EXPLANATIONS

TO ACCOMPANY

SHEET 136 OF THE MAPS

OF THE

GEOLOGICAL SURVEY OF IRELAND,

ILLUSTRATING PARTS OF THE

QUEEN'S COUNTY, AND THE COUNTIES OF KILKENNY AND TIPPERARY.

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

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

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

Condensed memoirs on particular districts will also eventually appear.

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

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EXPLANATIONS

OF SHEET 136 OF THE MAPS

OF THE

GEOLOGICAL SURVEY.

General Description.

The district included within this sheet consists of a portion of the southern side of the Queen's County, in which are the towns of Ballynakill, Durrow, and Rathdowney, and the villages of Donaghmore, Errill, Ballycolla, and Cullahill, and the N.W. corner of the County Kilkenny, containing the towns of Ballyragget, Freshford, and Johnstown, and the villages of Lisdowney and Galmoy; a small part of the eastern side of the County Tipperary also comes into the S.W. corner of the sheet.

1. *Form of the Ground.*

The features of most note are, the high ground at the eastern side of the map, east of Ballyragget and Durrow, having to the N.E. of Ballyragget a height of upwards of 1.000 feet; that to the S of Durrow extending towards Johnstown and Freshford, and attaining, two miles E. by S. of the former, to a height of 1,156 feet; and a broken chain of small elevations which runs from the S.W. corner of the map in a N.N.E. direction to its northern edge. This last mentioned feature, although rather inconspicuous (its highest point being only 644 feet) is geologically remarkable, as will be hereafter seen.

The remaining portion is tolerably level, its mean height being probably about 350 feet.

The western part of the district is drained by the Erkina river, and its tributary, the river Goul. The Erkina river enters the map at its western edge, at an elevation of upwards of 400 feet above the sea, and flows into the river Nore, three-quarters of a mile E. of Durrow, at a height of about 250 feet.

The eastern side is drained by the river Nore, and its tributaries, the Gully and Owveg rivers.

The Nore enters the map at its northern edge, at an elevation of about 400 feet above the sea, and leaves it at its southern edge, at a height of about 180 feet above that level, thus giving a fall of 220 feet in twelve miles.

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

Name.	Colour on Map.
Alluvium, Bog, &c.,	*Pale Sepia.*
Drift,	*Engraved Dots.*
d^5. Coal Measures,	*Indian Ink.*
d^4. Upper Limestone, / d^3. Calp,	*Prussian blue (dark).*
d^2. Lower Limestone,	*Prussian blue (light).*
$\mu\,\delta$. Dolomite.	*Olive green.*

d^2. *Lower Limestone.*—The lowest beds of this division seen on this map are thin bedded dark gray limestones, having an oolitic structure, and dark gray or black flaggy crinoidal limestones with partings of shale. It is difficult to estimate the thickness of these beds, as they are only seen in a few scattered quarries, and dip in every direction; they may be about 600 feet. Above these thin beds come massive limestones, varying in colour from dark to pale gray, often curiously variegated or streaked with veins of carbonate of lime, in places highly magnesian, and generally abounding in fossils.* Occasionally lines like stratification may be observed in these beds, but they are for the most part amorphous. It is almost impossible to say what their thickness is; it may be about 400 feet. Thus the whole thickness of the Lower Limestone is, possibly, about 1,000 feet.

The magnesian character which is frequently observable in these gray beds becomes stronger in the beds immediately above them, which consist of pale buff coloured, finely crystalline dolomite, generally traversed by vertical N. and S. joints, but in other respects amorphous. It is exposed in large masses forming knolls or hillocks. All through the mass the rock is homogeneous in texture.† Its thickness, as calculated W. of Phillipsburgh House, is about 300 feet. This dolomite occurs in such a well-defined band as to allow of boundaries being drawn for it, and a separate lithological colour being assigned to it with the distinctive letters $\mu\,\delta$.

d^3. and d^4. *Calp and Upper Limestone.*—As no natural boundary exists here between these two divisions, they will be described as one. Immediately above the dolomite, and in several places seen resting on it, is a band of dark gray or black compact thin bedded earthy limestones, having nodules and layers of chert, and varying from 25 to 100 feet in thickness. Above these cherty beds are a set of black compact earthy thin bedded limestones, with partings of black shale, altogether amounting to a considerable thickness. These beds probably answer to the calp division. From these to the base of the Coal Measures, the beds are of variable character, thick and thin bedded,

* The following were the most abundant fossils, as determined by Mr. W. H. Baily:—Amplexus coralloides, Spirifera imbricata, and striata, Producta semireticulata, Terebratula hastata, Aviculo-pecten planicostatus, Trochella prisca, Euomphalus pentagonalis.

