EXPLANATORY NOTES

TO ACCOMPANY

SHEETS 131 AND 132 OF THE MAPS

OF THE

GEOLOGICAL SURVEY OF IRELAND,

ILLUSTRATING PART OF

THE COUNTY OF CLARE.

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Mr. C. GALVIN; &c.

The observations made in the course of the Geological Survey, are entered, in the first instance, on the Maps of the Ordnance Township 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, or in preparation.

Compressed 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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EXPLANATIONS
OF SHEETS 131 AND 132 OF THE MAPS
OF THE
GEOLOGICAL SURVEY OF IRELAND.

GENERAL DESCRIPTION.
The district included in these sheets of the map is a part of the
western side of the county of Clare. The principal places in it are
the towns of Ennis and Miltoon-Malbay, and the villages of Doonbeg
and Mullagh.

1. Form of the Ground.
The most remarkable physical features are Slieve Callan and the
hills on its flanks, which, together, occupy a considerable tract N.W.
of the centre of the district; the elevated table-land lying between
these hills and the River Fergus; and the rocky hills about Ennis.
The summit of Slieve Callan is 1,252 feet above the sea-level; its
outline, to a person looking at it from the west, presents the appear-
ance of a flat-topped hill, with terraced sides.
East of Miltoon-Malbay, and N.W. of Slieve Callan, the country
is a hilly plateau, some points of which attain to an elevation of 800
feet, the average height being about 500 feet. This plateau slopes
away very gradually towards Miltoon-Malbay, and thence westward
to the sea; but about two miles N. of the town, the high land ter-
minates suddenly in a low range of hills, the mean height of which
is about 270 feet, the slope on the western side being rather abrupt,
ending at the shore in cliffs of from fifty to seventy feet in height.
The district south of Slieve Callan, and south-eastward towards
the River Fergus, is an elevated undulating table-land, attaining in
some places to a height of upwards of 700 feet above the sea-level.
Doo Lough (a fine sheet of water one mile and a half long, and
nearly half-a-mile broad), three miles S.S.W. of the summit of
Slieve Callan, has a water-level of 280 feet, and is surrounded by
rocky abrupt hills, which give it a peculiarly wild and picturesque
appearance. This plateau decreases in height towards the River
Fergus, and terminates towards the S.E. in a rather steep slope, down
to a low undulating ground, studded with rocky knolls from thirty to
seventy feet in height, which is bordered by the wide alluvial flats
of the river.
The hilly ground which surrounds Ennis on all sides except the
east, is very rocky and craggy, its summits rising only from 200 to
nearly 400 feet above the sea-level, but often seeming more lofty from
their broken aspect and abrupt slopes.
The western portion of this district is drained by several streams, flowing nearly parallel to each other. The principal of these are the Anagh river, which rises on the flanks of Sleave Callan, at an elevation of about 750 feet, flows into the sea about two miles S.W. of Miltown-Mulroy; the Annagareagh river, which springs from Doe loch, at an elevation of 380 feet, and flows into the sea through the lagoon of Lough Donnell, which is sheltered from the encroachments of the Atlantic by a barrier of shingle, twenty-nine feet in height, thrown up from time to time by the waves; the Creech river, which rises at Cahirmurphy lough, at a height of 149 feet, and flows into the sea at the White Strand, one mile and a-half N.E. of Doonbeg; and lastly, the Doonbeg river, which, entering the southern edge of Sheet 131, at a height above the sea-level of twenty-six feet, flows into the southern end of Doonbeg bay. The eastern side is drained by the River Fergus and its tributaries, the two principal of which are the Inch and Owenalleure rivers. The Fergus is tidal as far as the west side of the town of Ennis, at the mill. At the point where it enters the district included in Sheet 132, it has an elevation of about twenty-eight feet above sea-level. It flows thence in a nearly south-west direction towards the town, being relieved in time of floods by a natural channel, which, leaving the parent stream at a point a little S. of Brookville, enters the district belonging to Sheet 133, in which direction the two courses unite again, thus making an island of a large tract of ground on which stands a considerable portion of the town of Ennis, with the College and the Union Workhouse. The Inch or Claureen river joins the Fergus half-a-mile N.W. of Ennis; it rises at the north side of Lough Namina at an elevation of 560 feet, and in its course receives the waters of many small tributaries. The Owenalleure river rises in the hills, two miles and a-half E. of Lough Namina, at a height of 600 feet above the sea, and after a circuitous route, in which many minor streams flow into it, it joins the Fergus at Ballycorick bridge, near the S.E. corner of the district. Neap tides flow up the Owenalleure river as far as the stepping-stones, a little west of Ballycorick Castle.

2. Geological Formations, or Groups of Rocks entering into the structure of this District.

Alluvium, Bog, or other superficial covering.
Drift.
d° Coal Measures.
d° Upper Limestone.

<table>
<thead>
<tr>
<th>Formation</th>
<th>Color or Map</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alluvium, Bog, or other superficial covering.</td>
<td>Slight</td>
</tr>
<tr>
<td>Drift.</td>
<td>Exposed pale.</td>
</tr>
<tr>
<td>d° Coal Measures.</td>
<td>Indistinct.</td>
</tr>
<tr>
<td>d° Upper Limestone.</td>
<td>Prominent.</td>
</tr>
</tbody>
</table>

d°. Upper Limestone.—The lowest beds seen in this district are a portion of this formation. They are for the most part thin-bedded, dark gray, sometimes nearly black, compact, and often crystalline limestones, with occasional bands and nodules of black or gray chert; the stratification is generally very distinctly marked, although in some places it is not determinable, either because there is an insuffi-

cent exposure of the rock, or because the rock is so weathered that its stratification is obscured. Near the top of the formation are some pale gray, crystalline, and crinoidal limestones, remarkably thick bedded, and generally over these pale beds, are dark gray, thin bedded, crystalline limestones, having bands and nodules of chert, and partings of black shale. The thickness of as much of the Upper Limestone as occurs in this district is probably about 600 feet.

