

The Penrhyn Slate Quarries in North Wales

In *The Illustrated London News*, Vol. XXXII, No. 913,
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(Note: There is a typed transcription of this article located after the images below.)

This article, which begins on the next page,
is presented on the Stone Quarries and Beyond web site.
<http://quarriesandbeyond.org/>

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Penrhyn Slate Quarry in North Wales circa 1858

If the tourist in North Wales, with face southward, between Conway and the stupendous bridges of Telford and Stephenson, which span the Menai Strait, should think that these are the only works of wonder in his route, he is mistaken. At Bangor, let him turn eastward, and ascend the country (about five miles) until he sees a dark gorge in the mountain range of Snowdon which there begins to rise. Before he comes in sight of it he will probably hear a heavy roll of distant thunder. If it be an hour since he heard that thunder, he is startled by another, louder and nearer than before. In another hour there will be, in the same direction, a third; each lasting five or six minutes. These are repeated ten times a day, at the same hours, every working-day of the year. The sound indicates that the dark gorge in the mountain through which the turnpike-road leads is not the only place of mystery to a stranger in that neighbourhood. Turning to the right hand from that road, and climbing over successive ridges of silty *dolers*, and across tramroads, for half a mile or thereabout, the astonished traveller looks upon a scene such as he has behold nowhere else in Britain—the Penrhyn Slate Quarry in before him. An amphitheatre is scooped out of the mountain, so deep, high, grand, that its grandeur approaches or reaches that quality which the mind for the first half hour or two confesses to be sublime.

If you have read and followed the speculations of the best-approved geologists, you will probably believe that the county of Anglesea, which is separated from Carnarvon, in which you now stand, by the Menai Strait, is the fragment of a floor of an ancient ocean. Its fossil shells, and other evidences of having been a marine deposit of limestone, are abundant; the rocks before you—granite above, slate below—have been melted by heat far below this limestone floor, where they cooled, and have been thrown up in a solid rugged form, breaking through that floor of limestone as through a shell. Probably it was when that mighty disturbance occurred that the fracture was made in which the impetuous tide of the Menai Strait now flows.

The slate is supposed by some to have been deposited as the floor of an ocean still more ancient; one that, if not always at boiling heat, was too hot to sustain organic life. This is suggested because most of the slate rocks are stratified, bearing the appearance of having been deposited in horizontal layers. Those layers are now contorted, and are seen in every confusion of angle, indicating that they were disturbed by the upheaving of a harder rock before they were cooled. Besides the stratification or markings of their layers, they have what are called "joints," which seemed to be only fractures caused by the superimposed weight of other rocks. But the most interesting and inexplicable characteristic of the slate rock is that called "cleavage." This is found always, or nearly always, to stand vertically to the present position of the rock, irrespective of its contorted stratification and joints. It is as if sheets of paper had been laid together in an infinity of number, their edges uppermost.



QUARRYMAN AT WORK.

Quarryman at Work in a Penrhyn Slate Quarry in North Wales circa 1858

Perhaps electricity, or that mysterious something so called for want of knowledge of its proper nature and name, has operated on the slate rocks differently than on others. The quarrymen sometimes meet with a substance reaching like a column of iron from the uppermost layer of slate to the bottom of the quarry, 300 feet down, and deeper than they have penetrated. This is always vertical, and runs through the layers irrespective of their angles or distortions, and unites them like an iron girder. Like the lines of cleavage, it therefore seems to have been formed after the rocks were disturbed by the upheaving of the neighbouring granite. In the Penrhyn Quarry a number of those columns are run together in one perpendicular mass, which, being harder than the tools of iron and steel with which the workmen bore and blast, and rive the slate rock, have been left standing. They form an object (as shown in the first Engraving) rather picturesque and graceful; but, when seen by the spectator standing at their base, they seem so insecure, so thin, so fearfully high, that one is pleased when any suggestion is made to remove to a safer position.

The theories of geological causation just glanced at are too doubtful, even as expounded by the most profound inquirers, to be further urged or quoted here. Instead of speculating on what occurred in this part of Carnarvonshire in the millions of millions of years supposed to have elapsed between the time when that slate was the sooty sediment of a boiling-hot ocean and the advent of man, let us glance at the industrial economy of man in his recent and present generations, as witnessed in this quarry.

When the base of the hill, into which the quarrymen have now advanced about half a mile, was broken by the first picks and chisels, the beginning was made at a level probably two hundred feet higher than it should have been. By this cause an enormous mass of the best slate, the best lying undermost, is lost. It could only be recovered now by an expenditure of capital and labour which it might not repay; and, as the slate seems inexhaustible for ages yet to come on the level now worked, the attempt is not likely to be made.

