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## Chapter 32 The later Superficial Deposits

### Introductory

These deposits are of considerable importance in Anglesey, for a large proportion of its surface is covered by them. Apart from the numerous minor tracts, the great alluvial expanses of the Malldraeth, Cors y Bol, and Cors Erddreiniog, together with the blown sands of the western coast, amount to not less than 30 square miles. The deposits are also of considerable scientific interest. A mere beginning, indeed, has been made in the examination of their flora and fauna; and important additions to this may be expected when the lower beds come to be explored by boring.

As is usually the case with deposits that are grouped under this head, a strictly chronological arrangement is not possible, for those of the several classes overlap in point of age. Nevertheless, the order adopted here will be found to be in a general way chronological; that is, the oldest part of each class of deposit is older than the lowest beds of the class that follows it in the arrangement.

Strictly speaking, the deposit of Porth Dafarch ought to have been treated in the preceding chapter, but chronology has been ignored because its physical affinities appear to be with the class in which it is here placed.

### Raised beach

There is no definite raised beach along the coast of Anglesey. But at six places there are small tracts and patches of what appear to be marine deposits at levels varying from a few feet above high-water mark to the 50-foot contour.

**Perth Dafarch, Holyhead** — In a sheltered corner of this cove (Figure 336), about three feet of rather angular but well-bedded sandy grey gravel rest upon decomposed rock, the base of the deposit being a little above extreme high-water mark. It is overlain by boulder-clay, and may therefore be merely one of the Glacial gravels described in the last chapter.

But its bedding is more even than is usual in those gravels, and it may possibly be a fragment of the Pre-Glacial marine deposits that are much more extensively developed on the Irish coast.

**Portly Cwyfan, Abeffraw** — Resting upon the boulder-clay of the cliff north-east of the church-islet, about 10 to 12 feet above high-water mark, and surmounted by blown sand, are two to three feet of sandy gravel, containing abundance of [Af. 732–3] *Patella vulgata* Linn. The Mollusca mentioned in this chapter were collected by the writer and named by Dr. Kitchin and Dr. Ivor Thomas. Its general appearance is more that of a raised beach than anything in Anglesey, for its upper surface forms a tolerably level terrace that curves round the back of the little bay, and contrasts with the gently sloping land behind it.

**Borthwen, Rhoscolyn** — On the eastern side of this cove there is some sand and gravel about six feet above high-water mark and in so sheltered a position that it can hardly be a storm beach. But its relation to the boulder-clay has not been ascertained.

**Red Wharf Bay** — At the old mill in the western corner of the bay is a little cliff about 10 feet high of stony loam with gravelly partings, not like the tumultuous Glacial gravels. The back of the deposit is a small terrace-like feature that appears to be cut out from the surrounding drift-covered slopes. The beds contain *Cardium edule* Linn. in considerable numbers, and the shells are well preserved.

**Llanddona** — At the stream's mouth by the church a coarse sandy gravel is seen for a little way with its top just at the 50-foot contour. It did not appear, in 1895, to be overlain by boulder-clay, though gravels do occur in that clay a little to the north, and at a rather lower level.

**Llanidan, Menai Strait**—At the old quarry, south of the church, 30 or 40 feet above Ordnance datum, is a stony loam with *Cardium* and other shells, a few of which retain traces of their colour. The loam seems to graduate into the boulder-clay below, but no shells were seen in this, whereas they are abundant in the loam.

Such is the meagre evidence for an old Post-Glacial beach in Anglesey. Whatever the deposit of Porth Dafarch represents, it is certainly Glacial or Pre-Glacial. Of the remaining five sections, three are of doubtful meaning; but those of Porth Cwyfan and Red Wharf Bay do seem to show that something like a marine terrace was formed in Post-Glacial times, perhaps for a little while. It is curious, however, that the remains of this should be so scanty along more than 150 miles of coast.

