EXPLANATIONS

TO ACCOMPANY

SHEET 152 OF THE MAPS

OF THE

GEOLOGICAL SURVEY OF IRELAND,

ILLUSTRATING PART OF

THE COUNTIES OF KERRY AND LIMERICK.

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, GREEN, LONGMANS, AND ROBERTS.

1860.

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 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.

Condensed memoirs on particular districts will also eventually appear.

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

AGENTS FOR THE SALE OF THE MAPS AND PUBLICATIONS:

Messrs. LONGMAN, GREEN, & Co., London;
Messrs. HODGES, SMITH, & Co., Grafton-street, Dublin;
Messrs. ALEX. THOM & SONS, Abbey-street, Dublin.

EXPLANATION

OF SHEET 152 OF THE MAPS

OF THE

GEOLOGICAL SURVEY OF IRELAND.

General Description.

The area included in this sheet of the map contains parts of two counties. A strip about three miles wide, running down the west side of the map, belongs to the county of Kerry; all the rest forming part of the county of Limerick. In the county of Limerick, the places of note are the small town of Newcastle and the villages of Abbeyfeale, Ardagh, Athea, and Mahoonagh, while those in Kerry are the villages of Newtown-Sandes and Duagh.

1. *Form of the Ground.*

There are two principal features in this district, the high undulating ground to the west, and the low champaign country towards the east. The latter is part of the plain that stretches over the greater part of the county of Limerick, this portion of it being on an average about 150 feet above the sea level. It is drained by the River Deel and its tributaries. This river enters the map on the S.E. at a level of 190 feet, and leaves it on the N.E. at the level of 120 feet, curving round the western termination of a low ridge, which, further east in sheet 153, is continued up to the prominent height called Knockfeerina. The low country spreading round this ridge is continued towards the west, to the foot of a rather steep and unbroken escarpment which forms the boundary of the higher land which occupies all the western side of the map. This is a portion of a wild and generally dreary tract, largely covered with bog and heather, that extends from Kanturk and Mallow, in the county of Cork, through the northern part of Kerry into the western part of Clare.

In the district included in Sheet 152, the ground rises from the valley of the River Deel, at first very gently, but afterwards more rapidly, to the edge of a kind of table-land which forms a line of heights running nearly north and south, some of them towards the south exceeding 1,000 feet in absolute elevation, but sinking to 700, and less, as they proceed to the north. The steepest and boldest part of this escarpment is that which lies just west of Newcastle, where, in less than two miles, the ground ascends from 400 to 1,132 feet in the peak called Knockanimpaha. This is the highest point in this map, but it is but very slightly elevated above the general level of the ground for some miles north and south of it. From this bold margin the table-land declines towards the west, in which direction it is furrowed by numerous valleys, traversed by the rapid waters of the Gale River, the Oolagh River, and other tributaries of the River

Feale. The Feale runs across the S.W. corner of the map, its water level having an elevation of ninety-eight feet where it leaves it. This then is the lowest point in the ground on the western, as that of the exit of the Deel is the lowest on the eastern side of the map. At the north of the map are the head waters of the streams, called the Glin, White, and Robertstown Rivers.

The views from some of the summits near the edge of this escarpment are very extensive, as is generally the case near the border of the coal measure districts in the south of Ireland. Perhaps the most extensive prospect in our district may be gained from the summit marked 917, about three-quarters of a mile north of Aughatliggeen Bridge, from which the eye ranges over nearly all the county of Limerick, and a large part of Clare, by the Keeper and Slieve Phelim Hills to the Galtees and Knockmealdowns on one side, and takes in many of the peaks of the mountains of Cork and Kerry on the other, including the Paps, the Reeks, Carrantuohill, and Mount Brandon.

2. *Geological Formations, or Groups of Rocks.*

Aqueous Rocks.

	Name.	Colour on Map.
	Alluvium, Bog, &c.	*Pale sepia.*
	Drift.	*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.*
Old Red.	c^3 Upper Old Red Sandstone.	*Indian red (dark.)*

Igneous Rocks.

None.*

c^3. *Upper Old Red Sandstone.*—Not more than about a hundred feet of the upper portion of this formation is found in the district under examination. It is composed of yellow and gray grits and sandstones, and red and greenish yellow shales and clay rock. The grits are frequently marked by dendritic stains caused by the infiltration of oxide of manganese along the joints.

The *Carboniferous Group* is represented by the whole of the Carboniferous limestone and a large part of the lower Coal measures.

The Carboniferous limestone may be divided into three sub-groups as follows:—

d^1. *Lower Limestone Shale.*—No rocks belonging to this sub-group can be actually seen *in situ* in the district included in this map, as a low band of country, covered by drift, occupies all the space where it could be found. In the adjoining sheet to the east (153), are places where it is well exposed on the flanks of the Old Red sandstone hills, and shown to have a thickness of about fifty feet.

d^2. *Lower Limestone.*—The lowest beds of the Lower Limestone

* Trappean ash may possibly exist interstratified with the upper limestone, but as no conclusive evidence of its existence *in situ* has been found, it is omitted, both from the map and explanation. *See note, page 12.*

are thin bedded, often interstratified with a few shales. It is of a dark blue colour, granular, fetid, inclined to exfoliate, and usually has veins of shale of a black, red, or gray colour running every way through the mass of the limestone. Above these there are gray limestones, in which the bedding is rarely perceptible, the rock being very much cut up by joints, and generally affected by a coarse cleavage and sometimes by oblique lamination. Except at the northern part of the district, very little rock *in situ* is seen, and its thickness is unknown, but it may be from 600 to 900 feet.

The rocks of this sub-group are generally rich in fossils; corals, encrinites, bivalve and univalve shells, and a few trilobites—the latter being abundant in some particular localities.

d^4. *Upper Limestone.*—Above the rocks just described, there comes a band of thin bedded limestone, very full of black chert, in layers and nodules. It is about thirty feet in thickness, and is taken as the line of demarcation to separate the rocks above from those below. For a considerable thickness above the chert band the limestones are dark and earthy, sometimes nearly black, often fetid, and generally thin bedded, with partings of shale; they are sometimes affected by a coarse cleavage. Chert is frequent in these upper beds, and occurs in some places very abundantly, especially near the base of the coal measures. The black shaly part of the limestone answers to the character assigned to the *Calp or Middle limestone*, and at first a threefold sub-division of the limestone was attempted. The difficulty of carrying it out, however, has led to its abandonment in this locality. In the northern part of the district, included in the map, the dark earthy limestone described above was separated from the coal measures by a narrow band of pale gray limestone, which was looked upon as a distinct subdivision, and called *Upper Limestone.* Its thickness, however, was not more than 250 or 300 feet, and the subdivision could not be traced, with any precision, either to the north or south of this map. It was, therefore, at last decided to group the limestones as an Upper and cherty limestone, and a Lower limestone without chert.

Fossils are much rarer in the upper than the lower subdivision, there being only a few univalves to be found, and in some few localities a number of trilobites.

d^5. *Coal Measures.*—These consist, as elsewhere, of alternations of grits, sandstones, and shales of many varieties, having thin beds of coal, fireclay, and clunch in the upper part of the series.

No general section can be given of the beds above the coal called No. II. Coal, as their exact position and thickness is undeterminable. Of the beds below, the following may be stated as the General Section:—

General Section.

	Ft.	In.
5. Upper beds, grits, shale, coal, fireclay, and clunch, *thickness unknown.*		
II.—Coal, *about*, . . .	2	0
4. Intermediate beds, ,, . . .	250	0
I.—Coal, ,, . . .	0	6
3. Grits and shale, ,, . . .	550	0

	Ft.	In.
2. Flagstone series, *about*, . . .	250	0
1. Black shale series, „ . . .	700	0
Total thickness, *about*, .	1,752	6

The black shale series lies immediately on the limestone, and is about 700 feet thick; the lowest part is generally very siliceous, and contains usually a few grit beds. Thin beds of clay also occur, and veins of Wavellite are sometimes found. This lowest part is nearly destitute of fossils; but over it the beds are flaggy, and in those are found posidonimya, which gradually give place, as we ascend, to goniatites and aviculopectens, while the shales often become concretionary, and form large spheroidal nodules. In the southern part of the district, and close to the supposed limestone boundary, these shales are full of the remains of grass-like plants.

Flagstone Series.—At the north of the district, in this subdivision, there are few or no flags to be found; but at the south, as will be seen in the *Detailed Description*, there are good flags, which are occasionally quarried to a slight extent. The flags to the north of Athea may belong to this series; but their exact geological position is uncertain. These flags are remarkable for the molluscan, annelidan, or other tracks found on them.

Nos. 3 and 4 of the general section are composed of alternations of grits, shale, and occasional beds of clay and clunch. Some of the shales are very abundant in fossils.

No. I. Coal has not been found anywhere in this district in such a situation as to allow of its being indisputably proved to be the lowest Coal; but as that bed is always so thin, it might easily be passed over without being remarked. There is said to be a coal about half a-mile to the N.W. of Glenastar House, which lies west of Ardagh. If there is a coal in this place, it must be the representative of this coal. The small coal that underlies that which was worked in the Carrigkerry Colliery, is also supposed to be the same.

