EXPLANATIONS

TO ACCOMPANY

SHEETS 150 & 151 OF THE MAPS

OF THE

GEOLOGICAL SURVEY OF IRELAND,

ILLUSTRATING PART OF

THE COUNTY OF KERRY.

DUBLIN:
PRINTED FOR HER MAJESTY'S STATIONERY OFFICE:
PUBLISHED BY
ALEXANDER THOM & SONS, 87 & 88, ABBEY-STREET.
HODGES, SMITH, & CO., 104, GRAFTON-STREET.
LONDON:
LONGMAN, BROWN, GREEN, LONGMANS, AND ROBERTS.
1859.

DUBLIN: PRINTED BY ALEX. THOM & SONS, 87 & 88, ABBEY-STREET,
FOR HER MAJESTY'S STATIONERY OFFICE.

The GEOLOGICAL SURVEY of the UNITED KINGDOM is conducted under the powers of the 8th & 9th Vict., chap. 63.—31st July, 1845.

DIRECTOR-GENERAL OF THE GEOLOGICAL SURVEY OF THE UNITED KINGDOM:
SIR RODERICK IMPEY MURCHISON,
D.C.L., F.R.S., G.C.ST.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. (*Acting Palæontologist*).

ASSISTANT GEOLOGISTS:
G. H. KINAHAN, Esq.; F. J. FOOT, Esq.; J. O'KELLY, Esq.;
A. B. WYNNE, Esq.; J. KELLY, Esq.

COLLECTORS OF FOSSILS, &C.:
MR. C. GALVAN; MR. ——.

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 at 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, or in preparation.

Condensed memoirs on particular districts will also eventually appear.

EXPLANATIONS

TO ACCOMPANY SHEETS 150 AND 151 OF THE MAP

OF THE

GEOLOGICAL SURVEY OF IRELAND.

General Description.

1. *Form of the Ground.*

These sheets of the map include that part of the County Kerry in which the town of Listowel and the villages of Ballylongford, Ballybunnion, Ballyduff, Causeway, and Ballyheige are situated.

The principal features of the district are, the promontory of Kerry Head, on the W., rising to the height of 700 feet, and the elevated tract of ground on the E., which sweeps round both to the N.E. and S.E., and rises to altitudes of 600 and 800 feet, enclosing, in a rude sort of amphitheatre, the plain of Listowel, which stretches out to the sea, at Ballybunnion on the one hand, and Ballyheige Bay on the other.

The promontory of Kerry Head may be described as a regularly formed hill, upwards of twelve miles in length, from its western extremity to the point where it sinks eastward into the plain.

The direction of the summit ridge or watershed of its western portion is due E. and W., while that of the eastern is about E. 30° N. Its highest points are Trisk and Maulin Mountain, which are upwards of 700 feet above the sea. From these points the ground slopes very gently towards the sea on all sides except the east, terminating in rugged cliffs, which attain, in some places, to a height of 200 feet, but generally vary from fifty to 100 feet.

The northern slope is from 700 to 200 feet in a mile and a-half; the western from 700 to 200 feet in a little less than two miles; and the south somewhat more steep, declining from 700 to 80 or 100 feet in one mile. East of Maulin Mountain the hill becomes more of an elevated and slightly undulating table-land, averaging 200 feet in height, and inclining gradually towards the sea on its north side. At its N.E. and S.E. sides the table-land slopes into the plain from 200 feet to about twenty-five, in a horizontal distance of about one mile and a-half.

The greatest elevation of the high land which lies north of the plain is Knockanore Mountain, 880 feet above the sea level. North of Knockanore Mountain the ground, which is rather irregular in form, slopes from 880 to 350 feet in one mile and a-half.

The western slope is about the same for the same distance, the ground then being nearly level, till it ends in the picturesque cliffs,

N. of Ballybunnion, the incline being from 350 to 200 feet in about two miles.

The southern slope is more abrupt, the ground decreasing in height from 880 to 100 feet in one mile and a-half.

East of Knockanore the slope is very gentle, the elevation diminishing to 150 feet in the space of four miles.

South-east of Ballylongford the country becomes an undulating table-land, ranging in height from 100 to 300 feet above the sea. Its average western slope towards the plain is from 300 to 100 feet in one mile.

South and south-east of the town of Listowel this table-land increases in height, attaining, in some places, to an elevation of upwards of 600 feet. It is cut through in a N. and S. direction by the valley of the river Smearlagh, a tributary of the Feale. South of Listowel the average slope of the table-land towards the plain is from a height of 350 feet to one of 60 or 70, in the space of a mile.