4°. Coal Measures.—The beds last mentioned, viz., the dark thin limestones with shale partings, pass upwards into black and dark gray shales, the lowest of which are generally cherty; these beds are highly fossiliferous; they seem to vary considerably in thickness, but the average may be about 150 feet.

Over these shales is a series of brownish gray, or olive-coloured grits and flags, with curious track-like marks, alternating, as we ascend, with frequent beds of shale, and having a few thin beds of coal. The total thickness of this group is about 2,600 feet.

These beds are separated from higher ones—consisting of alternating grits, flags, and shales, amounting in thickness to about 350 feet—by a band of hard, gray, impure limestone, from three to five inches thick, and abounding in fossils; this band was observed in two different localities, and is probably the same as that which occurs near Kilkee, running down towards Loophead; it is consequently important as constituting a useful horizon in this formation. The general section, then, of the Coal Measures of the district may be given as follows:

**General Vertical Section of Coal Measures.**

<table>
<thead>
<tr>
<th>Formation</th>
<th>Feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>5. Alternating grits, flags, and shale, the shale having occasional seams of coal.</td>
<td>350</td>
</tr>
<tr>
<td>4. Limestone band.</td>
<td>0</td>
</tr>
<tr>
<td>3. Alternating grits, flags, and shale, with a few thin beds of coal.</td>
<td>2,000</td>
</tr>
<tr>
<td>2. Grits and flags, about</td>
<td>850</td>
</tr>
<tr>
<td>1. Dark shales, highly fossiliferous.</td>
<td>100</td>
</tr>
<tr>
<td>Total thickness,</td>
<td>.3,350</td>
</tr>
</tbody>
</table>

These thicknesses must only be considered as approximations, as the coast section does not expose the lowest beds, and the inland sections are too imperfect and unconnected for accurate calculation.

F. J. F.


As is usually the case in the S. of Ireland, the Carboniferous Limestone, although a hard rock, makes the low ground, while the Coal Measures, consisting of softer but tougher materials, form higher land, which ends in a continuous and rather steep escarpment.

* See Explanation of Sheets 140 and 141.
overlooking the limestone plain (see figs. 1 and 2). Towards the northern part of the district, however, the Limestone rises into higher land, though still not equal to that of the Coal Measures.

Fig. 1.
Section N.W. from the River Fergus. S.S. corner of Sheet 132.

Sea Level.

Fig. 2.
Section N. and E. of Clontibury Cottage. N.E. edge of Sheet 132.

Sea Level.

There is a difference between the two formations, not merely in altitude, but also in aspect of ground. The limestone country is low, but often abruptly undulating, with steep little knolls and craggy hills rising from the plain, while the Coal Measure country, even where most lofty, rises and falls in long sweeping undulations, with gently sloping outline, making wide open valleys, and round humpy hills and ridges.

The Coal Measure country has commonly a barren and dreary aspect, while the limestone ground is generally more fertile and pleasant-losing, except where it is covered by bogs. Even where considerable spaces of bare limestone rock form the surface of the ground, its aspect, culled by the appearance of strips and tufts of grass, and little thickets of shrubs and bushes, is more interesting than that of the Coal Measures, although it may, in those places, be less valuable than even the thinly-sanded ground over the Coal Measures.

On examining the position of the rocks near the Coal Measure escarpment, it is at once evident that the Limestone rises up to the surface from beneath the Coal Measures, and that the beds of the latter end abruptly at the escarpment. It is clear that this abrupt termination of so great a thickness of beds can only be due to the fact that the former continuation of these beds has been cut off and removed by the action of denudation.

The limestone plain, then, was once covered by a great thickness of Coal Measures, which spread to an indefinite distance eastward of their present boundary; and the Limestone only appears now at the surface in consequence of the removal of that covering. In like manner, the lower beds of the Limestone rise to the surface in consequence of the denudation that has removed the upper beds (see sections, figs. 1 and 2).

When, too, we follow out the superficial indications so as to determine the internal structure of the ground, we find that the undulations of the surface have no constant relation to the undulations of the beds below the surface. The summits of the hills are sometimes capped by higher beds than those that appear on their flanks; sometimes lower beds rise steeply out on the crest of a hill, and are covered on one or both sides by higher beds, which come in over them as they dip beneath the surface.

We know that all the rocks were originally deposited beneath the sea-level, and have been lifted up above it by the action of the internal forces of elevation, being variously bent and tilted during that operation. The altitude above the sea, then, which any particular part of any bed now stands at, is the result of elevation; but the form of the surface of the ground, and the comparative altitude above the sea of that part of any bed which comes to the surface at any particular spot, is determined by the greater or less amount of erosive action that has affected it. The hills are those parts that have been comparatively less worn down than the plains and valleys, no matter what may be the features and inclinations of the beds beneath the surface.

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

4. Palaeontological Notes.
Most of the fossils collected in this district were obtained by Mr. F. J. Foot from the Coal Measures, with a few from the Carboniferous Limestone, all being from localities in the County of Clare.

From the Coal Measures at Ballin Bay, County of Clare, Mr. Foot procured from the grit beds an impression of a disœtid Nautilius, showing the cephalic division, which appears to resemble Nautilus posticus (Momberger).

