

EXPLANATIONS

TO ACCOMPANY

SHEET 101 OF THE MAPS

OF THE

GEOLOGICAL SURVEY OF IRELAND,

ILLUSTRATING PART OF

THE COUNTIES OF MEATH, DUBLIN, AND KILDARE.



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.

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, Jernyn-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 101 OF THE MAPS

OF THE

GEOLOGICAL SURVEY OF IRELAND,

ILLUSTRATING PART OF THE

COUNTIES OF MEATH, DUBLIN, AND KILDARE.

THE district included in sheet 101 chiefly lies in the county of Meath; two small portions of the county Dublin enter it: one at its N.E. and the other at the S.E. corner; and about two square miles of the county Kildare come into the western part of its southern margin.

The principal places included in this sheet are Trim, the county town of Meath; Dunshaughlin, Dunboyne, and Ratoath, with the smaller villages of Ashbourne, Garristown, Summer Hill, Rathmolyon, and Kilmessan, to which may perhaps be added the group of cabins which crown the summit of the celebrated Hill of Tara.

GENERAL DESCRIPTION.

1. *Form of the Ground.*

There is no very striking feature in the form of the ground included in this map. The S.E. portion is comparatively level in the neighbourhood of the villages of Dunboyne, Dunshaughlin, and Ashbourne, having only an average height of from 200 to 250 feet above the sea. As we approach the centre of the district the land rises into gentle eminences, which extend obliquely across it in a N.E. and S.W. direction, forming a wide undulating ridge, the highest summit of which is on its northern termination, and is the celebrated Hill of Tara, 512 feet above the sea; two miles to the east of this is Skreen Hill, 507 feet high, having Candle Hill (400 feet) adjoining it on the east. From both Tara and Skreen Hills most extensive views are obtained; and from the latter, though the lower of the two, it is asserted that land in eleven counties can be pointed out. The continuation of the range southwards includes the high ground over Killeen Castle, which has an average elevation of 400 feet; and that north of the old posting stage, called "The Cross Keys," which undulates from 400 to 440 feet. The ground still further south between Arodstown House and Paget Priory, along with the elevated plateau in the neighbourhood of Bloomfield and Garradice, has a mean level of about 400 feet, and the ridge terminates on the south at Gallow Hill.

The water shed for the whole of the district included in the map

runs along the south-eastern border of the broad belt of elevations just mentioned. The ground, as we approach Trim from them, slopes gently to the N.W., being eventually drained by the River Boyne, which enters the district on the N.W. margin of the map, close to Trim, at an elevation of 182 feet above the sea; and after passing in an easterly direction by Trim, Newtown, and Skurlockstown, it turns abruptly to the N.E., and passes out of the map at its northern margin, beyond the Abbey of Bective, at 140 feet above the sea, thus showing a fall of a little more than forty feet in a distance of nearly seven miles, or at the ratio of five feet 8 inches and a fraction per mile.

The streams which drain the N.W. slopes of the district are the Moynalvy River, which rises in the flat lands to the W. of Paget Priory, and runs N.W. right across the Summer Hill range for about three miles, to Clonmeath Bridge, when it assumes the name of the Clonmeath River; this it retains for only a mile and a-half, when it reaches Dangan (the original estate of the Wellesley family), when it is called the Dangan River; but after passing through that demesne, it finally assumes the name of the Knightsbrook River, under which appellation it falls into the Boyne, close to Skurlockstown. The next principal stream which drains this district, rises in the alluvial flats of Culmullin and Knockmark, south of the Cross Keys stage; it flows in very nearly the same direction as the former stream, and is first called the Derrypatrick River; this name it retains for about three miles, when it is known as the Boyetown River, under which name it falls into the Boyne, at Skurlockstown Castle. A third stream, still further to the N., and running also to the N.W., is called the Skane River; it rises in the boggy and alluvial ground to the N.W. of Dunshaughlin, and traverses the extensive alluvial flats which lie to the southward of the Castle of Killeen and Dunsany, and past the small village of Kilmessan, where it turns to the N., and flows out of the district on the northern margin of the sheet, adjoining Moortown.

The streams which drain the S.E. slopes of the Tara Hill range, are very numerous; those on the north of the map, draining the Skreen district, all run easterly, and fall into the Hurley River, which appears to have its rise in the boggy ground east of Curragha, on the bounds of the county Dublin, and which flows northward out of the map, past Macetown Castle, at an elevation of 160 feet above the sea. The other streams run to the S.E., past Ashbourne, Ratoath, and the cross-roads of Kilbride. South of the last stream is the Pinkeen River; and still further to the S.W. is the commencement of the Tolka River, which has its rise in the country adjoining Piper Hill (a small eminence of 339 feet), and flows out of the district on the S. margin of the map, adjoining Dunboyne.

The Hill of Bray, to the south of Laracor cross-roads, where a small fragment of a ruined wall is pointed out as part of the residence of Dean Swift, is a feature in the landscape when viewed from Trim; it rises only to the height of 115 feet above some alluvial flats, which are themselves but 210 feet above the sea, and yet a most extensive prospect is obtained from it, especially to the N. and W., where the hills of Louth and Westmeath are distinctly seen.

About four miles to the southwards of the Hill of Bray, is Summer Hill, 464 feet high, which also forms a well-marked object, as it is somewhat steeper on its north-western side than is usual with similar elevations in the county. Tara Hill* is, in its outline, very similar to that last-mentioned, and on its western side it is wooded to its summit, which is crowned by the parish church; this aids in making the hill a conspicuous object, which can be distinctly seen from Trim and the adjacent county. The Hill of Skreen, adjoining Tara Hill, commands the prospect to the N.E. and S., that to the W. being shut out by Tara Hill; it is only five feet lower than the latter, and on its summit are the ruins of an ancient church, with a high square belfrey attached to it at its west gable. Garristown Hill, which occupies the extreme N.E. corner of the district, resembles both the former elevations in general outline, and on its summit are the remains of a wind-mill, which forms another land-mark, visible for miles around. The small Hill of Crossmacool, which adjoins that of Garristown on the N.W., but the summit of which, 316 feet, lies out of the map about three quarters of a mile beyond its northern margin, also forms a feature in the outline of the county.

In the western half of this sheet there are many extensive alluvial flats, the largest being that which is drained by the Skane River, and which is six miles in length, and, at Dunsaney, one mile and a-quarter in width. The next in point of extent is that which receives the drainage of the head of the Derrypatrick River; this is about two miles and a-half from E. to W., by three quarters of a-mile from N. to S. Similar flats occur along the course of the Clonmeath or Knightsbrook River; and to the S. of Summer Hill is an extensive bog, which measures more than two miles from N.W. to S.E., by three quarters of a-mile at its widest part. This bog is memorable as being the scene of the slaughter of 3,000 Irish in the year 1647, by the English army under General Preston.

To the east and north of Dunshaughlin, and closely adjoining it, are two bogs, now reclaimed; the former is celebrated as having afforded, during the operations of draining, a wonderful collection of ancient Celtic weapons and ornaments, formed of flint, stone, bone, wood, bronze, and iron, associated with a vast quantity of bones and skulls of the horse, ox, cow, red deer, sheep, goat, pig, dog, cat, &c., &c.; and below the peat, in the marl, were discovered the remains of the *Megaceros Hibernicus*, or great Irish deer. The antiquities and recent bones were chiefly found in the centre of what was once an artificial island, called a Crannogue, circular in plan, and formed of wooden stakes; near to this, the remains of a flat-bottomed canoe were found: and, in the memory of many people of the neighbourhood, access to this island was both difficult and dangerous, as the way to it led over a shaking bog. Other smaller alluvial flats and bogs occur here and there over the district, the largest being those which extend into that portion of the county Kildare included in the map, a glance at which will explain their position and size.

