before described as appearing on the coast to the west of the entrance to Ventry Harbour, but the fossiliferous pebbles so abundant at the latter place, are of rare occurrence here. The pebbles contained in the Ballynagall conglomerates are for the most part well rounded fragments of purple grit, greenstone, purple and green porphyry, and purple hornstone, jasper, and quartz, all enclosed in a dark purple sandy base. As we pass along the coast northwards to the village of Glashabeg, we observe several faults in the Dingle beds, some of which may be of more importance than we now suppose. This series appears to terminate at the embouchure of the Feohanagh River, in purple slaty beds and thin brown purple sandstones, dipping to the S.E. at 55° . On the opposite cliff forming the N.E. coast of Smerwick Harbour, and to the S. of the village of Ballydavid, the Smerwick beds again appear, to the exclusion of the Upper Silurian rocks of Ferriter's Cove, which have either thinned out, or, as is more probable, are faulted out in the distance represented by the width of Smerwick Harbour at this spot, which is three miles; the dip and strike of the Smerwick beds exposed along the coast S. and W. of the village of Ballydavid is precisely the same as that on the opposite side of the harbour.

As we pass on to Ballydavid Head, we again enter on the upturned and unconformable beds of the Old Red sandstone which form the sea face of the head for the distance of two miles; the dip and strike of these beds agree within 10° of that observed in the same rocks at Sybil Head, being N. 20° W., at 75° ; but here we have an exposed thickness of beds amounting to 3,100 feet, and striking obliquely at the boundary line between them and the underlying Smerwick beds, which dip S. 30° E., at 75° to 80° .

From the deep hollow on the coast, about one mile east of Ballydavid Head, called Poulavoondoon, for the distance of two miles easterly, the sea has cut away the unconformable Old Red, and eaten into the underlying Smerwick beds beneath. Throughout this extent these beds can be well examined, and they are found to consist of dull purple grits, slaty beds, and a few conglomerates and sandstones, all dipping S. 30° E., at 40° to 75° . At the western end of this section, the beds are jointed in the direction of N. 60° E., the inclination of the joints being only 30° to the N.W.

The Old Red sandstones are again regained at Benaman Point, where they are exposed to the thickness of 1,884 feet, the dip of the beds being the same as before, and presenting the same regularity of strike.

6. *Brandon Head.*—The wide indentation in the coast to the east of this point, extends to the western base of Knocknabreestee Mountain (2,509 feet high) which terminates in Brandon Head, and here we find the Old Red sandstone concealed by a mass of rubbish formed from itself, the result of an enormous landslip, which covers the sea face of the cliffs for a width of 750 yards, or nearly half a mile.

This slip appears to be bounded on its eastern side by a fault, and then we again see the Old Red beds rising with their accustomed regularity to form Knocknabreeste, the dip being to the N.N.W. at 45°.

As we pass around the point of Brandon Head, we reach the deep and wide indentation in the coast called Sace Creek, half a mile wide across.

The Old Red sandstone forms the sea face at either point of this bay, with a dip of 25° to the N.N.W., while the dip of the underlying Dingle beds is S. 25° to 30°, E. at 70° to 85°. On the opposite side of the creek the same fact is observed, but here we find that the Old Red sandstone, as it rises with a dip of 25° to form the cliff, flattens in the distance of 400 yards inland, and with rolling dips to the S. and E. at low angles, sprawls over the edges of the nearly vertical Dingle beds, and conceals them so as to form the whole of the eastern termination of the broad promontory ending in Brandon Point, and the belt of country around the village of Cloghane, at the extreme S.W. extremity of Brandon Bay.

Along the coast south of Brandon Point, the Old Red beds are very accessible. The only interesting point about them, however, is the occurrence of a well marked cleavage in all the beds along the shore to the east of Brandon Lodge, which dip to E. 10° N., at 15° to 20°; but when the same beds vary from this dip, the cleavage is not so perceptible in them, and is confined to the earthy layers. At the rock called Carrignakilla, to the west of Caher Point, there appear along its sea face some beds of hard, flaggy, greenish gray, and pale gray grit, irregularly laminated, and in places finely conglomeritic. These beds, I believe, represent the base of the Yellow sandstone or Upper Old Red, and they are of importance as they determine the upper boundary of the Old Red proper, and thus enable us to form some estimate of its probable thickness in this district, which may be 4,000 feet.

Caher Point is formed by a sharp anticlinal curve in the Old Red sandstone. The beds are partly dull purple grits and thick earthy layers dipping to the N.W. at 55°, curving to the N.E. at 20°, and lastly to the S.E. at a maximum angle of 30°. These beds throughout exhibit a cleavage which strikes E. 20° N., inclined S. 70° E., at 60°.

The basal beds of the Old Red sandstone which appear on the hill-side over the village of Cloonsharagh, are composed almost entirely of salmon-coloured conglomerates, the pebbles of which are principally grit, vein quartz, and jasper.

7. *Brandon Mountain Ridge.*—It may be well now to leave the Old Red rocks for a short time, and return to the description of the district lying to the north of Dingle, with especial reference to the section through the Brandon mountain range, on the scale of six inches to a mile, engraved in section 2, sheet 15, of the sections published by the Geological Survey.

The basal beds of the Old Red sandstone south of Brandon Head, are distinctly seen striking E. and W. with a dip of 40° to the northwards along the Pass of Brandon, and at the distance of 325 yards S. of the summit of Knocknabreestee Mountain, their elevation here being 2,232 feet above the sea. The underlying Dingle beds are also well exposed at this locality, dipping S.S.E. at 60° to 80°. Pebbles of brilliant red jasper, derived from these conglomerates, lie scattered about here in great abundance.

At the southern side of the pass, and on the northern slope of Brandon Mountain, there are two small isolated cake-like patches of Old Red conglomerate, resting almost horizontally on the edge of the Dingle beds. The smaller and most northerly occurs at the distance of about 225 yards from the basal boundary of the Old Red sandstone of Knocknabreestee Mountain, and is surmounted by the remains of one of those signal towers

erected along this coast at the beginning of the present century.* The southern detached mass is higher up the slope of the mountain, and measures about 250 yards from N. to S., with a width of 180 yards; it is known by the name of Pierasmore. To the west of this a deep rain channel exposes a good section in the reddish purple slaty and flaggy Dingle beds, which dip S. 20° E., at 50° to 60°. As we ascend the northern slope of Brandon Mountain we pass from off these beds and enter on a series of thick, irregularly laminated, purple grits, with conglomerate layers, some purple slates, which are often calcareous, and very distinct purple cornstones, which weather to a rusty brown colour and decompose. These beds, which dip steadily to the S.S.E., at from 15° to 25°, are exposed for the distance of a mile, and form the main mass of the upper portion of Mount Brandon. The beds which form the absolute summit of the mountain are chiefly purple conglomerates, arranged in a series of shallow basins, having a maximum dip of 20°, and which get smaller and smaller as the hill rises till the basin† is not more than fifty yards across uppermost.

As we descend the mountain on its southern side we pass over some of the same beds as those noticed on the northern—the dips being now to the westward, or W.N.W., at angles as low as 10°, and it is not till we reach the northern base of Brandon Peak that we again find the beds with a dip to the southward. On the northern slope of this well-marked peak there are two thick bands of coarse purple conglomerate, having purple grits and slaty beds between them. At the bottom of the slope they dip to the southwards at 30°, increasing up to 50°, and midway they dip to N.N.W., at 65°, decreasing to 50°, at the summit of the peak. From this peculiar arrangement these two groups of conglomerates present the appearance of four distinct bands.

On the southern slope of the peak the same conglomerates are again met with, but bent anticlinally, and at the base of the peak at this side they disappear with a dip to the S.S.E. at 50° beneath purple grits, slates, fine gravelly conglomerates, and purple cornstones.

In the depression of the mountains between Brandon Peak and the summit of Gearhane, and also in the lofty rugged cliff overhanging Lough Avonane, we find marked evidence of a fault running E.N.E. and W.S.W., which brings the purple and conglomeritic portion of the Dingle beds into juxtaposition with the lower or green and gritty part which forms Mount Eagle.