On the coast, at Cleenish Point, near Killard Point, the "Sea Rock" which is immediately underneath a thin bed of coal, where exposed, presents a mass of un compassed Stigmatica roots; these, with their long and numerous flattened rosettes attached, may be seen spreading in all directions over the surface of this grit bed, some of them measuring as much as seven feet in length.

At Clodagh, near Ennis, in the bed of the Inis river, we found the lower shales of the Coal Measures to be full of fossils, consisting of plant stems, some of them very large, measuring two inches in diameter, and longitudinally ribbed. The Acanthopecten gravidae was here very abundant, together with small examples of Pectenoides venustus and Gonolites cruciatus.

The Carboniferous Limestone, where it appears close to the road W. of Dauphine Castle (see page 51), we found to be highly charged with fossils. The following species were observed on a very casual inspection:

MOLLUSCA BRACHIOPODA.

*Oxymyena Brachiopoda.*
*Crenulata.*
*Spiriferidae.*
*Henerella.*
*M. bivalvium.*
*Rhiphopecten spinosum.*
*Fissurella compressa.*
*M. minuta.*
*Corrobella.*
*Arbilestes Muschelii.*
*Atrita longula.*

W. H. R.
DETAILED DESCRIPTION.

[The area included in these maps was surveyed entirely by Mr. P. J. Foot, by whom the accompanying descriptions have been drawn up. — J. B. J.]

S.—Position and Line of the Rocks.

We shall commence the description at the S.E. corner of the map 132. Between Gornfield House and Fort Fergus are clumps of dark grey compact limestones, and also some light grey. The surface is much weathered, and the stratification obscure, and in one or two places there is an apparent dip of S. 20° E. at 30°. N.E. of Gornfield House, at the N. side of the avenue of Fort Fergus are beds of granular, and also very compact dark grey limestones, both thick and thin bedded, dipping W. 25° N. at 20° to 30°. These beds abound in fossils. On the east side of the Eminis road, opposite Gorton Castle, are pale grey compact limestones, full of fossils, and dipping S. 8° E. at 30°. These beds are only a little way below the base of the Coal Measures. At Knocknook Roman Catholic Chapel, and south of it, are highly fossiliferous beds of dark grey limestones, having a general dip of about 30° to the W.N.W. The beds east of Ballyragh Bridge, and between it and Rush Island, with some undulations, have a general dip of W. at about 30°. The principal joints are vertical, and have a direction N. and S. In some places these joints have the appearance of plates of stratification. Northward, at Island O'Brien, and north of it, beds of dark limestone exhibit a tolerably steady dip of W. 30° N. at 23°, for a distance of three-quarters of a mile. Between this and the Eminis road we meet the same beds continued. E. of Island O'Brien, at "the Store," they dip S.E. at 35° to 40°. While farther W., at the Eminis road, and extending for a mile along it (its direction being that of the stream), the dip is W. 25° N. at 30° to 50°. These beds exhibit bands of black or grey chert in several places.

The tract between Drumquin Point and the Eminis road consists of almost bare limestone rock, the beds of which have a general dip of W. 20° N. at 10° to 15°. Some of these beds abound in fossils. They vary from a dark grey, very compact, or sometimes fine grained limestones, to a dull grey crystalline rock, generally decomposed, and extremely flinty when freshly fractured. There are occasional light grey crystalline beds. They are covered, the dip of the cleavage being S. 25° E. at 65°.

West of Craigheen House the rocks also drop out in cliffs. They are generally light grey, compact, and crystalline limestones; the small undulations. Fossils are to be met with in abundance. North of Berrymore House, and north-east of it, along the Eminis road, and at Dunruggy House, the beds of limestone, similar to, and apparently the same as those already described, are exposed in quarries and cliffs, and have a general dip of from 15° to 25° W. 20° N.

West and north-west of Rathmore House beds of grey and pale grey compact and granular limestone dip W. 10° N. at 10° to 20°. At the eastern side of Kilmore, and along the north-east shore of Ballyragh, length, and between it and the Eminis road, the beds of limestone form a craggy hill. They vary from a dark grey compact, or fine grained, to a dull grey crystalline fine limestones. The strata appear undulating; at the shore of Kilmore they dip W. 10° N. at 10° to 50°, becoming horizontal as we proceed northwards. At the top of the hill they are horizontal, and going from this in a direction N.E. for about half-mile they show a general dip of W.S.W. at angles from 5° to 15°.

Between Ballyragh Bridge and Eminis length the beds form a very rugged and picturesque hill, intersected in some places by ravines, the sides of which are steep precipices; they are the same as the beds kilkerto described, immediately W. of the southern end of Ballyragh length they are horizontal, and form precipices, the sides of which are caused by vertical joints, which have a direction nearly N. and S. Between this and Eminis length they are contorted, the very topmost beds forming basins, in which lie the lower beds of the Coal Measures. Then as a quarter of a mile N.E. of Newball House the dip is S.E. at 30°. Between this and Eminis length the beds are horizontal; whilst at the west side of the latter, they dip N.W. at 10°. In a direction N.E. of Eminis length, and north of Ballyragh length, the district may be said to be composed of almost bare limestones rock; the beds having a general dip to the W. of from 5° to 15°, and being horizontal in many places. The direction of the principal joint is N. 20° W.; and in several places small ravines are formed by the depression of masses of rock. Fossils (principally oysters and products) are locally abundant. A considerable tract, consisting of limestones crags, also lie to the N.W. of Eminis, between the Inish river and the Kinsis and Kilrush road.