The coal called No. II. Coal, is believed to be that which has been worked in the Sugar Hill and the Carrigkerry Collieries. It was also proved to the west of Barnagh Hill. The other coals found in the district, contained in this map, will be described in the *Detailed Description*.

Drift, Bog and Alluvium.—These do not need any general description distinct from that given at the end of the *Detailed Description*.

G. H. K.

---

3. *Relations between the External Form of the Ground and its Internal Structure.*

All the low ground on the eastern side of the map has the Carboniferous limestone for its subjacent rock, except in the little rise of ground about Knockaderry House (east of Newcastle), where the Old Red sandstone begins to crop out. The hilly ground which occupies the western two-thirds of the map, is composed of the Coal Measures, which here, as elsewhere in the south of Ireland,

almost invariably end in an abrupt escarpment overlooking a limestone plain.

If we looked at the inclinations of the beds of these three formations, as seen in the various detached quarries, or short natural sections, they would be found to be so various, that it would not be easy to group them in any regular order, or assign any general dip to the beds. The order of superposition of these formations, however, is well known; the Old Red sandstone being the lowest, and the Coal Measures the highest of the three. Guided by this clue the general arrangement of the rocks of this district is at once seen to be a simple and symmetrical one.

The Old Red sandstone rises in the centre of the east side of the map, in a short oval apse-like form, and the boundaries of the several sub-groups of the Carboniferous formation sweep round, that in wider and wider curves, till we reach the escarpment of the Coal Measures.

The northern part of that line of escarpment, indeed, after partially sweeping round towards the east, is again deflected towards the west, in obedience to the impulse derived from another centre of elevation situated to the north-east of the district included in this sheet of the map.

The beds then, of all the formations, have a general inclination towards the west, and are at the same time traversed by a low anticlinal curve, the axis of which strikes east and west through the centre of the map, rising gently to the east, or dipping gently to the west; while many minor parallel anticlinal and synclinal flexures exist on both flanks of the main one.

This "lie" of the beds has been imparted to them by the action of subterranean forces of elevation, which has at some very remote geological period lifted all these beds from the floor of the ocean in which they were deposited; and at the same time tilted them and crumpled them in the manner above described.

If this force, however, had acted alone, we have no reason to doubt that the Coal Measures would still have spread over the whole area, as they evidently did originally, and would have now existed as a lofty undulating ridge above the part where the Old Red sandstone crops to the present surface of the ground. That present surface has been formed by the action of another cause operating from above on the beds that had been thus disposed. This cause is that known as "Denudation," the result of the action of the sea, as the rocks slowly rose from out it, and the atmospheric forces of the "weather" since it so rose. By this action a vast thickness of Coal Measures has been removed from the whole district; some of the lower measures of that formation having been spared towards the west, while towards the east, not only have the whole of the Coal Measures been removed, but a large part of the limestone, and at one part the whole of it, so as to expose at the surface the Old Red sandstone that lies below it.

In this way, by the general and wide-spread, but rather unequal action of Denudation on the previously tilted and contorted rocks, has the present surface of the ground been produced.

J. B. J.

Detailed Description.

[The part of the district lying in the County Limerick was surveyed by G. Henry Kinahan; that belonging to the County Kerry by F. J. Foot, A.B.]

5.—*Position and Lie of the Rocks.*

Upper Old Red Sandstone.—About 200 yards to the eastward of Knockaderry House, are some yellow and gray compact quartzose grits* and sandstone, with greenish shale partings between the beds; they dip N.N.W. and W.N.W. at an angle of 15°. To the south of these, in the cutting for the road, are the same kind of grits overlying red and yellow clay rock. The latter is a very remarkable bed, and is well seen in this cutting. At the top and bottom it is of a red colour, while in the centre it is greenish-yellow—the different coloured portions having no regular boundary, but blending imperceptibly into one another; it breaks with a cubical fracture, and when exposed to atmospheric influence is soon weathered down into a clay. Under the clay rock are yellow grits. All these beds dip W.N.W. at from 10° to 15°. To the S.E. of this locality, on the road leading to the village of Mahoonagh are thin-bedded yellow grits and sandstone, with greenish-yellow shale partings. The first met with dip S. at 5°, and those situated still further S. at 25°.

These are the only localities where the rocks of this formation are seen *in situ* in this sheet of the map. In consequence of this paucity of evidence the boundary between this and the Lower Limestone Shale, as also the boundary between the Lower Limestone Shale and the Lower Limestone, have been drawn in solely by the physical features and appearance of the ground.

Lower Limestone Shale.—No rocks of this formation were seen *in situ* in the area contained in this map.

Lower Limestone.—The lowest beds of limestone to be seen in this district are exposed in a quarry that is situated about a mile to the N.E. of the village of Mahoonagh. It is dark blue, argillaceous, fetid, with shale partings between the beds; when weathered it is apt to peel off in flakes. The beds dip to the N.N.E. at an angle of 15°. In the river at Mahoonagh, very fossiliferous light blue and gray limestone was observed. It dips N.W. at 20°. One bed, about six feet thick, is nearly a true dolomite, and of an orange gray colour. To the S.E. of this, in the same river, gray limestone, without any bedding, is also seen. About one mile to the S.E. of Bunoke Bridge, along the road from Newcastle to Dromcolliher, gray limestone, in which no bedding is perceptible, is quarried. Gray limestone is also found to the S. of Newcastle, where the first A in Ardnacrohy Bridge is engraved on the one-inch map. At Newcastle the rock comes to the surface of the ground, being well seen in the River Arra, and also in quarries to the W. and N.W. of the town. It seems to dip to the W. at about 15°. Five miles to the N.E. of Newcastle, at Reens, there is gray compact limestone. To the N. of this, the uppermost beds of the Lower Limestone are well seen dipping N.N.W. and W. At St. Keiran's Well, which lies a little to the W. of Reens, there is a detached elevation of the Lower Limestone rising up through and surrounded by upper beds; here, as also in another similar locality which lies still more west, some of the limestone is of a purple colour. A quarry, about five miles to the south of Newcastle, and three-

* In some of these grits there are little fragments of slate which gives them a brecciated appearance. These, however, are not bits of rock that were broken off and incorporated in the grit as pebbles, but portions of clay that were drifted on the sandy beach at the time of the formation of the rocks, and the sand was indurated into grits and they into slate.

quarters of a mile N. of Ballintober House, has been opened on the junction beds of the Upper and Lower Limestone, the cherty beds, the lowest member of the Upper Limestone, being on the top of the quarry, and under them gray limestone, which is partly magnesian.

Near the N.E. corner of the map, at and to the S. of Golden Craggs, and also to the N. of Riddlestown Park and Kilcoole, gray and blue limestone was observed in which no undeniable bedding was seen, the whole being cut up by joints and a coarse cleavage. This remark is applicable to most of the Lower Limestone seen in this district. The Lower Limestone, which lies on the northern side of the map, is very full of fossils.

The boundary between this sub-group and the Upper Limestone over greater part of the district is to a certain extent an arbitrary one, as but little rock *in situ* was seen near it, in consequence of the country being so much covered with deep drift.

Upper Limestone.—To the S. and W. of Newcastle, excepting the quarry previously mentioned, there is no evidence of the existence of the Upper Limestone to be found, the plain being covered with deep drift. Three miles to the N. of Newcastle, at Ardagh, there is black and dark blue argillaceous fetid limestone, with black shale partings, dipping S.W. at 30°. N.W. of Ardagh, near Cahermoyle House, are black limestones, dipping S. at an angle of 15°. To the N. of these the same kind of rock is seen dipping N.W. at from 35° to 50° in four different quarries. About half way between Cahermoyle House and Elm Hill, the black limestone is affected by a coarse cleavage, and dips at 20° to the N.W. About 800 yards to the W. of Reens, the cherty beds, which are taken as the base of this sub-group, are seen with dark blue and black limestone over them, and surrounding the before-mentioned detached elevation of Lower Limestone. To the N. of this place, and to the W. of Ballykenry House, the limestone appears in various places, being generally cleaved into a coarse slate. The strike of the cleavage is N. 25° E.; its dip being nearly vertical. The beds dip to the N.N.E. at angles varying from 30° to 40°, in one place being as high as 60°. A little to the E. of Lisnacullia Castle, there is an extremely good building stone, a black limestone, the beds of which dip N.N.W. at 45°. About 100 yards to the E. of Tallyho Lodge, the limestone dips W. at 25°. Immediately S.W. of Riddlestown Park, there is dark blue and black limestone, dipping nearly S. at 40°. 200 yards on the W. of the same place, the rocks are undulating, with a general dip of 5° to the E. Just E. of Riddlestown Park, there is a quarry near the road in which the limestone is thin-bedded, interstratified with shales, and dips E. at 5°. The rocks contain many trilobites. Black limestone was also noted *in situ* about half a-mile to the N.W. of this, but the bedding and dip were undeterminable. On the road at the S. of Golden Craggs, near the I in Kilbradran, the black limestone dips at 20° to the S.W. About two miles to the S. of this, at the Mount William National School-house, the limestones, which are blackish and dark blue, make a good building stone, and are extensively quarried. They dip S.W. at angles varying from 10° to 20°. About two miles due W. of this last place, near a rath N.W. of the old castle, there is dark blue limestone. On the S. of the rath it dips S.S.W. at 20°. Half a-mile W. of this the limestone, which is black and dark blue, dips first S. at 45°, then S.W. and W.S.W. at 40°. Over this limestone, in the cutting for the road from Kilcolman to Ardagh, are thick black and blackish gray shales, dipping nearly W. at 40°. A little further W. on the hill are blue and white limestones, associated with which is siliceous ore of iron. These beds overlie the shales just mentioned. Due N. of this, on the E. side of the R. C. Chapel, is a quarry of blue limestone, full of strings