## Submerged Peat Or Forest Bed

A deposit full of remains of terrestrial vegetation is sometimes laid bare along the shores of Anglesey at various levels below high-water mark. During the present survey it has been seen at the places that are described below. But it is not always to be seen at them. Certain combinations only of storm and tide sweep it bare for a while: then comes a change, and it is once more buried under sand. No doubt it may be visible from time to time in many more places than those recorded here; perhaps it is not far below the sand in all the gently shelving bays.

It is a peat, peaty loam, or clay, full of rootlets and twigs, with pieces of tree-trunk, sometimes three feet in length and in one case as much as six feet long and six inches thick, as well as tree-stools in the position of growth, sometimes eight feet across. Among those from Rhosneigr Mr. Clement Reid has identified oak and alder (?), but the remains have not yet been thoroughly examined. The great stools are of oak, so far as is yet known. Under the peat is a blue marine clay with *Scrobicularia piperata* Gmel. in the vertical attitude of burrowing, and small gasteropods [Af. 4157–4181].

The deposit extends seawards to an unknown distance from a little below high-water mark, and there is reason to think, from the evidence obtained at Traeth Dulas that it occurs as low as 20 feet or more below that level. Similar beds at Rhyl and Barry (see Chapter 34) are known at much greater depths. Where its base has been well exposed it rested upon boulder-clay.

**Rhosneigr** — In favourable states of the beach, peat and peaty clay with tree-trunks can be seen at each end of Traeth Llydan. Near the rocky reefs it is a carbonaceous clay, a foot or more in thickness. At the south-east end of the beach it rests upon boulder-clay, the boulders of which stand up into it.

**Gareg-lwyd Cove, Rhoscolyn** — There is a sheltered little cove among rocks, to the south-west of Gareg-lwyd house, in which more than two feet of peat were seen in 1906.

**Tre-Arddur Bay** — At the north end of this beach the peat is very full of wood, the trees being larger than at any other place. In 1906 and 1915 the six-foot trunk and the great upright stools of oak, and in 1915 the *Scrobicularia*-clay, were well exposed.

**Penrhos Beach** — Peat with plants has sometimes been seen at low water.

**Bodlasan** — On the wide low shore north of the Alaw's estuary, peaty clay was laid bare in 1907, far below high-water mark. This was by the Pen-yr-allt reefs, but most likely the great muddy flat that stretches thence to Penial is really the surface of the peat-bed.

**Llanrhwydrys** — Patches of peat with twigs and rootlets were seen in 1908 in the little bay north-east of the church.

**Traeth Dulas** — It is stated by Mr. R. L. Edwards of Bodafon that at the brick works by Llaneuddog the following section was exposed some years ago, all below high-water mark:

Bedded blue clay (yellow at top)	18 feet
Gravel with tree-trunks	2 feet

Some of the trunks are said to have been 10 feet long. The work was not carried down into the gravel, whose bottom was not reached. In the natural exposures, therefore, we only see the upper portions of the Forest bed.

**Lligwy Bay** — On September 28, 1912, after many days of strong easterly wind, blue clay with rootlets, and peat, were laid bare at the mouth of the Lligwy River. Lord Boston told me that no such exposure had ever been seen by him before during a period of more than 20 years. Red boulder-clay lies immediately below, so that the Forest bed is quite thin, and its base much higher than in Traeth Dulas, only a mile away.

**Red Wharf Bay** — On the southern shore, north-west of Coch-y-mieri, blue clay with plants, and a little peat, were seen in 1897. It is likely, therefore, that the Forest bed extends across the great ebb-flats of the bay, covered, perhaps not very thickly, by the sand.

**The Lavan Sands** — Bingley (ed. 2, p. 226) says that 'The bodies of oak trees, tolerably entire', have been found at low water, in a long tract of red loam, far from the present banks of the sea'. There are said to be signs of ruins on the sands.

## Marine alluvia

Fringes of sand and silt occur in many places; a few only of the larger tracts can be considered here. Occurring in the seaward parts of valleys which wind far up into the land, these deposits pass imperceptibly into estuarine and finally into fresh-water alluvia.