The plain occupying the centre of the map is contracted to a breadth of only two miles at its western termination, S. of Ballybunnion, where it may with propriety be called the valley of the river Cashen. It rapidly widens out eastwards, and in a line west from Listowel, becomes more than seven miles across. From this it stretches to the S.W. with an average breadth of five miles. Its mean elevation above the sea is about forty feet. It is drained by the river Feale and its tributary the Brick, which uniting about one mile and a-half east of the village of Ballyduff, form the river Cashen. Neap tides flow up this river and its main tributary, the Feale, to a point about three-quarters of a mile W. of the hamlet of Finuge, or three miles from Listowel, a distance of seven miles, in a straight line, from the mouth of the river.

---

2. *Relations between the Form of the Ground and its Geological Structure.*

The relations between the form of the ground and its internal structure, at the western portion of this district, are exactly the reverse of those on the eastern.

The plain and low lands everywhere have limestone for their subjacent rock. The high lands on the western side consist of red and greenish sandstones and slates, belonging to the formation termed Old Red sandstone, while those on the N.E. and S.E. are composed of black and grey shales and olive sandstones, forming a portion of the Coal Measure series. But the red rocks underlie the limestone, whereas the shales and olive sandstoues overlie it; so that the plain may be said to be the mean between the two masses of high ground which bound it. The form of the ground here, as everywhere else, is due to the action of two great antagonistic forces, viz., that of elevation, *acting from below*, and tending towards the formation of dry land, by lifting subaqueous beds of rock from their original horizontal position, and that of denudation, *acting from above*, always tending to lower the surface of ground, by eating into and removing large portions of the rocks either during their elevation or subsequent to it. The force of elevation acted with greatest intensity under Kerry

Head along a line having a general E. and W. direction and forming the axis of that hill; for it is on that line that the lowest beds in the district are most elevated above the sea, declining from it on either side. Such a line is called an anticlinal axis.

The anticlinal axis of Kerry Head is not horizontal, but declines gently, both eastward and westward, from the summit, where the lowest beds are seen; so that, if we proceed in either of those directions, the beds of rock observed are higher and higher, until we arrive at the Coal Measures eastward, while the sea places a limit to our observation towards the west.

When the forces of elevation began to act, the beds of the Old Red sandstone were doubtless covered by those of the Limestone and Coal Measures, all horizontal, the upper strata of the latter forming the bed of the ocean.

When the beds of Coal Measures, which then covered that part which is now Kerry Head, were slightly bent and tilted and lifted within the reach of the action of waves and currents, parts of them would be destroyed and removed by that action. This would go on simultaneously with the action of elevation, so that the greatest amount of denudation has taken place over the axis of elevation, and the greatest quantity of matter been removed therefrom.

Although it is most probable that the two forces commenced their action in the region of Kerry Head ridge, yet it is obvious that they were not confined to this place, and that to them is due the form of the county everywhere else, according as one or other predominated or one was counteracted by the other.

In the plain of Listowel denudation has acted with greater intensity than in the region enclosing it on the N.E. and S.E., while it has not been counteracted so much as in that to the west. The Coal Measures, and more or less of the limestone, have been swept away from one part, to produce the valley or plain; while they have been left more or less untouched to form the high land enclosing the plain on the N.E. and S.E.

J. B. J. and F. J. F.

---

3. *Formations and Groups of Rocks entering into the structure of this District.*

	Name.	Colour on Map.
	Alluvium and Superficial Accumulation.	*Pale Sepia.*
	Drift (Limestone Gravel.)	*Engraved Dots.*
Carboniferous.	d^5 Coal Measures.	*Indian ink.*
	d^4 Upper Limestone.	*Prussian blue (dark.)*
	d^2 Lower Limestone.	*Prussian blue (light.)*
	d^1 Lower Limestone Shale.	*Prussian blue and Indian ink.*
	c^3 Upper Old Red or Yellow Sandstone.	*Indian red (dark.)*
	c^2 Old Red Sandstone.	*Indian red (light.)*

c. *Old Red Sandstone.*—This group is divisible into two parts;

the line of boundary, however, being rather arbitrary, as it depends solely on the position and the difference of *colour* in the beds.

c^2. *Old Red Sandstone* (*proper*).—Purplish, red, and salmon coloured sandstones, and red slates; here and there interstratified with green grits and slates. A section north and south across Kerry Head only gives a thickness of about 700 feet, or the height of Trisk Mountain, above the level of the sea. The lower beds, however, are not visible, so that the total thickness is unknown.

c^3. *Upper Old Red or Yellow Sandstone.*—Greenish, gray, and brown grits and sandstones and flags, and pale green or yellow shales; some purple or red slate bands occur. Near the top of this formation is a bed of green micaceous sandstone abounding in plants. There are also calcareous conglomeritic bands, generally much decomposed; thickness about 1,200 feet.

d. *Carboniferous.*—This group is divisible into three portions; the boundary between two of them, however, being extremely arbitrary, on account of the Calp or Middle Limestone being wanting.