of calc spar. A little to the W. of Kilcolman, near the Grouse Lodge, is a hill of limestone thrown up by an anticlinal curve, the axis of which runs N.E. and S.W., and a fault running E.N.E. and W.S.W., with a downthrow to the southward or an upthrow to the northward. The united effect of the fault and the anticlinal is to cause the Coal Measure boundary suddenly to recede to the S.W. for a distance of three-quarters of a mile. The lowest beds seen here in the centre of the curve are gray limestones, over which are dark blue, with shale partings of a red ochreous clay.*

About two miles to the N. of this, where 429 is engraved on the one-inch map, there is a quarry of dark blue, thin-bedded limestone, dipping E. at 15°.†

The junction of the Limestone and Coal Measure is nowhere seen on this map, but it must necessarily run about where it is marked on the map.

Coal Measures.—All along the line of escarpment before spoken of, the lower shales of the Coal Measures are well seen. At the S. of the map, to the S. of Glenquin Castle, are black shales, in which are a few grits. They dip W. at 15°, S.W. at 15°, and near the Castle again W. at 10°. The lowest shales seen are very full of plants and shells. To the N. of this, and a little to the S. of the Old Church, there is an anticlinal curve in the beds; which dip S. at 85°, W. at 10°, and N.W. at 30°. They are exposed in a quarry by the side of the new road, and are composed of black shales and olive grits.‡

Up the road that runs in the wood to the N.W. of Lissurland House, a good section of the basal beds of the Coal Measures was examined, and the beds calculated to have the following thickness:—

Section No. 1.

					Ft.	In.
8. Olive and black shales, dipping	W. at	10°,	about	- -	52	0
7. Olive grits,	,,	10,	,,	- -	17	0
6. Black and olive shales,	,,	10,	,,	- }	202	0
5. Black shale,	,,	10,	,,	- }		
4. Olive grits,	,,	10,	,,	- -	35	0
3. Olive and black shales,	,,	10,	,,	70 0 }	110	0
2. ,, ,,	,,	5,	,,	35 0 }		
1. Olive shale,	,,	2,	,,	5 0 }		
					416	0

At the W. corner of the wood the section is interrupted, the country being covered with drift and bog, but half a mile of the bog being passed, its continuation is found in a stream, one of the head waters of the Allaghaun River.

Section No, 2.

	Ft.	In.		Ft.	In.
11. Olive and black shales, about	52	0	5. Black shale, about	17	0
10. Olive grits, with a few black shales, ,, .	68	0	4. Olive grits and flags, ,, .	240	0
9. Black shale, ,, .	106	0	3. Black shale, ,, .	205	0
8. Olive grits, ,, .	40	0	2. Olive grits, ,, .	21	0
7. Black shale, ,, .	25	0	1. Olive and black shales, ,, .	104	0
6. Olive grits and flags, ,, .	30	0		908	0

* This stone burns into an excellent lime, and is extensively used by the people inhabiting the hill country to the west. It goes under the name of the *Grouse Lodge Stone.*

† Between the last named quarry, Grouse Lodge, and Kilcolman, there is a long hill covered with drift and blocks of trappean ash and breccia, which seem not far removed from their matrix; but as it is not found anywhere *in situ*, it is considered advisable not to take them into account, as they may possibly have been transported by drift action from the trap district that lies to the N., near Shanagolden, in Sheet 142.

‡ These are likely to be the beds near the limestone; and if so, the latter rock would be found on the hill side at the E. of this quarry.

The lower beds of Section No. 2, and the upper beds of Section No. 1, seem to be the same beds, for in the bog that lies between them there appears to be an undulating curve. Evidence for this is seen in the little stream that runs to the S. of that in which Section No. 2, was computed; as a little to the N. of where the first N in Glenquin is engraved on the one-inch map, there are black shales dipping to the S.S.E. at 30°. All the Section No. 1, and the beds 1, 2, and 3 of Section No. 2, belong to No. 1 of the *General Section*, which here must be from 600 to 700 feet thick. Beds 4, 5, and 6, of Section 2, represent No. 2, of the *General Section*, and are 287 feet thick. About 50 feet of the lowest portion of them are excellent flags, and have been partially quarried. The other beds in Section No. 2, belong to No. 3 of the *General Section.* Part of No. 9, in Section No. 2, is very fossiliferous.

To the N. of Glenmageen, where the old road from Newcastle to Abbeyfeale crosses the hill of Barnagh, a partial section of the shale series is exposed, and from it only a rude approximation of the thickness of the beds could be made, as the boundary between the limestone and the Coal Measures lies to the E. of the escarpment in the low ground; and the basal beds of the latter are covered with deep drift. A section of this series is seen about half a mile to the N. of Garryduff House, in a ravine where the new road bends sharply to the W. It was calculated to have about the following thickness:—

Section No. 3.

	Ft.	In.
3. Olive and black shales, with a few grits, - - - -	90	0
2. Black shales, - - - - - - - -	240	0
1. Olive and black shales, full of spheroidal concretions in the upper portion,	420	0
	750	0

The basal beds in this section are also not seen, being covered with deep drift. Both at the W. of this section and of Barnagh Hill, there are outcrops of coals, which seem to be of the same coal. They will be referred to further on in this explanation. This coal is supposed to be about 600 feet over the highest bed in Section No. 3, and to be the Coal No. II. of the *General Section.* Going to the N., on the east face of Knockanimpaha, there are two or three sections of the basal shales, among which are a few thin grit beds. Along the division, between the Limestone and Coal Measures to the N.W. of Knockanimpaha, there is no good section of these shales; though in numerous places, near the boundary, different beds belonging to the series are seen, and are found to be very full of fossils. A section of the basal beds is exposed in a stream, and along the road to the N. of Cahermoyle, and in them are veins of Wavellite, and thin beds of clay. In one of these beds of clay, about 9 inches thick, were observed two round balls about the size of cocoa nuts. The outside of these balls was a shell about three-quarters of an inch in thickness, that enclosed clay, with little balls of Wavellite about the size of pistol bullets. Due west of Grouse Lodge the beds are very full of fossils.

A little to the N.W. of the old castle that is situated about three miles nearly due W. of Grouse Lodge, are gray and olive grits, that dip W. at 25°, and S. at 88°. To the W. of the castle are thin black and olive grits, which dip S., first at 20°, then 40°, and at the road are horizontal. To the S. of the road the grits are lying on a thick bed of black shales, which continue nearly horizontal up the stream for more than half a mile, when they begin to dip S. at 20°, and the overlying grits again make their appearance. Half a mile further S., black shales dip N. at angles varying from 10° to 15°; and at Bauraneag there are black shales on olive grits, that dip N.W. at 40°.

To the W.N.W. of Bauraneag, at the distance of about two and a-half miles lies Spa Hill, so called from a chalybeate spring that rises out of a bed of shale. About three miles to the W. of Spa Hill are olive and black shaly grits that dip S.S.E. at 35°. To the W. of these, at the place where the county boundary forms an angle to the W., are gray and olive grits and black shales, that dip S. at 50°, and N.N.E. at 20°, forming a synclinal curve. To the N.W. of this, where the road crosses the county boundary, are black and olive shales that dip nearly S. at 25°. They look like the shales over No. II. Coal. Immediately W. of Tullyleague are gray and olive grits, some of which are flaggy; they dip S.E. at about 30°. A little to the N.E. of Tullyleague is the same sort of rock, dipping E. at 15°. At the pointed angle of the county boundary, that lies about half-way between Tullyleague and Ballygoghlan, are olive and black shales, that dip N. at 10°.