As we ascend the northern slope of the summit of Gearhane we find the hard greenish gray conglomeritic grits, and the purple grits and slates of the lower Dingle beds, well exposed, dipping to the N., at 40° to 80°. In the cliffs over Lough Namna, and at the Pass of Mullaghveal, between the summit of this hill and that to the south, called Ballysitteragh, beds similar in character, but lower geologically, appear, dipping to the north at 85° and 90°.

The true superposition of the vertical grit beds is here determined by the fact that the associated shales are found adhering to them on their

* A similar signal tower was erected on the southern summit of the great Blasket Island; another on Sybil Head; and a third on Ballydavid Head.

† The apex of the mountain is crowned by the remains of a group of small rude stone circular huts, one of which is supposed to be the cell or oratory of Saint Brendan, who is said to have lived in the sixth century. There is here also a monumental pillar-stone, and a so-called well, or deep hole in the peaty covering of the conglomerate, which, unless in the driest weather, is filled by the percolation of the rain water, or that derived from the clouds which for the most part of the year envelop the summit of this mountain. The whole group of these ancient ruins are held in great veneration by the people, who at stated periods perform pilgrimages to the place.

northern faces, but they readily become detached from the same grits on their southern sides; hence, it would appear that the intervals of deposition took place at the completion of the muddy or earthy matter of each deposit.

On the southern side of the pass, as we ascend the slope of Ballysitteragh summit, the beds dip to the north at 80° , and here, beneath some dull purple grits and slates, there occur a few beds of gray slate containing small lenticular pea-sized nodules of hard gray shales, which on weathering from off the face of a bed give it a singular dimpled look.

At the distance of 500 yards S. of the rough road through the pass, and midway up the northern slope of the summit just named, the lowest beds of the section, geologically speaking, are reached, and here, after a few large crumplings, they are reversed *en masse* and dip to the southwards, at angles from 15° up to 30° , increasing to 45° , on the southern flank of the mountain, above the new line of road through Connor Hill Gap, from Dingle to Cloghane and Castlegregory. Along the line of section, for the distance of three miles S.E. of where the lower Dingle beds were last observed on the flank of the mountain in the townland of Coombowler, the ground is comparatively low, and covered with a thick deposit of local drift, which conceals all the rocks; from the evidence, however, afforded by detached bosses of rock occurring within a mile or so to the west of the section, there is no doubt whatever that it is formed of the Dingle beds.

Before leaving the Brandon district I would remark that the western slopes of that range are smooth, and the rocks concealed by grassy soil. But on the eastern side its aspect is totally different; there the whole line of summits is steeply escarped in rugged and lofty precipices, overhanging a chain of lakes, which extend for the distance of two and a half miles in a N.N.W. and S.S.E. direction. The lower and upper portions of the Dingle beds are well exposed in these cliffs and precipices.

At Ballysitteragh summit, which forms the southern termination of the Mount Brandon range, the mountains strike to the eastward, forming the summits called Beennabrock and Beenduff. Connor Hill Gap now intervenes, and thus forms a break in the continuity of the range. The southern slopes of this portion of the chain of hills presents the same general aspect of smoothness and fertility, characteristic of the western slopes of Brandon, but those to the north are steep and rugged.

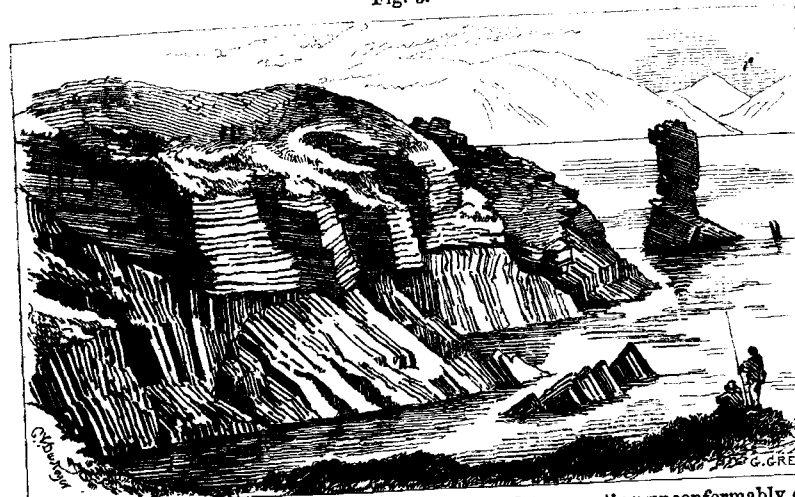
Along the summit of the precipices over all the lakes of this district, the Lower Dingle beds have a persistent dip to the S.E. of 30° to 45° , but adjoining the lakes they are observed to curve anticlinally and dip to the E., and eventually to the northwards, in low angles, thus forming a portion of the extension to the east of that large crumpling of the beds described as appearing in the line of the Brandon section, on the northern slope of the summit of Ballysitteragh Hill.

8. *The Bull's Head Promontory.*—When we arrive at the head of Trabeg Creek we find on its eastern side some dark reddish purple sandy, and often conglomeritic grits with slates, dipping S., at 80° . Both are cleaved, the former in the direction of 30° N. of E. and S. of W., the planes of cleavage dipping at 80° to the southward; and the latter, 20° N. of E. and S. of W., at 60° to the southward. A little to the S. of this, on the east side of the creek, similar beds are observed, dipping to E. 10° N. at 85° , and cleaved in the direction of 25° N., of E. and S. of W. As we approach Kinnard Point we find a thickness of several hundreds of feet of rock, dipping to the S. at 70° , and quite free from all appearance of being cleaved. But at the point, the same beds as those last observed change their dip to N. 30° , E. at 80° , and exhibit a marked

cleavage, having a strike of 25° N. of E., and S. of W., vertical. There is no apparent reason why the beds just north of Kinnard Point, which dip to the S., should not be cleaved; while those first noticed at the head of the creek, and having a similar dip, are markedly affected in this way.

There is no rock seen on the northern slope of Kinnard Hill on the line of the Brandon section; but the adjoining coast, which is not half a mile from it on the west, most clearly supplies this deficiency.

Fig. 5.



Bull's Head, looking S.E., showing the Old Red Sandstone resting unconformably on the Dingle beds.

The unconformable Old Red sandstone, which occupies the summit and southern slopes of Kinnard Hill, lies like a massive undulating flake on the top of the highly inclined or vertical Dingle beds, the last or uppermost of which form the point jutting into Dingle Bay, west of Coosatorrig, called Bull's Head. On the eastern side of this point, at Coosatorrig, purple and pale gray sandy shales, containing well-known Upper Silurian fossils, strike directly at the edges of the Dingle beds being brought against the other by a fault, or an unconformable junction. The Silurian beds, on the latter supposition, at one time formed the sea-cliff, against which the Dingle beds were deposited, and from which those fossiliferous pebbles were derived which we find so frequently in their coarse conglomerates.

The deep indentation in the coast, between Coosatorrig and Bull's Head, is formed entirely in Upper Silurian thin grits and slates, which vary in colour from pale greenish gray to a dark purple, and some of the latter beds are quite muddy and black. As we pass round to the S. of Bull's Head the coast is formed of pale greenish gray gritty beds, which are much contorted; but when we reach the extreme southern point of the Head these contortions cease abruptly, and the whole coast easterly, for the distance of nearly two miles, up to the western corner of Minard Bay, is formed of green and purple slates and flags, dipping with the utmost regularity to the S.E. at 65° to 80° . Many of the grit surfaces are covered with delicate and well-formed current marks; and some of the softer slate beds exhibit large surfaces covered with fine cracks or

small fissures of dessication of the most perfect character, in which, as in every other respect, they accurately resemble the grits and slates of the Dingle beds which form the coast of Esk Hill, to the west of the entrance to Dingle Harbour.

Over all these beds the unconformable Old Red sandstone lies in a thick and comparatively horizontal flake, measuring about two miles and three-quarters, in a N. and S. direction, with a width of 700 yards at the head of Minard Bay, but increasing at its southern end to three-quarters of a mile, where it forms Kinnard Hill and Lea Hill.

9. *The Hills east of Connor Hill Gap.*—On the eastern side of Connor Hill Gap, the ground again becomes mountainous, forming the lofty summits of Slieveanea, 2,026 feet; Coumanare, 2,202 feet; Slievenalecka, 1,514 feet; Slievenagower, 1,603 feet; and Beenbo, 1,565 feet. The valley of the Glennaho River then intervenes where the chain is continued in the same direction, that of N.E. and S.W. by the mountains of Beenatour, 1,945; Coumbaun, 2,017 feet; Stradbally Mountain, 1,275 feet, with the most lofty of the whole group, Beenoskee, 2,715 feet above the sea, lying midway, but to the south of the two former summits.