d. *Lower Limestone Shale.*—Brownish green, gritty, calcareous flags, with laminæ of black shale, and in places an interstratified bed of dark gray crystalline limestone. These beds are similar in appearance to those seen at the west of Currans, between Tralee and Castleisland, see explanation of sheet 162. The gritty calcareous flags are full of fossils, both shells and corals. Thickness apparently about 700 feet.

d^2. *The Lower Limestone.*—Generally light gray, hard compact limestone, but is often also dark gray and flaggy, it passes upwards, imperceptibly, into—

d^4. *The Upper Limestone.*—Many beds exactly similar to those described under d^2, but, as we ascend, it becomes a dark gray granular thin-bedded limestone. Both these subdivisions abound in fossils. It is impossible here to determine their thickness with any exactness.

d. *The Coal Measures.*—The base of this division consists of black flaggy shales, with occasional chert bands, and soft black splintery shales. They contain fossils, such as Goniatites, Aviculopecten, and (Posidonia, or) Posidonomya. The thickness of these lower shales is about 800 feet. Above these shales are beds of strong olive, olive gray, and gray grits and flags, with thick and thin beds of dark gray and black shales interstratified with them; of these beds, we have in this district a thickness of about 2,500 feet. Thus the total thickness of the Coal Measures (*i. e.*, as much of them as are seen here) is 3,500.

The Drift will be noticed in the detailed descriptions.

F. J. F.

Detailed Descriptions.

[The whole of the district comprised in these sheets of the map was surveyed by Mr. F. J. Foot, by whom the following detailed descriptions are drawn up.]

4. *Position and Lie of the Rocks.*

Commencing from the west, the rocks may be seen in the following places, more or less perfectly.

Old Red Sandstone.—At the extremity of Kerry Head are seen alternating beds of strong purple and greenish gray grits, dipping W. at a low angle from 15° to 20°. At the very edge of the cliff they are horizontal. Proceeding south-east along the cliffs, the same set of beds is seen dipping S.W. at from 0° to 15°, further south-east they assume a due southerly dip of 15°, sometimes "rolling over" and dipping at as high an angle as 70°, but soon again returning to 15° or 20°. Along the cliffs some slight faults are seen which cause a trifling displacement of the strata. As far as St. Macadaw's Well (south of Glenderry Cottage), the dip continues steady to S. at 15° or 20°. Still, at the very edge of the cliff, where the beds disappear inland, they are horizontal, or dip S. at 5°. And thus, although the direction of the shore is N.W. and S.E., and the dip due south, we still only see the same set of beds, viz., purple or red, and green sandstones and slates. At St. Macadaw's Well, and for some distance east of it, the beds have a slight change of strike, and dip S.E. at 15°. Inland, near the summit of Trisk Mountain, are beds of greenish sandstone, micaceous, and apparently containing grains of felspar; they are also slightly conglomeritic, having small pebbles of quartz and jasper; they are probably the same as some of the green beds seen at the shore. Proceeding again eastwards along the cliffs, the same beds still are seen, being nearly horizontal at the edge of the cliff, and dipping to sea at an average dip of S. or S. 20° E., at from 5° to 20°.

In the townland of Ballylongane, hardly half a mile from the shore, and a quarter of a mile E. of the National school, is a prominent knob of rocks, consisting of horizontal beds of red or salmon coloured sandstone.

Near Mooghaunnamarve Caves, half a-mile S.E. of "the Bone fortification," is a small fault hading W. at 60°, by which beds of purple grits and slates are caused to abut against green sandstones with calcareous bands. It is hereabouts that the boundary can be best drawn between the Lower and Upper Old Red Sandstone.

Eastwards from this, the beds seen are brownish-green grits, alternating with reddish grits and slates, and having calcareous conglomeritic bands much decomposed.

Not far west of the village of Ballyheige is another small fault, having a downthrow to the west. No rocks are seen along the shore further than the village; the dip here being about S. at 10° to 20°. About a mile and a-half N.E. of the village of Ballyheige, in the townland of Booleenshar, at the road side, near the old corn mill, are red grits, dipping S. 20° E. at 10°. Further east, at south side of the road, in the townland of Baliinclemesig, are broken pieces of brown grit, evidently the top of a quarry. They apparently belong to the Upper Old Red Sandstone. Still further east, in the bed of a small stream, a little east of Rathmorrel House, are horizontal beds of yellow sandy shale and green grits.