Along the road that runs beside the parish boundary, and lies to the S.W. of Spa Hill rocks *in situ* are exposed. Where the boundary crosses the road are black shales, dipping nearly S. at 45°; to the west of these are olive grits that dip at 20° to the E.; under which are olive and gray grits and shales, that undulate with sharp folds, dipping E. at 15°, S.E. at 30°, S.W. at 10°, S.E. at 10°, and lastly, S.W. at 30°. Over these are olive grits and flagstones, on which are molluscan tracks and plants, together with olive and black shales. These are the beds that are seen along the road, and they all dip to the S.W., at angles varying from 40° to 60°; while a little to the N., at the farm house that lies to the S. of where 803 is engraved on the one-inch map, are olive and gray grits, flags, and shales, that dip nearly S. at 45°. Near where the road turns to the S. are black and olive shales, with a spheroidal structure, under olive spheroidal grits; they dip S. at 30°. Over these are black sandy shales and flagstones. To the N. of this are olive and gray grits, under dark blue grits, over which are black spheroidal shales. Where the road goes due S., olive grits and black shale, olive and gray flagstones and shales are seen, dipping S. at 30°, and S.S.W. at 25°. A little more S. are black and olive shales, that dip W. at 3°. In the stream that runs by the farmstead to the S. of the road are similar beds to those just described rolling along the stream in gentle undulations. To the W. of the road that goes to Athea, similar beds to those just described, are seen in the stream and in the cliff over the new road; they are at the S. of a large synclinal curve, the northern side of which has just now been described; they dip, first to the N.E. at 15°, and farther south at 35° to the N. Where the road turns to the W. is the top of an anticlinal curve; the beds, olive grits, flagstones, and shales, are nearly horizontal, with a slight dip to the W. To the S. of this the beds dip S. at 15°. From this to the S., for about a quarter of a mile, the beds are undulating, but at such a low angle as to be nearly horizontal; after this the beds dip S. at 30°. At the place where the stream turns to the W.S.W., under the second A in Nantinan, is a flag quarry; but unfortunately the flags are very much cut up with parallel joints, one set of which runs nearly N.E. and S.W., and dip S.E. at 45°, and the other N.W. and S.E., and dips S.W. at 70°.

Due S. of Spa Hill, and half a mile to the N. of Tooreendonnell, are olive and gray grits, flags and shales; the highest grit looking very like the seat rock of a coal; they dip S. at 20°. Over these is a thick bed of black shale. A little further south are olive grits, under strong light gray grits, the highest of which latter seem to be the seat rock of a coal.* Over

* In these two places no coal was found, the section not being sufficiently exposed; and unless basset pits were sunk, it could not be proved whether there is any coal or not at this place. The shales are very like those that are over the coals in other places.

these is a thick bed of shale, the lower part being black and fine, it gradually becomes coarse, and changes into a grey spheroidal shale, near the top. All these beds dip S. at 15°. The shale is capped by olive and gray grits, flags and shales; they dip in the same direction, first at an angle of 25°, and afterwards it is reduced to 10°. A little to the N. of Tooreendonnell the strike changes, and the beds dip S.E. at from 10° to 15°. At Tooreendonnell they dip S.S.E. at 20°, which dip rises to 55°, where the road crosses the stream. In the latter part of this section there are a good many beds of black shale. No more evidence is seen in this stream until it flows into the stream which is the parish boundary between Kilmoylan and Rathronan. At this place the rocks are found in the following order:—

Section No. 4.

7. Olive shales.
6. Black shales.
5. Coal, 4 inches thick.
4. Gray pyritous grit, 3 inches thick.
3. Black sandy shales.
2. Black shales.
1. Olive grits and flags.

These all dip S.S.E. at about 25°. On proceeding down the stream, gray and olive grits are met with, which dip S.W. at 20°, then become nearly horizontal; and further down the stream are found to dip S.E. at 20°. No more rocks are seen in this stream, as it flows through deep local drift. On proceeding back to where the stream forks, and on going along that which runs nearly E. and W., in about a quarter of a mile, there will be found the following beds:—

Section No. 5.

	Ft.	In.		Ft.	In.
7. Black shales,	–		3. Coal,	0	7
6. Coal rod,	0	2	2. Blue clay,	1	2
5. Olive grit,	1	0	1. Olive and gray grits and flags,	–	
4. Black shales, with a few thin grits,	–				

Bed No. 3, seems to be a higher coal than that in Section 4 (*bed* 5), and the rocks, bed No. 1, Section 5, to be the same as those that were mentioned as being found above the coal in the lower part of the stream. The beds in the last section dip nearly S. at 15°. The strike of these beds follows the course of the stream for half a mile. Where the parish boundary, between Rathronan and Dunmoylan goes to the S., the beds below No. 1, in Section 5, are seen in the stream. In a descending order they are as follows:—black shales, olive flags, olive grits, black shales, and olive grits, all dipping S. at 15°. Where marked on the map there seems to be a fault cutting off the beds to the east. On going a little further up the stream there are found—

Section No. 6.

	Ft.	In.
4. Black shale,	–	
3. Culm,	0	6
2. Blue clay,	1	2
1. Olive grits,	–	

dipping N.W. at 15°, and N.N.W. at 25°. The two feet of No. 4, immediately over the coal, abounds in fossils, goniatites, and aviculopectens; one of the former that was found was five inches in diameter.* The beds,

* The following are the species which were found by Mr. Kinahan in bed No. 4, section 6:—
Aviculopecten papyraceus.
Goniatites Listeri and crenistria.
Posidonomya, small species, probably membranacea.—W. H. Bailey.

No. 3, Section 5, and No. 3, Section 6, seem to be the same coal, which could not possibly be unless there was a fault where mentioned. What height any of these coals are above the limestone it is hard to say, as there are no connecting data between these rocks and those whose positions is known. The coal in Sections 5 and 6 may be No. II. Coal; and that in Section No. 4, No. I. Coal; but for these suppositions there is no evidence, except that the coals are about the proper distance apart, and the rocks seen in the road to the N.W., and before examined, may belong to the lower flags series, No. 2, in the general section.

To the S. of these rocks is the Gale River, which flows through Athea. Along this river there are many rocks *in situ*. At Athea are olive grits, which dip N. at 35°. In the stream that flows to the east of Parkmount, which lies E. of Athea, there is a good section. At the N. of the road are black shales, under olive and gray grits. To the S. of the road are black shales over gray and olive grits and flags, with a few shales, the uppermost grit looking very like the *seat rock** of a coal. These beds all dip N. at about 30°. A little to the N. of the Rath are olive sandy shales, and to the south of it are the following rocks, all dipping S. at 30°:—Gray grits, black shales, and gray grit, with a few black and gray shales. These last named rocks strike along the river up to the Glasheennabaultina River, and dip southwards at angles varying from 20° to 50°. In the south part of the last named river, is a section of the same beds, as will be enumerated in that part of the Gale River that lies to the E. of its mouth, and in the stream that flows from the Carrigkerry Colliery. To the west of Glasheennabaultina are alternations of gray, olive, and black grits, flags, and shales, and black nodular shales, all dipping S.W. at from 10° to 25°. Where the river divides there are gray and olive grits and flags, black shales, and a thin coal. Under these are gray grits and flags over olive and black shale, which seems to overlie a coal. These beds dip S. at angles varying from 50° to 25°. A little to the N.W. there is an anticlinal curve, in olive and gray grits, flags, and shale; the sides of it dip S.S.E. at 30°, and N.N.W. at 40°. A little farther up the stream there is also an anticlinal curve, which dips S.S.W. at 40°, and N. at 30°: it is in the same or similar beds to those just enumerated. From this up to the out crop of the coal that was worked in the Carrigkerry Colliery, the beds all dip N. at about 30°, and consist of alternations of olive and gray grits, and flags with black and gray shales. One gray grit is the seat rock of a small coal, which seems likely to be No. I. of the *General Section*; above which is black shale and olive and gray grit; and over this is a thin bed, three inches thick, of very black shale, which seems to be a *Kelve*†. Over this bed are black shales, which underlay the grits, the highest of which is the seat rock of the coal (supposed to be No. II.), that was worked in this colliery. Over this coal are thick black and olive shale, in which are a few grits. To the N. of the colliery the rocks are seen in a few places dipping S. at from 20° to 40°, being some of the beds that have been recorded in this section.

To the N.E. of the colliery in the Daar River, a section is seen of the beds that compose Nos. II. and III. in the *General Section*; but as the beds are undulating, it is not instructive. About half a mile to the N.W. of Glenastar House, there is said to be a coal; if there is, it is most likely No. I., and not worth working; but in that case, the out crop of No. II. ought to be found in the bog to the N.

* The fire clay under the coal is here, as usually in the collieries in the S. of Ireland, called *clay*, the clunch under the clay *the coal seat*, and the grit under the clunch *the seat rock*.

† *Kelve* is a shale full of carbonaceous matter.

On going back to the Gale River, and proceeding up it to the E., olive grits, under black shale, will be seen striking nearly along it, and dipping S. at about an angle of 45°. Where the river flows at the W. of Knockanimpha, the beds are undulating, dipping S.S.E. at 20°, N.N.W. at 30°, S.S.E. at 15°, and then S. at 30°.