† The local term for this rock is "*Freestone.*"

often flaggy, especially near the top, crystalline and compact of a dark or light gray colour, many beds abounding in Productæ, Corals, and Crinoids, and many highly magnesian. At a depth of about 100 feet or so below the base of the Coal Measures, the beds contain bands of white chert, full of crinoids; the top beds seem generally to be pale gray crystalline crinoidal limestones.

The total thickness from the dolomite to the Coal Measures is apparently about 1,700 feet.*

d^5. *Coal Measures.*—Resting on the top bed of the Upper Limestone, are black flaggy shales, with bands of black chert, altogether about ten feet thick. These shales are locally full of Posidonomya. Above them are dark gray and brownish splintery shales, attaining to about forty feet in thickness; and then come olive gray flags and strong grits, with occasional beds of dark gray shale. Only one outcrop of coal occurs. From the imperfect sections exposed, it is impossible to say what may be the thickness of as much of the Coal Measures as is exposed in this district.

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

As in similar districts in the S. of Ireland, the low ground is formed of the hard rocks of the Carboniferous Limestone, while the softer but more endurable materials of the Coal Measures compose higher land, which ends in a nearly continuous and rather steep escarpment, overlooking the limestone plain (see fig. 1 and fig. 2, pp. 8, 9).

At the southern side of this district, however, and E. and N.E. of Johnstown, the limestone rises into higher ground, even exceeding the Coal Measures in elevation; forming a marked exception to the general rule, as to the kind of ground occupied by the two formations in the S. of Ireland.

But beside the general difference in altitude, the ground consisting of the two formations differs considerably in external appearance. The Coal Measure high land has more or less a barren and dreary aspect, while the generally lower lying limestone country, with its occasional crags, is usually more fertile and presents a more agreeable appearance, except where, as in the centre and S.W. part of our map, it is covered by bog.

The small chain of elevations, running N.N.E. across the western side of the district, is composed of the durable materials of the hard crystalline dolomite.

F. J. F.

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* The strike of the upper surface of the band of Dolomite is remarkably steady across the country; that of the Coal Measures between Johnstown and Durrow is, if we make allowance for the undulations of the ground, equally steady. Every quarry, and every natural exposure of the Upper Limestone between these two places, shows a steady strike N.E. and S.W., with an invariable dip towards the S.E., at angles varying from 5° to 30°. Not a single instance occurs of a contrary dip. The shortest distance between the top of the Dolomite and the base of the Coal Measures is three miles. Now, suppose we allow the mean inclination of the Upper Limestone to be only 5°, and the horizontal distance across it to be only 15,000 feet, we get a thickness of rather over 1,300 feet.

J. B. J.

Fig. 1.

Section E.S.E. from Rathdowney.

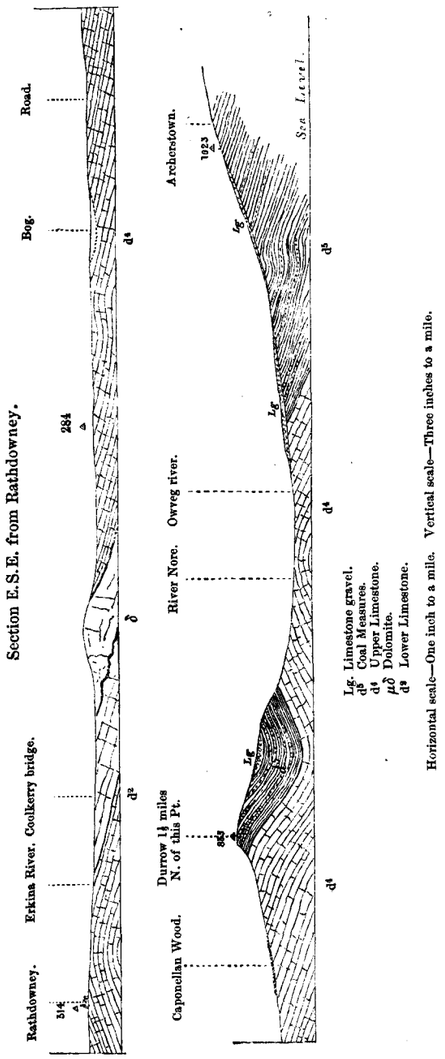
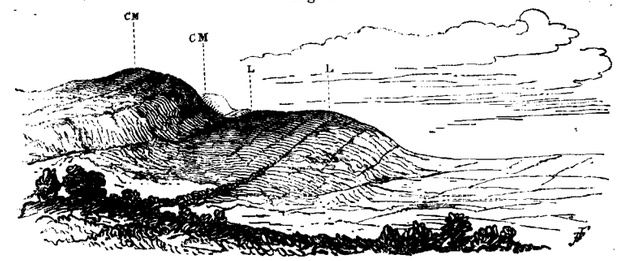