* The ancient Celtic ruins on the summit of Tara Hill consist entirely of tumuli and circular mounds, and fosses of earth. The "Teach Miodchuarta," or Banqueting Hall, is a large oblong, rectangular earth-work, the sides of which bear evidence of having been pierced at regular intervals with wide apertures.

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

AQUEOUS ROCKS.

Name.		Colour on Map.
Alluvium, Bog, &c.		Pale sepia.
Drift (Limestone Gravel).		Engraved dots.
Carboniferous.	d ³ Coal Measures.	Indian ink.
	d ⁴ Upper Limestone.	Prussian blue (dark).
	d ³ "Calp," or Middle Limestone, not distinguishable from d ⁴ .	do., do.
	d ² Lower Limestone.	Prussian blue (pale).
	b Lower Silurian Beds.	Purple.

b. *The Lower Silurian.*—But a very small portion of these rocks is seen in the district on its N.E. margin: they consist of pale greenish-grey, close-grained, and evenly-bedded grits, with slate layers between them. The grits are frequently calcareous, and weather to a pale brown colour. Both sets of beds are rudely "cleaved" and very much jointed; the result being that they easily break up into small masses. As yet no fossils have been found in them here, though in their extension to the eastward they yield graptolites and other typical forms of the Lower Palæozoic beds.

d. *Carboniferous.*—In the district under review, this group can be separated into three divisions only, and the boundaries between them are, for the most part, purely inferential, owing to the fewness of the quarries or exposed rock surfaces, and the vast amount of drift which covers the country up to an elevation of 360 to 370 feet.

d⁴ *Lower Limestone.*—This rock is generally pale gray, finely crystalline and crinoidal; sometimes bedded, and sometimes not, when it presents the appearance of an amorphous mass, cut up by joints in every direction, and seamed with veins of carbonate of lime. In one instance, the upper portion of this deposit is thin bedded, and passes into a pale brown dolomite. It is only at the N.E. corner of the district, in the parish of Kilmoon, that the thickness of the Lower Limestone can be even approximately guessed at, and it can scarcely exceed 300 feet; in the southern and western portions of the map, however, it must be considerably thicker.

d³ *Middle or "Calp" Limestone.*—Not distinguishable from—

d⁴ *Upper Limestone.*—In this sub-division the rock is invariably evenly bedded and compact, of a dark gray colour, sometimes almost black. The beds are often separated from each other by layers of dark gray earthy or sandy shale. Black chert, especially in the upper part of the deposit, is common. These beds pass up by a gradual change in lithological character into the superincumbent Coal Measures. The thickness of this group, is in the Summer Hill district about 700 feet, but not more than 300 in the neighbourhood of Garristown and Crossmacool.

d² *The Coal Measures.*—The lowest portion of this deposit in the district can with difficulty be distinguished from the top of the Upper Limestone, the chief characteristic differences being a change from limestone to a very compact, dark gray calcareous grit, with layers of impure siliceous, or, often earthy, so-called limestones, or

highly calcareous grits. Above these the black shales become more abundant, and in some places they form a deposit possibly fifty feet or so in thickness, in which *posidonomyæ* are so abundant as to be seen in almost every portion of the shale, which may accidentally be taken up and broken. Above these shales the mass of the strata is made up of alternations of dark grey calcareous flags, earthy calcareous beds, which decompose into rotten stone; layers of shale often full of *Posidonomya*, *Goniatites*, *Aviculopecten*, and plant impressions, and other well-defined Coal Measure fossils. The estimated thickness of these lowest Coal Measures is about 700 feet at the most.

Above these beds the Coal Measures change completely and at once their mineral character and lithological structure; we now find them to consist of pale brown, or claret-coloured, and sometimes olive gray sandstones and grits, occasionally soft, but tough, and containing small flakes of mica, and sometimes specks of white felspar. Throughout these beds are layers of soft brown, sandy shale, which are frequently full of calamite impressions and fragments of *stigmara*, and such like typical coal plants. As these sandstones are the uppermost of the Coal Measure rocks of the district, their total thickness of course cannot be determined; I have, however, estimated the amount seen in the Summer Hill basin at a maximum of 300 feet; we have, therefore, a total thickness of about 1,000 feet for the Coal Measures of that particular district. Although belonging to the group of rocks called Coal Measures, it must be clearly understood that *no beds of coal will be found* in them. The lowest thousand feet of the Kilkenny Coal Measures are entirely destitute of coal.*

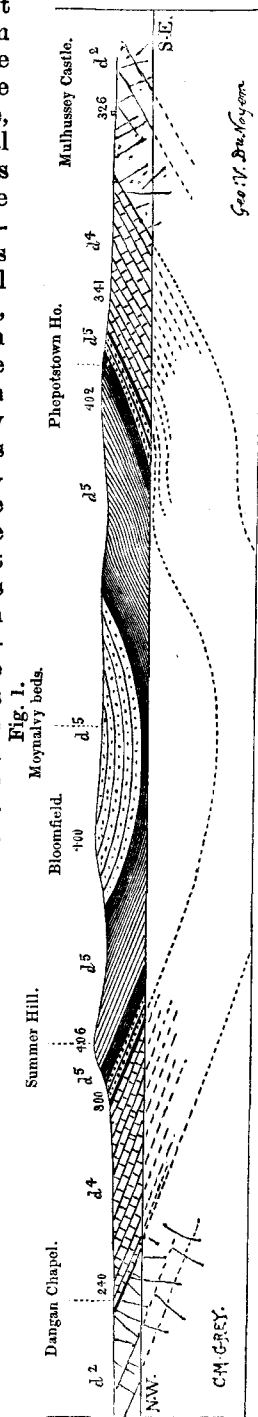
3. Relations between the Form of the Ground and its Geological Structure.

The relation between the form of the ground and its internal structure is quite similar to that which is apparent in most districts, formed partly of carboniferous limestone and partly of Coal Measures; the latter occupies the higher grounds, and the former the lower. An exception to this, however, occurs in the country along the banks of the Boyne, from Trim to near the Bridge of Bective, as the basal beds of the Coal Measures which occur there do not form any distinct physical feature rising above the adjoining limestones. The slight elevation in the limestones called Bray Hill, is also an exception to the general rule, as it rises to about 100 feet higher than the adjoining limestones in the low ground, though it is presumed that they do not differ in compactness or density from those forming the hill; the beds there, however, have been upheaved and contorted, and thus been originally thrust up to a higher relative level than those surrounding them.

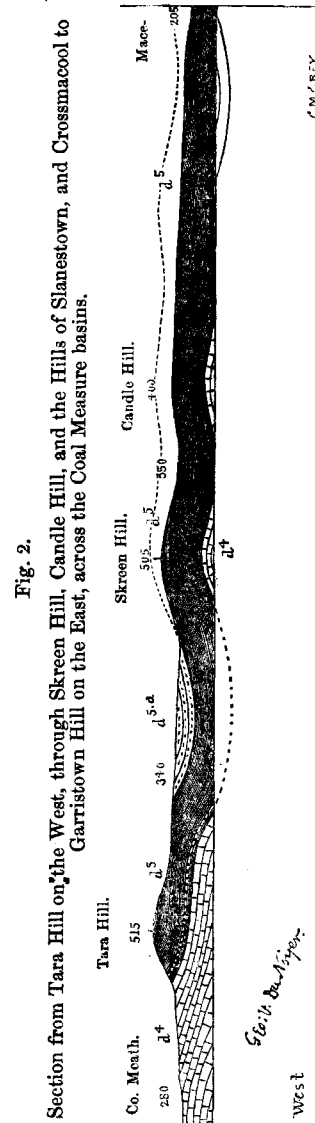
The forces of upheaval which have been exerted over the area in-

* The beds here called Coal Measures are, most probably, the representatives of the Upper Limestone shale of Derbyshire, and the bottom part of the Millstone Grit. They are, however, the same beds as those which in Kilkenny and all over the south of Ireland, are coloured as Coal Measures, and have therefore been so coloured here. All Geologists are aware that the subdivisions of the Carboniferous system are after all but local groups, and that in some places, as in Scotland, for instance, it is all Coal Measures from top to bottom.—J. B. J.