To the W. of Sugar Hill is the source of the Oolagh River. The first beds met with are black shales; these strike nearly down the stream, and dip at from 10° to 30° to the N.N.W. To the west of Garryglass are black shale, olive grits and shale, and two beds of coal; they dip N.W.W. at 10°, N.W. at 35°, and W. at 35°. On descending the river about a quarter of a mile, olive and black grits and shales are seen dipping to the N., at angles varying from 50° to 60°. In these beds are two small coals, and under the V in river, the grit there seen seems also to be the seat rock of a coal. To the S. of these, where the M in Monagay is engraved on the map, the rocks, which are olive flags and grits, under black shale, dip S. at a low angle; and at the Tulligoline Colliery they are dipping S. at 25°. On going back to the Oolagh River, where we left off, will be found black shale that dips N. Where the stream that flows through the Crataloe Colliery enters this river, are black shales that dip N. at 30°. These are very remarkable beds, as they are full of thin layers of pyritous grit. These beds are met further W. in this same river, and will be again spoken of. Proceeding up the Crataloe stream, over these shales, are olive grits and black nodular shales, with the bed of culm which was last worked in this colliery, and flags, all dipping N. at 30°. The last named rocks form a synclinal curve, and to the north of Glenbridge the same rocks that have just now been enumerated are again met with, dipping S. at an angle of 80°. The bed of culm is also seen. Under the culm are black and olive shales and grits, all dipping S. and S.S.E. at about an angle of 65°. The preceding rocks are over black and olive gray grits and shales, in which there is an anticlinal curve, whose axis runs nearly E. and W. To the N. of the curve are olive and gray grits and flags, and black shales, some of the shales being very fossiliferous, all dipping N. at from 20° to 15°. Over the last-mentioned grits there is a bed of coal, with its accompanying fire clay under a bed of black shale. This shale lies in the trough of a synclinal curve, as a little further north the coal again crops out. This coal appears to be a much lower coal (see fig. 1, page 24,) than the bed that was worked in the Crataloe Colliery. No more rocks *in situ* are found in this stream.

In the Oolagh River, at the W. of the mouth of the Crataloe stream, olive and gray grits and flags are seen, dipping to the N.N.W. at about 40°. Near Oolagh Bridge are black shales, interstratified with thin pyritous grit, the same beds as were remarked under the coal in the Crataloe Colliery, which shows that the out crop of that coal must be a little to the north of this place.

A good section is seen in the Knocknasna stream, which flows into the Oolagh River, near the bridge of that name. Beginning at the N.W. of Gorteen, there are olive grits and flags, over black shales; these dip to the S.S.E. at the same angle, 15°, as the slope of the ground, and are found in the stream for half a mile. Where the stream from Gorteen joins this, there are olive flags and grits, that dip N. at 5°. Where the road comes to the stream are also olive grits and flags, which dip in the same direction at 5°. Under these are olive and gray grits, black shale, and olive and gray flags, all dipping N. at 15°. Where this stream flows into the Oolagh, and also farther down the river, are olive and gray grits and flags, that dip to the N.W. at 30°; they are likely to be the grits under the Crataloe coal. Lower down the river are more olive shales, grits, and flags, that dip to the N.N.W., at angles varying from 15° to 30°. The next rocks seen in the river are

black shales, that seem to be over a coal, and dip N.W. at 25°. A little to the N. of where the road from Portrinard to Abbeyfeale crosses this river, there is an anticlinal curve. On the north side of the curve the beds dip N.N.E. at 50°, and the following rocks are found:—black shales, in which there are plants and shells, clay, culm, olive grits and flags, and black shale, in which there are plants. At the south of the curve are the same beds, except that the part where the coal ought to be in, is now covered with drift, and it was not observed; they dip S. at 50°. At the bridge are black shales, which seem to be the same as those that were spoken of a little higher up the river, at the other side of the curve; here they dip S.E. at 25°.

If we fall back again to Sugar Hill, at the east of it will be found the Eeghaun stream. The beds seen nearest its source are olive grits, under black shales, that dip S.S.W. at 20°, and S.W. at 15°. A little further down the stream are the shales that underlie these grits, and that are over the coal, No. II. Coal, that was worked in the Sugar Hill Colliery. Under the coal are olive grits and flags and black shales, dipping N.W. at 15°; olive grits, and olive and black shales that dip N. at 15° and 25°. These beds lie to the N. of an anticlinal curve. At the south of it the same beds are met with, dipping S.W. at 40°. The crop of the coal was not observed, but it must be near where marked on the map. Over the coal are olive grits, and black shales, that dip S.W. at 30°. The next beds seen are olive and gray grits and flags under black shales; the latter being very fossiliferous. They dip W. at 25°. These beds form the side of a synclinal curve; the other side of which is seen on proceeding further down the stream, dipping N.W. at 10°; and the coal must again crop out a little to the S. of where the N in Monagay is engraved on the map. After the coal crop is passed the angle of dip rises to 25°. A little to the N. of the old road there is another anticlinal curve, the sides of which dip N. and S. at 40°. The coal must necessarily crop on the S. of this curve; and it appears to be under the black shales that lie to the S. of the place where the by-road crosses this stream by an old broken bridge. The beds here dip S. at 40°. A little to the N.E. of this bridge, where the old road crosses the river, the shales are flaggy, and have been quarried for flags. From the last crop of the coal to where this stream runs into the stream that rises at the W. of Sugar Hill, all the rocks seen are black shales. In the stream that is now come to a good section is seen. Beginning near its source, where the bog road crosses it, are olive grits overlying black shale. Under them are olive grits and black shales, that dip N.N.W., first at 75°, and lower down at 45°. The next rocks seen are black shales, that dip N. at 20°; under which are olive and gray grits and flags. These last beds, at the road that ends at the stream, are dipping N.; and to the S. of the road are black shales that dip W. at 20°. The next rocks seen, in descending the stream, are olive and gray flags and grits that undulate, but in such a way as to lie nearly horizontal. Under these are black shales, and olive and gray grits and flags. They dip nearly N. at 10°. For about half a mile to the N. of where the old road crosses this stream, the rocks are all undulating, bringing up always the same beds, which are black shales with a few thin grits. They seem to be those that immediately overlie No. II. Coal. From where this stream joins into the one before examined, down to where the stream that flows from Inchabaun bridge joins into them, the rocks undulate in sharp and gentle curves. In the stream to the S. of the Inchabaun National School the rocks dip with nearly the same inclination as the slope of the hill (20° to the N.W.); and the same beds, black shale over olive grits, are seen up it for half a mile. All the tributaries that empty themselves into this stream afford sections, but they are all of the same or similar rocks. In the stream

that flows to the S. from Tulligoline Colliery, there are, beginning at the N., black and olive shales, in which are a few thin grits, and three or four beds of coal. They dip N. at about 10°. Under these are olive grits and flags, interstratified with shales. A little to the N. of these is an anticlinal curve, and at the road a synclinal curve. This latter prevents the coals first met with from again coming in; but a little to the W. of the stream, along the old road, the coal-bearing shales are found in the trough of this curve; and in them one coal was remarked which is supposed to be one of these. To the S. of the old road in this same stream are alternations of olive grits and black shales, which dip N.W. at 25°, and N.N.W. at 45°. A little to the N. of where this stream flows into the Allaghaun River, there are similar beds, over which is a thin coal under black shales: they all dip S. at about 25°. At the E. of Ballaghbehy Colliery, a good section is seen of the beds that are under the coal that was there worked. The first beds seen in descending the stream are black shales, under which is a thin coal, that lies on olive grits; these dip nearly N. at 25°, below which, as well as near the road, and to the south of it, are beds of the same description as those described above. Below these are a few shales and olive grits and flags, dipping at 40° to the N.; and black shales that dip at 5° in the same direction. At the edge of the alluvial flat are olive flags dipping at 40° to the S.; which show that the last black shales mentioned are on one side of an anticlinal curve. Between this and Abbeyfeale, along the Allaghaun River, a few rocks, which are principally grits and flags, were observed in situ, but no continuous section is seen. At Abbeyfeale there are olive grits and shales lying above an anticlinal curve, which dip N.W. at 15°, W. at 10°, and S.W. at 10°. Where the boundary of the alluvial flat joins the river Feale, at the N. of Moysha House, the strata are lying horizontal over black shales, olive grits and flags. On the flags there are annelid tracks. In the stream that flows at the E. of Portrinard, and at the N.E. of that place, black shales, in which there are a few grits, are found lying nearly horizontal. These shales seem to be on the top of a coal; and a coal 12 inches thick is reported to have been proved here.

In the stream which lies to the N.W. of Portrinard, and that divides the counties of Kerry and Limerick, a broken section is seen. The first beds remarked are a little to the N. of Rathoran Bridge: they are olive flags, and dip S. at from 2° to 15°. Half a mile to the N. of these are olive flags, that dip S. at 15°. Higher up the stream are olive grits and a few shales, traversed by an anticlinal curve. They dip S. at 55°, and N.N.E. at 10°. The next beds seen are olive flags and grits under black and olive sandy shales, dipping N. at 15°. Over these are olive flags and grits lying horizontal. The uppermost grit is the seat of a 9-inch coal, which was proved in this place; though when visited no traces of its outcrop or smut could be observed. This coal lies under black shale. These latter beds are in the trough of a synclinal curve, as the beds are found nearly immediately to crop out to the N., and the coal smut was observed a little to the N. of the county boundary, dipping S. at 5°.