Fig. 2.



Coal Measure Escarpment, S. of Durrow.

Detailed Description.

[The whole of this Sheet was surveyed by Mr. F. J. Foot, except the strip of Coal Measures at its eastern side (comprising the western limit of the Castlecomer field), which was surveyed by Mr. W. L. Willson].

J. B. J.

4. *Position and Lie of the Rocks.*

Commencing at the N.W. side of the map, the beds of the Lower Limestone may be seen in many places. N. and S.W. of the village of Errill, are numerous exposures of dark gray thin bedded limestone, having an oolitic structure, and black flaggy crinoidal shaly limestones; they seem to undulate at low angles, but have a general dip towards S.E. at from 5° to 10°.

These oolitic beds are also exposed at the following places:—In a large quarry at the east side of the road leading to the railway, one mile N. of Donaghmore, where they lie horizontal; in two quarries, one in the townland of Raheen Upper, half-a-mile E.N.E. of Donaghmore, and the other at the same distance E.S.E. of that village, in the townland of Castletown—the beds in these quarries are also horizontal; in several quarries along the roadside N. and N.E. of Kilbreedy Castle, about two miles due east of Donaghmore, the beds dipping S.E. at from 5° to 25°.

The black shady crinoidal beds, associated with the oolitic beds, may also be seen half-a-mile N.E. of Errill, in the townland of Rossmore, dipping S.E. at 10°; at the west side of the road, one mile N. of Farranville House, dipping S.E. at 10°; in a quarry on the roadside in the townland of Graigueanossy, less than one mile E. of Levally House, dipping S. 20° E. at 10°; in the bed of the stream at the south side of the town of Rathdowney, dipping N.W. at 30°; at the north side of the townland of Cloonburren, half-a-mile S.E. of the *Corn-mill;* and about one mile S.S.W. of this, in a drain in the townland of Clonmeen South, dipping S. 10° W. at 15°; and lastly, in the little bog island near the western edge of the map, about three-quarters of a mile W.N.W. of Derrygreenagh, the beds dipping S. 10° E. at 10°.

The upper beds of the Lower Limestone, in which stratification is generally obscure, and which lie next under the dolomite, are also exposed in many places; some of the best exposures are the following:—At the northern edge of the map, a little east of Cuffsborough cross-roads, and at the schoolhouse one-third of a mile S.E. of this; at the S. side of the hamlet of Clogh, where the limestone may be seen in conjunction with the dolomite and ap-

parently dipping S. at 20°; further S. in several quarries, E. of Bordwell Church; at the edge of the little wood half-a-mile N.W. of Grantstown House; in the road cutting a quarter of a mile S.S.E. of Middlemount House; in several quarries west of Rathdowney, and half way between it and Errill, and in quarries S. and S.E. of Levally House—here fossils, particularly corals, are very abundant. Proceeding still farther southward, these beds may be seen at the south side of the hamlet of Ballyphilip, the beds dipping apparently E. at from 15° to 25°; half-a-mile further south on the hill on which is the trigonometrical point (height 581), the beds dipping S.E. at 10°; half-a-mile N. of Harristown House; one mile and a-quarter S.S.W. of Harristown House, at Cloonburren Castle, where the rock shows planes dipping S.W. at 45°, which look very like bedding, but may only be joints. The limestone here is very compact and of a bluish gray colour.