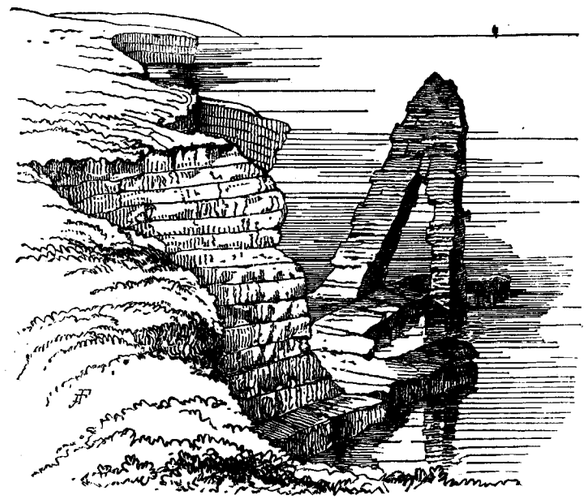
On the road side, north of the village of Causeway, near the National School, is a quarry of brownish ferruginous sandstone, apparently dipping S. 20° E. at 10°; and half a-mile due west of this, in the stream which bounds the townlands of Farren and Dromkean East, similar beds are seen lying horizontal; as also about a quarter of a mile south-east of this, in a quarry at the north side of the road.

North of the quarry mentioned at the boundary stream, and at the side of

the same stream, in the townland of Ballinglauna, are soft brown sandstones, the dip of which is obscure.

Proceeding along the north coast of Kerry Head from the original starting point, beds of red and green sandstones and slates, which, at the extremity of the head (as above described) dip due W. at 15° or 20°, dip N.W. at from 15° to 25°; but, at the edge of the cliff, are horizontal. All along this north shore these beds are in every respect similar to those described on the southern shore; their dip being to the north instead of south.

The action of the water has caused the cliffs to assume various curious forms in many places, such as caves and natural arches; near Ballingarry Island are some good examples, as also at Illaunamuck (see fig. 1).



Natural Arch at Illaunamuck, N. Coast of Kerry Head.
The summit of the crag is 90 feet above the sea.

At the place where the boundary line is drawn between the Lower and Upper Old Red Sandstone, the beds are first horizontal and then dip on the north side of the boundary N. at 15°. Going from this along the coast, the beds undulate slightly, the greatest amount of dip being 15°.

At the southern extremity of the townland of Clashmelcon, E. of Pierce's Island, they become horizontal. They are brownish sandstones, and greenish gray grits and flags, with calcareous decomposed beds, which latter are generally conglomeritic.

At about half a mile south of Brown's Castle, on the shore of the townland of Clashmelcon, the beds, which were horizontal or dipped N. at 5°, dip N.W. at 10°, and then is exposed a section of contorted beds as far as the Castle; the highest angle of dip seen being N. at 40°. At the north side of the Castle, they dip S.W. at 10° to 15°, and preserve this dip for about half a mile, when they become horizontal, and turn over to the north at 15° or 20°. At the north point of the townland of Kilmore, and somewhat more than half a-mile W. of the Coast Guard station, the dip is N. 20° W. at 30° to 40°, and west of this it becomes N.W., N., and N.E. at 20°.

A little west of this north point of Kilmore is the Plant bed, mentioned before in the general description.

The fossils are chiefly stems of plants, some of them bifurcated, while some resemble fern-leaves, although imperfectly. The uppermost beds are yellow shales or claystones, with brownish-green grits, having crystals of iron pyrites. Beds exactly similar in appearance to these are seen in a quarry half a-mile W. of the river Cashen, and at the south side of the road which crosses that river by a bridge three-quarters of a-mile S.W. of Ballyconry House. These beds dip at the north side, N.E. at 15°, and at south, S.E. at 15°; and as they are evidently the same as the uppermost beds seen at the sea-shore in the townland of Kilmore, are a good guide for drawing the boundary line between the old Red Sandstone and the Carboniferous series.

Carboniferous Series.—The beds at the shore, in the townland of Kilmore above described as the uppermost beds of the Upper Old Red Sandstone, pass almost imperceptibly into brownish-green flags, generally calcareous, and having laminæ of black shale. These beds are the base of the Carboniferous system, or the Lower Limestone shale. They contain here fossils in abundance, such as shells and corals. They dip N. 20° E. at 20°, or conformably to the beds below.

The next place that beds belonging to the Lower Limestone shale are seen is in a quarry at the side of an old road in the townland of Bishopscourt South, about a quarter of a-mile S.W. of the village of Ballyduff. They are similar in appearance to those last-mentioned, but are probably higher in the series, and have interstratified with them a bed of dark gray crystalline Limestone; they are horizontal, but acquire a little southwards a dip of S.W. at 15°. They also contain fossils.

These beds are also seen a little N. of Glanerdalliv bridge, on the road running north and south between the townlands of Rahealy and Knockanore, and in the stream which flows through the little wood, east of Rattoo House, the Limestone-bed being also present. They are horizontal, or dip at very low angles to the south or south-east.