Those of the Alaw, Traeth Dulas, and Dwyran are really drowned land-valleys (partly choked with boulder-clay) in which the process of silting-up has been aided by the protection that tidal spits of sand afford. Dunes, moreover, accumulating at low water on the spits, shelter the valleys even more, till they become at high tide nearly closed lagoons, in which the quiet waters are able to drop, undisturbed, whatever burden of sediment is brought to them.

**Valley** — The tidal flats of the Strait of Holy Isle send labyrinthine tongues of salt marsh, studded with rocky islets, far into the land. One of these, which is in line with the Vale of Alaw, passes completely across Holy Isle and reaches the open sea at Tre-Arddur Bay; so that at no very remote period that isle was really two, a Holyhead and a Rhoscolyn island. Probably the rise of the Tre-Arddur dunes has added to the shelter given by the rocky islets, and for many years past the process has been accelerated by the embankments that have been made to carry the roads and the railway. On the Anglesey side, the large alluvial tract of Valley Village, more than a mile in length, has been reclaimed by the construction of a dam only 130 yards long about half-a-mile from the station. Its old deposits are exposed in the drains near Valley Station. Four or five feet of sand are usually seen, on which rests a sandy loam with [Af. 3122] *Cardium edule* Linn.

**Malldraeth Marsh and Red Wharf Bay** — The largest tracts of marine alluvium, however, are those that floor the valleys of the great Berw line of faulting. Even as lately as the year 1788 the sea, flowing at spring-tides to the bridges of Ceint and Pentraeth, left an interval of only some three miles between the headwaters of the inlets, parting what is even now sometimes alluded to as 'Sir Fon' from 'Sir Fon bach', or 'Anglesey' from 'Little Anglesey'. Red Wharf Bay is still but little modified by man. At low water its eastern part is a great spread of yellow sands; at high tides in heavy weather the salt water still approaches Pentraeth (the 'Sands Head') Bridge and floods the alluvium of the valley. Of the great alluvial tract of Malldraeth ('The Sodden Sands'), some nine miles long in all, two-thirds have been reclaimed. The whole was once an inlet of the sea, whose waters flowed to Hirdrefaig, and at ebb-tide a flat of silt and sand. Such are still the outer three miles of the inlet, from the Bodorgan headlands to Malldraeth Yard; but in 1788–90, a sea-dam was built across the valley at the 'Yard', the river Cefni straightened and embanked for some six miles, and the lowlands drained. To-day the valley floor is a tract of about eight or nine square miles of green but marshy, reedy, pasture land, with here and there an undrained lagoon, and the deserted meanders of the old river still traceable as a series of stagnant, crescent-shaped pools along the alluvial plain.

Much less than might be wished is known of the deposits of this plain. The visible sections, even in summer, are but shallow; and unfortunately the 21 records of what has been passed through in the coal-borings were not scientifically made. There can be little doubt that the older deposits of the hollow would well repay a systematic exploration. The total

depth of superficial accumulations increases markedly seawards, from about 30 feet at Berw, to 45 or 50 opposite Hendregadog, 80 or 90 at Fferam and Paradwys, and finally to 110 opposite Tyddfyn-isaf, Llangaffo, but no doubt most of this was boulder-clay, for no report has been obtained of more than 36 feet of beds that appear from the descriptions to be Post-Glacial. The deposits that certainly do form the surface are marine sand, blue clay, peat and marl; but the true vertical succession among them is not known. Beginning at the seaward end, blown sand has encroached much upon the surface, but north of the main line of railway true marine sand is the principal deposit. At Hendregadog it was proved to be 30 feet thick, and was covered by six feet of 'yellow clay', which appears to be really a fine grey clay with yellow oxidation spots. At Paradwys, 20 feet of sand with 'cockles' is reported, with a one-foot 'oyster-bed' beneath. This is probably correct, for *Cardium edule* Linn. [Af. 734] is plentiful in a loamy sand at the surface of the marsh near Hendregadog. Between the railways this marine sand is replaced by a widespread deposit of blue clay with rootlets, often sandy. Near the branch railway peat comes on, and forms most of the surface; replaced by peaty loam in the tongues of the great marsh that run up into the valleys of the Cefni, Ceint, and other streams. At the head of the alluvial tongue west of Hirdrefaig, the following section was seen:

	Feet	Inches
Marly clay	0	6
Peat	0	3
Marly clay	2	0
Peaty loam	1	6

so that here the marine deposits were being replaced by fresh-water.