G. H. K.

At the N.W. corner of this sheet, at Tarmon Castle, in the county Kerry, is a quarry in which black splintery shales are seen, the dip being obscure. Eastwards in the stream N. of Tobermartin, a tolerably good section is exposed. The rocks are gray and olive shale, with some beds of strong olive grit, dipping to the S. at 10° or 5°. In the shale as we ascend in this section, a little N. of Tobermartin, is a band of iron stone 3 inches thick.

At the side of the same stream, and about one-fourth of a mile W. of

Tobermartin, are beds of olive grit and gray shale, lying nearly horizontal or dipping E. at 5°.

To the S. of this, towards Newtown-Sandes and beyond it, the great amount of local debris conceals the rocks to such an extent that hardly any sections are exposed, even in the stream courses. At the place where the road leading from Newtown-Sandes to Tullyleague crosses the boundary between the counties of Kerry and Limerick, black and olive shales are seen apparently dipping to the S. S.E. of this the Owenmoy stream exhibits a section in beds of olive grit and gray shales. A little W. of where this stream crosses the county boundary, and for a distance of about three-fourths of a mile to the S.W., the rocks seem to have a steady dip of 50° to the N. About 150 yards S. of the point at which the stream changes the direction of its course to N. and S., the beds become flat, and then dip S. at an average angle of 40° for about one-third of a mile.

At the ruined castle, and for half a mile S. of it, they are contorted, dipping N. and S. at low angles.

Then the stream again changes its direction, and flowing westward exposes in its bed strong grits and gray and olive sandy flags, covered with tracks probably molluscan. From this the section becomes discontinuous. Olive and gray shales are seen at intervals; but from about a mile E. of the village of Newtown-Sandes nothing is seen in the stream but local drift.

About two miles and a-half S.E. of Newtown-Sandes, at the trigonometrical point and height 373, are light gray and olive flags, obliquely laminated, lying horizontal, and exhibiting on their surfaces fragments of plants. 300 yards S.E. of the trigonometrical point another quarry exposes beds of olive and gray shale, which dip to the S. at 15°.

At Beenanaspuck Bridge, and S. of it, where the road between Gortaglanna and Athea crosses the county boundary, there is a small section in contorted beds of olive grits and shales. Westwards, at Glenruckaun Wood, a stream exposes horizontal beds of dark sandy shale, with olive grit bands. Southwards, the stream which, rising near the county boundary a little S. of Athea wood, flows into the river Feale about half a mile S.E. of Kilmeany House, affords an interrupted section in contorted beds of black shales and olive grits. On the N. bank of the river Feale, N. of Inchipatrick Island, are beds of olive grit, dipping S. at 20°.

At the stream which crosses the road N.W. of Duagh Church are quarries in horizontal beds of olive sandy flags and shale. On the same road, a little S.E. of the R. C. Chapel, are quarries of gray grits and flags, with partings of sandy micaceous shales, lying horizontal. At Kilcarra, and N. of it, the southern bank of the Feale exhibits horizontal beds of gray and olive shale.

The little stream S.E. of Kilcarra affords a noncontinuous section for about three-fourths of a mile, in beds of olive and bluish gray grits and black shale, which dip N. 20°, E. at an average angle of 20°. South of this, as far as the edge of the map, there is a large tract of bog, hardly any rock being visible. About one mile S.E. of the hamlet of Knockmeal, at N. side of the road, a quarry exposes beds of olive and gray shale, and grit bands, dipping S. 20°, E. at 25°. And half a mile eastward, on the side of the same road, is another quarry in similar beds, which dip S.E. at 10°. About one-fourth of a mile W. of Moynsha House, at the N. side of the new road, are beds of olive grit, with fragments of plants, underneath black shale, and dipping N. at 15°.

The road cutting E. and S.E. of Moynsha House, and the cliff bounding the alluvial flat on the W. bank of the river W. of Abbeyfeale, afford a section in beds of grit and shale, with small coal seams traversed by an anticlinal curve, the axis of which runs due W., or nearly so, of the village

of Abbeyfeale. At the N. side of the axis, they dip N.W. at from 30° to 10°; the amount of dip decreasing as we go northwards. At the S. side they dip S. at 25°. The following is the vertical section:—

Section No. 7.

	Ft.	In.		Ft.	In.
8. Thick beds of black shale, with grit bands,	–		4. Black and olive shale (about)	20	0
7. Indurated clay,	3	0	3. Coal smut, ? thickness,	–	
6. Culm and coal,	0	4½	2. Indurated clay,	2	6
5. Gray indurated clay,	0	1	1. Olive grits,	–	

In No. 8, minute univalve shells were observed.

At the S. side of the anticlinal the coals are not seen, as the section is not continuous; but about half a mile S.W. of Abbeyfeale, at the W. bank of the river, are beds of olive grit and shale (probably higher in the series than No. 8 in the above section), dipping S. at 40°.*

About half a mile to the E., in the townland of Abbeyfeale (county Limerick), a section is exposed in the little stream at the roadside. The beds are olive grits and black shales (some of them with concretions,) much contorted. Continuing this section southward, into Sheet 163, a seam of coal is seen where trial pits were sunk some years ago.

In two streams to the east of this, broken sections are seen in beds of grits and shales. Further eastward, about half a mile W. of Goulbourn Bridge, in the townland of Dromtrasna, a stream exhibits beds of grits and shale, having an average dip to the N. of 20°. A seam of coal occurs in it, which will be described below among the coals.

F. J. F.

Carrigkerry Colliery.—A coal was raised in this colliery twenty-seven years ago, but now all the pits are closed; and no information is obtainable, as the colliers that worked in it came from the county of Cork. It is said to be 15 inches thick, and seems likely to be No. II. Coal, as about 250 feet under it a small coal six inches thick, is seen in the stream that flows to the S.W., which may be No. I. Coal. This coal was first discovered in sinking a pit in the shale for road metal.† It was afterwards worked on the deep, and scarcely any of the crop proved; but it must necessarily run near where it is marked on the map.

Sugar Hill Colliery.—Three and a half miles to the south of Carrigkerry lies the Sugar Hill Colliery. In it was worked a coal which also appears to be the coal called No. II. Coal. This coal is said to be 18 inches thick; but of the old working no information is now to be obtained. This coal was also proved to the west of the Barnagh, where the smut was first discovered in an old car road, and afterwards when the Board of Works were running a line of road round the valley. I was informed by Mr. Maurice Wren, of Tulligoline, that the coal in this place was a bituminous coal.‡

---

* About three-fourths of a mile southward, in the county Limerick, coal is seen in the little stream crossing the road, and dividing the townlands of Abbeyfeale and Kilkinlea Lower. This will be mentioned in the explanation of Sheet 163 in which it occurs.

† It appears to be customary in this district to use these shales for road metal. They are locally called *gravel;* and even when good materials are close at hand, they apparently prefer to cart this very inferior stuff for miles, even down into the limestone country. Any indurated clay would make almost as good a road metal as these shales, since they "melt" into a clay when exposed for a short time to atmospheric influence.

‡ Mr. Maurice Wren is a very intelligent farmer, who holds a farm on the Earl of Devon's property. His knowledge of nearly all the coal crops in the country hereabouts was of great use to me. He seemed to have a natural taste for tracing the crops of the coal, and would go miles only to see one, having for his own amusement examined all the streams in those hills in search of them. The coal at Barnagh Hill

At Sugar Hill this coal was worked rather extensively, with pits near its outcrop, which was proved for some distance in the bog to the N.

Tulligoline Colliery.—This colliery lies about two and a-half miles to the S.W. of Sugar Hill. It was discovered in 1834 by Maurice Wren, who was cutting turf, and remarked that the lowest part of the peat seemed to be mixed with culm. On sinking a basset pit he found he was on the outcrop of a *slaty culm.**

During the time he was working this colliery, he sank a trial pit 37 feet deep, of which the following is the account:—

Section No. 8.

(Communicated by Maurice Wren.)

	Ft.	In.
7. *Binder*, thin grit,	2	0
6. Black *pencil*, shale,	18	0
5. *Slaty culm*, carbonaceous kelve, from 2 6 to	3	0
4. *Rotten pencil*,	9	0
3. *Soft pencil*, soft shale,	4	6
2. Coal,	0	6
1. *Clay*, fire clay, not sank into.		
	37	0

NOTE.—Bed No. 4 seems to be fire clay, or fire clay and shale mixed.

In a stream about a mile to the S.W. of the colliery, the following section was noted:—

Section No. 9.