The workings are carried forward from the two flanks in a kind of half circle. There are twelve terraces of slate workings, each apparently sixty feet high, and two, which embrace the overlying stone, of a granitic character. Each terrace is of a like width, and is laid with iron rails, by which its products are conveyed away in trains of small waggons drawn by horses. The *dolers*, of which the blasting causes a disproportionate quantity, is carried away by the same means, and deposited in continuation of the same terraces, to the distance of half a mile on the sides of the hill. Thus, at a distance, the appearance of the quarry and works above suggest a bird standing a thousand feet high, with outstretched wings, each half a mile in length.

The quarrymen do not work into the face of the terrace; they

edge themselves in at different points, and gain a face of workings at nearly a right angle with the terrace. In doing this they at first cut a passage with sharp picks and chisels, gaining no slate, only chips. Having obtained a workable face of rock, they work from the level of their respective terraces downward. Four or five, or six, join in a gang, or it may be a family of a father and several sons. One or two of them bore (as seen in the second Engraving), and put in the blasts of gunpowder; another, or perhaps two, as occasion requires, squares and splits the shapeless masses detached by an explosion into slabs. These are conveyed in the waggons to the terraces outside the quarry, which we have compared to a bird's wings, where some of the gang split them into slates; or, should the slates be large enough, into shapes for billiard-tables, tombstones, or like purposes. At the end of a month the price given by the owner of the quarry for the marketable slate turned out by the gang is paid to the headman, and divided. It averages about £5 per man upon the whole year; but sometimes they work a month, and have not as many pounds to receive for the whole. This arises from their fortune in the quality of the rock. They do not pay for the conveyance of the slate or débris from the workings, but they provide their own tools, and are charged for the gunpowder used. They are paid different rates, according to the size of the slates obtained. The sizes are known by such names as "duchesses," "countesses," "ladies," &c. The origin of these terms has been variously alleged. The most probable is, that English-speaking overseers and merchants had a difficulty in dealing with Welsh-speaking workmen, and that they mutually agreed to use a nomenclature which had no double signification. The "queen" slate is 36 inches by 20 inches; for a ton of these, made ready for market, the quarriers receive 8s. The "imperial" slate is 36 inches by 18 inches, for which they get 6d. per ton. The smaller sizes are paid by the thousand. Thus, the "duchess" is 24 inches long (breadth in her and all below variable), and the workmen's price is 2s. per 1000. The "countess" is 20 inches, and "small countess" 18 inches long; price 2s. per 1000. "Ladies" are about 16 inches long, and are produced at 1s. per 1000. "Doubles" are the smallest size produced at Penrhyn (though not so elsewhere), and are paid for at 6s. per 1000. The billiard-tables and other slabs are paid for according to size and quality.

The number of men employed in this quarry is about 2500; yet diffused throughout its workings they seem so thinly placed that a casual visitor would hardly reckon a third of that number.

At five minutes before the hour a horn is heard sounding the signal of retreat. The spectator, standing at a safe distance in the frizz, looks down to the depth of 200 or 300 feet below, where, in the bottom of the quarry, he sees the tunnel through which the slates obtained there are conveyed away (See the third Engraving). His eye ranges upward and



THE FITZROY QUARRY.

The Fitzroy Quarry in North Wales circa 1858

around the successive terraces until he takes in a scene about 300 feet high. Each terrace, from lowest to highest, and all the half circle of the vast amphitheatre, is about to fire its broadsides. There is to be a cannonade on a scale never witnessed elsewhere. The workmen have excavated places of retreat for themselves, or have built sheds which are barricaded to withstand the flying fragments of rock. At the first sound of the horn you observe they disappear. Those full-sized men and horses which were near you on your own level, those dwarfs far below, those insects, which some of them appeared only to be while working in rope ladders, and discernible only as flies upon the wall of a room in antuan—all have disappeared except the man with matches. The horn has sounded two minutes. It is silent. The last men have laid their matches, and they, too, are gone. You look aloft as if you stood in Ludgate hill, London, looking to the top of St. Paul's, or to a height two hundred feet higher, watching for the first explosion. You are wrong; you see it down below as if you stood on the Monument and looked on London-bride; but your head is hardly turned in that direction until there thunder off one, two, or three, or more explosions like cannon close beside you. And aloft you see them going, and down on every level, and all round the circumference, quick in succession, a dozen at once, perhaps; then a momentary pause, and then a terrible recommencement, a flying of splinters, a groaning of the ruptured rocks, a re-echo of sounds, and rebound of concussions—far below, high above, and again all round, the war continues. The rock is riven in several hundred places; vast masses are overthrown, and fragments fly into the air, and over the next and next terraces below, where they fall with terrific violence. But five, or six, or seven minutes have elapsed, and the blasts are done: no! there is yet one, and again another, which had slower matches than the rest. But now there comes dead silence, and a smell of gunpowder and thickness of smoke which fill the whole amphitheatre. Presently the horn sounds, and the men and horses reappear. The smoke speedily clears away, if it be a dry, breezy day, and you see the work going forward as before. The men who bear assume their mallet and long round chisels; their mates, who shape the blocks, make incisions with a sharp pick, and, having inserted, drive in their rows of wedges; men engaged in loading the waggons lift the portable iron sledges, and relay the railway in a minute in any place where it is required; those who cleave the slabs into slates, and who did not cease working, being at a distance safe from the firing, continue to sit with the slab between their knees, and with a light mallet, on a long, thin, sharp knife, slice off the slates from "queens" to "ladies."