These beds may also be seen between Cloonburren Castle and the large tract of bog at the western edge of the map, in several quarries. Three-quarters of a mile S. of Kyle House, on the top of the hill—the height of which is 555 feet—an outlying patch of this limestone, abounding in fossils, is seen resting on the dolomite.

Lastly, it may be seen in a quarry at the S. side of Cooleeny, in the S.W. corner of the sheet.

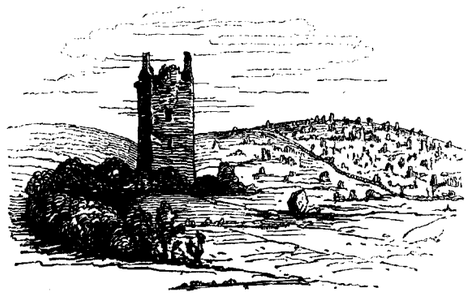
The rocks seen in all these places are very much alike, their general character being compact, variegated, massive, dark or pale gray limestone, more or less magnesian, occasionally exhibiting stratification, but generally amorphous, and having fossils in abundance. The principal sets of joint are vertical, having a direction N. and S., and E. and W., or nearly so.

The band of Dolomite.—Commencing at the S.W. corner of the map, and tracing the dolomite across it, the rock is exposed in the following places:—

On the south side of the road, about a quarter of a mile N.E. of the church of Cooleeny, and about one mile N.E. of this at both sides of the Bog-road, the dolomite appears in crags, and again farther eastward on the same road, and at Cloonsaul.

Three-quarters of a mile N.N.W. of Cloonsaul, at both sides of the road near the school-house, are quarries, in one of which the dolomite shows planes dipping S.S.E. at 15°, very like bedding. Northward of this several quarries lie between the last locality and Castle Pierce; and around Castle Pierce, it forms a craggy knoll, the rock cropping out in upright blocks, and giving the place somewhat the appearance of a grave-yard (see fig. 3).

Fig. 3.



Hillock of Dolomite, Castle Pierce.

North of the ruined church in the townland of Baunaghra, Queen's county, one mile N.E. of Castle Pierce, the rock is well exposed, and a little more than half-a-mile E. of this church, forming crags in the townland of Graigueadrisly, and also further eastwards in the same townland at *Corbally Church.*

Still further east, it forms the rocky hill at the boundary between the Queen's county and county Kilkenny, at the south side of Kyle Wood, the height of which is marked as 644 feet, and again along the road, and in crags a little N. of Mount Pleasant. It may be seen on the road-side, half-a-mile W.N.W. of Ballinfrase House, and two miles northwards, in crags and road cuttings; as also at the cross-roads, a quarter of a mile E. of Knockfin House—where the dolomite shows planes like bedding (see fig. 4).

Fig. 4.

Hillock of Dolomite, S. of Carrick bridge. Rock showing lines like bedding.

A quarter of a mile E. of Middlemount House, it forms a hill of nearly bare rock, and may be observed in quarries a little W. of Grantstown House.

At Carrigan wood at the S.E. side of the hamlet of Clogh, the dolomite appears in conjunction with the gray fossiliferous beds below it; and lastly, at the northern edge of the map, one mile and a-half N.E. of Clogh, it makes several rocky knolls in the townland of Dairy Hill.

d^4. *The Upper Limestone.*—The lower or cherty black beds of this division of the limestone, which lie immediately above the dolomite, are to be seen in numerous quarries from the S.W. corner of the map to its N. edge, all along the line drawn as the eastern boundary of the dolomite. The principal are as follow:—in the bog island in the townland of Derryfadda, about one mile and a quarter E. of Cooleeny (S.W. corner of map) are cherty beds passing downwards into dolomite, and dipping S.W. at 10° to 20°; also at Cloonsaul, three-quarters of a mile N.E. of the last mentioned place, the cherty beds, dipping S. at 10°, are plainly seen resting on or passing downwards into dolomite, and two-thirds of a mile further N.E. and W. of Baunmore House, lying horizontally on the dolomite in one place, and in another dipping S.E. at 20°.

A quarter of a mile S.W. of Ballydonnell House, on the roadside, they dip S. 30° E. at 10° to 15°, and somewhat less than half-a-mile E. of Ballydonnell House, they dip S.E. at 10° to 20°.

About a quarter of a mile S.E. of the village of Galmoy, two quarries show these beds dipping S.E. at 10°, and they are also exposed in quarries at the edge of the small bog, two-thirds of a mile N.N.W. of Phillipsburgh House, the beds dipping E. at 10°.