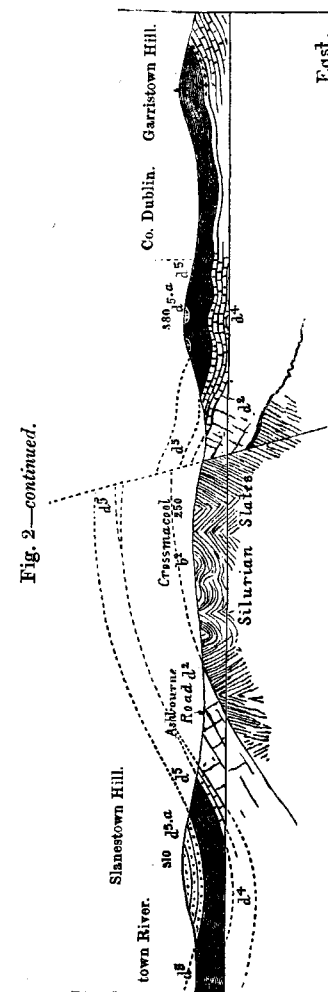
cluded in this map, have in the main bent the rocks in such a way as to form them into five irregularly shaped basins, in the hollows of which rest the Coal Measures (see sections, fig. 1 & 2.) Doubtless, at one time, the whole district was covered by these Coal Measures, but this partial upheaval has brought the lowest portion of the limestone to the level of the upper rocks, while subsequent denudation has cut both sets of beds down in such a way as to leave the Coal Measures in detached basin-shaped masses, having the limestones dipping towards them and surrounding them on all sides. In the N.E. corner of the map the Lower Silurian rocks appear in such a manner as to show that they were elevated, and their beds denuded before the deposition of the carboniferous rocks, since different parts of the limestone repose on different parts of the Lower Silurian. It is even believed that originally the Coal Measures may themselves have rested directly on the Lower Silurian in some places in the neighbourhood, without the intervention of any limestone. Since the formation of the carboniferous rocks other movements have taken place, and the beds have been both bent and broken through by dislocations, which have changed the level both of Lower Silurian and carboniferous. Great though these disturbances were, they have left at present scarcely a superficial trace to indicate them, as the levelling and planing action of the subsequent denudation have smoothed down almost all inequalities. While the upper portion of the limestone has been bent into troughs containing the Coal Measures, the lower part of the same deposit, where it appears at the surface and is farthest from the upper, has necessarily been curved into elongated dome-shaped forms, from all sides of which the upper beds of the limestone dip or slope away. In the western portion of the district it is inferred that the lowest limestone beds which occur there are bent into an arch-shaped curve, part of one of those domes, the beds of which incline to the N.W. and N., in one direction, and to the S.E. and E. in the other; and in this manner eventually disappear below the overlying rock. Subsequent denudation has smoothed



Section from Dangan R.C. Chapel on the N.W. to Mulhusey Castle on S.E. across the Summer Hill Coal Measures.
Scale—One inch to one mile horizontal; three inches to one mile vertical.



Section from Tara Hill on the West, through Skreen Hill, Candle Hill, and the Hills of Slanestown, and Crossmacool to Garristown Hill on the East, across the Coal Measure basins.
Scale—One inch to one mile horizontal; three inches to one mile vertical.



Scale, one inch to one mile horizontal; three inches to one mile vertical. The formations are distinguished by letters, for explanation of which see p. 8.

appears on the S.W. margin of the map, the northern termination of a low hill of Coal Measure which occurs in the adjoining portion of the county Dublin.

It is remarkable that rocks which are argillaceous, shaly, or earthy in their composition, and cut up by cleavage, appear sometimes to have stood the wear and tear of denuding forces better than those which are much more hard, and to all appearance less indestructible. The reason is to be found in the jointed structure of the latter, and the fact that the former yield to breaker action in small fragments or chips, the result of its peculiar cleaved structure. In all stratified rocks the beds are separated, not only by the seams of stratification, but by two or more sets of joints, into blocks, more or less cuboidal. In granites, greenstones, and other igneous rocks, the sets of joints are even more numerous than in those which are stratified; these joints are frequently very open, and allow of the percolation of water, which exerts either a chemical or mechanical effect, and sometimes both. Blocks thus naturally loosened from the parent mass, are of course easily acted on and detached by breakers, tides, and currents. In limestones especially, the joints are often very open, owing frequently to the dissolving power of the acidulous waters that percolate or flow through them; and when waves break on such a partially corroded mass, they exert a vast mechanical motive power. Ice forming on the shore may often remove such naturally separated blocks.

Such are a few of the most obvious causes which may have given to the limestone formation of Ireland its generally low and comparatively level surface, while the softer and apparently more destructible Coal Measures were left here and there as eminences or raised plateaus, above the limestone plain.

G. V. D.

4.—Palæontological Notes.

From the Upper Coal Measure grits described hereafter by Mr. Du Noyer, he obtained the following fossil plants, which, although fragmentary, are of a very interesting character; they consist principally of the jointed and fluted stems of *Calamites*, a group of succulent plants, very characteristic and abundant in the shales and sandstones of the Coal Measures.

*Moynalvy Glen, County Meath—Sheet 4³.**

Calamites cannaformis, *Schlotheim*. × † | *Calamites Steinhauerii*, ? *Sowerby*.
,, *ramosus*, *Brongniart*. | And other large stems of plants.

One of the above specimens, *Calamites Steinhauerii*, is the base of a stem having a series of impressions or pits, where the rootlets were attached; a second referred to *Calamites ramosus* shows the cicatrice of attachment of a branch; with these were associated other plant stems, having a smoother surface, one of them being a large flattened and twisted stem, from one and a-half to two inches in diameter, having a finely striated surface, with occasional depressions connected with irregular grooves. These plant remains occur in loose sandy shales, full of smaller fragments, and from the nature of the deposit would appear to indicate a drifted condition.

* Each sheet of the six-inch map is divided into quarters, of which 1 = N.W., 2 = N.E., 3 = S.W., and 4 = S.E. quarter, so that 4³ means the S.W. quarter of sheet 43.

† The mark × indicates the abundance of the species to which it is attached.

From the Coal Measure shales at Agher Quarry, county Meath, Sheet 42.4, the following species were determined:—

Small branching plant stem.	<i>Aviculopecten variabilis</i> , <i>M'Coy</i> .
<i>Posidonomya membranacea</i> , <i>M'Coy</i> .	<i>Orthoceras Steinhauerii</i> , <i>Sowerby</i> .
„ <i>Becheri</i> and <i>costata</i> , <i>do.</i>	<i>Goniatites crenistria</i> , <i>Phillips</i> .
<i>Aviculopecten papyraceus</i> , <i>Goldfuss</i> .	„ <i>spiralis</i> , <i>do.</i>

From the Townland of Culmullin, County Meath,—Sheet 4³, the following fossils were procured:—

Large dichotomous plant stem.	<i>Aviculopecten papyraceus</i> .
<i>Posidonomya</i> , <i>Becheri</i> , and <i>membranacea</i> .	<i>Goniatites crenistria</i> and <i>spiralis</i> .

From the Townland of Curroghtown, County Meath—Sheet 4³.