At the north side of the road, at the west end of the village of Causeway, are horizontal beds similar in appearance to those belonging to this series, on the shore of Kilmore. There is no unbroken section between these beds and the Lower Limestone, the rocks being hidden by local drift and alluvial deposit.

The Carboniferous Limestone.—As the Calp or middle member of the Limestone is wanting in this district, the boundary between the upper and lower members is arbitrary. All we can say is, that the Limestone next above the Lower Limestone shale is Lower, and that next under the Coal Measures is Upper Limestone.

The Limestone spreads over the plain, and is seen in numerous quarries, or cropping out in knolls. Some of the most important quarries are mentioned underneath.

One mile and a-half south-east of the village of Causeway, near Aghamore House, dark gray and light gray Granular Limestone is to be seen, dipping S.E. at 50°.

East of this, at Ballinclogher Cross-roads, the Limestone forms a knoll, and dips apparently N.W. at 25°, and S.E. at 25° or 30°. South-west of this, near Killahan Church, it is seen dipping S.W. at 45°.

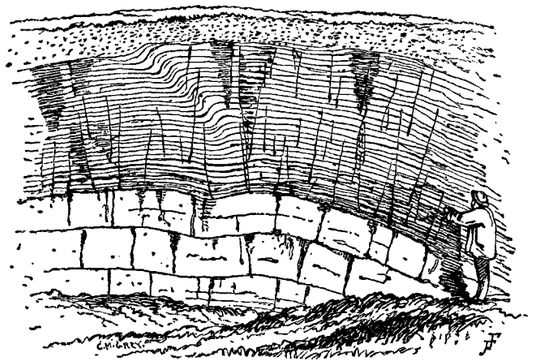
One mile and a-half north-east of Ballinclogher Cross-roads, in the townland of Aghabeg, East, are several quarries of light gray compact and dark gray crystalline, and fine-grained Limestone, dipping N. and N. 20° E. at from 30° to 50°. These beds abound in fossils. At the ruins of Lixnaw House is seen dark gray compact thin-bedded Limestone, dipping N.E. at 50°; and half a mile northwards, in the townland of Clogher, is dark gray thin-bedded Limestone, with a band of Magnesian Limestone, dipping N. at 55°.

A quarter of a mile south of the village of Lixnaw, is a large quarry of dark gray and light compact thin-bedded Limestone, over finely laminated Limestone, having a ribboned appearance, and over black, flaggy, shaly

Limestone, dipping N. at 40° to 50°. North-east of Lixnaw, near the monument, several quarries exhibit similar beds to those last-mentioned, the dip being N. and E. at various angles.

Two and a-half miles south-east of Lixnaw, near the ruined church of Kilfeighny, and north of it are quarries of light gray and bluish compact or granular Limestone, apparently dipping E. at 35° to 45°. The dip is rather obscure, but a little east of these quarries are Coal Measure grits and shales, dipping distinctly E. and S.E. at 30° to 45°. The junction between the Upper Limestone and Coal Measures may be very well seen in a quarry about 270 yards S.W. of Coolnaleen Cottage, at the spot where the boundary stream of the townlands of Coolnaleen Upper and Ballyduhig crosses the old road (see fig. 2.

Fig. 2.



Quarry in Townland of Coolnaleen Upper, showing Junction of Coal Measure Shales and Limestone.

Dark gray, black, and olive shales, with thin grit bands and black flaggy shales rest on dark gray crystalline Limestone, and dip E. and S.E. at 15° to 25°.

East of the town of Listowel, and 300 yards N.E. of Listowel bridge, on the north bank of the river Feale, are large quarries of dark gray Granular Limestone, thin-bedded, and having chert layers. The beds dip E. and S.E. at from 10° to 15°. They are probably the top beds of the Limestone.

For a distance of two miles north of Listowel, no rocks are seen; at that distance, on the south bank of the river Galey, about 400 yards S.E. of Shrone bridge, is a quarry in beds of dark gray fine-grained, and some light gray thick and thin-bedded Limestone, lying horizontally, and less than half a mile N.E. of this quarry, at the north side of the river, are beds of dark gray Granular Limestone, full of fossils, and dipping W. at 5°. This must be near the top of the Limestone, inasmuch as about a third of a mile eastwards, and a quarter of a mile south of Bedford House, are Coal Measure shales, dipping E. at 5° to 10°.