About a quarter of a mile S.S.W. of Newball House, these crags attain a height of upwards of 200 feet above the sea level, and being traversed in a direction N. and S. by two ravines formed in the manner above described, assume the shape of three rocky hills, which form a conspicuous object in the landscape. The beds here undulate considerably, dipping in different directions, at angles varying in amount from 0° to 30°. At Newball House, and a little south of it, some very rich beds, and also a magmatic band, are exposed, dipping W. at 35°.

Between the Inish river and the road which leads from Kinsis to Mahonagh the beds undulate at low angles to the W. and S.

At Beoolepark Cottage, and south of it, along the eastern bank of the Inish river, are thick beds of grey compact limestones, dipping S. at from 5° to 10°. N. of Inish bridge, a craggy hill, attaining to a height of 175 feet above the sea, is formed of beds of limestones, which dip in all directions, as follows:—On the east side, S.E. at 10° to 15°; on the north, S. at 10°; on the west, W. at 10°; on the north-west, to the N.W. at 40° to 50°; on the S. at from 5° to 10°; and are horizontal in the middle, or rather at the top of the hill. The beds vary in thickness and in character from a dark grey to a pale grey very compact limestones. The whole description makes a very remarkable building stone, and has been much quarried here. The new Court-house at Kinsis, and several other buildings in the neighbourhood, have been constructed of this stone.

At the north side of the hill, at the large quarry, a small submarine stream issues from the rocks, and after flowing for about 200 yards, again disappears. At the north side of the Inish river, and S. and W. of Swarren House, the beds of limestone undulate with great energy, and are horizontal, or have a general dip to the W. of 5° to 10°.

To the N. of the town of Inish, and between Swanagh House and Clonagh lough, the rocks are much coved by a considerable amount of local drift; but patches of limestone appear through. Brookvillie is one of these patches of nearly bare rock, the beds of which have a general dip of S.W. at 5° to 10°. Between Swanagh House and Clonagh lough the land is strewn over with limestones boulders, some of which are of considerable size; they are the same in lithological character and probability have not travelled very far. The general dip of any beds that do appear through this tract is W. at 5° to 10°. They are the same described, being generally dark grey, compact, and thin-bedded. Those keel-shaped, described being generally dark grey, compact, and thin-bedded. The conspicuous hill, called Corriss Hill, N. of Huskerry House, on the west side of which stands Sheeler Castle, and which attains to the height of 350 feet above the sea-level, is formed of the upper beds of the
limestone, which from the east to the west side of the hill, a distance of more than a mile, has a dip to the W., varying in amount from 2° to 10°. About a quarter of a mile S.S.W. of Smartphone, on the W. side of the old road, is a dipping cave, where the basal shales of the Coal Measures are seen lying on the topmost bed of the limestone, the dip being W. at 10°. East of this, on the road, there are chalk bands in the limestone, and a little below the crest, a bed of breccia, decomposing, magnesian limestone.

This Corin Hill is a fine specimen of a limestone hill, or "crags." It is traversed by large and deep fissures, abounding in vegetation, and which are caused by the weathering out of pieces of the rock between vertical joints, having a N. and S. direction, or more accurately N. 20° E. and S. 20° W... In some places the rock is grooved and hollowed out, as by the action of water in motion.

Northwards of Corin Hill, and to the W. of Fountain House, between the two roads, is another tract of "crags," the beds dipping S.W. at 10°, and N.W. at 10° to 20°.

Somewhat less than half-a-mile S.W. of Shalesquarry House, in a small stream at the north side of the road, is seen the junction between the top bed of the limestone and the bottom of the Coal Measures, the dip being S.W. at 10°. From this another rocky hill extends to Magovna Castle, and thence eastwards as far as the road west of Tonnah House. The highest point of this hill is about a quarter of a mile S.E. of Magovna Castle, and is at an elevation of 396 feet above the sea-level. At this point, and a little south of it, the general dip of the beds of limestone is N. at 10° to 12°. Between Shalesquarry House and Magovna Castle they lie horizontally, or dip N.W. at 3° to 7°, while, at the east side of the hill, near the road west of Tonnah House, the dip is W. at 10° to 15°.

Another hill, the summit of which is 327 feet above the sea, and lies a little E. of "Cahersuperran," is composed of beds of limestone, which have a general dip towards the W. The beds E. and N.E. of the summit are dark grey compact, generally thin-bedded limestone, containing numerous fossils, dipping W.S.W. and S.W. at low angles from 3° to 12°. At the summit, and extending N. and S. of it, are cherty beds, dipping W. at 15°. At the west side of the hill the beds are horizontal, being either pale or dark grey compact, very cherty limestone. Both this hill and that last described are seen situated in the valley of "Corin Hill." The direction of the principal joints is in N. and S. and E. and W.

Fastwater, between this latter hill and Ballygriffy Castle, the country is covered with local drift and large boulders, with here and there the limestone rock protruding.

At Ballygriffy Castle, and for nearly a mile S. of it, along the eastern bank of the river, beds of dark grey compact limestone are exposed, dipping W., at from 10° to 13°.

Fastwater at Knockanough, are cherty beds, dipping S.W. and W. at 10° to 15°.

In Knockanough the same beds are also exposed, and W. of this dip, and N.W. of it, beds similar in appearance, but lower in the series, are seen, having a general westerly dip of from 10° to 20°.