With the exception of the peak of Beenoskee and the northern slope of Stradbally Mountain, commencing at its summit, the whole group of mountains just named are formed by the greenish gray gritty and conglomeritic layers of the lower Dingle beds, and their northern and eastern summits are steep and rugged.

Throughout a distance of seven miles, the Ballysitteragh anticlinal is clearly seen to pervade all the beds exposed on the various precipices just named, as well as in those forming the northern slopes of Beenbo Mountain, and over the rugged ground at the head of the valley of the Glenahoo River.

How much further to the eastward of the last named locality this singularly well-developed anticlinal extends it is impossible to say, as just here the Dingle beds are concealed by the overlying Old Red sandstone, which forms the southern and eastern slopes of Beenoskee Mountain.

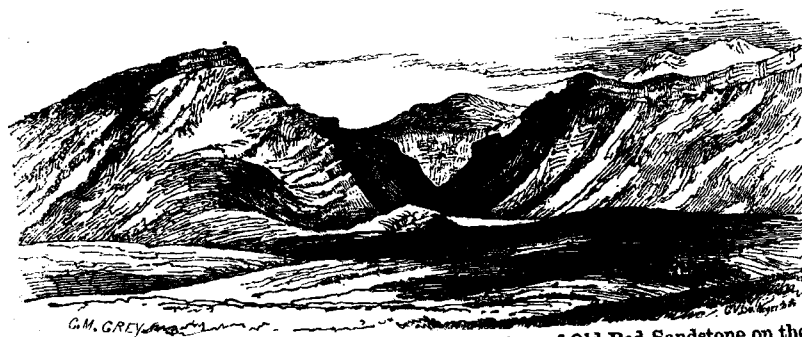
In the elevated plateau, to the south of the summits of Coumanare and Slievenalecka, lies the three Coumanare Lakes, and along their southern side, which is rugged and lofty, the Lower Dingle beds are well exposed, being bent synclinally towards the W., and anticlinally towards the E., in a great S-shaped fold, the axes of which have an inclination to the eastward. These beds are, geologically speaking, higher in the series than those seen in the escarped summits of the mountains lying to the northwards. The hills south of the Coumanare Lakes are over-spread by the Old Red sandstone, and a detached flake of this deposit, which measures only 700 yards from N.E. to S.W., by 300 in width, caps the summit of Croaghskeara Mountain, 2,001 feet in elevation, and distant one mile to the S.W. of the most western of the Coumanare Lakes.

The overlying Old Red sandstone, which lies to the S. of the Coumanare Lakes, forms here an irregular and narrow tongue—the western extension of that portion of Old Red sandstone, which extends along the entire northern base of that part of the Dingle promontory included in Sheet 161, and lying to the S. of Castlegregory. On the southern side of this tongue or flat ridge the lower Dingle beds are exposed only at scattered localities. Of these, one of the most prominent is that deep hollow on the southern brow of the mountain over the valley of the Owenclondrig River, in which Lough Barnanageeha lies. Here we find that the base of the cliff surrounding this lake is formed of the ordinary thick bedded irregularly laminated greenish gray conglomeritic grits, and green and purple slaty layers of the lower Dingle beds, all dipping on the E.

side of the lake to the N. at 50°, and on the opposite side to the W. at 20°. These are overlaid by horizontal beds of the coarse salmon-coloured conglomerates of the Old Red sandstone which form the brow of the cliffs to the W. and N. of the lake.

At the distance of about three miles to the east of this locality, the southern side of the mountain chain is again deeply hollowed out to form the wide amphitheatre which encloses Lough Anascaul.

Fig. 6.



Anascaul Lough, showing the unconformable capping of Old Red Sandstone on the summits of the hills.

The geological structure of this remarkable hollow is precisely the same as that last described, but all the rocks are here exposed on a far grander scale. On the S. side of the lake the lower Dingle beds dip to the W.S.W. at 10° to 20°, and from this point they can be distinctly traced extending up the glen along its western side as far as its termination, a distance of half-a-mile, the dip of the beds being nearly the same as before. At the head of the glen the beds curve round to the N.N.W. at 20°, thus exhibiting a flattened anticlinal; and in this manner they form the eastern side of the valley at the head of the lake, and the upper portion of the lofty and rugged precipices overhanging both on the N.E. Throughout all these grits and slaty beds there is a well-developed vertical cleavage, the direction of which is 20° N. of E. and S. of W.

At the head of the glen the Old Red sandstone is observed crossing it from side to side, with a northerly dip of 10° to 25°, so as to conceal the Dingle beds.

The illustration (Fig. 6) shows the general form of the Lough Anascaul Amphitheatre and the surrounding nearly horizontal beds of the Old Red sandstone.

From the head of Lough Anascaul Glen the ground rises gradually to the northwards, till, at the distance of one mile and three-quarters, it attains, in the summit of Beenoskee, a greater elevation than elsewhere over the district between Castlegregory and Anascaul. The terminal peak of this mountain is steeply escarped on its northern face into a deep but narrow amphitheatre, which encloses Lough Acummeen, the level of the lake being nearly 700 feet below it, though the horizontal distance between the two is only 300 yards. The upper portion of the precipice, which surrounds the lake on all sides but the north, is formed by the salmon-coloured sandstones, grits, and coarse basal conglomerates of the Old Red sandstones, which contain well-rounded and various coloured pebbles of grit, with white quartz and red jasper. The beds all dip to the southwards and towards the hill, at 30° to 35°, having their edges exposed in the escarpments which almost surround the lake. The lower portion of

the precipice is formed of the lower Dingle beds, which dip to the N.N.W. at 55° to 60° , and hence the junction of the two formations is very plainly perceptible.

The head of the valley of the Owencashla River lies at the distance of about one mile and a-quarter to the S.E. of Beenoskee, enclosing the small lakes of Doo Lough and Lough Caum. To the west of these lakes the overhanging rugged cliffs are formed of Old Red sandstone, the beds of which are bent synclinally, dipping S.S.E. at 20° , and N.N.W. at from 5° to 20° , a fact which is very apparent in the cliff on the western side of Lough Caum. At the distance of something over half-a-mile lower down the glen is Lough Slat, the western side of which is also bounded by a precipice. Here, however, the base of the unconformable Old Red sandstone is reached, and the beds forming it are observed to dip to the northwards, at 30° , while the subjacent Dingle beds, forming the western and southern shores of the lake, exhibit a dip to the N.N.W. of 60° . On the south-east side of the lake, the ground rises to form Doon Hill, 1,199 feet above the sea, or 848 above the lake, and this prominent elevation is capped by a few detached beds of Old Red sandstone, which dip to the N.N.W. at 25° . These are steeply escarped on all sides, excepting that to the south, the underlying Dingle beds being well exposed along the flank of the hill, having a dip to the N.W. of 50° to 70° .

The accompanying view of Lough Slat and Doon Hill, taken from the S.E. base of Carrigadav Mountain, shows very clearly the prominent features of the facts just described, and the nature of the junction between the Old Red sandstone and Dingle beds at this locality.

Fig. 7.



Lough Slat and Doon Hill, looking west, showing the unconformable capping of Old Red Sandstone.

On the same side of the valley as Doon Hill, and at the distance of about one mile to the east of it, is the Hill of Cumeen, which rises to the height of 1,577 feet above the sea. Midway on its northern slope, and occupying a deep indentation, lies Loughacumeen, at an elevation of 593 feet above the sea, having lofty precipices overhanging it on its southern and western sides. The same geological facts as those described at Lough Slat are here again apparent. The Old Red sandstone has been cut through by denudation, and the underlying Dingle beds exposed. The former dipping steadily to the north at 30° , and the latter being contorted, but yet presenting a main dip to the N.W. of 55° to 70° . These facts are very clearly seen on the cliffs on the S. and W. of the lake.