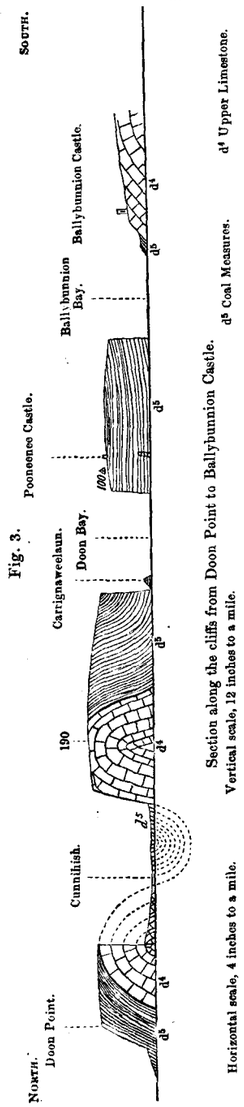
About three miles W.S.W. of Shrone bridge, in the townland of Dromalught, about 140 yards north of Dromalught Cottage, which stands on a green knoll, appearing like an oasis in the bog, is a quarry in horizontal beds of dark gray and light gray flaggy Limestone, abounding in fossils, and traversed by numerous veins of Carbonate of Lime.

About one mile and a-half W.N.W. of this, on the side of the road leading to Millstreet, is another quarry in beds of light gray crystalline Limestone, the bedding of which is quite obscure.

One mile N.E. of Dromalught Cottage, in the townland of Ballyegan, is another quarry, exposing beds of very compact light gray Limestone, in which the bedding is not discernible.

These three last-mentioned quarries are valuable from their occurrence in the middle of the bog, as affording mineral manure with which to cultivate it.

Fig. 3.



A little less than a mile N.W. of Shrone bridge, and half a mile E.S.E. of Gunsborough, at the side of an old road, and in the bed of a small stream, dark gray Limestone, with chert layers, similar to that described at the quarries east of Listowel, is to be seen, apparently dipping W. 20° N. at 25° or 30°. This is obviously very nearly the top of the Limestone, as, at Gunsborough are strong olive grits and flags with shale partings, belonging to the Coal Measures, horizontal, and then dipping N.E. at 15°. Two miles N.W. of Gunsborough, at the stream which bounds the townlands of Lyre and Guhard South, is a quarry of dark gray, granular, massive Limestone. The dip is not observable, probably on account of the Limestone being very thick-bedded.

Proceeding westward from this point, no rocks are to be seen till we arrive at Ballybunnion. There a junction between the Limestone and Coal Measures is to be seen, the beds being similar to those in the quarry near Coolnaleen Cottage, south of Listowel (see page 12). The uppermost beds of the Limestone are also like those in the quarry S.E. of Gunsborough.

The beds at the junction dip N. at 35° and N. 20° E. at 60°.

S.W. of Ballybunnion, and seen at low water, is a large reef of rocks. They are dark gray, flaggy, and light compact Limestone. At the northern extremity of the reef they dip N. at 60°, but southwards the angle diminishes to 25°.

d^5. *Coal Measures.*—Going along the cliffs, northwards from Ballybunnion, a fine section in the Coal Measures is seen. The beds of black flaggy and decomposed shale which, close to the village and a little N. of the junction, dip N.E. at from 25° to 10°, become horizontal and continue so for about a quarter of a-mile, they then dip E. 30° S. at 10° to 20°. Fossils are got here. A little further north they roll over and dip E. 10° N. at from 5° to 20°, and north of the rocks called Carrignaweelaun they dip S. 20° E. at 35° to 40°, and the top of the limestone again appears, the dip at the junction being S. 20° E. at 40°. The promontory west of the hamlet of Doon then is composed entirely of the top beds of the limestone, forming a beautiful little anticlinal, the beds being horizontal in the centre and curving regularly, so as to dip at 40° to a point 20° E. of S., on the one side, while on the other the dip is N. 10° W. at 60°.

In the picturesque bay of Cunnihish, of which this promontory forms the southern side, is a

synclinal curve in the basal shales of the Coal Measures, which lie horizontal in the middle of the bay, but rise on either hand, so that on the S. side they are inclined at an angle of 60° to N. 10° W., while on the N. side they dip S. at 60°; this southerly dip or rise to the N. again causes the limestone to appear at the surface, the dip at the junction being S. at 70°. The beds of limestone soon flatten, and then again dip to the north and disappear beneath the shales of the Coal Measures, which at Doon Point dip N. or N. 10° E. at 40° to 50° (see section, fig. 3, page 13).

As we proceed N. from that, however, the angle diminishes to 30°, and then the beds, forming another synclinal curve, dip S. 30° E. at 35°. A little further N. they become horizontal and then acquire an undulating dip to the northwards of from 35° to 20°.

Further N., where the Glenachoor stream flows into the sea, are beds of olive gray grit, the first of any importance occurring above the limestone, although in the shales, hitherto described, are numerous strings and thin bands of grit. These first grit beds which are about 1,000 feet above the top of the limestone, form a valuable horizon in the Coal Measure; they here contain numerous fragments of plants.