Posidonomya membranacea and *Goniatites*. ×

From the Townland of Glane Great, County Meath—Sheet 3⁷.

Posidonomya membranacea. × | *Goniatites crenistria* × and *spiralis*.

From Primetown Quarry, County Meath—Sheet 3⁸.

Posidonomya membranacea. ×

From Skurlockstown Quarry, County Meath—Sheet 3⁷.

Plant stem.

From Summer Hill Quarry, County Meath—Sheet 4³.

<i>Posidonomya membranacea</i> .		<i>Goniatites spiralis</i> .
----------------------------------	--	------------------------------

From the Quarry N. of Mitchelstown House, County Meath—Sheet 3⁹.

Surface of shale bed, with tracks of mollusca.

From the Townland of Clonfane, County Meath—Sheet 3⁹.

Goniatites spiralis. ×

Townland of Killeen, County Meath—Sheet 3⁷.

Plant stems.

Posidonomya Becheri, *Goldfuss*.

Goniatites.

All the fossils just enumerated were collected by Mr. Du Noyer.

The most characteristic fossil in this collection is the *Aviculopecten papyraceus*, a bivalve shell, abundant in true Coal Measure strata wherever situated. A less common species, the *Aviculopecten variabilis*, from the same locality, I also found in Coal Measure shales on the south bank of the Boyne, near Drogheda, and in the townland of Westown, county of Dublin. The shales at Agher, county Meath, are full of *Posidonomya*, a genus of thin and concentrically furrowed bivalve shells, a species of which, described by Professor M'Coy as *Posidonomya membranacea*, occurs at most of the localities, well preserved, and often with both valves; another and smaller species is much more abundant, the shales being often charged with individuals of all sizes. From the excessive wrinkling of their thin shells, some of them would appear to be identical with *Posidonomya costata* M'Coy, which may possibly be merely a wrinkled variety of *P. Becheri*, a species so beautifully preserved in the shales of Loughshinny. Of the Cephalopoda a small *Orthoceras*, with fine transverse striae, from Agher Quarry, doubtfully referred to *O. Steinhauerii*, I obtained also at Loughshinny, accompanied as here by numerous specimens of *Goniatites spiralis*, a concentrically striated species; like the *Orthoceras* easily identified. The most abundant of the *Goniatites* appears like it to be *G. crenistria* and *G. spiralis*, which, like all the fossils in these Coal Measure shales, are much compressed.

The identification of the majority of the species in the above list, with fossils found at Drogheda, Westown, and Loughshinny, indicates the occurrence of the same prevailing conditions during the formation of the Coal Measure shales at all these localities.

November 10, 1859.

WILLIAM H. BAILY.

DETAILED DESCRIPTIONS.

[The whole of the district comprised in this sheet of the one-inch map, was surveyed by Mr. George V. Du Noyer, by whom also the accompanying explanation of it has been drawn up.]

5. Position and Lie of the Rocks.

At the N.E. corner of the map, on its northern margin, there appears the extreme south-western end of a large and somewhat elevated district, formed of Lower Silurian rocks, which can be traced the whole way from the coast westerly to this locality.

The portion under review is only one mile and a-half from E. to W., and about three-quarters of a mile from N. to S., and appears as a gently rising low hill, the summit of which is only 316 feet in elevation, and is distant about three-quarters of a mile beyond the northern limit of the map. These rocks consist of pale gray and greenish gray, evenly bedded, close grained grits, with argillaceous bands of a similar colour, both being much cut up by joints and a rude cleavage, the former traversing the rock in every direction; the planes of the latter having an average strike of either E. and W. or W. 30° N., inclined to the southwards, at from 60° to 75°. Owing to all these beds being split up in the manner described, they make but indifferent building stones; some of these grits are often calcareous, and weather to a pale brown colour. The rocks just alluded to are best seen in the townland of Piercetown—sheet $\frac{3}{4}$ of the six-inch maps.

On the west side of this low boss of Silurian rock, the Lower Carboniferous Limestones which appear as an amorphous pale gray, finely crystalline rock, seem to be deposited on them as on the shore of a sea, though the junction of the two is nowhere to be seen, and the boundary between them as drawn on the map, purely inferential. On the east side, however, the case is very different, for in the low grounds of Moorpark and Piercetown the Lower Limestone, similar in lithological character to where it is observed on the W., approaches to within a few yards of the Silurian rocks; and close to the farm houses, in the latter townland, certain gray, cherty, dove-coloured dolomite beds, supposed to represent the Upper Limestone, dip at the Silurian slates at an angle of 20°; and this, taken in connexion with the other peculiarities in the mode of occurrence of the limestones, indicate that their junction with the lower rocks is a fault, such as that shown in the map and in section fig. 2. This may be called the Crossmacool fault.

From the peculiar position of the Coal Measures in the neighbourhood which we are now describing, it is quite evident that the Upper Limestone is rapidly thinning out or becoming overlapped by the Coal Measures, and a little less denudation would have shown them resting directly on the Lower Limestone, as they certainly do adjoining this locality, close to the village of Rathfreigh, a short distance north of Slanestown, just out of the map. See section fig. 2.

The Crossmacool fault is further proved by the fact that the Coal Measures, which form the main mass of Garristown Hill, are traceable along the stream which there forms the boundary between the counties of Dublin and Meath, into the alluvial flats of Primetown, which appear, from the only available evidence (a boss of pale gray finely crystalline limestone, on the boundary of the county Dublin), to be occupied by the Lower Limestones. The estimated thickness of both Lower and Upper Limestone, at Piercetown, where they adjoin the fault, is not more than 750 feet.

The next locality where the Lower Limestone can be seen in the eastern portion of the map, is distant from the former fully ten miles and a-half in a straight line; it is at a quarry adjoining the Carriers stage, called "The Hatchet" (sheet $\frac{3}{4}$ of the six-inch map). These beds, however, belong to

the very uppermost part of this deposit, if indeed, they should not be classed with the beds of the Upper Limestone—and may be thus described: dip S. 30°, E. 25°; thin, evenly bedded, light gray, compact limestone, having a highly conchoidal fracture, beds varying from twelve to four inches in thickness; black chert layers and segregations abundant, and the beds often parted by seams of black shale. In this instance, the colour of the rock, as well as the dip of the beds, favours the supposition of its being nearly the top of the Lower Limestone.

From this point to the eastern limits of the district, and over that space coloured on the map as Lower Limestone, which extends for ten miles in a straight line, with an average width of three miles, there is not to my knowledge a single quarry opened; the boundary, therefore, of this rock as shown on the map is one of inference, and has been determined from a few scattered quarries around it, though rather distant from it, in the Upper Limestone.

About one mile and a-half S.W. of the quarries, at the Hatchet, unmistakable Lower Limestone appears in the townland of Mulhussey, adjoining the castle; it is here a pale gray compact or finely crystalline amorphous-looking rock, the bedding not being discernible in it; where it appears in the field northwards of Mulhussey Castle, there is a thin dyke-like mass of brown quartzite, full of cavities, which are coated with crystallized carbonate of lime; the apparent strike of this "dyke" is N.W., but it can be traced only for the distance of a few yards. It may be an infiltrated vein filling up a fissure in the limestone.

The rock which we are describing does not again appear in this district till we find it in the demesne of Rahinstown, distant seven miles from Mulhussey; here it is light gray compact or finely crystalline, having numerous veins and irregular segregations of carbonate of lime, it is distinctly though irregularly bedded, the dips being from 10° to 25° eastwards, and is at present quarried for burning as well as building.