	Ft.	In.
19. Black shale, over	10	0
18. Fine black shale, }		
17. Coal, ? }	8	0
16. Clay, }		
15. Olive grit,	1	9
14. Olive and black shales,	12	0
13. Fine black shale,	4	0
12. Culm,	0	5
11. Fine black shale,	2	0
10. Culm,	0	8
9. Olive shale,	3	0
8. Olive grits, with shale partings,	1	6
7. Culm,	0	5
6. Yellow clay,	2	0
5. Olive shale, }		
4. Coal, ? }	8	0
3. Clay, }		
2. Olive grit,	3	0
1. Olive and black shales, over	40	0
	96	9

The coal here lies in a synclinal curve; Section No. 8 being near its N. outcrop, and Section No. 9 on its south. From these sections it will be seen that there are more coals in the same measures at the south of the curve than at the north. The height of the coal that was worked in this colliery above the limestone is unknown.†

was observed by him when the Board of Works were making roads in the country; and according to his account the coal was 1 foot 6 inches in height, quite black, and burned with a bright flame. The place being full of water when the district was surveyed, the coal could not then be seen; but as it is most probably the same coal as that which was worked in the Sugar Hill Colliery (*see map and the supposed outcrop of the coal*), and as that is an anthracite, it would seem to be unlikely that it should be a bituminous coal at Barnagh Hill.—G. H. K.

* *Slaty Culm*, a highly carbonaceous kelve. Kelve is a carbonaceous shale. *See Minerals at the end of this Explanation.*

† This coal may be the same as that which was worked in the Sugar Hill Colliery; but in that case more coals have appeared here in the same measures. Or what is more likely, they are higher coals in the series. Their exact positions cannot, at present, be determined, on account of the want of the appearance of rocks *in situ* in this part of the coal field.

Garryglass Coal.—A mile to the north of Tulligoline Colliery, the following beds were noted in the Oolagh River, due south of the village of Garryglass:—

Section No. 10.

	Ft.	In.
10. Olive and black shales, over	15	0
9. Olive grit,	0	5
8. Black shale,	10	0
7. Culm,	2	0
6. Black shale,	20	0
5. Olive grit,	4	0
4. Black shale,	20	0
3. Culm,	1	6
2. Clay,	1	6
1. Olive grit, over,	5	0
	79	5

The two coals mentioned in this section may be some of those in Section No. 9.* They dip to the N.W. at 25°, but seem to flatten as they go under the hill. A little to the W.S.W. of this, farther down in the Oolagh River, there was a small coal pointed out to me by Mr. Wren. The following section was noted:—

Section No. 11.

	Ft.	In.
8. Olive grit, over	2	0
7. Black shale, about	40	0
6. Olive grit,	3	0
5. Black shale,	15	0
4. Culm,	0	5
3. Fine black shale,	0	5
2. Olive grit,	0	10
1. Black shales, in which there are thin grits and a coal rod, three inches thick, over	15	0

These beds dip N. at about an angle of 50°.

Crataloe Colliery.—This colliery lies due W. of the Garryglass coal, and nearly three miles to the N.W. of the Tulligoline Colliery. In it there has been a bed of culm,† fifteen inches thick, worked along its outcrop, none of the pits being more than forty feet deep. No section of any of the pits were able to be procured, as at the times they were visited the works had ceased, and the colliers disappeared. The beds that underlie this coal are seen in the bank of the river, a little to the N.E. of Oolagh Bridge, and the verge of the coal, must necessarily run near where the broken coal crop is marked on the map. The beds dip N.N.W. at about 30°. To the N.E. of Glen Bridge the same bed of culm was found outcropping to the S., the beds dipping S. and S.E. at a high angle, about 70°. There was an old working along this crop, all traces of which are now nearly obliterated. This outcrop was copied from Sir R. Griffith's six-inch map, which he was kind enough to lend us. In the stream that runs due S., at the north of Glen Bridge, there is a section seen which seems to be of the measure in which this coal lies. The following was noted at this place:—

Section No. 12.

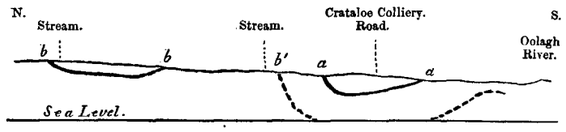
	Ft.	In.
12. Olive grits and flags, over	8	0
11. Black shale,	30	0
10. Culm,	0	4
9. Black shale,	1	6
8. Olive grit,	4	0
7. Black shale,	12	0
6. Coal (?), }	2	6
5. Clay, }	10	0
4. Olive grit,	3	4
3. Clunch,	5	0
2. Olive grit,	10	0
1. Olive shale, over		

* At the south of the district contained in this sheet, the coals are found very near together, much nearer than to the N. just S. of the Shannon. (*See explanation of sheet* 142.) Either the intermediate beds between the coals must have thinned out, or a greater number of coals have come in. The latter supposition is more likely to be correct than the former; as we find to the south of this four thick workable coals close together. (*See explanation of sheets* 163 *and* 174).

† The culm raised in this colliery seems to be a highly carbonaceous kelve; at least such was the culm lying at the pit mouth at the different times it was visited.

Bed No. 6 could not be seen; but there seems to be a coal there, and apparently it was the bed worked in this part of the colliery. The N. and S. outcrops of a coal are seen to the N. of this, where marked on the map. The N. outcrop, for the insertion of which we are indebted to Sir R. Griffith, dips S.S.W. at about 10°; the S. outcrop dips nearly N. at 7°. This latter is seen in the stream to the E., and in the west stream it was proved by Mr. Wren, in a shallow trial pit, which was sunk a little to the N. of where the crop is marked. The coal here has a thick fire clay under it, and appears to be a lower coal than that which was worked in the Crataloe Colliery (see fig. 1).

Fig. 1.



Section through the Crataloe Colliery to show the supposed relation of the coal.
Scale, 3 inches to a mile, horizontal and vertical.

a. Crataloe coal.
b. Coal seen in stream to the north.
b'. Supposed continuation of *b*.

To the S. of the Crataloe Colliery there is a coal crop, which was also taken from Sir R. Griffith's MS. maps. This we were not able to verify, as at the time it was visited the place was covered with peat bog. It is only a thin coal, and seems to be the same as that which is seen a little to the east, in the Oolagh River, and before described. (*See Section* 11, *Bed* 4.)

To the N. of Crataloe Colliery, on the N. slope of the Dromada Mountain, a small coal appears. Its outcrop is caused by mere denudation; the hill sloping N. at about an angle of 35°, while the beds dip in the same direction at an angle of 15°, (see fig. 2,) and from this cause

Fig. 2.

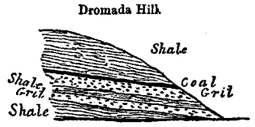


Diagram to explain the outcrop of the coal on the north slope of Dromada Hill.

exposing a downward crop of the coal. The coal is insignificant, being only seven inches thick. It lies on a hard *seat*, which is a pyritous grit. To the N. of this last coal, and S.W. of Carrigkerry Colliery, there is a small coal outcropping, at the forking of the Gale River, which lies due W. of Knockaunroe, where the following section was measured:—

Section No. 13.

	Ft.	In.
5. Fine gray grit, over	5	0
4. Black shale,	3	0
3. Coal smut,	0	6
2. Blue clay,	1	2
1. Gray grits, flags, and a few black shales, over	20	0
	29	8

Due N. of this, and S.S.W. of Tooreendonnell, are three small coals, which were before spoken at page 15.

Ballaghbehy Colliery.—Due south of Crataloe, and N.E. of the village of Abbeyfeale lies the Ballaghbehy Colliery. The coal that was worked in this colliery was first discovered by a man that was sinking the foundation for a house a little to the E. of where the height, 693, is seen on the map. He worked it along its outcrop for a short distance. In 1832 Maurice Wren sank a trial pit to the W. of the first working, near the road, of which the following is the account:—

Section No. 14.

(Communicated by Mr. Wren.)

	Ft.	In.
5. Black *pencil*, shale,	13	0
4. Black *rotten pencil*, fine shale,	4	6
3. Coal,	2	0
2. Clay,	1	6
1. *Brass binder*, pyritous grit, not sunk into,	–	
	21	0

He worked in this place a little, but only along the outcrop of the coal, which dips under the hill to the N. at an angle of 30°. It is a very good hard coal, and easily worked. The old basset pits are now all closed. The outcrop is traceable for about half a mile to the W. A little to the S. of the first working the outcrop of two small coals are seen in the stream that flows nearly S. The most northern of these is eight inches thick, the other is covered up at present; but the following is the account of a small pit sunk near its outcrop:—

Section No. 15.

(Communicated by Mr. Wren,)

	Ft.	In.
5. Black *pencil*, with shells, shale,	3	0
4. *Rotten black pencil*, fine shale,	6	0
3. Coal,	0	6
2. Clay,	1	0
1. *Hard sandy clay or seat*, clunch, not penetrated,	–	
	10	6

These coals are respectively about 150 and 275 feet below the coal that was worked in the Ballaghbehy Colliery. A coal which seems to be the same as the lowest seam (*Bed* 3. *Section No.* 15), was shown to me by Mr. Wren in a deep gully, cut by a stream that runs along the N. side of the old road from Abbeyfeale to Newcastle, and a little to the W. of the crossroads that lie to the S.E. of the colliery.