The quarries have been connected with the Chester and Holyhead Railway by a branch line of about four miles in length, which joins the main trunk on the London side of the two tunnels that are traversed previous to reaching Bangor from the south.



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"The slate is supposed by some to have been deposited as the floor of an ocean still more ancient; one that, if not always at boiling heat, was too hot to sustain organic life. This is suggested because most of the slate rocks are stratified, bearing the appearance of having been deposited in horizontal layers. Those layers are now contorted, and are seen in every confusion of angle, indicating that they were disturbed by the upheaving of a harder rock before they were cooled. Besides the stratification or markings of their layers, they have what are called 'joints,' which seemed to be only fractures caused by the superincumbent weight of other rocks. But the most interesting and inexplicable characteristic of the slate rock is called 'cleavage.' This is found always, or nearly always, to stand vertically to the present position of the rock, irrespective of its contorted stratification and joints. It is as if sheets of paper had been laid together in an infinity of number, their edges uppermost.

Perhaps electricity, or that mysterious something so called for want of a knowledge of its proper nature and name, has operated on the slate rocks differently than on others. The quarrymen sometimes meet with a substance reaching like a column of iron from the uppermost layer of slate to the bottom of the quarry, 800 feet down, and deeper than they have penetrated. This is

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"The quarriers do not work into the face of the terrace; they edge themselves in at different points, and gain a face of workings at nearly a right angle with the terrace. In doing this they at first cut a passage with sharp picks and chisels, gaining no slate, only chips. Having obtained a workable face of work, they work from the level of their respective terraces downward. Four or five, or six, join in a gang, or it may be a family of a father and several sons. One or two of them bore (as seen in the second engraving), and put in the blasts of gunpowder; another, or perhaps two, as occasion requires, squares and splits the shapeless masses detached by an explosion into slabs. These are conveyed in the wagons to the terraces outside the quarry, which we have compared to a bird's wings, where some of the gang split them into slates; or, should the slates be large enough, into shapes for billiard-tables, tombstones, or like purposes. At the end of a month the price given by the owner of the quarry for the marketable slate turned out by the gang is paid to the headman, and divided. It averages about £5 per man upon the whole year; but sometimes they work a month, and have not as many pounds to receive for the whole. This arises from their fortune in the quality of the rock. They do not pay for the conveyance of the slabs or debris from the workings, but they provide their own tools, and are charged for the gunpowder used. They are paid different rates according to the size of the slates obtained. The sizes are known by such names as 'duchesses,' 'countesses,' 'ladies,' &c. The origin of these terms has variously alleged. The most probable is, that English-speaking overseers and merchants had a difficulty in dealing with Welsh-speaking workmen, and that they mutually agreed to use a nomenclature which had no double signification. The 'queen' slate is 36 inches by 20 inches; for a ton of these, made ready for market, the quarriers receive 3s. The 'imperial' slate is 36 inches by 18 inches, for which they get 6s, per ton. The smaller sizes are paid by the thousand. Thus, the 'duchess' is 24 inches long (breadth in her and all below variable), and the workmen's price is 25s. per 1000. The 'countess' is 20 inches, and 'small countess' 18 inches long; price 20s. per 1000. 'Ladies' are about 16 inches long, and are produced at 10s. per 1000. 'Doubles' are the smallest size produced at Penrhyn (though not so elsewhere), and are paid for at 5s. per 1000. The billiard-tables and other slabs are paid for according to size and quality.