Northwards from this locality the Lower Limestone does not show at the surface for the distance of fully four miles, when it appears on the road side in the townland of Umberstown Little (sheet $\frac{3}{4}$), here it is light gray, finely crystalline or compact, full of crinoidal fragments, and no dip discernible. Close to this on the north is Bray Hill, where the Lower Limestone shows in great force, the greater portion however being quite amorphous, but on the brow of the hill to the W., and just on the summit, its beds dip from 20° to 35° to the westward and northwards; it is in some places full of crinoid fragments.

Bray Hill completes the list of localities where the Lower Limestone can be seen in the district, and we shall now note the occurrence of the Upper Limestone.

In the N.E. corner of the map, adjoining Meadsbrook, the Upper Limestone is by no means well developed, being represented by a few beds of thin, pale gray and dove-coloured, compact and cherty, dolomitic limestone; indeed, it may be questioned if any of the true Upper Limestone appears at this place, as it is highly probable that it is here overlaid by the Coal Measures in the same manner as at Rathfreigh, to the N. of Slanestown Hill, just beyond the north border of the map, and which is explained in the diagram (fig. 2). It is partly from the peculiar position of these beds that the fault between them and the Silurian slates on the W. has been held to be proved.

At the quarries on the Hill of Kilmoon, distant from the last observed beds, about two miles to the S.W., the Upper Limestone is well exposed. It consists of thin, hard, black compact limestone, with occasional hard, shaly beds and thin chert layers, and some of these beds burn freely to form lime, though they are chiefly sought after for building purposes, the Lower Limestone making the better mortar. The dip of the Kilmoon beds is S.E., at only 5°, and on the northern flank of the hill, northwards, at a slightly in-

creased inclination. In consequence of these gentle undulations, though the rocks extend over a large space of ground, their stratigraphical thickness may be inconsiderable, probably not more than 250 feet. These beds in their extension to the east must rise so as to overlap the Lower Limestone, and dip S.W. or in the opposite direction to that where they were first observed at Kilmoon. On the flank of the hill to the south of Windmill Stump, 402, in the townland of Kilbrew, there is a large quarry, which is interesting, as exposing the lowest beds of the Coal Measures, or the uppermost of the Upper Limestone, the latter supposition being, however, the more probable. These beds dip S. 15° , E. at 30° , and consist of bands of black, flinty shale; black, finely laminated, calcareous and earthy grits, which weather rusty; two beds of dark gray compact earthy and impure limestone, which are separated from each other by a band of black laminated shale, three feet thick; the calcareous beds containing bands of chert. Notwithstanding the occurrence of limestones in the section just described, the general aspect of the beds has more the character of Coal Measures than any group of the subjacent limestone. Though in the counties of Carlow, Tipperary, and Clare, the transition from true limestone to the black earthy deposit of the Coal Measures is sudden and well defined, this does not appear to be the case with the same rocks in the counties of Dublin, Meath, and Kildare; here the passage from one to the other is by gradual changes and alternations, the black shales increase in thickness and frequency, the limestones become more siliceous or argillaceous as they pass up into the Coal Measures, eventually giving place to close grained dark gray grits, which are frequently calcareous and micaceous.*

In that part of the county Dublin, which joins the parish of Kilmoon on the east, and to the S. of Garristown, as well as close to that village, the Upper Limestones are well exposed in many places, they are all thin bedded, very dark gray, with bands and nodules of chert through them, and layers of black sandy or earthy shale. A quarry near Tobergregan House shows these beds in a tolerably instructive section, and is important as defining the southern limit of the Coal Measures of Garristown Hill. North of Garristown, adjoining the village, a quarry is opened in the very topmost beds of this Limestone, and is therefore of value as explaining its lithological character, which does not differ from the beds last described on the road side. Near the old church of Cookstown, one mile to the W. of Ashbourne, a few evenly bedded dark gray compact limestones appear, and from their position it is supposed that they belong to the lower beds of that group; about three miles in a straight line to the W. of this, and in the lands of Lagore House, on and near the bye road, there are two quarries in the Upper Limestone—the beds are thin, very dark gray, with shale layers, and all dip to the northwards at 55° , an inclination in them which is clearly local. Close to Dunshaughlin, a few quarries in this limestone have been opened, which expose dark gray compact beds, with dark gray shales; those on the N. of the village dip to the southwards at 30° , and those on the opposite side to the northwards at 5° , rapidly curving over to the eastwards at 45° , these beds appear to occupy a middle position in the group.

Before the Upper Limestones are again seen in this district, we have to pass over an extent of two miles and a-half of ground, lying to the northwards of Dunshaughlin. They are there observed at two localities, in Smiths-

* At Mallow, county Cork, in the railway cutting north of the station, there is a thick band of limestone (now a brown rotten stone), full of well-known Carboniferous fossils: this occurs in the lower part of the black shales and flags of the Coal Measures; and in the county Clare, Mr. Foot has described a similar limestone band, under similar conditions. A few beds of good limestone in the Irish Coal Measures, or a few layers or beds of sand grit or conglomerates in the associated Carboniferous Limestones, are no proof that the beds belong to other groups than those so named.

town and Berrillstown townlands, on the great northern road appearing as thin gray compact, but impure limestones, having soft earthy shales between them. In the northern of the two quarries the beds are siliceous, the surface smooth, with layers of dark gray shale between each.

Adjoining Killeen Castle, on the north, and appearing in the stream which runs through the demesne, limestone beds very similar to those last described are seen, the only difference being the increase of the shales amongst them, and that they are contorted. From this stone the modern portion of Killeen Castle has been built. I should mention, that some beds of dark gray, thin, and compact limestone, having a dip to the northwards of only 10° , appear in the S.E. angle of Sheet 5⁸, distant from Dunshaughlin about two miles. These belong to the upper part of the Upper Limestone, as the black shales of the Coal Measures are observed not very distant from them on the N.

The top boundary of the Upper Limestone, which runs along the western slopes of Tara Hill, and the high land to the S. of it is well defined, both by the physical features of the ground and the occurrence of three quarries in such positions as to expose what are evidently the junctions or passage beds between these rocks and the Coal Measures. These limestones are best seen in the stream which supplies Dunsany Mill. They are dark, gray, compact, thin-bedded, and impure, with shales between the beds, the dip of all being S.E. and S. at 35° . About half a mile above the mill, similar beds appear, having a dip to the N.E. and then to the N.W., at from 40° to 35° respectively. Close adjoining, higher up the stream, are the black shales of the Coal Measures.

The low knoll called Crockaphobble (423 feet), lying to the west and at the foot of Belpore Hill, affords a quarry which exposes what are clearly the passage beds from the Upper Limestones into the Coal Measures; the lower part of the quarry shows thin evenly bedded limestones parted by thin layers of black shale, which pass upwards into thin, dark gray, earthy shales, and bands of hard, compact, black, semi-calcareous grit, the dip of all being E. at 10° . To the N. of this on the Odder Castle road, two quarries have been opened in beds which appear to be on the same geological horizon as those last observed. They are siliceous, black, impure limestones, calcareous fine-grained grit, with black earthy shales between. Some of the lower beds in the eastern quarry resemble good Upper Limestone, and are sought after for burning—said to make most excellent lime. These, from the dip of all the exposed beds being to the S. at 10° , would overlie the siliceous layers first described, and on the top of all the black Coal Measure shales appear.

About one mile to the S.W. of these quarries, in the townland of Ringletown, two quarries have been opened in the Upper Limestone; the beds are thick and thin, compact, with black chert layers, and thin seams of dark gray shale, and thin slaty layers between the thicker beds; the dip being eastwards at 15° .