Whether the blue clay and peat are special deposits of this estuary, or whether they are really a portion of the Forest bed is not certain. The Forest bed might be expected, but such records as we have do not show any decided sign of its existence through the 20 feet of beds below high-water mark in which it is found at other places.

**Cemlyn** — An exceptional marine deposit is the great curved shingle-bank of Cemlyn Bay, half a mile in length. This great storm-beach (Chapter 34) has acted as a natural dam, behind which has accumulated the 'Cem-lyn' ('Curve-lake'), a true lagoon, a quarter of a mile wide at one part, which falls and rises with the tides. The top of the pebble-ridge is about 20 feet above the high-water mark of the lagoon.

## Fresh-water alluvia

A considerable proportion of the surface of Anglesey is covered by alluvial plains, as a glance at the one-inch map will show. Only their general characters and a few matters of interest concerning the more important ones can be considered here. They fall into two natural groups: fluviatile alluvia, which are merely the flood-plains of the rivers; and true lacustrine alluvia, deposited in old closed hollows.

The first type call for little remark. Their deposits are usually brown loamy silts, sometimes four or five feet in thickness. Along the river-courses are many broad oval expansions of the flood-plains, and some of these may be lacustrine in their lower parts, the dams having been later on cut through by the rivers.

Lacustrine alluvia occur in great numbers, but nearly all of them are on the western side of the main watershed. Most of them are quite small, but there are nine that approach or exceed a mile in length. These are:

	Miles
Cors y Bol	5
Erddreiniog	2
Bodwrog	1½
Bodeilio	1
Eilian	¾
Mynachdy	¾
Llyn Cadarn	¾

Llanfwrog Marshes

$\frac{3}{4}$

Cremlyn

$\frac{3}{4}$

Sections are, as in the marine alluvia, few and shallow; but such as there are show that the deposits are gravel and sand (rather rare), blue clay, brown loam, peaty loam, peat, and marl. Peat is frequent; a thickness of two feet is common, and as much as six feet thick are seen occasionally. Marl has been seen only in Cors Bodeilio, but the name of the adjacent 'Cors y Farl' (six-inch map) suggests that it is not rare in the lower deposits.

The organic remains have been examined only in a few cases, which were submitted to Mr. Clement Reid. Oak and Equisetum were rather abundant in the two marshes between Pen-y-garnedd and Mynydd Llwydiarth. In Cors Bodeilio is a Chara marl, containing seeds of

Myriophyllum spicatum

Potamogeton, 2 sp.

Carex

Chara, several sp.

Beetle, fragment.

Mr. Reid remarks that the poverty of the flora is a usual character of marls of this kind.

In some cases dwindled remnants of the old lakes even now remain. At Cadarn the whole marsh is still called 'Llyn', ('A Lake'). A rising in Cors Bodeilio is called 'Ynys', ('The Island'). Most of the hollows appear to have been drift-dammed; but at Llyn Bodgylched, near Beaumaris, and Treban Marsh, near Gwalchmai, new drains have revealed rock at the only exits, so that a certain proportion are probably rock-basins. The longer axes of most of them lie north-east and south-west.