The black earthy beds mentioned above as probably representing the Calp, are best exposed (commencing at the north of the map) in several quarries around Ballycolla, the beds dipping S. or S.E. at 10° to 15°, and at the cross-roads, a little more than a mile S.S.W. of Ballycolla, and also half-a-mile W. of this.

They may be seen also in two quarries W. and S.W. of Oldglass House, the general dip being S.E. at 10°, and at the east side of the road N.E. of Carrick House, in several quarries; in one of these, a quarter of a mile N. of Bellmount, there are partings of black shale, and the dip is S.E. at 8°. There are also quarries in them S of Bellmount House, and W. of Cullahill, and W. and S. of Phillipsburgh House.

S. of Oldtown House and N.W. of Glashare Castle, the shale partings are frequent, and the limestones are of a particularly earthy character; and also still further southward, N. and S. of the *Round Tower*, the beds preserving a tolerably steady dip of about S.E. or E. 30° S. at 10°.

The other (superior) beds of the Upper Limestone are exposed in numerous quarries, scattered all over the low ground, while the highest beds of all, or those nearest the Coal Measures, as has been mentioned above, form high ground all along the Coal Measure escarpment N.E. of Johnstown, and between it and Freshford. On this high ground they are often but thinly covered with soil or herbage, and may be seen running in lines round the slopes of the hills. From the dolomite to the Coal Measure N. of Johnstown, there is an apparently steady dip to S.E. averaging 10° in amount; and however much we might suppose the spaces between the quarries in the low ground to be possibly occupied by beds inclining in a different direction, there is at least a thickness of several hundred feet of limestone beds exposed on these slopes, in which no such change of dip occurs. As, however, we follow the beds round the curve of the hills S. of the Coal Measures, the beds bend gently round, so that between Johnstown and Freshford the general dip is N. at an average angle of 8°. N.E. of Johnstown the beds near the Coal Measures occasionally become highly magnesian, and are then generally brownish gray decomposing limestone. Here many bands of white chert, containing encrinite stems may be seen, and likewise between Johnstown and Freshford N.E. of *Templeclashibawn*, where there is a bed of snow-white chert three feet in thickness, in beds of thin and flaggy crystalline dark gray limestone.

Following these round by Freshford, into the valley of the Nore, and proceeding up that valley to Durrow, these upper beds of limestone, which are seen in a few scattered quarries, appear to have a general horizontality, or to undulate at low angles, so that they appear at the surface, rather in consequence of the fall of the ground, than on account of the rise of the beds. There is, however, a general tendency in the beds on the opposite sides of the Nore to dip from the river, so as to separate the outlying patch of Coal Measures, that forms the hills of Durrow, from those of the Castlecomer coal field; the limestone immediately along the boundary of that outlying patch dipping W. at angles of 10° or thereabouts, while those on the slopes N. and S. of Ballyragget dip E. at from 5° to 10°.

One mile and a-half N.E. of Durrow, the upper beds may be seen in numerous quarries, dipping in various directions at angles varying from 5° to 25°.

d[s]. *Coal Measures.*—The basal Coal Measure shales, which contain Posidonomya, appear resting on the top beds of the limestone, in a quarry at the N. edge of the map, about half-a-mile N. of Ballymullen House, dipping S.E. at 20°. They abound in Posidonomya, reduced to fragments.

In a quarry somewhat less than one mile S. of the village of Lisdowney similar shales appear in an outlier resting on the limestone, and dipping W.S.W. at 20°. After a close search, no trace of Posidonomya was observed here.

The shales and flags above these basal shales are exposed in many quarries and crags all along the escarpment of the outlier of Coal Measures which lies south of Durrow, the beds invariably dipping *inwards*, or towards the central hills, at low angles. About one mile and a quarter S. of Durrow, a thickness of about 700 feet of olive grits and flags is exposed on the hill at the north side of the townland of Archerstown, the beds dipping E.S.E. at from 20° to 50°. Nearly an equal thickness of the same beds may also be seen E.N.E. of Johnstown, S. of Coolcashin House, the average dip being E.S.E. at 10°.