For the distance of nearly two miles and a-half in a straight line N.W. from the last-named quarries, the Upper Limestone does not appear at the surface; we then find it at a small quarry on the roadside S. of Bective Bridge, the beds being black and compact, with black chert nodules, and black shale partings, the dip being N.E. at 20° . At Bective Bridge, near the mill, a few thin flaggy looking black calcareous beds, with black shales, appear, nearly horizontal. These may possibly belong to the Coal Measure series, but from the want of further evidence, it is deemed advisable to include them in the uppermost beds of the Upper Limestone. Half a mile to the N. of Bective Bridge, on the left bank of the Boyne, an extensive quarry is opened in these limestones, the dip of the beds being N.E. at 10° . In appearance and lithological character, they are quite similar to the other Upper Limestones so often described before.

A few beds in the Upper Limestone again appear at Skurlockstown Castle on

the Boyne, three miles and a-half to the S. of Bective Bridge. These also so closely adjoin the Coal Measures, that they may be considered as passage beds from the limestones. They consist of dark, gray, compact, and earthy calcareous beds, and thin flags with black sandy and earthy shale partings. On the latter plant impressions are frequent, the dip of all being to the N. at 20° .

From Skurlockstown to the N.W., over the remainder of the district included in the map, there is not a single quarry opened in what is supposed to be the Upper Limestone.

Adjoining the cross-roads called "Batterjohn Big," on the Dublin road, four miles S.E. of the last-named quarries, beds in the uppermost part of the limestone we are describing are quarried into, the dips being S.E. at from 5° to 20° , in which direction they underlie the Coal Measures which appear close to them on the E. They do not differ from those previously described. Between Batterjohn cross-roads and the village of Summer Hill, a distance of four and a-half miles, there is but one quarry to be seen in the Upper Limestone. It occurs on the summit of the rise of ground in the townland of Clonmeath, and exposes thin and evenly bedded gray and dark gray compact limestones, with thin seams of gray earthy shales; the beds in the upper portion of the quarry contain black chert in thin layers. Some of the so-called limestones are very siliceous, and are unfit to burn. Dip of all, S. 30° E. 20° ; thickness of exposed section, about twenty-five feet.

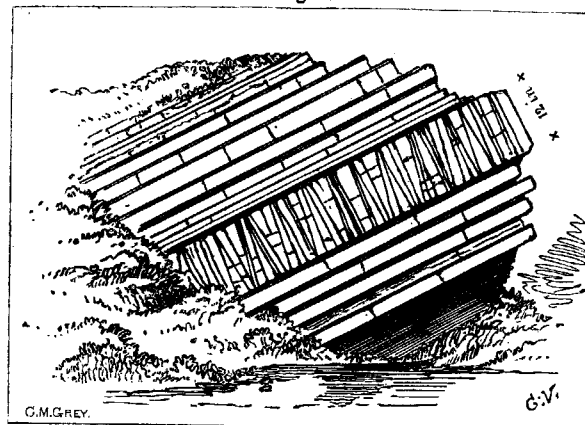
Over the whole extent of ground between the quarry last-named, and that with a dip of 70° to the N.W. adjoining Jenkinstown Bridge, distant from the former not less than twelve miles, along the supposed run of the Upper Limestone, no place can be found where this rock either comes to the surface or has been exposed by quarrying. The boundary now drawn between it and the Coal Measures is, therefore, one inferred from evidences which were obtained of the presence of the latter rock, coupled with the form of the ground. To the north of Jenkinstown Bridge, the quarry opened there is now almost filled with water, the tops of the beds are alone seen, and they appear to dip to the N.W. at 70° . One would expect to find these beds, at some such inclination, just at this spot, since the Lower Limestones appear in the flats of Mulhussey, near the quarry on the south, and the Coal Measures approach very close to it on the N. The space between them, however, is quite sufficient to allow of the existence of more than 700 feet of rock, even at a much less angle of inclination than that observed.

The last quarries which we shall have to notice in the Upper Limestone, are those which appear at the cross-roads of Culmullin, S. of the R.C. Chapel. Here, however, as in one or two former instances, the beds are close to the undoubted Coal Measures, and it is difficult to decide on the exact line of boundary between them. They consist of black, earthy, compact, calcareous grits, and impure limestones, with earthy black shales, and calcareous, close-grained, flaggy grits. These beds appear in the stream which drains the extensive drift-covered flats which lie to the S. of Culmullin House.

d. Coal Measures.—The principal area of Coal Measures which occurs in this district, may be called the Summer Hill basin. This is nine miles in extent from the southern base of Killeen Hill on the N.E., to the alluvial lands S. of Agherpallis on the S.W.; and four miles in its greatest width, or from near Arodstown cross-roads on the N.W., to the fall of the ground adjoining Jenkinstown House on the S.E. The outline of this trough is somewhat irregular on its eastern and southern sides, but nearly a straight line on its western limit. The beds of Upper Limestone were observed to dip towards this basin wherever they can be seen around it, and the Coal Measures dip towards its central portion, in which direction the beds all flatten so as to be nearly horizontal. It may be well to commence the details of these rocks by taking them up where we last described the occurrence of the topmost beds of the Upper Limestone, viz., at the cross-roads of Culmullin, S. of the Chapel.

Here the upper part of the exposed section becomes full of beds of black shale, along with beds and bands of black and dark grey, close grained, earthy calcareous grits. These are supposed to belong to the Coal Measures, as they all, especially the shales, contain coal measure fossils in more or less abundance, the most marked of which are *Posidonomya*, *Aviculopecten*, flattened *Goniatites*, and plant impressions. On the side of the road leading

Fig. 3.



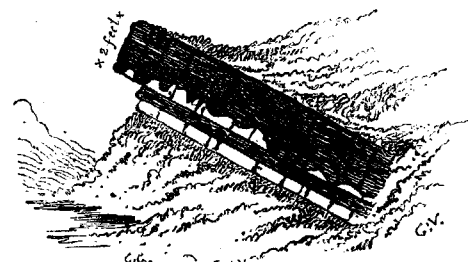
Quarry in lower beds of the Coal Measures.
Sheet 43.3, Co. Meath, Culmullin cross-roads.

to Culmullin House, adjoining the cross-roads just named, a quarry has been opened in these lower Coal Measures, where a few of the shale beds are so very black, earthy, and friable, that they closely resemble what the miners term "pindy," or coal mud. Here also a black calcareous compact grit band exhibits such a number of joints at right angles, or nearly so, to its bedded surfaces, as frequently to break up into thin flags, the width of which corresponds to the thickness of the bed, which is twelve inches (fig. 3.)

On the south as well as west of this locality, in the townlands of Curraghtown and Culmullin, the Coal Measure rocks are tolerably well seen in two small quarries; the dip being in the former to the S. and W. at from 5° to 10° ; in the latter, N.W. at from 20° to 30° . The beds consist of black, siliceous, flaggy layers, finely laminated, and thin, hard, calcareous grits, with black shales. At Paget Priory, two miles to the south, black shales with *Posidonomya* also occur. Gallow Hill, which is distant about three miles to the S.W. of Paget Priory, is the next locality where the lower Coal Measures appear at the surface; they consist of black earthy shales, with black calcareous sandy layers, containing small specks of mica, and weathering to a pale brown colour. The general inclination of the beds is northward and westward at a maximum angle of 30° , dipping into the hill, from the Upper Limestones to the south. An excellent exposure of some of the lower beds of the Coal Measures, is seen on the roadside S. of the R.C. Chapel of Agher, where the high ground of Garradice slopes rather abruptly to the west: the lowest exposed beds are black shales, in the upper part of which are thin layers of black close-grained grit, and at the angle in the road, is a thin layer of black, earthy, impure limestone, which weathers to rottenstone of a rusty brown colour. Layers of black chert are common in all these calcareous grit layers. The dip of these beds is to the east at from 5° to 15° . Along the N.W. margin of the Summer Hill Coal Measure basin, there are several quarries, which, though far apart, afford conclusive evidence. The most southerly is that close to Agher cross-roads. From the position of these