The summit of Cumeen Mountain and its southern side, as well as the upper and southern slopes of all the hills to the east of it, as far as the village of Camp, and beyond that along the north-western slopes of the Caherconree Mountain, are formed entirely of Dingle beds, while the northern slopes of the same range are occupied by a thin covering of Old Red sandstone, the beds of which have an average dip to the northwards, at low angles. On the northern slope of Beenacon Mountain, and at the distance of something less than a mile to the S. of Castle-gregory, the thin layer of Old Red sandstone has been eaten through, and the Lower Dingle beds exposed beneath it, over a space of about three-quarters of a mile from N.E. to S.W., by about 550 yards in width. Some of these beds, where they appear along the Tralee road, just S. of Castle-gregory, have a dip of 55° to the N.N.W., but, as they are followed up the side of the hill, they soon flatten to 15° .

10. *Tralee Bay District.*—As the Old Red sandstone is traced easterly from near Castle Gregory, it gradually narrows in superficial width till, in the distance of five miles, when it is exposed in the glen of the Finglass River, close to the village of Camp, its width is only 620 yards: but as the average dip of the beds is estimated at 60° , we may infer that its stratigraphical thickness is 1,600 feet.

At the distance of one mile still further to the east, and in the bed of the stream dividing the townlands of Knockglassbeg and Killeton, we find the Old Red beds in junction with the Dingle beds. To the north of this spot it is presumed that we reach the basal horizon of the Upper Old Red or Yellow sandstone, as, doubtless, these beds occur on the northern, as they undoubtedly do on the southern, side of the great Old Red anticlinal. In this section, the lowest part of the Old Red consists of a coarse conglomerate of well rounded pebbles of many coloured grits, white quartz, and red jasper, the dip being N. 15° , W. at 60° . These beds are observed to rest unconformably on reddish purple grits and slates, belonging to the upper portion of the Dingle beds, which dip to the S.S.E. at 60° to 80° . Throughout the section the most prevalent beds are reddish purple grits and cleaved earthy beds, having, here and there in the upper portion, impure rusty cornstone layers.

From the ridge on the Tralee road northwards, to near the sea shore, the space coloured on the map as yellow sandstone is entirely covered by a thick deposit of coarse local sandstone drift, but on the shore we come on dark and light gray, and pinkish compact limestone, dipping to the N.N.W. at 30° , and hence the upper boundary of the Old Red sandstone is capable of being defined with tolerable accuracy. That the Carboniferous limestone now occurs "en masse," forming the southern coast line of Tralee Bay, we have additional evidence in the fact that it appears to the east of the locality just alluded to, at Pointnarusheen, while to the west it forms the entire shore below Camp Church, and the reef of rocks terminating in Carrigaharoe Point.

The Maharee Islands also are composed of Carboniferous limestone, partly massive and partly thin-bedded, with layers of black chert.

The best exposed section through the Dingle beds, which we have in this neighbourhood, occurs along the banks of the Finglass River; and though the rocks are not continuously exposed, it is evident that at the northern part of the section they are bent anticlinally, for they dip to the north at 45° , along the east boundary of the townland of Camp, while at a short distance S. of that, where the river forms the boundary of the townland of Kiltenebane, they dip to the S. at 60° to 85° .

Higher up the glen, at the distance of half a mile, and to the last-named townland, near the farm-houses close to the ford, we find similar beds of purple and green grits and slates, having also a southerly dip of 60° to 70° .

Here we appear to lose the Dingle beds; for, as we proceed up the glen of the river, we very soon arrive at pale yellowish and light, as well as dark, gray shales with impure limestones through them, and gray micaceous grits with green shales. A totally different assemblage of rocks, the description of which may be better deferred till we come to those of the Anascaul Valley.

11. *Caherconree*.—On the eastern side of the valley of the Finglass River, in the townland of Curraghcullenagh, the ground rises in the form of a large knoll, which is capped by a few outlying beds of Old Red sandstone.* These cover a space of about half a mile from N.E. to S.W., having a width of 350 yards. At the N.E. extremity, these beds appear to dip to the S.E. at 50°, and in this manner to abut against the dark and pale gray Upper Silurian beds which form the chief western slope of Caherconree Mountain. At the distance of about one mile to the eastward of this outlying patch, the Old Red sandstone crosses the summit ridge of Gearhane and Caherconree Mountains, at a maximum elevation of 2,713 feet, in a narrow band which, at the head of Derrymore Glen, on its western side, is contracted to the width of not more than 200 yards, being at the same time proportionately thin. To the east of the summit of Caherconree and close to it, the Old Red suddenly widens and thickens, having here been deposited against what is now a nearly vertical cliff in the Upper Silurian rocks exposed in Derrymore Glen, which curious fact is illustrated by the view (fig. 1), taken from the west flank of Baurtregaum Mountain, and looking in a W.S.W. direction across the head of the glen.

From this point the course of this Old Red sea cliff can be distinctly traced in a S.W. direction for the distance of two and a-half miles, till we find it again admirably shown at the head of the glen of the Finglass River, in the great amphitheatre called Coumastabla.

12. *Caherconree to Minard*.—In the extension of the Old Red sandstone, from the summit of Caherconree Mountain, it forms on the N.E. and E. the mountains of Scragg, 2,038 feet, and Baurtregaum Mountain, 2,796 feet above the sea; and from the latter point it stretches to the westward, forming the range of mountains which bounds Castlemaine Harbour on the north, and the northern extremity of Dingle Bay, as far as Minard Point, a distance of about fifteen miles.

At Minard Head the junction of the Old Red sandstone with the black and gray silty and ribboned slates and thin grits, which occupy the valley of Anascaul, is very clearly seen; the latter beds are much contorted, and the Old Red rests on their upturned edges, having itself been subjected to forces of disturbance which have bent its lower beds into sharp folds.

The basal beds of the Old Red of this locality, consists of hard purple and salmon-coloured grits, sandstones, and flags, forming a band of about 200 feet in thickness. Above this we find a mass of purplish red sandstone, forming the coast line for the distance of 250 yards, and throughout this we find the most striking illustrations of oblique lamination which it is possible to imagine. This peculiar structure is so well developed that it assumes all the characteristics of *bedding*; and, unless this portion of the coast was examined carefully from a boat, the spectator viewing it from the cliffs would not hesitate to suppose that what he saw so clearly, was the result of *contortion*, if not an absolute unconformability, and not the product of mere deposition.

It is also a remarkable fact that this peculiarity of structure is clearly traceable for the distance of seven or eight miles, and possibly much fur-

* It has always been doubtful to my mind whether this was not part and parcel of the Dingle beds.—J. B. J.

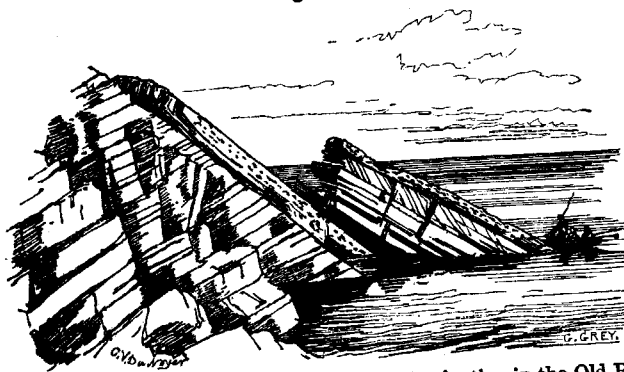
ther to the eastward, out of the limits of the district we are describing; but, so far as it can be connectedly traced, it forms a well-defined band at this horizon in the Old Red sandstone.

Above this band of obliquely laminated rock, we find thin purple sandstones, gravelly conglomerates, some green grits, slaty beds, and thin current-marked sandstones, all dipping steadily to the S.S.E. at 30° to 35°, and forming the coast line for the distance of one mile.

At the cliffs under the summit of Glan Mountain, these layers terminate in a bed of conglomerate, dipping S.S.E. at 35°, formed of large pebbles of very white quartz, enclosed in a matrix of purple sand, and this rests on a mass of purple sandstone, the oblique lamination of which presents so much the character of true bedding, that unless we were previously aware of the true nature of the case, we should at once say that this conglomerate was unconformable to the sandstones beneath it.

The accompanying view of this conglomerate, with the underlying obliquely laminated sandstone, as they are exposed on the coast opposite to Carrignanean (a point 650 yards eastward of Sharragh rock), will fully explain the foregoing remarks.

Fig. 8.



Western end of the Inch conglomerate and oblique lamination in the Old Red sandstone cliffs, west of Minard.