**Cors y Bol**, the largest of these lacustrine plains, lies at about 120 feet above the sea. Its present exit is lateral, through a rocky pass of the River Alaw at Bod-deiniol. Unless there be an old exit, now dammed by boulder-clay, at Chwaen-hen, it is probably a rock-basin. At Caergwili drumlins it is suddenly constricted to less than 40 yards in width. There is a great spread of peat, which is cut for burning. Three feet or more have been seen, well stratified; and below it are said to be more than six feet of sand and gravel. This peat yields a red ash in abundance, which is said to be excellent manure either for turnips or grass. A determination of the phosphoric acid of this ash gave 1.75 per cent.  $P_2O_3$ .

**Cors Erddreiniog**, about 180 feet above the sea, has an extensive peat-bed that is more than four feet thick in places, but sections are rare. More than one hollow, lying along the foot of the Carboniferous limestone escarpment, is included under this name. They drain into the Cefni; but at the north end is an overlapping watershed, a parallel alluvium lying to the west, close by, draining into the Lligwy. The parting between this and the great marsh is low and boggy, so that very little change would divert the drainage of that into the eastern sea.

**Cors Bodwrog** lies in a deep hollow, just below the 200-foot contour: and is almost certainly a rock-basin, for its exit is through a rocky barrier close to Gwalchmai church, across which the contour passes. More than four feet of peat are seen, and near Llynfaes ('Lake-field') the peat rests upon a blue-clay. A little of the old lake still survives.

**Cors Bodeilio** lies just upon the watershed, at the 100-foot contour. To the south-west of Ynys, beneath two feet of peat, was seen the Chara-marl described above.

**Cors Eilian** contains more than five feet of clay. Its exit is through drift to Porth yr Ysgaw.

**Mynachdy Marsh** is almost certainly a rock-basin, for its exit (towards Hen Borth Cove) is through a narrow cleft in rock.

*Llyn Cadarn* is the only one of the larger lacustrine alluvia lying well to the east of the watershed. Its exit is between rocks, and it is probably a rock-basin.

*The Llanfwrog Marshes* are only 8 or 10 feet above Ordnance datum, and may be partially marine.

*Cremlyn* is the only one of the basins in which evidence has been found of any important changes in the water levels. Its floor is not very marshy, and is rather uneven, but there are in it beds of sub-angular ferruginous gravel, and of a blue clay in which no stones were seen. The exit (Figure 337) is at a bridge at the head of a little ravine, where there is a 289-foot level. But the floor is at a slightly higher level; the alluvium even ends off in a small terrace that overlooks the hollow just above the bridge, and the lake-edge feature is continued on along the ravine-side. There is, moreover, a traceable feature parallel to that of the northwestern margin at about 30 feet above it. There is now no barrier that could hold up water at even the lower of the two levels indicated by these terraces. It is clear that the ravine must have been for a while choked with either drift or ice, so that flood-waters from the north-east could form a temporary lake.

The rest of the lacustrine deposits of Anglesey belong, at any rate in their upper beds, to a time which, if historically remote, pertains essentially to the present order of things. The island was dotted with numerous lakes and pools, of which only some 30 now survive. The flora and fauna differed in no essential particulars from those that are there now. But what little is known of the lower beds suggests that in the bottoms of the old hollows exploration might reveal a sub-arctic flora and fauna like that of the old lakes near Edinburgh which was discovered by Mr. Bennie and Mr. Clement Reid.

## Blown Sand

It is a striking illustration of the prevalence and power of the south-westerly winds that whereas along the eastern and northern coasts of Anglesey accumulations of blown sand are insignificant, along the western seaboard some 15 or 16 square miles are more or less deeply covered with that deposit. The sandy tracts of Tywyn Trewan extend for two miles inland, and the dunes along Cymyran Bay must be some 30 or 40 feet in height. Those of Malldraeth Bay have encroached upon the outer parts of the alluvial flats, so that it is perplexing to decide how to treat those surfaces upon a map. In the course of its eastward march, the sand has overwhelmed much cultivated country, and remains of the old boundaries and homesteads are still to be seen in Tywyn Trewan and on the southern slopes of Newborough. In the Act of Parliament 10 Elizabeth, the land is described as 'overthrown with sand'.