Coal Measures.—Commencing near the N.E. corner of the map (123), the basal beds of the Coal Measures are seen in the little stream bounding the townland of Cooinshill and Knockanamurragill, a quarter of a mile S.E. of Cooinshill Cottage, they dip to the W. at an average angle of 10°. Formally abundant. Overlying these shales, on the hill at, and north of, Cooinshill Cottage, are beds of olive greens, flags, and sandy shale, dipping W., at from 0° to 10°. Southwards from this, and about a quarter of a mile S.W. and W. of Magovna, in the stream dividing the townlands of Magovna West and Cahersubbaunagh, a very good section in the lower beds of the Coal Measures is exposed, the basal shales being seen to rest upon the top of the limestone. This section is continuous for more than a quarter of a mile. The beds are nearly horizontal in place, but have a general dip to the W. of 3°. The greens and flags are seen on the bank of the S. of this stream, dipping nearly horizontally.

The junction of the limestone and Coal Measures is also seen in the little stream at the north side of the road, less than half-a-mile S.W. of Shalesquarry House, and about a quarter of a mile S.S.W. of Shalestock Castle, at the eye in the townland of Gort research; the beds at the former dipping nearly S. at 10°, and at the latter W. at 10°.

On the level of the escarpment, a little west of both those localities, and almost continuously between them, and for a mile S. of the latter place, the greens and flags above mentioned are traced, lying in a great horizontal or dipping at low angles to the W. The basal shales are also well exposed, lying in beds of the upper beds of the limestone, in the bed rock, a quarter of a mile S. of Beedsparks Cottage. They are contorted, as perhaps an, in one place, where near the limestone they dip E. 20° S. at 30°, to suggest the idea of a fault. This dip is, however, most probably merely a local undulations, as the same beds are seen dipping W. at 30° on the side of the little road leading to Coor Spa Well, and evidently overlie the limestone in the usual manner.

This is an extremely good locality for fossils, such as Palaeonome, Oinitides, etc., etc.

About a mile south of this, in the townlands of Jacob and Kilmena, the superior beds of olive greens and flags form an escarpment, the beds being traceable along its brow for one mile and a direction nearly E. and W. Those nearest the limestone dip S. at 40° to 50°, but the amount of dip diminishes to 10° at about 200 yards to the south. About a quarter of a mile west of Beedsparks House this escarpment terminates in a knoll of olive greens and sandy shale, which dip W. at 10°.

The same beds are also seen similarly situated in the following places, on the side of the old avenue, about a quarter of a mile N.E. of New- ball House, where they are contorted, at, and extending for more than a quarter of a mile in a direction N.E. from Newball House, and dipping S.E. at 3°; in the haun at the west side of the avenue, west of Killeen House, where they are horizontal; on the side of the old road and in the wood half-a-mile west of Grafton House, dipping W. at 20° at 40° southwardly; on the brow of the hill, over Kilbin Holy Well, where they dip N.W. at 30°, less than half-a-mile south of Kilbin Holy Well, in the townland of Liskeen, the dip being W. 10° N. at from 30° to 20°.

In these three last-mentioned localities, part of the band shales is to be seen under the greens and flags, although the junction with the limestone is not visible. Fossils are abundant in them. From the last locality the greens and flags are traceable along the brow of the escarpment for nearly a mile and a half in a direction S.S.W., the general dip being W. 25° to 30°, from 20° to 30°. Here their continuity is broken, by the escarpment losing itself in the valley of the Owanceoriver.

In the bed of this river, just south of Ballygriffy Castle, dark grey sandy shale are seen dipping W.S.W. at 20°. The greens and flags are a bed of a mile west of Knockroy chapel, and are continuous S. of it to the southern edge of the map. Where no actual junctions were visible, the boundary between the limestone and Coal Measures has been drawn provisionally, at the foot of this escarpment; as, wherever junctions were seen, this was their position. Springs occur at frequent intervals along this boundary.**

* The escarpment above alluded to is so prominent, that Mr. Evans Jones, of Knock, remarked to me that it was probably used in former times as a boundary of property, as the eastern of Magovna, etc. Shalestock, Beedsparks, and Dungar (on Sheet 142) are ranged at intervals along it.
The principal sections in the superior beds of the Coal Measures must now be described as they cross the way to the east of Baskets Hill and near the S.E. edge of Sheet 132, several quarries and crags exhibit beds of strong olive grit and flags, with occasional fragments of sandy shale, sometimes undulating, but having a general dip to N.W., at 10° to 20°.

The road N. of Baskets Hill, and the Greensleeve river, also exhibit sections in the same beds, that is in the latter being tolerably continuous, and showing the beds much contorted at low angles.

In this river, a quarter of a mile W. of Clondagh church, is a bed of dark slate full of fossils, such as Goniolithon, Avrillepsis, and fragments of plants. In the stream, N. of the B. G. chapel, which is situated on the road side, one mile and half W.N.W. of Clondagh church, are dark grey slates, over olive grits, dipping R. 80° S. at from 20° to 40°. At the west side of this stream, the beds become horizontal and then dip N.W., W. and S.W., at 10° to 15°, thus forming an anticlinal curve; thence to the road leading from Ennis to Kilrush, by Lough Achoyane, several quarries exhibit beds of grits and flags, undulating at low angles.

Northwards from this, at Mullagh House, east of it and along the old road south of it (which running in a direction nearly N. and S.W., joins the Ennis and Kilrush road), several quarries exhibit beds of olive grey grits, which, though locally contorted, have a general dip to B.W. at an average angle of 10°. In a quarry 300 yards S.E. of Mullagh House, the flags exhibit the ripple or current mark, and one bed is full of fragments of plants, interspersed with the flags is a bed of nodular sandstone.

In another quarry, 250 yards east of the house, the beds form a small valley of a small valley or dome, dipping in all directions at low angles.