The northerly dip of about 20° is continued for some distance to the north, but at Lackacre, a quarter of a-mile N. of the Glenachoor stream, it increases to 75°, soon again, however, diminishing to 25°. For the rest of this section, see the Explanation of Sheet 141.

Going eastwards from the shore no rock is seen till we reach a stream a little N.E. of Knockanore Mountain, where some olive gray grits and flags are exposed dipping S. 20° E. at 10° to 15°. S. of this, and about one mile N. of the little village of Lisselton, on the main road, are some olive grits dipping S. at 20°, and half a mile east of this, on the side of the road leading from Lisselton to Ballylongford, is a quarry of strong gray and olive gray grits with partings of black shale. The quarry at Gunsborough has been already mentioned; about half a mile N. of it, on the east side of the road leading to Ballylongford, is seen light gray splintery shale, the bedding being rather obscure.

One mile east of Shrone Bridge, and about 150 yards S.E. of the gate-lodge of Bedford House are dark gray sandy shales, with calamites, dipping E. at 5° to 10°.

Half a mile E. of this, in the townland of Knockane, are thin olive gray grits, dipping S. at 30°, and about one-third of a mile S.E. of this, in the same townland, is another quarry of strong olive gray grits dipping N. at 5°, and becoming horizontal. Less than a mile east of this, on the east side of the road leading from Listowel to Galey Bridge, in the townland of Cloonmackon, are olive sandy shales lying horizontal. Eastwards from Listowel the river Feale presents a broken section along its banks. A little east of Feale Cottage, on the south bank of the river, and at the side of the avenue running through Ballinruddery Demesne are gray ferruginous grits and olive sandy shale, dipping S. 20° E. at 10°. The same beds appear at the north bank, at the western corner of the townland of Dromin Lower, dipping S.E. at 10°. On the south bank, in the bed of the river and at the avenue, are olive grits, sandy shale, and black splintery shale with thin grit bands, dipping S.E. at 30° or 35°. On the north bank, in the townland of Skehanierin Lower, beds of sandy olive shale dip N.E. at 30°. Under Ballinruddery House, on the bank of the river, are thin olive gray grits and flags, dipping S. 30° E. at 10°; and a little further east, on the north bank, olive grits, nearly horizontal, having a slight undulation to the south of 10° or 15°. Further south-east, in the townland of Inchymagilleragh, are olive grits and shales, dipping N. 10° E. at 30°, and rolling over to E. at 20°. At the north bank, in the townland of Bunagarha, is seen dark gray sandy shale, dipping S.E. at 25°.

The river Smearlagh, a tributary of the Feale, affords a similar broken section from N. to S. A little north of the ford, in the townland of Inchymagilleragh, less than a quarter of a-mile S. of Duagh Glebe-house, are olive grits, dipping S.E. at 30°. On the road side, N. of the "Knight's Bridge," are some gray and olive sandy shales, lying horizontal; and at the bridge, and a little west of it, apparently, the same beds dip S. at 10°. About a quarter of a mile south-west of this, in the townland of Moyassa, are olive gray grits and sandy shale, having a steady dip to N. at 30°, for more than a quarter of a mile; the section here, however, is not quite continuous, and there may, accordingly, be contortions which are hidden by the alluvial flat of the river. Southwards, and opposite the south end of the wood, which lies on the west side of the river, where "*h*" of Smearlagh is engraved on the map, are thin gray and olive grits and shales, dipping S. at from 30° to 45°, and then, for some distance, dark gray splintery shale, the dip of which is not discernible, but which may probably be horizontal. Going still south, olive gray grits and ripple-marked flags are seen at intervals, having a steady dip to the south of 30°, and then become horizontal and undulating at angles varying from 10° to 20° towards the S.S.E. At Beheens Wood are beds of dark shale, horizontal. South of the wood are thin olive grits and dark gray shale, dipping N. at 20°. This northerly dip continues as far as the abrupt turn of the river, where it changes the direction of its course from N. and S. to E. and W.; at this turn the dip is N. at 50°. At the next turn, where it again changes its direction to N. and S., are olive grits dipping S. at 60°. Gray and olive shales, having the same dip, are seen south of this, and a mile E. of the hamlet of Rathea, where the stream forming the south-eastern boundary of the townland of Rathea, joins the Smearlagh. The section seen in this stream will be presently described.

From the last-named point, the direction of the course of the Smearlagh is from S.E. to N.W. for about three-quarters of a mile, only exposing rock in one place, about half-way in the flat, where some dark gray shale is seen lying horizontal. At the S.E. end of this flat are olive grits, dipping N. at 60°, then becoming vertical, and then dipping S. 25° E. at 45°. At the angle of the river, west of Knockaunbrack, are olive grits and shales, dipping S. 20° E. at 45°.