Old Colliery at the S.W. of Tulligoline, South.—S.E. of Ballybehy, and a little to the N. of Goulbourne Bridge, there is a small coal that dips to the S. at 30°. Pits were only sank along its outcrop, where it was from eight to twelve inches thick. It seems to be the same coal as that which was worked to the W. of Goulbourne Bridge, and described by Mr. Foot, when speaking of the Dromtrasna Colliery. To the E.N.E. of this, and to the S. of Tulligoline Colliery, in a small stream, a small coal was discovered by Mr. Wren, who says it is the same as the one that has just now been spoken of.

Two miles to the north of Abbeyfeale, in the Oolagh River, a small

coal appears in a low cliff, along with a good section of the neighbouring beds:—

Section No. 16.

(Measured by G. H. K. and F. J. F.)

	Ft.	In.
9. Black shale, over	30	0
8. Coal,	0	4
7. Pyritous ironstones and fire clay,	0	3
6. Culm,	0	9
5. Clunch,	3	0
4. Black shale,	6	0
3. Olive grit,	4	0
2. Black shale, and a few olive flags,	15	0
1. Olive grits and flags, over	20	0
	79	4

A mile to the N.N.E. of Rathoran Bridge, in the stream that divides the counties of Kerry and Limerick, a small coal was proved in a trial pit, four feet deep.

S.S.E. of the Sugar Hill Colliery, and two miles due W. of Glenquin, near the S. of the map, a small coal was sank on, but the working was abandoned, as the coal was unprofitable. It is supposed to be No. I. Coal.

G. H. K.

Dromtrasna Colliery.—This colliery lies due E. of Abbeyfeale, and about half a mile W. of Goulbourne Bridge. A coal was worked in it formerly, but now all the pits are closed, and no information can be obtained of the old working. The following section was noted in the stream that flows at the W. of the colliery:—

Section No. 17.

	Ft.	In.
13. Black shale, with Aviculo-pectens, Goniatites, &c.,	–	
12. Culm and Coal,	1	3
11. Clay,	0	2
10. Olive grit, ? thickness,	–	
9. Black shale, ? thickness,	–	
8. Culm,	0	6
7. Black shale,	1	0
6. Indurated clay,	2	0
5. Olive grit, ? thickness,	–	
4. Olive grit, with shale partings, ? thickness,	–	
3. Black shale,	15	0
2. Coal smut, ? thickness,	–	
1. Olive grit and shale partings,	–	

F. J. F.

6. *Drift and other Superficial Deposits.*

Drift.—Over most of the Limestone country to the E., and on the N.E. part of the Coal Measure table-land, there is Drift made up of gravel and clay, containing pebbles and blocks of limestone. The Drift of all the valleys in the table-land, whose drainage flows to the north, is full of limestone blocks and pebbles to such an extent that, after the winter floods, they are found in abundance in the beds of the stream, having been washed out of the banks. They are collected by the inhabitants, and burned into lime for manure. In the White River the drift also abounds in blocks of granite, syenite, trap, and trappean breccia. One boulder of breccia found in this stream was cemented together by a peculiar form of Wavellite, of a bright sea-green colour.* Another remarkable patch of this limestone drift is found in the valley at the West of Knockanimpaha where the river Galeyrises. The stream is full of blocks and pebbles of limestone, which are locally called *running limestone*, and are much prized by the lessor of the adjoining farm.†

* Specimens of this are in the Museum of Irish Industry, Dublin. It was analyzed by Mon. A. Gages, the Curator, who read a paper on it before the Geological Society of Dublin.—*See their Proceedings*, A.D. 1858, vol. v., page 153.

† One piece observed in this place is at least fifteen tons weight, and it lies at an elevation of about 700 feet above the adjacent limestone plain. When first seen it was supposed to be limestone *in situ*, protruding through the Coal Measures, as there are regular beds which dip N. at 8°, seen in the block; but on an examination of the Coal Measure rocks that lie a little way to the N. of it, they were found to be dipping S., and to be beds rather high up in those measures (part of No. 3 in the General Section).

The only probable cause for a mass of this drift being found here in an isolated patch is that now usually put forward by geologists, namely, that it was carried there by ice when the country stood at a lower level, so as to be below the sea, the iceberg being stranded on this hill and melted away, while the rocks and other insoluble matter that it contained, were deposited immediately in its vicinity. In support of this hypothesis, I may mention that all the blocks are polished and scratched as if they had been ground against other rocks when embedded in moving ice.

The drift to the N. of Glenastar House contains numerous boulders and pebbles of a siliceous hematite, which seems to be part of a vein of that ore, which will be spoken of presently.

None of the other drift is remarkable or economically important, being either local, *i.e.* derived from the immediately adjacent rocks; or subaerial, *i.e.*, deposited by the atmospheric action of rain and floods since the country was above water.

Bogs.—A great portion of the high-land has a peat covering, ranging from a few inches to nine or ten feet in thickness. These bogs are extensively used by the inhabitants of the plain to the east, who are supplied by them with fuel for twenty miles distance. Some of the bogs are systematically laid out, and properly drained; while others are in a state of confusion causing a great waste of the raw material.

Alluvial Flats.—These flats along the river are formed of the mud and silt carried down during floods. In the marshes to the north of Reens, a mixture of peat and argillaceous matter is being deposited, which is formed by the plants that grow in them being weighed down and covered by the silt and other matter carried into them during the winter rains.

7. *Minerals.*

The following mineral substances are found in this district:—Three varieties of coal, four kinds of iron ore, two clays and Wavellite.*

The coals are *Anthracite*, *Culm*, and *Kelve*.

The *Anthracite* is of a dark brown or black colour, a high metallic lustre, and often impregnated with iron pyrites.

Culm is an argillaceous exfoliating coal, which when taken from the working is in large flakes, and has a high metallic lustre, but when exposed to the atmosphere it crumbles and loses nearly all its lustre.

Kelve is a carbonaceous shale. When the carbonaceous matter predominates it can be used as a fuel.

The ores of iron are *Clay Ironstone*, *Siliceous Hematite*, *Bog Iron Ore*, and *Iron Pyrites*.

Clay Ironstone nodules and layers are found in some of the shale, but the ore is either so very poor, or it is so scarce, that it is of no economical value.

To the south of Kilcolman, which lies about four miles to the N. of the village of Ardagh, there is an old iron mine, from which a *Siliceous Hematite* was extracted. Specimens of this ore were examined by M. Alphonse Gages, Curator of the Museum of Irish Industry, and pronounced to be of

* Sir R. Griffith has recorded lead ore (*galena*) near the village of Mahoonagh, (*see Catalogue of Irish Mines and Mineral Localities, published June*, 1854), but we were unable to find out the locality.

little value, as the ore contained a very large quantity of silica. Blocks of similar ore were found in the drift as previously mentioned.

Bog Iron Ore is found in most of the bogs, and in some of the streams. A large vein of it was found running nearly E. and W. in the bog that lies to the N.W. of Glenastar House.

Most of the shales are impregnated with *Iron Pyrites* to a greater or less degree, but nowhere is it in sufficient quantity to be of economical importance.

The clays are *Brick clay* and *Fire clay*.

Brick clay is found in various places on the Coal Measure hills. At the east of Spa Hill there are works for making it into bricks and tiles erected by Colonel Dickson, M.P., on his property. In the vicinity of Newcastle there are small pockets of it in the limestone drift.

Beds of *Fire clay*, from six inches to two or three feet thick, are found under most of the beds of coal.

Wavellite was observed in the lower shale series of the Coal Measures. Two large veins were found in the townland of Lisgordan, a mile to the N. of Cahermoyle, the residence of William Smith O'Brien, Esq., and traces in many other places.

G. H. K.

Glossary of Local Terms used in this District.

Binder—A thin grit in a bed of shale.
Brown stone—The general name for a grit regardless of colour.
Brass—Iron pyrites.
Brass binders—A thin pyritous grit.
Clay—Fire clay.
Crag—When the limestone rock comes to the surface of the ground and forms a tract of broken country.
Granat—Coarse quartzose grit
Gravel pit—Quarries in shale. The shales are called *gravel* when they can be worked with the pick and shovel. They are extensively used for road metal.
Melt—Applied to a rock that falls to pieces when exposed to the atmosphere.
Pencil or Pincil—Black shales that can be used by carpenters to mark wood, &c.
Rotten pencil—Is applied to both black shaly fire clay, and fire clay mixed with shale.
Running limestone—Blocks or pebbles of the limestone in the drift.
Seat—Clunch or hard sandy clay below a coal.
Seat clay—Fire clay under a coal.
Seat rock—The nearest grit under a bed of coal.
Slaty culm—Carbonaceous kelve with so much carbon in it that it can be used for fuel.
Spa—Bog iron ore, and the oxide of iron, that is precipitated at the bottom of the waters that flow from a chalybeate spring.
Spar—White quartz. *Soft spar*—Cale spar.
Stone—Grit.
Stone coal—Anthracite.
Verge of coal—Its outcrop.

Dublin: Printed by Alex. Thom & Sons, 87 & 88, Abbey-street,
For Her Majesty's Stationery Office.

INDEX

Memoir No.188.