beds, they are assumed to belong to the very lowest portion of the Coal Measures, if, indeed, the absolute line of boundary between them and the Upper Limestones might not be drawn through the centre of the quarry; the lowest beds are black, very compact, ringing, but impure limestones, with black shales, above which the shales increase in number and thickness, while the calcareous beds become thin and cherty. Near the top of the quarry is a bed of black earthy shale containing a band of nodular iron pyrites. Well-marked fossils occur throughout all these beds, especially in the uppermost, the most common being *Posidonomya* in vast abundance and showing both valves, small as well as large flattened *Goniatites*, and plant impressions. These beds have a steady dip to the eastwards of 30° , an inclination which, I think, is the maximum throughout all this basin. At the distance of two miles N.E. from Agher, in Summer Hill Demesne, a large quarry exposes a set of beds which are evidently next in succession to those last described. Here we find thin, evenly-bedded, black, micaceous and calcareous grits, with black, sandy, or earthy shales between them, a few thin chert layers, and evenly-bedded, black, compact, dark grey, impure limestones, if they can be so called. At the top of the exposed section, which is close on forty feet, the black shales predominate, and are filled with *Posidonomya* and flattened *Goniatites*. The dip of all is S. 30° , E. from 20° to 25° . Adjoining this quarry on the east, is a smaller one, exposing beds which are above all those in the great quarry; here we find absolute beds of black flint, an example of which is shewn in fig. 4.

Fig. 4.



The thick black bed is chert.
The thin shaded layer, siliceous grit with chert nodules.
The light beds, calcareous, approaching a gray limestone.

For the distance of five miles, in a straight line, N.E. from the Summer Hill quarries, there is not a single bed of these lower Coal Measures seen till we reach Warrenstown Hill, 413 feet in elevation. Here some very important quarries have been opened, the dip of the beds being nearly due S. at 20° . They do not differ much from those last observed at Summer Hill, and the *Posidonomya* continue to occur in great abundance in the shales. In the most northern of these quarries there are several beds of very earthy dark gray limestones, or highly calcareous earthy grit, which decompose rapidly into a dull brown rottenstone; but these being the very lowest beds of the Coal Measures, the calcareous passage beds may be expected. This completes the list of quarries opened in the lower Coal Measures of the Summer Hill basin.

If we proceed in the direction of the dip of the beds last observed, we find that at the distance of 550 yards S.E. from the summit of the hill, there is a sudden change from black flinty shales, which may be seen in the by-road leading to the townland of Gibraltar, to pale brown sandy micaceous grits, and soft sandy shales, the beds of which are frequently parted by thin seams of black earthy shale. These grits are exposed in a quarry at the

E. corner of this townland, having a dip of 35° to the S.E., with the black shales under them. It is singularly fortunate that this quarry should exist, as by means of it we have the key to the complete structure of the Summer Hill Coal Measure basin, as well as that portion of the Tara Hill and Slanestown Coal Measures which comes into the limits of this map, and, lastly, the Garristown Hill basin. The extent of these Upper Coal Measure grits at this locality is very trifling, their E. and W. extension being estimated at three-quarters of a mile, with a maximum width of 500 yards, and a thickness of not more than 150 feet. From the fact of a small quarry having been opened in the black earthy layers below these grits, on the side of the old road between the two Cross Keys, in which the beds incline to the N.W. at only 10° , it is evident that they occur in the form of a shallow basin, deepest on its N.W. side. The grits from this quarry has afforded the materials for the walls of Derrypatrick Demesne, and the buildings recently erected in the neighbourhood.

Over the comparatively high ground between Baltrasna House and Ards-town House, and at the other side of the Glen of the Moynalvy River, over the plateau surrounding Bloomfield House, directly in the centre of the Summer Hill basin, are grits and sandstones, precisely the same as those we have just described; they extend for more than four miles in a N.E. and S.W. direction, with a maximum width of over a mile and a-half. In the district I am now describing, these rocks are familiarly known as "Moynalvy stone," so called from quarries opened in them in the little glen of that name in Sheet 4⁵. Here these beds consist of pale greenish brown soft sandstones, and brown sandy shales, containing abundance of Calamite impressions, and specks resembling chips of slaty coal. The dip is N.N.E. at from 5° to 10° . They occur nearly midway and on the eastern limit of these Upper Coal Measure grits. Adjoining Moynalvy Bridge, near the old corn mill, a quarry has been opened in these beds; their dip is not determinable, but they consist of massive pale greenish brown, close-grained, and very tough sandstone. Throughout the rock are small flakes of mica. It is also speckled with black carbonaceous matter, resembling small fragments of coal plants. When large blocks of this sandstone are freshly broken open the colour of the stone is a clear bluish grey, but here and there in it are very minute crystals of iron pyrites, which, though difficult to detect at first, when the rock is freshly fractured, soon weather out rusty and thus disfigure the stone; when care, however, is used in its selection, these fine-grained sandstones take an excellent smooth surface, and retain the tooling quite sharp for centuries, as may be proved by an examination of the exquisite windows in Dunsaney Abbey. On the high ground between Ballygartagh House and the Balloon Houses, a quarry exposes similar beds to those last noticed. No dip can now be seen, as the excavation is filled with water and used as a cattle pond, there is little doubt, however, that it is to the S.E., as this is the inclination of the lower Coal Measure beds which appear in Summer Hill Demesne. The thickness of these sandstones has been estimated at about 350 feet.

A broad strip of Upper Limestones comes in N. of the Coal Measures just described, and between them and similar rocks which form the southern portion of the Tara Hill basins. The Tara Hill Coal Measure basin has a wavy and indented outline, for which, however, there is sufficient evidence derived from quarries and the form of the ground. If we commence their examination at Tara Hill, we find along the summit of that eminence beds of black shale, with black, earthy, calcareous, and compact beds, passing up into thin grey calcareous grits, which weather to a pale brown colour, with thick and thin layers of black chert, and thin black shales between them. These are the uppermost of the exposed beds, but all belong to the lower portion of the mass of the deposit, as the Upper Limestone is presumed

to be just below them at the foot of the hill on the west; the dip of all being eastward at from 5° to 15° .

At the ancient circular earth-work, called Rathmeave, on the crest of the rising ground, and about one mile due S. of Tara Church, the lower black Coal Measure shales appear in the fosses; and also, on the parish boundary, which strikes down the hill towards Crockaphobble, where they dip at about 5° to the S.E. In the dike on the roadside, at Rathmeave, close to the cottage, and overlying the black shales, are a few horizontal beds of light brown micaceous sandstone, which contain the joints of small encrinites. These are the equivalents of the "Moynalvey stone." The estimated thickness of the black shales and calcareous grits below them here is not more than 550, while at Summer Hill they are 700 feet. As these brown sandstones are traced northwards and to the east of Tara Hill, more and more of them come in as we follow the ascending order of the beds. Just out of the limit of the map, at Lismullin Church, and along the road from it to Skreen Hill, thin sandstones appear in many places, being coarse grained, micaceous, soft, and decomposing freely to a sand. In a quarry W. of the Glebe of Skreen, this rock appears as a coarse-grained reddish brown sandstone, thick bedded, but in no instance can the absolute dip be seen; and hence there is a difficulty in estimating its thickness, which, however, according to the dips in the underlying black shales and grits, cannot be more than 150 feet. At the Hill of Skreen, these lower beds come to the surface, having an average dip of only 5° to the S.E.; it is clear, however, that on the W. side of the hill, they must dip in the opposite direction, so as to underlie the brown sandstones which occur there. The *Posidonomya* still holds its place in these beds as the characteristic fossil. If we now return to Skreen Hill, and pass from it in nearly a due east direction to Macetown Castle, we find on the left bank of the Macetown River, in the fence to the north of the old castle, the hard black splintery shales of the Coal Measures, in which are abundant fossils. The dip of these shales is very obscure. Less than half a mile to the N. of them, and lower down the river, on its right bank, the pale brown close-grained sandstones, in every respect the same as those before described, appear. These same grits come to the surface at two other localities, on the neighbouring Hill of Slanestown, and north of it, near Rathfreigh; but the dip of the beds is nowhere apparent. South of the elevations just named the black shales again appear, underlying these sandstones.