A little more than half-a-mile S.E. of Coolcashin House, a pit was sunk beside a stream in search of coal; in the bed of the stream are gray flags, dipping N. 20° W. at 10°. The pit was sunk through gray shale with nodules of ironstone, but no coal was found, the whole of the beds it passed through being probably below the lowest bed of coal. E. and N.E. of this, the stream bounding the parishes of Coolcashin and Sheffin, exhibits a section in beds of olive and gray grits, flags, and dark gray shale, undulating to N. and S. at low angles. East of this stream, on the top and sides of the steep hill, the elevation of which is 1,000 feet, are several quarries and natural out-crops, in beds of olive gray grits and flags, overlying olive gray shale; some of the flags exhibit track-like marks, probably the traces of molluscan animals.

It is most likely that in no part of this outlier of Coal Measure is there a sufficient thickness of rock for the existence of coal, that is to say, all the beds in it are those which lie below the first bed of coal.

The small patch of Coal Measure marked on the map as lying E.N.E of Durrow, is indicated by some beds of dark gray shale, underneath olive grits, dipping S.W. at 10°; these rocks are at the N. end of the outlier, about two-thirds of a mile N.E. of Castlewood House.

Of the tract of Coal Measures occupying the eastern side of the map, olive and gray flags and shales, dipping E.S.E. at from 5° to 15°, are exposed S. of Ballymullen House along the line marked as the Coal Measure boundary. Eastward, near Valleyfield House, and N.W of Haywood House, olive flags, with shale partings, are seen lying horizontal, or dipping W. at from 10° to 30°. At the eastern edge of the map, one mile and a-half E.N.E. of Ballynakill, at the east side of Moat Castle, is a bed of black shale, lying horizontal; and a little further east are inferior beds of olive grits over gray shale, dipping W. at from 30° to 50°. This olive grit may possibly be the seat of a bed of coal. South of Ballynakill at the north side of Loughill Bridge, and at the south side of the *Corn-mill*, are gray shales, dipping S.E. at from 15° to 25°. Eastwards about a quarter of a mile E.S.E. of Loughill House, a small stream exposes a section in beds of gray grits, flags and concretionary shales, dipping W. 20° N. at 50°, and E. 20° S. at 5°.

About one mile S.W. of this, a bed of coal was observed; the order of the beds in the section being as follows:—

	Ft.
6. Coal,	1
5. Gray clay,	3
4. Gray sandstone with plants.	
3. Blue and black shales.	
2. Dark gray shales.	
1. Gray sandstone and grit.*	

The dip is E., at from 10° to 15°.

Half a mile to the southward, at the elevation marked 1,027, are coarse gray sandstones and gray shales, dipping W. at from 5° to 15°; and about one mile S.E. of these, apparently the same beds are seen dipping at from

* No. 1 is the lowest bed in the section.

20° to 40°. In the Glashagal river, about one mile N.E. of Glashagal Bridge, and on the little by-road, are contorted beds of hard gray grits and concretionary shales. In the grits casts of shells and plants were observed.

To the east of Ballyragget, beds of grit and concretionary shales are exposed in many quarries, in the stream courses, and on old roads; the general dip being E. at from 5° to 30°. Some of the beds abound in fossils.

Southward at and to the westward of Barrack village, beds similar to those last mentioned are seen undulating in all directions, at angles varying at from 5° to 15°; near the Coal Measure boundary the dip is E. 20° N. at 10° to 15°.

Large flags are raised in a quarry three-quarters of a mile S.W. of Barrack village, and are sold at 1s. per yard.

About quarter of a mile S.W. of Jenkinstown House is a quarry in beds of strong olive grits, dipping S.E. at 10°, probably the first grit beds above the top of the limestone.

5. *Drift.*

All this district is more or less covered over by limestone drift, gravel, and boulders. Some large patches, however, such as the high ground E. and N.E. of Johnstown, are quite free from this covering.

N.E. of Durrow and N. of Ballyragget there are large accumulations of limestone gravel, generally forming low rounded hills.

Bog, Alluvium, &c.—The principal bogs are those north and west of Durrow and the large tract east of Johnstown, at the S.W. corner of the map. These afford a plentiful supply of turf to the surrounding neighbourhood

N.E. of Ballynakill, at the west side of the Owenbeg River, is a deposit of calcareous tufa, lying in a thin bed on the side of the slope. It may also be observed on the little patch of Coal Measures east of Durrow.

F. J. F.

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[redacted]