At the west side of the Ennis and Kilrush road, about one mile and half west of Mullagh House, and in the townlands of Kylannus and Lismul-whel, beds of strong olive quartzite grits, with some flags, are exposed in crags. On the eastern side, which is an abrupt cliff, they appear lying horizontal, but further west, they dip W. and N.W. at from 0° to 20°. These beds exhibit vertical planes of cleavage, the strike of which is about E. 20° and W. 20°.

Northwards, the Irish river from Mahonbridge bridge, to Kilnamery, where it is called the Killarney river, exhibits a discontinuous section, showing the beds hitherto described contorted; and at both sides of the road which runs from Kilnamery bridge, and at the east side of Congreve lough, are crags formed of beds of strong olive grits and flags, which have a general dip to W. of 10°.

About a quarter of a mile S. of the southern end of the road, where a stream runs through a ravine, are olive grits under dark grey shale containing beds of iron stone, dipping S. and S.W. at from 0° to 10°. All along the N. or S.W. side of the Ennis and Kilrush road, from the crags west of Mullagh House to where the road leaves the map S. of Lough Achoyane, the rocks are in many places exposed.

The best section may be seen in a ravine in a westerly direction near the N.S. cross the road and a mile N. of the road, the beds dip S. at various angles, but taking the average at 25°, there is probably a thickness of nearly 600 feet. Of this thickness, the beds consist of the thin lenticular portion; some are beautifully ripple, but most of them are covered with track-like marks, similar to those seen on the flags of Shannon Point, east of Kilrush. (See Explanation of Sheet 141, pp. 9 and 10.) The flags are much used for roofing purposes and other domestic purposes.

North of this stream, and about half-mile east of Lough Tribor, is a ravine caused by a synclinal fold three-quarters of a mile in length, the direction being identical with the strike of the rocks, (viz. N.E. and S.W.). The beds forming it are grey, flags, and shales, probably the same as those seen in the stream section, and caused by the contortion to be visible here. On the S.E. side they dip N.W. at 10° to 20°, and on the N.W., S.E at 10° to 20°.

Proceeding westward along the road, which lies S. of Baskets Hill and near the S.E. edge of Sheet 132, several quarries and crags exhibit beds of strong olive grit and flags, with occasional fragments of sandy shale, sometimes undulating, but having a general dip to N.W., at 10° to 20°.

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North of this stream, and about half-mile east of Lough Tribor, is a ravine caused by a synclinal fold three-quarters of a mile in length, the direction being identical with the strike of the rocks, (viz. N.E. and S.W.). The beds forming it are grey, flags, and shales, probably the same as those seen in

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(No. 1 is the lowest bed.)

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Olive grey grits</td>
</tr>
<tr>
<td>2.</td>
<td>Nickel grey shale</td>
</tr>
<tr>
<td>3.</td>
<td>Black shale with fault</td>
</tr>
<tr>
<td>4.</td>
<td>Black slate with fault</td>
</tr>
<tr>
<td>5.</td>
<td>Calcareous shale with fault</td>
</tr>
<tr>
<td>6.</td>
<td>Dark grey shale</td>
</tr>
<tr>
<td>7.</td>
<td>Olive grits and flags</td>
</tr>
</tbody>
</table>

No. 3 is the Lime Stone band mentioned in page 7. Half-mile S.E of Slaghoole, on the N. slope of the hill, and in quarries three-quarters a mile east of the lough are grey flags covered with the track marks above stated to. In the former place the bed is about N. 30° W. at 10°; at the quarries they are horizontal.

One mile N. of these quarries, at the head of the Aughabensna river, are grey flags dipping S 30° W. at 5°, and over them an olive grit bed containing flint. In the bedrock and small stream below the site is seen a bed of coal and bituminous shale, so that in all probability this is the site of a small bed of coal.

From the last mentioned place to the northern edge of the Sheet 132, the rocks are much hidden by local drift and tracts of bog. On the old road which runs N. of Lough Aklit, beds of olive grits and flags with sandy shale, are seen lying horizontal, and at a distance of a quarter of a mile N. of Lough Aklit, in two streams across, are horizontal beds of olive grits, which are covered by grey concretionary shale. Further north, on the road which runs westward from Lough Aklit, beds of bridge, and cropping out in knolls on both sides of this road, are beds of bridge, and cropping out in knolls on both sides of this road, are beds of grits and flags, generally horizontal or N.W. and S.E., at from olive grits and flags, generally horizontal or N.W. and S.E., at from
The beds are nearly horizontal. The best sections are seen in a little stream somewhat more than a quarter of a mile S. of Loughey Boggsyraga, and in that which runs E.N.E. and W.S.W., a little N. of the Head Cross road.

The vertical section of these beds, as obtained by actual measurement, is as follows:

**Vertical Section of the Beds of Sliabh Callon, No. 1 being the lowest of the series.**

1. Olive-grey and black, with occasional beds of sandy shale, about 400 ft.  
2. Black shale with bands, about 200 ft.  
3. Olive-grey, about 300 ft.  
4. Gray and black shale, about 300 ft.  
5. Olive-grey flags, about 200 ft.  
6. Dark grey nodular shale, lower beds becoming flaggy, about 100 ft.  
7. Black shale, with bands of iron ore, about 100 ft.  
8. Black grey shale, with bands of iron ore, about 100 ft.  
9. Grey, and blackish grey, and olive flags, about 70 ft.  
10. Black shale, with bands of iron ore, about 200 ft.  
12. Dark grey shale, with bands and nodules of ironstone, about 30 ft.  
13. Grey, and blackish grey, and olive flags, about 70 ft.  