Large deposits of blown sand are generally formed along gently shelving bays, which are themselves the seaward ends of broad and shallow valleys. Such places are naturally poor in steeply outstanding rock-exposures, so that we have not often in Britain the opportunity of seeing the action of the sand upon rock on any considerable scale. An interesting exception to this occurs at Newborough. Between the sandy tracts of the two bays of Mall-draeth and Llanddwyn runs the ridge of spilitic lavas described in Chapter IV. It is about three miles in length and a quarter of a mile wide, a range of steep ice-worn bosses, 50 feet or more in height, standing 'out of boulder-clay. Upon this the sands of both bays, creeping obliquely inland, have gradually encroached, so that now the boulder-clay is rarely to be seen, and great drifts of sand, shifting with every change of wind, have gathered round the rocks, burying them sometimes nearly to their summits (Plate 49). The ridge is a curious piece of scenery, bringing to the mind some views that have been published of the rocky deserts of the Soudan and of Central Asia; and that, by a paradox of Nature, in a district with a rainfall of 37 inches in the year. The barrenness of some parts of the ridge is indeed remarkable. One may stand in some of the hollows between the bosses of Bryn Llwyd and see not so much as a blade of bent-grass, not even a lichen on the clean-swept rocks, nothing but the knobs of dark green lava and the drifts of yellow sand.

The effects of natural sand-blast on the rocks are also well developed. Long ago grooved and rounded by ice that came from the north-east, they are now being grooved and rounded in a different manner by an agent coming from the opposite direction. But the grooving is quite different. It is really a series of short, shallow troughs, an inch or so in length, giving a sort of elongated-dappled aspect, and the surface, too, is often pitted. The fine-grained lava has been polished, much as if it were 'black-leaded', and even when rugged and sub-angular this polish has been imparted not only to the projections but to little nooks and corners. Porphyritic feldspars and spherulites have been picked out; and, standing up sometimes as much as an eighth of an inch above the general surface, undercut and polished on the windward side,

have little banks of the fine green matrix tailing away from them to leeward. The same phenomenon can also be seen at one place in Tywyn Trewan, the end of the great boss of conglomerate at Harlech cottage, where grooves and 'tails' run up the face of the crag to the north-east, away from the prevailing wind. Boulders and fragments lying in the sand have been even more polished than the rock in place, and some have been cut to incipient 'dreikanter', thus completing the phenomena of this miniature desert.

A photograph (No. A1715) taken at the same spot as (Plate 49), some 10 years before, by Mr. Trevor Owen, shows that the dunes have considerably changed.

Besides these greater tracts, some small dunes have been formed in two places under rather exceptional circumstances. One of these is on the floor of the Malldraeth Marsh just to the north of the main line of railway, where no sand is blowing now. There would, however, have been a time, after the building of the dam, when the floor of the valley must have been an expanse of sand, and being no longer swept by the tide's daily flow, it would have lent itself readily to the formation of dunes in dry weather. But not for many years, because the growth of vegetation checked the process; and so the dunes are small. The other is upon the high brow of the cliffs of Rhoscolyn Head, a place where the usual sources of supply do not exist, for the cliff's foot stands in deep water even at low tide. The deposit appears to be due to blowing upwards from the face of the cliff of debris of the quartzite as it decomposes, without its ever having reached the sea at all.

## Miscellaneous phenomena

***Ferruginous and Calcareous Deposits*** — Ferruginous 'pan' in small quantities forms in the neighbourhood of springs at many places, and upon the out-crops of many different rocks. At the north end of Caethle, Llangwyfan, a number of stalagmitic aggregates have formed at a certain level in the boulder-clay. About a quarter of a mile south-west of the old Woollen Factory, New-borough, the blown sand has been cemented into an iron sandstone, almost black internally, and glistening; which forms fantastically shaped concretions.

At the same place, on a crag-face close to one of the Gwna limestones, the spring-waters have converted the sand into a calcareous sandstone. At the shore-house, north-west of Pentre, Penmon, the Glacial drift has been cemented into pebbly limestone.