There is another interesting fact in the history of the structure of the Old Red sandstone of this district. The conglomerate, which at Carrignanean is a single bed of a few feet in thickness, when traced easterly, is found to contain pebbles and blocks of metamorphic rocks; and in the distance of about fourteen miles, when it appears at the head of Derrymore Glen and at Baurtregaum, it has increased in thickness to not less than 400 feet, and its base not seen.

At Carrignanean the coast strikes in a northerly direction for the distance of half a mile, and the general dip of the sandstone is to the S.S.E. at 20°. That this is their true inclination is proved by the occurrence of current marks on some of the beds in the southern corner of the townland of Kilmurry, to the S. of the old church.

The cliffs under the coast-guard station at the old Castle of Minard afford most striking illustrations of oblique lamination, in purple and salmon coloured sandy beds of great thickness.

On the opposite shore of Minard Castle Bay, which terminates in Acres Point, there is a decided change in the lithological character of the Old Red, though the dip of all the beds is clearly the same as before at angles of 30° to 35°. Here the bedding is thinner and more defined, and the oblique lamination, though still persistent, is consequently on a more

prescribed scale. The sandstones occur in thick groups of beds, divided by bands of dark brownish purple shale and slate. The extreme termination of Acres Point exposes a bed of conglomerate, precisely the same as that at Carrignanean. From Acres Point, easterly for the distance of one mile, the coast is formed of irregularly bedded brown and yellowish brown sandstones, with a few beds of gravelly conglomerate, the dip of all being as before to the S.S.E. at 25° to 50° . As we approach the point to the S.E. of the summit of Acres Hill, we find some yellowish brown sandy mottled beds, obliquely laminated; and in the S.W. corner of the Townland of Doorah, where the dip arrow with 30° is engraved on the one-inch map, we again find the Carrignanean conglomerate. Here the enclosed pebbles are subangular lumps of white quartz from 3 to 6 inches in diameter, scattered with singular regularity through the mass, pebbles of brownish purple grits, small fragments of purple slate, micaceous gneissose slate, and micaceous sandstone. Above this conglomerate are a few beds of dull brownish purple finely and obliquely laminated sandstones, with some flags. The shore to the eastward of this point, for the distance of one mile, exposes dull brownish purple, pale brown, and yellow sandstones, finely and obliquely laminated, and dipping to the southward at 40° . As we approach the entrance to the glen of the Owenascul river, all trace of the true bedding disappears, and, as at Minard Head, the sandstones become of enormous thickness and one mass of oblique lamination. As we pass up the west bank of the river below Bunaneen Cottage, the bedding becomes somewhat better defined, and the dip appears to be to the S. at 70° .

At the distance of half a mile north of the cottage, the base of the Old Red sandstone is reached, the beds forming it being exposed along the high ground on the west side of the river, they consist of dark red purple grit and sandy shales dipping to the S.S.E. at 65° ; within a few yards of these beds, and just N. of the bridge at the sharp turn of the river, the Silurian pale gray silty slates, which form the main mass of the rocks of the Anascaul Valley, appear beneath the Old Red sandstones with a dip to the N.E. at 80° . At the eastern side of the mouth of the glen and opposite to Bunaneen Cottage, the Old Red sandstone has been steeply escarped by the sea, and at low water the view of the horizontal section of the beds at the base of the cliff, as seen on looking down from the road, is exceedingly instructive; at this spot the oblique lamination is again admirably developed, and this natural weathering of the laminae brings out the structure with singular clearness. These obliquely laminated beds can be traced easterly, for the distance of nearly one mile, till, at the cliff west of and just under Foildarrig House, they are observed to abut against a series of massive bedded coarse conglomerates, dipping S.S.E. at 30° ; a fault is therefore inferred at this locality, the direction of which would be about N.N.E. and S.S.W. The conglomerates thus suddenly brought to view on the east side of the fault present a thickness of 300 feet, and contain pebbles of granite, white quartz, gneiss, mica slate, grits, jasper and purple slate. It is therefore the same conglomerate, as that before mentioned as on the shore to the east of Sharragh Rock. These beds are overlaid by evenly bedded brick red and purplish sandy shales and flags.

At the distance of 450 yards E. of Foildarrig House another small fault is apparent, the direction of which is nearly N. and S. On its E. or up-east side, we again find the same conglomerates as those just described, and they are overlaid as before by purple sandy beds. The amount of displacement caused by this latter fault cannot be much over 175 feet.

From this point easterly, for the distance of more than a mile and a half, the conglomerates can be traced almost continuously near to and along the shore; and they are especially well developed and exposed as

we approach the base of the projection of the coast just west of Inch. From this fact we have called it "The Inch conglomerate," and by that name it is proposed in future to describe it. On the shore, and just under the road, at the distance of one mile west of the village of Inch, this conglomerate has been broken up by the sea into enormous masses, thus affording every facility for its thorough examination. Here we found that its pebbles and enclosed masses partook much of the nature of a breccia, indicating that the fragments were not far travelled, though they all presented rounded edges. The principal pebbles are pale greenish gray micaceous grit, very shiny gneissose slate, some lumps of which are a mass of silvery mica, purple grits and slates, quartz, feldspathic granite, and jasper—all enclosed in a brownish purple sandy base. One pebble of white quartz, broken from out the conglomerate, contained good sized crystals of schorl; the largest block was one of grayish grit, which measured two feet six inches by two feet two inches. This conglomerate is overlaid by brick-red or purple, thin bedded, sandy flags and sandstones, dipping to the S.S.E. at from 20° to 30° , the uppermost exposed beds of which are salmon coloured, often obliquely laminated, and many of their surfaces covered by delicate current marks.

Brickany Mountain, which rises from this shore, exposes at its summit obliquely laminated salmon coloured grits, and flaggy sandstones, dipping to the S.S.E., at 30° to 40° , and the base of the Old Red sandstone is reached at the distance of 300 yards north of this point, and along the northern slope of the mountain. Near the village of Inch, the cutting afforded by the road to Anascaul, along the W. side of the glen, exposes a good section through the Inch conglomerate, which here attains a thickness of fully 800 feet. The base of the conglomerate at this locality is often micaceous. Higher up the glen, in the eastern corner of the townland of Tullig, and at the distance of 1 mile N. of Inch, the base of the Old Red sandstone is reached, the observed beds being hard massive brownish purple grits. At the distance of a few hundred yards to the north of this, and in the same townland the pale gray, Silurian flags and slates of the Anascaul valley appear beneath the Old Red, dipping to the northwards at 55° . The Old Red sandstone district lying to the eastward of Inch, though mountainous, is singularly deficient in exposure of rock: enough however is seen to fully explain its geological structure. At the distance of about 1 mile and a quarter to the eastward of Inch, and on the southern slope of Beenduff mountain, above the village of Caheracruttra, and at an elevation of 369 feet, the Old Red sandstone has been completely eaten through by denudation, and the underlying greenish and gray flags, grits, and slates of the Silurian rocks are exposed.

In the small stream course which runs through the townland of Caherpierce, half a mile to the east of this spot, a few beds of the Inch conglomerate are exposed, dipping to the S.S.E., at low angles. Here the blocks of micaceous schist and gray grit are unusually large; and, as before, the conglomerate is overlaid by reddish purple grits, which appear lower down in the stream cutting.

In the glen of the stream which traverses the western flank of Lack Mountain, and in the townland of Lack, we find the purple and reddish grits tolerably well exposed, especially in the southern or lower portion of the section above the main road. Here the dip is uniformly to the S.S.E. at 20° to 30° . Above this and nearer to the summit of the mountain, similar beds appear, but they are either horizontal or are inclined to the westward at low angles. The last rock seen is at an elevation of 1,100 feet and is a portion of the Inch conglomerate.

The summit of Knockbrack Mountain is steeply escarped on its northern

face, where it overlooks the deep glen of Coumastabla, the exposed beds being the base of the Old Red sandstone; at the foot of the precipice these were observed to rest on the dark gray and grayish purple slaty beds of the Anascaul valley, which have here been quarried for roofing purposes, the slates procured being very small and of inferior quality; the junction between these two formations is here very clearly seen, and, as before stated, rather a remarkable one, being that produced by a cliff in the Silurian rocks, against which the Old Red sandstone was deposited; the former and softer strata have been cleared away by denudation, leaving the latter to form a precipice which thus defines what was here the temporary limits of the Old Red sandstone sea.