Nos. 4 and 5 are seen in the stream north of the road, a little west of the Head Cross road, where the beds dip S. 10° W., at 10° to 20°; also in the stream about half a mile N.N.E. of the "Head Cross road," where they dip horizontal or dip N.W. at 6°. The lower beds of No. 15 (olive-grey flags) are exposed around Loughey Boggsyraga; S. and E. of the head they dip N.W., at from 10° to 20°; N. of the loch, and a little S. of Conor's monument, N.W., at 10°; while at the N.W. side, a contortion causes them to dip E. at 20°.

At Dou Lough the rocks seem to form an anticlinal curve, in which lies the loch. The beds are strong olive grey and flags. At the south side of the loch they dip N., at from 5° to 10°; at the west side they dip E., at 10°; while at the north, they dip S., at 10° to 15°.

Somewhat less than a mile N. of Powertown House, in the Angharacna river, beds, probably the same as Nos. 4 and 5 of the Sliabh Callon section, are seen dipping S. 25° E. at 20°.

Northwards of this, and up to the N. edge of the Sheet, beds similar to No. 15 of the same section, and also still lower, grey and flags are exposed in the Glandine and Silverhill rivers, where the general dip is S. at 5°; and around the hills of Knocknaboulshusk and Blossborough, where it is S.S.E. at 5° to 20°. Beds of olive grey and flags are to be seen in several other places cropping out at intervals, and dipping in different directions, generally N.W. or S.S.E. at low angles. It is unnecessary to describe each of the outcrops, as the sections already cited are sufficient to explain the structure of the district. The sea-shore section, however, the greater portion of which is on Sheet 131, must be described.

At the N.W. corner of Sheet 132, and at the N.W. side of Poulsdonness, are beds of olive-grey flags, with the track-like markings. They are contorted—being horizontal at the cliffs, and then dipping S.E. at 45°, and N.W. at 10°. These flags also appear in several quarries a quarter of a mile S. of Poulsdonness. In lithological character, and in the trends, they closely resemble the Money Point flags east of Kilbrack (see Explanation of Sheet 141).

Interest with the flags is a bed of thick black shale, which appears at and N.W. of Poulsdonness, lying horizontal. Proceeding along the shore S.W. from Poulsdonness, the flags on the right are black shale, sometimes horizontal, but having a general dip of from 25° to 30° to S. At Bineenasrogh they form a synclinal fold, dipping S. at 10°, and N. at 10°. These southwards, as far as Omery Point, the beds, which are olive grey and flags, with some beds of black shale, undulate E. and W., at low angles.

At Omery Point, and along the N. shore of the little bay which lies S. of the Coast Road Station, the dip is S. at 5°, and S.E. at 10°. On the southern shore of this bay, just N. of Mervulet House, the beds (apparently the same as those on the northern side) appear contorted, but have a general dip to N.W., at from 10° to 30°; further south, at Poulsdonness, the same set of beds dip S. at 5° to 10°; then, as far as Poulsdonness, a thick bed of black shale, over olive-grey grits and flags, is seen dipping N.E. at 5° to 10°. At Poulsdonness, and thence to Spanish Point, these beds appear lying horizontal, and forming a large reef of rocks. At Spanish Point they undulate slightly. At the S.E. side of Spanish Point, proceeding S.E. along the shore, beds of olive-grey flags and black shale are seen undulating to the south, at from 6° to 20°. Some of the flags exhibit fragments and impressions of the stems of plants on their surfaces.

A little south of Sandhill Cottage the continuity of the section is interrupted by a sandy beach.

At the mouth of the Annagh river is a horizontal bed of thick black shale, with bands of ironstone. Northward, at Stackpole's bridge, the same shale is seen resting on a bed of olive grey, and dipping S.W. at 10°.

On the shore, a little N.W. of Cassino Lodge, a bed of coal is reported to exist.* I could not, however, find any trace of it. The following is the vertical section as obtained from actual measurement.

**Vertical Section of the beds on the shore N.W. of Cassino Lodge.**

(No. 1 is the lowest bed in the series.)

1. Black shale, with ironstones, about 100 ft.  
2. Olive-grey, about 100 ft.  
3. Black shale, with ironstones, about 100 ft.  
4. Olive-grey flags, about 100 ft.  
5. Black shale, with bands of ironstone, about 100 ft.  
6. Olive-grey, about 100 ft.  
7. Black shale, with ironstones, about 100 ft.  
8. Olive-grey flags, about 70 ft.  
9. Dark grey shale, about 70 ft.  

The beds here have an average dip of N. of from 5° to 15°; thence to Caerbrack Point lower beds, consisting of massive olive quartzite grits, with flags and shale, are seen undulating to N.W. at from 6° to 10°. For half a mile S. of Caerbrack Point the same beds have a general dip to N., at from 5° to 10°.

At Enlish Point the beds (flags and shale) are much contorted. *Curruddagh, west of Quilty, is a large reef formed by horizontal beds of black shale, and ironstone, of great thickness, with bands of ironstone; these bands and other superior coal (ripped grey flags and shales), are intrusive all along the shore from Quilty to the western point of Mull Rock. In this distance, which is a quarter of a mile, the general dip is S. 20° E. at 10°. At the Mull Rock it is S. at 10°.

The beds composing the eastern end of Manton Island, undulate to S.E., at from 5° to 10°. At the western side, the same beds form a flattened anticlinal curve, inasmuch as at the south-western point they dip S. at 20° to 25°.

* See Mr. Griffith's map.