The district east of the Smearlagh shows little or no rocks, being covered by bog and local drift. On the road side running east and west through the southern portions of the townland of Lisroe and Knockundervaul, one mile south of the fort called "Cahergal," on which is the trigonometrical point marked 680 feet, are quarries of olive grit and sandy shale, dipping N. at 10°. And two miles northward on the road which runs from Listowel to Duagh, in the townland of Trienearagh, are olive grits and sandy shale, dipping S. 20° E. at 10° to 20°.

The section in the tributary of the Smearlagh which forms the S.E. boundary of the townland of Rathea, must now be described. At the confluence are gray and olive flags, dipping S. at from 50° to 40°; a little further south, these beds, over which is seen a bed of gray sandy shale, become horizontal, and then undulate slightly, dipping N. and S. at 5°. Further S.W. is seen black shale, lying horizontal, and traceable as far as the road; at the west side of which the shale dips N. at 35°. These beds look much like coal shales, but no coal is seen here. Less than one mile west of the hamlet of Rathea, at the side of the old road to Banemore, are light gray flags over black shale, dipping S. 30° E. at 45°. Pits were sunk here many years ago, and coal was got; but no farther information respecting it can now be obtained in the neighbourhood. The shales here may probably be the same as those near the road in the last section. About three-quarters of a mile west of these pits, thin olive grits are seen on the road, dipping S.E. at 45°. These are probably the "*seat*"* of the coal; and a little south of this, in the ravine, are gray flags over dark gray shale, the same as those described as being over the coal. Still further west, on the side of the road both east and

* *Seat* is the technical term for the bed of rock on which a coal rests.

west of Banemore Cottage, dark gray and olive sandy shale are seen dipping S. and S. 20° E. at from 20° to 35°. It is hard to say exactly how these shales lie with respect to the coal; but they are probably below the "*seat*." Further west, in the townland of Pallas, on the side of the old road running due east from Banemore wood, are quarries of dark gray shale, the dip being obscure.

At Banemore wood, on the road cutting near the western end of the wood, are olive grits and shale, dipping N.E. at 35°; and east of this, dark gray shale and grit bands, dipping N. at 60°. About half a mile N.E. of the wood, in another cutting, are gray grits and rippled flags with shale partings, and thick dark gray shales, dipping S.E. at from 10° to 20°. North-west of this, and a little east of the R. C. Chapel, are dark shale and gray grits, dipping S.E. at 45° to 35°; and further N.E., on the road from the chapel to Listowel, are quarries of gray and olive grits and shale, dipping S. and S.E. at 10° or 15°, and becoming horizontal towards the north. A mile east of this, the new road through the townlands of Toornagheehy and Beheens West, affords a broken section in dark gray shales and olive gray grits, dipping S. and S.E. at angles, varying from 0° to 15°; and a little southwards, in the quarry on the road side, at the stream bounding the townlands of Beheens West and Rathea, are dark olive and gray grits and sandy shales, dipping E. at 10°.

Drift.—That so little bare rock is seen in this district is owing to the great amount of local drift with which it is covered. In the streams of Knockanore mountain, nothing is to be seen but the local *debris* of grits and shales.

The plain of Listowel is covered to a great extent by bog and alluvial land, but there is a considerable amount of local Limestone *debris*, particularly on the flanks of the high ground, as the Limestone gravel extends in many places beyond the boundary of the Limestone on to the Coal Measures.

Near the N.W. end of Kerry Head, just behind the houses that lie a third of a-mile E. of the Barrack and Signal Tower, large water-worn blocks of Limestone may be seen, partly embedded in the drift derived from the subjacent Old Red Sandstone.

At Ballybunnion, on the Coal Measure side of the boundary, is a patch of drift, consisting of thirty feet of Coal Measure *debris*, and fragments of olive grits, over genuine Limestone gravel and boulders.

Here and there blocks of Syenite are found scattered through the drift.

The hills of blown sand, south of Ballybunnion, are an interesting feature of the district.

Minerals.—A vein of Amethyst, of a very beautiful colour, is said to exist at Kerry Head, and many years ago it was used for jewellery; but I could not discover it, nor could any of the country people show me the spot.

The coal near Rathea, judging from specimens collected at the pit's mouth, seems to be a tolerably good quality of Anthracite, splitting into small cubes; when thrown into the fire it becomes red hot without blazing.

About one mile north of the village of Causeway, near the stream which flows N. and S. through the townland of Ballinglanna, numerous lumps of Galena were found in the local drift. The ore is apparently of a good description.

Most of the caves at Ballybunnion are coated with crystals of Alum, of a whitish or pale yellowish white colour.

Nodules and bands of Ironstone also occur in some parts of the Coal Measure shales.

FREDERICK J. FOOT.

January, 1859.

Dublin: Printed by ALEX. THOM & SONS, 87 & 88, Abbey-street,
For Her Majesty's Stationery Office.