The southern slopes of Caherconree Mountain, as well as its immediate summit, are occupied by the Inch conglomerate, great beds of which are observed in the upper portion of the Townlands of Beheenagh, Ballyarkane, Oughter, and Gortaleen Mountain; in the latter the beds are rolling at low angles, their average dip however being to the southwards; the southern end of Derrymore Glen is steeply precipitous and formed entirely of Inch conglomerate, the beds of which dip to the southwards at 20°. To the east of Derrymore Glen is Baurtregaum Mountain, the summit and sides of which is formed by horizontal layers of this same conglomerate. These beds, however, in their extension over the northern flank of the mountain, dip to the northwards at low angles, to form the northern side of the great Old Red sandstone anticlinal. At the distance of 500 yards to the east of Baurtregaum summit is Curraheen Glen, a very remarkable and well defined hollow, at the head of which is the small tarn called Coumbrack Lake. The position of the head of this glen is indicated on the Map, sheet 161, by a semicircular double row of dots, representing the basal conglomerate of the Old Red sandstone, which is here horizontal, and forms the precipitous cliffs bounding this end of the valley. The beds on which this conglomerate rests are obliquely laminated purple grits, the dip of which is rather obscure, but which is supposed to be to the southwards at 30°.

The stream which traverses the southern slope of Baurtregaum, leaving Castle Hill to the east of it, and forming the boundary of the townlands of Fybagh and Shanakeal, affords a tolerably continuous section through the Old Red rocks. The upper part of the stream exposes purple grits and some gravelly conglomerates, the average dip of which is to the southwards at low angles. Lower down the slope higher beds dip at 25° and 30° as we approach the main road; and when we come to within 425 yards of it, it is presumed that we have reached the horizon of the upper Old Red or Yellow sandstone, though at this locality all the rocks are concealed by a thick accumulation of local sand, gravel, and boulders.

The evidence on which the yellow sandstone has been here introduced, is derived from the appearance of some soft light brown and yellowish shales, sandstones, and marls, in a stream-cutting, in the Townland of Shanahill, at the distance of one mile to the eastward of this locality, and about 400 yards above the main road; these beds dip to the S.S.E. at 15°.

14. *The Anascaul valley.*—We have now to describe the rocks of the Anascaul valley, which are supposed to be Silurian, probably of Llandovery age; and as the most comprehensive section through these is that afforded by the coast at the head of Minard Bay, we shall commence our description of them at that locality.

At the N. western corner of the bay, where the green and purple, evenly-bedded grits and slates, which form the cliff section from Bull's Head, disappear in a most mysterious manner, we suddenly find a lofty cliff of crushed green and purple schistose and ribboned slates, overlaid unconformably by the Old Red sandstone, in its extension easterly from

Kinnard Hill, and Bull's Head. These crumpled beds occupy an extent of 350 yards of coast, where some black earthy slates appear, lying against a fault which has a strike of N.N.E. and S.S.W. This fact is very apparent at the end of the hollow in the coast called Foilnarea.

On the east side of the fault, the ribboned green and purple slates dip with great regularity to the S. at 75°, and this apparent want of disturbance is observable along the coast for the distance of 450 yards, as far as the embouchure of the small stream which has its rise in a very active spring in the village of Doonmanagh; from this point easterly, the coast section shows the beds to be again very much contorted, and besides being ribboned, they are here mottled green and purple, having a few thin irregular bands of pale gray grits through them. At the mouth of the stream passing the village of Minard, we find pale gray flaggy layers, with dark gray slates, all much crushed, and the section terminates on the S.E. in crumpled black silty slates, with thin dark gray gritty laminae, which are eventually concealed by the Old Red sandstones of Minard Head.

The rocks just described, are very imperfectly exposed inland in the shallow cuttings made by roads and fences. Of these the best is that seen along the road leading from Minard coast-guard station to the main Dingle and Tralee road, where we find dark gray ribboned slates, which is reached at the distance of 500 yards N.W. of the coast guard station, and is superficially exposed for about three-quarters of a mile, terminating near to the standing stones and ancient monumental pillar in the townland of Lugnagappul. On the west of the road, and within three fields of the standing stones, the rock called Carrignacourty is a mass of porphyritic greenstone. To the north of the standing stones, we at once enter on the soft brownish purple grits and slates of the Dingle beds.

At the distance of about one mile and three-quarters to the N.E. of this point, some cuttings on the road from Dingle to Tralee afford a tolerably good section through the Anascaul slates, as well as in the Dingle beds to the north of them. The most comprehensive is that at the sharp turn of the road, when it crosses the little stream, dividing the townlands of Gortacurraun and Farrannacarriga. Here the dark gray ribboned gritty slates appear to be vertical, and bands of black slate are common through them. At the northern end of the section, the dull brownish purple sandy flags and purple slates of the Dingle beds, dipping N.N.W. at 75°, are very well exposed, and though they approach to within a few yards of the Anascaul slates, the junction between them is totally obscured.

At the village of Anascaul, in the three stream-courses which there unite from the north, the dark gray and black slates are well seen; and in the bend of the stream to the east of and close under the church, we find a massive dyke of porphyritic greenstone, the feldspar crystals being a pale yellowish green colour. Near this spot on the western stream-course, some few fragments of encrinite rings and graptolites, were found in the dark gray slates. The strike of the slates here is E.N.E. and W.S.W., apparently vertical. The ordinary red purple earthy slates and grits of the Dingle beds are reached at a distance of 500 to 600 yards to the north of them.

To the south of Anascaul, on the road leading to Bunaneer Cottage, and on the S. side of the river at its sharp angle, just below the glebe house, we again find in the gray and black gritty slates a thick dyke of greenish porphyry.

At the distance of a mile and a half east of Anascaul, and at the sharp turn made by the new road from Inch to the main Dingle and Tralee road, in the townland of Ballynane, and close to the stream bounding it and Farranalickeen (on the west), we find gray slates and

dark gray shales with thin pale gray grits, curved anticlinally so as to dip to the S. at 30° , and then, E.N.E. at 40° to 60° , the lowest beds of the curve are clearly seen on the road side, and they consist of bluish gray calcareous grits, which weather rusty. These grits immediately overlie a series of purple flags and shales, the dip and strike of which coincide with them; these purple beds, when traced downwards, have some green sandy shales through them, and eventually they appear to merge into the pale gray earthy shales and slates of the Anascaul Silurians.

It appears, therefore, that in the townland of Ballynane, at the locality just described, the Anascaul beds have received a sudden twist which throws them out of their normal strike of E.N.E. and W.S.W., and that here they are interstratified with some purple beds. This locality is indicated on the one-inch map, No. 172, by the group of four dip arrows, on the space coloured Anascaul beds, and N. of the summit of Knocka-feehane.

To the eastwards of this spot and along the northern flank of the Old Red sandstone hills, we find many superficial exposures in the pale gray slates and thin gritty layers of the Anascaul beds. Of these, the best is that in the stream cutting dividing the townlands of Glannaheera and Tullig, the dip of some of these beds, just above the old line of road, is to the N.E. at 50° to 75° . Below that and on the road from Inch to the main Tralee road, the pale gray flags and slates, through which we occasionally find a thin band of dull purple shale, dip at the southern end of the section, near the base of the Old Red sandstone, to the N. at 55° ; they are then vertical, after which they dip to the S. at 80° . Beyond this the section is so obscure that no dip can be detected in the rocks. All that can be safely said regarding them is that they are sharply contorted.

At various shallow cuttings along the Dingle and Tralee road which skirts the northern side of the Anascaul Valley, we find the Anascaul Silurian beds are seen; and amidst the ordinary pale gray earthy slates, we frequently find purple beds.