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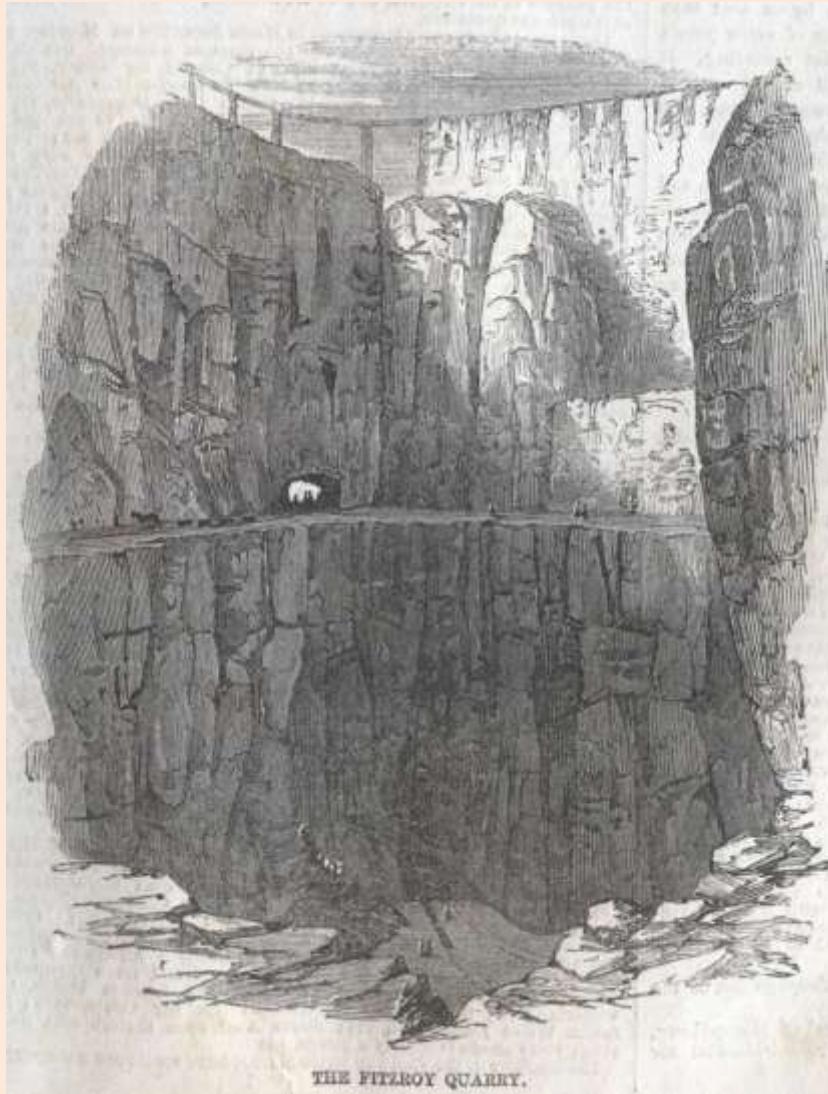
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The horn has sounded two minutes. It is silent. The last men have laid their matches, and they, too, are gone. You look aloft as if you stand in Ludgate hill, London, looking to the top of St. Paul's, or to a height two hundred feet higher, watching for the first explosion. You are wrong; you see it down below as if you stood on the Monument and looked on London-bridge; but your head is hardly turned in that direction until there thunder off one, two, or three, or more explosions like cannon close beside you.



And aloft you see them going, and down on every level, and all around the circumference, quick in succession, a dozen at once, perhaps; then a momentary pause, and then a terrible recommencement, a flying of splinters, a groaning of the ruptured rocks, a re-echo of sounds, and rebound of concussions – far below, high above, and again all around, the war continues. The rock is riven in several hundred places; vast masses are overthrown, and below, where they fall with terrific violence. But five, or six, or seven minutes have elapsed, and the blasts are done: No! there is yet one, and again another, which had slower matches than the rest. But now there comes dead silence, and a smell of gunpowder and thickness of smoke which fill the whole amphitheatre. Presently the horn sounds, and the men and horses reappear. The smoke speedily clears away, if it be a dry, breezy day, and you see the work going forward as before. The men who bore resume their mallet and long round chisels; their mates, who shape the blocks, make incisions with a sharp pick, and, having inserted, drive in their rows of wedges; men engaged in

loading the wagons lift the portable iron sleepers, and relay the railway in a minute in any place where it is required; those who cleave the slabs into slates, and who did not cease working, being at a distance safe from the firing, continue to sit with the slab between their knees, and with a light mallet, on a long, thin, sharp knife, slice off the slates from ‘queens’ to ‘ladies.’



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