20, 178. 
South of Carrmore Point, the White Strand, more than a mile in length, observes the rocks; but from its southern extremity to Maghran's Point, a distance of one mile and a quarter, alternating beds of grit, flag, and black shale, amounting to a thickness of about 1,300 feet, are seen dipping S. 10° E. at from 30° to 40°. At a distance of a mile, S.S.E. of Maghran Point, W. of Bavegnagh, the upper beds of this section form a synclinal curve dipping S. at 30°, and N. 20° W. at from 10° to 20°.

On the western shore of Donegal Bay, the same beds as these last-mentioned appear much contorted, and then, for a distance of about a quarter of a mile, have a steady dip of S. 20° E. at 40°. At this distance they are again contorted, and then, as far as Killard Point, dip N. 30° W. at 20° to 30°. Here beds probably higher in the series than those last-mentioned appear.

The following is the vertical section of the beds at and N.W. of Killard Point, as obtained from actual measurement:

**Vertical Section at and N.W. of Killard Point.**

| 17. Thin grits with a few shale bands | 7 7 |
| 18. Olive quartzose grits, | 7 7 |
| 19. Flabby grits, | 7 7 |
| 20. Olive quartzose grits, | 7 7 |
| 21. Grey shales, with thin Horstmein bands, | 7 7 |
| 22. Black shales, with nodules and bands of ironstone, | 7 7 |
| 23. Fine black shales, | 7 7 |
| 24. Sandstone, with thin grit bands, | 7 7 |
| 25. Flabby grits, | 7 7 |
| 26. Shales, with thin grit bands, | 7 7 |
| 27. Silty flabby grits, | 7 7 |
| 28. Calcareous, and dolomites, | 7 7 |
| 29. Fine grey-flint, with stigmata (moss), | 7 7 |
| 30. Flabby grits, | 7 7 |
| 31. Quartzose grit, with coal "red" (2 inches), | 7 7 |
| 32. Black shales, with thin grit bands, | 7 7 |
| 33. Olive grits, | 7 7 |

The beds of this section form a perfect synclinal fold; near Killard Point they dip N. 20° W. at 30°; and at "the Coler" S. 20° E. at 30°. The section was measured at the south side of the synclinal. No. 2 is seen at Killard Point.

The coal "red" in No. 3, divides into two seams, the under portion resting immediately on the top of the shale, No. 2, and the upper branch, traversing the grit bed in an irregular manner. See fig. 4.

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*Coal Bed* is a term used by miners to express a small seams of coal.
No. 4, 5, 6, 7, are seen plainly at both sides of the synclinal. No. 6, however, which at the S. side is two feet seven inches thick, is three feet eight inches at the Collar (north side), and between it and No. 5, is a bed of black sandy shale, having remains of plants; and No. 7 is represented by a grit bed three feet thick, which, however, thins out eastward to a few.

At the north side, the Killarney Coal "red" is working as far as Doolin bay, the beds being much contorted, and also faulted in many places. They are principally flags and grit, and some shale beds, and appear to be lower than those of the section last described. On the southern shore of Doolin bay are olive grit beds obliquely laminated, over black slate, dipping S. at 50° to 30°. Above the grits is another shale bed. The beds may be the representatives of those of Killarney and the "Collar," but this cannot be stated for a certainty, as the numerous small faults along the shore may have caused much displacement.

At the eastern side of Bally Bay, at the bottom of the cliff, the band of limestone formerly alluded to, and in all probability the same as that at Kilkee, is exposed. It lies nearly horizontal under black shales, which abound in fossils. The limestone beds here vary from three to five inches in thickness, and is full of encrinite stems and septaities. At the top of the cliff, and overlying the thick beds of shale, are olive grits, lying nearly horizontal; but at the "Telographe Strata" and Leamane Point they dip S.W. at 30° to 40°. Below the grits the underlying shales are visible, forming the sides of the little bay between Leamane and Dunagal Point, and in it, at the S.E. extremity of this bay, fossils are to be had in abundance.

S.E. of Dunagal Point, all along the northern shore of Fanore Bay, the overlying grits and shales are seen dipping S.W. at 20° to 30°.

6. Drift.

North of Ennis the country is more or less strewn over with clay, gravel, and boulders, the local debris of the limestone rocks. This drift extends over the Coal Measures in places, more than a quarter of a mile west of the boundary line. It is probable that all, or at all events the greater part of, the Coal Measures of this district were once covered over by limestone gravel, as patches of it are seen in several places. The small hills around Drumgal-lean lough, N.W. of Inch bridge, near the N. edge of 133, are all composed of limestone drift, more or less mixed up with the debris of Coal Measures, grits, and boulders, and pebbles from the Old Red sandstone. In the townland of Slievenan West, a quarter of a mile S.E. of the lough, the limestone boulder is sufficient quantity to render it worth while collecting them, for the purpose of burning for manure. On the drift is a covering of stiff whitish clay, from which tolerable good bricks can be made.

There is also a small patch of limestone gravel and boulders at the north side of the Owenafer river, a little east of Glandlagh House, near the S.E. corner of Sheet 132.

At Liscannan and Cloneton lengths, in the N.E. corner of Sheet 132, a bed of white or buff-coloured cherty marl occurs, of irregular thickness, overlying the limestone gravel. It seems to be principally formed of numerous fresh-water shells of existing species. The most abundant are

* Limosa perene,
* Limosa stagnalis,
* Ilyon argenteus,
* Eucnephyra marginata,
* Cyclas corinae,
* Vellera planiata,
* Siliquina testudinaria,
* Succinea patula.