At the distance of about two miles higher up the glen, and on the banks of the Emlagh river, in the townland of Glanmore and Slieve West, we again find one of those puzzling and imperfect junctions between the Anascaul slates and the Dingle beds, which we have previously remarked on the bank of the river, in the townland of Glanmore; the dark and light gray slates, in the distance of a few yards, dip to the north at 70° and then to the N.E. at 50° up to 70° . Similar rocks, superficially exposed, can be traced northerly from this spot for the distance of 150 yards, when they are concealed by drift, higher up the stream, in the townland of Slieve West. The slates appear to pass down into pale yellowish feldspathic slates, and hard flaggy grits, dipping S. at 60° , beneath which we find a mass of purple flags and slaty layers, dipping to the southwards at 80° , but flattening as we descend in the series to 50° , and they eventually disappear with a dip of 20° in the distance of 350 yards from the pale and dark gray Silurian slates. This locality is indicated on the one-inch map, at its northern margin, by the group of three dip arrows below the word "River," after "Emlagh;" and, higher up the stream, by the second group of four arrows, represented on the space coloured Dingle beds, to the W. of the summit of Knockbrack Hill.

From the spot where the Anascaul and Dingle beds appear so close to one another, in the Townland of Slieve West; for a distance of about two miles and a half, not a rock is to be seen to the south of Knockbrack and between that hill and the mountain of Moanlaur, which lies to the S. of it; and it is not till we descend into the valley, at the head of the Finglass river, which terminates in the "cul de sac" called Coumastabla, that we

again see any of the Anascaul Silurian beds; here however we have them well exposed along the new line of road from the Village of Kiltenebane to the head of the glen, under the precipice of Old Red sandstone at the northern brow of the summit called Knockbrack, marked 1,508 feet on the map. This section occupies an extent of about one mile, and exposes greenish, gray, black, and dark purple earthy slate, contorted and rolling at angles up to 60° . At the northern end of this exposure of the Anascaul beds and at Kiltenebane Village, we find the purple flaggy grits and slates of the upper Dingle beds, but the junction of these two groups of rock is concealed by drift for the space of 250 yards.

To the east of the glen the ground rises to form the western slope of Caherconree Mountain; and in two stream cuttings which traverse this slope in the northern portion of the townland of Beheenagh and along the brow of the mountain, near the base of the Old Red sandstone, the Anascaul beds are still further exposed. Here, at two localities, we find some beds of limestone which contain fossils; the most northerly of these occurs in the extreme N.E. angle of Beheenagh Townland; the rock is a pale pinkish colour very pure and full of corals: its dip and strike is not determinable, and directly above it is the Old Red sandstone. The most southerly limestone occurs at the distance of three quarters of a mile S.W. of the former, and, like it, close under the basal beds of the Old Red sandstone; it is not so pure as the former, being more of the nature of a highly calcareous grit.

In the N.E. portion of the townland of Curraclullenagh, which lies to the north of Beheenagh townland, the western slope of Caherconree mountain exposes well marked Upper Silurian beds, consisting of gray slates and thin grits for the most part highly fossiliferous. These are clearly seen in the stream cuttings which traverse the slope of the mountain.

14. *Derrymore Glen.*—To the N.E. of the summit of Caherconree is the deep glen of Derrymore, its longest axis is W. and S., and the Old Red sandstone is cut through at either side, thus exposing the subjacent Upper Silurian rocks for the distance of one mile, with an average width of 325 yards; the rocks thus irregularly exposed are precisely the same as those seen on the western side of the mountain, on the eastern portions of the townlands of Curraclullenagh Commons and Killelton, and the beds are more or less fossiliferous; they are contorted in very sharp folds, which causes them to dip to the S.S.E. and N.N.W., at various angles up to 70° , so that the same group of beds is again and again brought to view throughout the section.

At the southern end of the glen the Old Red sandstone abuts against these beds after the manner already described.

The view (fig. 1, p. 6), looking across the head of Derrymore glen, and showing the junction below the Upper Silurian rocks and the overlying Old Red conglomerate (the Inch conglomerate), taken from the western slope of Baurtregaum Mountain, illustrates and explains the foregoing remarks.

It is a remarkable fact that none of the Anascaul beds are exposed in Derrymore glen, though the latter lies almost directly in the apparent line of strike of the rocks in the former.

15. *The Blasket Islands.*—The Great Blasket Island which lies at the distance of one mile to the west of Dunmore Head, is three miles and three-fourths in length, with an average width of half a mile; it is formed almost entirely of the Dingle beds which strike seaward from Dunmore Head, and the coast north of it. The longest axis of the island agrees with the average strike of the beds, which is N.E. and S.W., their dip being to the S.E. at 40° to 85° , flattening to 25° at the extreme southern end of the Island. A few contortions are observable long the shore northwards

from Garraun Point, but the dip to the S.E. becomes steady as we approach the north point of the Island, and its amount is lowered to 20°; near this at the hollow in the coast called the Boat Cove, we find that the extreme north point of the island for the distance of about 100 yards, is formed of pale gray sandy and calcareous flags, dipping to the S.S.E. at 65° to 70°. By means of the fossils, which are very abundant, these beds are identified as forming portion of the upper part of the Ludlow or Croaghmarhin rocks of the mainland. The small island of Illaunboy, which lies at the distance of 300 yards N.W. of this point, is also formed of those same Upper Silurian grits and slaty beds.

Beginish Island, with Young's Island beyond it, lies to the N.E. of the great Blasket, at the distance of 850 yards from the Boat Cove. It is formed entirely of coarse trappean conglomerates, with layers of purple porphyritic (ash) grits; those at the southern extremity of the Island dip to the S.S.W. at 75°, but as they are crossed northwards, they are observed to curve over anticlinally, and by repeated subsequent rolls and flexures, they form the whole extent of the island; Young's rock is also a mass of trappean beds; and both these islands are doubtless portions of the great trappean ash series of Clogher Head and the shore N. of Dunquin.

Inishtooskert (or the Northern Island) lies right on the strike of the Smerwick beds, or those that occur between Sybil Point and the Upper Silurian rocks of Ferriter's Cove, from which it is distant six miles. The dip and strike of the Inishtooskert beds is precisely the same as that observed at Sybil Head, viz., S.E. at 60°, and it is remarkable that here also they are overlaid uncomfortably by the Old Red sandstone, which dips N.W. at 75°. A small fault which strikes nearly E. and W. crosses the northern point of the island, shifts the boundary of the Old Red sandstone, for the distance of about 100 yards. The view (fig. 2, p. 9) of the northern extremity of this remarkable island will give a clear idea of the mode of occurrence of the Old Red sandstone, and the underlying Smerwick beds.

Inishnabro,* which lies at the distance of one mile and a quarter S.W. of the great Blasket Island, and thus directly in the line of strike of the rocks composing it, was found by Mr. Wynne to be also formed like it, of Dingle Beds. At the northern part of the island, the beds strike E. and W. and are nearly vertical; but, along the cliffs southwards, they curve to the E. and S.E., with a dip of 35°, and at the extreme southern end of the island they dip to the S. at 50°.

To the S. of Inishnabro, and at the distance of 350 yards, is the island of Inishvickillane, its extreme northern point for the extent of 200 yards is formed of gray and brownish sandy flags, which have been recognised by the enclosed fossils to belong to the Ludlow or Croaghmarhin beds: the dip is to the S. at 65°, and hence it would appear that they overlie the Dingle beds of Inishnabro. This however cannot be the case, as I shall presently show. To the south of these fossiliferous flags and conformable to them, we find hard green flaggy ashes with a massive bed of greenstone above them, these are succeeded by ashes of various kinds, passing up into purple porphyritic ash grit, we then find a massive bed of greenstone, above which is a recurrence of the ash layer, and the whole series terminates in a thick bed of trappean conglomerate. Throughout this section the dip is steady to the S.S.E. at 65°, and the total superficial thickness from the fossiliferous beds is 560 yards.

Resting on the conglomerate is a large mass of conformable hard gray and greenish greenstone, which forms the cliff section opposite the "Black Rock" for the distance of 700 yards, when it abruptly termi-

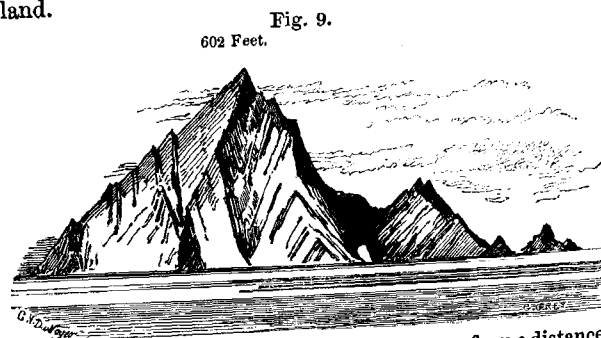
* "Quern Island," so called from its circular shape.—G. V. D.

nates at a deep indentation in the coast north of Reenacusheen Point. Though this chasm is only a few yards across, its sides do not correspond. The greenstone, just described, is on its west side, but on the opposite we find dark purplish, black, fine grained ash, abutting against the greenstone and presenting a section of 12 yards in extent; the beds dipping to the S.S.E. at 65°. A fault is therefore supposed to occur at this place, the bearing of which is nearly N. and S. as indicated on the map.