At the south end of Porth-delisc, Llanfwrog, in the nooks and corners of the beach close to the rocks, are deposits of heavy black sand consisting chiefly of octahedral iron-ores. No doubt this is derived from the basic plutonic rocks of the Mona complex at that place.

***Caves*** — Only three inland caves are known at present. One is in the great wooded escarpment of the Old Red Cornstones, Coed-y-gell; and was visited by Mr. E. Neil Baynes and the writer in 1909. The others are in the Carboniferous limestone at Llanddyfnan and Parciau. The contents of these caves are being investigated by Mr. Baynes.

***Kitchen-middens*** exist among the dunes of Newborough, but they have yet to be explored.

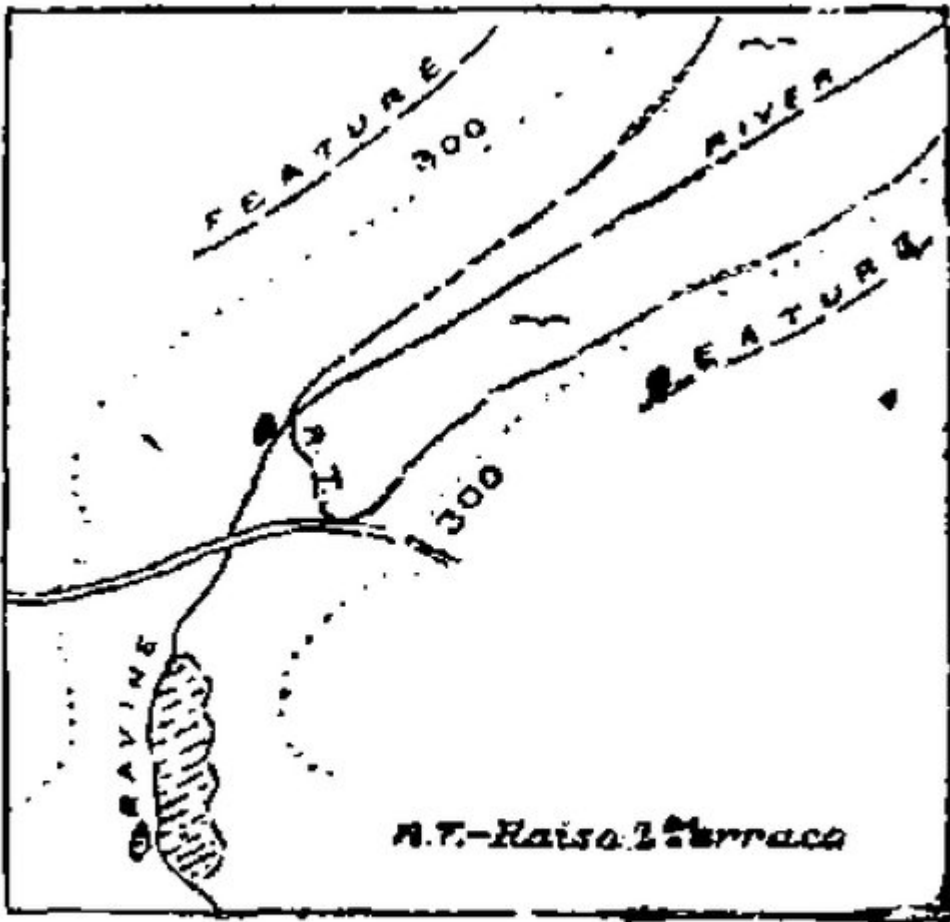


**FIG. 336.**

**THE GRAVEL OF PORTH  
DAFARCH.**

*(Figure 336) The gravel of, Porth-Dafarch.*





**FIG. 337.**  
**THE EXIT OF CREMLYN.**

(Figure 337) The exit of Cremlyn. Scale four inches = one mile.



*(Plate 49) Desert scenery. Dunes of Newborough.*