In the route, therefore, which I have just pointed out, we pass from Tara Hill to Slanestown Hill, over two shallow depressions in the lower Coal Measures, about three miles apart, and each having, as the uppermost rocks, brown sandstones, the equivalent of the "Moynalvey stone," and being separated by the lower Coal Measure shales, and dark gray or black calcareous grits, which occur over the space alluded to in gentle rolls (see section fig. 2.) From the foregoing observations, and others which refer more directly to the district N. of the map, it is clear that these sandstones now form shallow scoop-shaped deposits, the superficial outline of which, if completed northwards, would resemble a half moon, the ends pointing southwards. To the south of the Hill of Skreen, and W. of Corbalton Hall, a road, now closed, which led to the marsh called the Commons, passed near a quarry in the Coal Measure shales, adjoining the main road. *Posidonomya* are abundant in these layers, as well as small flattened *Goniatites*. Following this road as it branches to the south, the cuttings at either side of it in the townland of Branstown, expose black slaty shales, with the fossils just alluded to, black, flaggy, calcareous, earthy grits, and occasional chert layers, all dipping easterly at from 5° to 30° . At the angle of the road where it turns to the E., in the townland of Berrillstown, there are some dark grey earthy limestones and shales, with *Posidonomya*, and other

well marked fossils. As this road is followed to the east, the section is quite the same as before; and where it enters on the main road N. of Dunshaughlin, at the old Church of Trevet, the black shales are seen in abundance. The following beds appear in a quarry, close to the church: black shales; thin, hard, earthy layers; evenly bedded, black, very compact, siliceous limestone, some beds almost pure black chert; these are supposed to occur at the very base of the Coal Measures, the dip of all being towards the seam of those beds, or N.W. at 20° . A quarry in Gerardstown exposes some layers of thin quartzose, gray grit, containing numerous specks of white felspar, and flakes of mica, with black shales, and black calcareous softish grits and flags; the dip of all being the same as the beds last described. These also are supposed to belong to the lowest of the Coal Measure rocks, and the boundary is, therefore, placed close to them on the south. The above section and quarries are more particularly mentioned, as it is rare to see any Coal Measures *in situ* in that immediate neighbourhood.

To the east of the Crossmacool fault is the basin of Coal Measures which form the Hill of Garristown. At the base of its north-western slopes there occurs two small detached but adjoining basin-shaped deposits of the lower Coal Measure sandstone, similar in every respect to those formerly noticed in the Tara Hill and Summer Hill basins, and like them resting on the *Posidonomya* shales. The mode of occurrence of these sandstones with the underlying Coal Measures, and the structure in general of Garristown Hill, is clearly shown in the section fig. 2, and needs no further description.

The outline given to the small basin of Coal Measures which appears at Trim, at the N.W. corner of the map, is very uncertain. The Castle of Trim stands on these rocks, and has been built of certain dark gray grits and flags, derived from them. Many of the blocks in the walls of the castle, which was erected about 600 years ago, are now so decomposed on their exposed surfaces as to form a layer of "rotten stone."

The dip of the beds below the castle is northwards, at 15° , it is presumed, however, that on the opposite side of the Boyne they rise so as to be inclined to the opposite direction, and in this manner to form the W. end of the basin. On the bank of the Boyne, at Newtown Park, below Newtown Abbey, there are a few thin bedded and flaggy dark gray calcareous grits, with soft sandy shales, all dipping northwards, at from 10° to 30° ; and adjoining them at Skurlockstown, are highly calcareous, compact, dark gray grits, or impure limestones, with a similar dip. These are evidently the basal beds of the Coal Measures. Lower down the Boyne, at Rathnally, a very instructive quarry is opened in the Coal Measures, exhibiting a thickness of about fifteen feet, of which the section is as follows, commencing at the top:—

1. Flaggy thin, dark gray, close-grained calcareous grit, with black shale partings.
2. A bed of very compact siliceous limestone or highly calcareous grit.
3. Layer of black shale, which decomposes into small spheroids when exposed on the bank of the quarry, though no such structure can be detected when the shale is *in situ*.
4. A bed the same as No. 2.
5. Thick layer of dark gray shale and flags; on the under surface of a flag, occupying the centre of the group, are raised *Fucoid* impressions.
6. A bed, same as Nos. 2 and 4.
7. Black shales and thin flaggy calcareous grits.

The dip of all the beds is S.E. at 25° . The rocks just described appear along the bank of the Boyne at intervals, for the distance of about 700 yards. When near the mouth of the stream, which drains the lands of Rathnally and Dunganny, a few beds of a very hard, dark, gray grit, are seen, dipping westward at about 30° ; a short distance beyond them, to the N. or lower down the river, the top of some thin, dark gray calcareous earthy grits and shale appear,

which completes, so far as I have been able to determine, the evidence for the existence of the Trim Coal Measures. I may mention that I was informed by the most trustworthy authority, that at the building of the present county gaol at Trim, a little bunch of coal was discovered in the quarry opened on the spot, and a fire lighted with it.

The small portion of Coal Measures which enters the limits of this sheet on the south margin, adjoining the Midland Great Western Railway, and in the county Kildare, will be described when writing on the adjoining map to the south.

The Drift.

The drift which is spread over this district consists entirely of what is known as "limestone gravel," though a large per centage of the pebbles have been derived from many other rocks. The only peculiarity about it in this district is that it seldom extends over places which have a greater elevation than from 360 to 370 feet. To this there is however an exception in Summer Hill demesne, where a mound of limestone gravel and sand has been piled up on the top of the hill, and there forms an elevation, marked 464 feet on the map, while the flat lands to the S.E. of it, though averaging only 400 feet, have been bared of, or, at all events, are free from this drift.

In the low grounds at the N.W. of the map, the gravel has been heaped up to form a very perfect Escar ridge, which extends from near Newtown on the Boyne, in a S.E. direction, to beyond Curraghmon cottage, a distance of six miles. A road runs almost the entire way on the summit of this ridge.

Bray Hill, though only 321 feet high, is bared at its top of drift, which lies piled into knolls and low ridges at its western base.

The higher part of Crossmacool Hill is also free from it.

In the S.E. corner of the map, a short but well marked Escar ridge extends for the distance of about one mile in a N.E. and S.W. direction, from beyond Kilbride cross-roads to the eminence called Crockance, 291 feet high. It is somewhat interesting from the fact, that near Kilbride the gravel is quarried into for the large and numerous angular blocks of limestone which it affords, and which are broken up for building purposes or burned into lime on the spot. These blocks are formed of light gray and very cherty limestone, and so closely resemble the stone from the quarries adjoining the old posting stage, called "*The Hatchet*," that there is little doubt but that they were transported by ice, either from where they are now visible *in situ* or from some other locality in the line of strike of those beds, before the deposition of the sand and gravel by which they are elsewhere covered. As these beds are supposed to belong to the very upper part of the Lower Limestone, or base of the group above it, the spot where these blocks might occur *in situ*, may not be more than a mile or so distant from where the blocks are now found.

No mines or mineral veins are known in the district.

G. V. D.

October, 1859.