The extreme southern point of the island at Reenacusheen and Min-naun Rocks is formed of the same greenstone as that just alluded to; and hence, according to the observed dips, it should overlie the purplish black ash, just described. As we pass round the eastern cliffs of the island, we find the ashes of Reenacusheen to be only the upper portion of an enormous assemblage of such beds, which extend round the eastern portion of the island for the distance of 560 yards, with a steady dip to the S.S.E. of 65°; these are interstratified with layers of greenish feldspathic vesicular trap, purple pisolitic ash, and fine grained purple ash sandstone, the whole series terminating in a thick bed of greenstone, cut by the fault at Reenacusheen coose.

As the fossiliferous beds at the northern extremity of the island belong to the Ludlow or Croaghmarhin rocks, they cannot overlie the Dingle beds of Inishtooskert, as the observed dips would suggest; neither would the ashes and greenstones to the south of them, and which are conformable to them, be above them, though such ought to be their position, according to their dips, for then these trappean beds would be a new series, the position of which would be at the base of the Dingle beds, and we have not the slightest authority for entertaining such a supposition. We are driven therefore to one supposition, which is that the contortions observed in the central part of the island of Inishnabro is the evidence of an inversion of the beds to the south of it, including all those forming Inishvickillane, and that the trappean rocks of the latter agree, therefore, with those forming Clogher head, and the greater part of the coast north of Dunquin. This supposition is strengthened by the fact that at the cliff marked 206, on the southern shore of Mount Eagle to the S.W. of the village of Fahan, we see an unmistakable inversion of the Dingle beds, and this inverted synclinal can be traced easterly through the rocks as far as the eastern coast of Ventry harbour.

I have no doubt but that this contortion is prolonged easterly up to somewhere near the north base of Caherconree mountain, and it possibly may account for the presence of the Silurian beds in the glen of Anascaul, which, according to the observed dips, apparently overlie the Dingle beds; and that westerly the crumple extends to Inishnabro, which is 7 miles from the mainland.



The Teeraght Rock, from the E., as seen through a telescope from a distance of 12 miles.

The Teeraght rock, which lies at the distance of 2 miles N.W. of Inish-nabro, is the most westerly of the Blasket Islands: it consists of a series of grayish purple grits and conglomerates, dipping in a synclinal curve to the westwards at 15° to 25° , these in every respect resemble the lower Dingle beds, a portion of which they are believed to be.

5. Recent Deposits and Evidences of Glacial Action.

In the deep glens to the E. and W. of Mount Brandon we find clear evidence of glaciers having at one time been present there. Many rock surfaces are rounded, finely grooved, and striated, the direction of their markings being invariably more or less parallel with the longest axis of the valley, no matter what its compass bearing may be. Thus it is clear that Brandon summit, and the main ridge to the south of it as far as Gearhane, formed the centre of this glacial distribution. Thus on the western side of Gearhane and on the northern side of the rocky ridge which extends from it like a spur, as far as the village of Ballinlogig, we find glacial striæ near the head of the glen of the Feohanagh river, at an elevation of about 1,000 feet, their direction being W. 20° to 25° N. or somewhat oblique to the longest axis of the valley.

In the rugged hollow along the eastern side of Brandon summit, past Brandon Peak, to the entrance of the rocky amphitheatre, west of the pass of Coumhenry, we observe similar glacial markings, especially above Lough Nalacken, and between it and Lough Cruttia, and at an elevation of 1,000 to 1,300 feet, their direction being E. 10° S. or oblique to the glen which is N.W. and S.E.

On the eastern side of Lough Cruttia there are large mounds of coarse angular detritus, which is evidently the moraine of the glacier which occupied the rocky hollow to the north. Its highest point is about 800 feet, and its lowest 658, in the level of the adjoining lake. To the east of the gap of Coumhenry, and along the road leading to Cloghane, just north of Lough Gall, glacial striæ are again seen on surfaces of rock appearing from beneath the bog and drift at an elevation varying from 310 to 391 feet; these point in the direction of N.E. and S.W. or parallel to the open valley, which extends from Lough Gall to Boherboy ridge, near the village of Cloghane.

The localities just enumerated are those where the glacial marks are best developed and most accessible to the geological explorer.

It is an interesting fact to find that in this district, as well as that of Glengarriff, and generally along the S.W. coast of the county Cork, glacial striæ are observed at the present sea level. On close examination we find that these striations are different in form from those of the mountain glens, being thin at the end pointing seaward and *blunt* at the other direction, thus suggesting that their formation is due to the sudden grounding of drift ice, driven on the shore by winds and currents. This fact is very apparent on some rounded and polished rock surfaces on the S. coast of Brandon Bay, below Fermoy House, the direction of the scratches being N.W. and S.E.

The Slieveanea range of mountains, which extend easterly from Connor Hill Gap and bound the Anascaul Valley on the north, formed, like Brandon mountain, a centre of glacial distribution. In the deep escarpments and rocky valleys on the northern side of Slievenaleeka mountain, in which lie lakes Camclaun and Adoon, the glacial striæ are all nearly N. and S.W., which is also the main direction of these glens; while on the southern side of the range, especially at the entrance to the rocky amphitheatre in which Lough Anascaul lies, the direction of the striæ is 30° W. of N. and E. of S., which is also that of the longest axis of the glen.

Caherconree Mountain and Baurtregaum, with the range of mountains extending from them easterly into the district included in Sheet 162 of the one-inch maps, also formed a centre from which glaciers descended into the valleys lying to the north and south of them. This is especially evident in the glens of Derrymore and Curraheen, where glacial striæ, parallel to the longest direction of the glens, are of common occurrence. It is, however, at the mouths of these deep ravines that we find the most clear evidence of their having been the beds of glaciers. Here we find lunet-shaped mounds of gravelly clay and large boulders ranged with the utmost regularity, and extending into the plain for the distance of nearly half a mile, from the absolute mouth of the gorge. So regular are these moraines that when viewed from a distance they present quite an artificial look, but their nature and origin cannot for a moment be doubted: the streams which now issue from these glens cut through them in their passage to the sea in many places to the depth of 50 or 60 feet.

In the glen of the Finglass River to the S. W. of the village of Kiltenebane, large blocks of gray limestone, containing chert layers, and in every respect similar to some of the Carboniferous limestone exposed on the coast of Tralee Bay, under Camp Church, are found at an elevation of about 450 feet above the sea. One of these boulders measures $9+3+4$ feet, and they rest on the ordinary local drift, having been carried and left there by floating ice masses, when the land stood at a much lower level than at present.

During the same glacial period, large blocks of the Inch conglomerate, (a rock which there is no difficulty in indentifying) have been transported from the southern flank of Caherconree Mountain, and carried northwards through some depression in the Old Red sandstone ridge, and dropped on what is now the southern shore of Tralee Bay. One of them, measuring $18+7+6$ feet, is to be seen resting on the Old Red sandstones forming the point in the townland of Carrigaha, one mile and a half W. of Carrigaharoe Point.

The last great physical change which must have affected not only this portion but the whole of Ireland—and England also—was one of elevation, which bared what is now the shallow water surrounding our coast line for a considerable extent: thus a flat belt of land was formed between the present coast and the sea, broad or narrow according to circumstances, and this in process of time became covered with forest vegetation, consisting principally of fir, oak, and hazel: this flourished sufficiently long to reach to its full perfection, and may have existed for thousands of years; but eventually it decayed, and formed bog; the land then subsided to its exact former level, and the sea flowed over these decayed forests and covered them with sand and silt: clear evidence of this is to be seen here and there along the entire E., S., and S.W. coast of Ireland; and here on the shore of Tralee Bay, at the distance of about two miles east of Castle-gregory, we find large roots and stems of fir trees, standing upright in the sand and shingle of the shore.

There are not any mines or metalliferous veins in the district just described.

G. V. D.

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