OAKELEY SLATE
PART TWO
1889-1920
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The History of
The Oakeley Slate Quarries
Blaenau Ffestiniog

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From Amalgamation to the Great War

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To be continued in:-

PART THREE
1920-1968
From Peace to War and Back again

Continued from:-

PART ONE
1800-1889
From Beginnings to the Great Fall
19. THE ROBERTS YEARS I 1889-1904

With the ending at last of the protracted arbitration hearing, the Oakeley Quarries prepared for the long delayed unification or amalgamation. The organisation of the whole Rhiwbryfdir site was radically altered, the separate operations of the Middle and Upper Quarries were merged under the overall management of Robert Roberts, thereafter there would only be sub-managers at the old Upper Quarry offices. Despite this official merger, the divisions between the quarries both in terms of practice and labour remained marked throughout the rest of the quarries life.

It was at this time that the overall numbering scheme of the quarries was also altered to bring the nomenclature of the floors into a unified whole, with a notional base at floor 1 of the Middle Quarry. There were a few problems in implementing this, one being the area between the Middle & Upper Quarries where there were several floors in close proximity. In the event the old Upper Quarry floor designations in the Back Vein of A and B were retained, but the floors abandoned. The Upper Quarry floor 1, re-numbered 5u was only just above floor 4 Middle Quarry, while floor 5 Middle Quarry was only just above that. In the event, floor 5 Middle Quarry did not have any underground workings, while floor 5u's were merged with those of floor 4 and worked from that horizon. At a later date floor 5u was continued at its original level in the New Vein, but as there were no floor 4 workings in that area, no confusion arose.

Though A.M.Dunlop was the Managing Director of the whole enterprise, and for much of the time resident at Bryn Mawr, just below Plas Tan y Bwlch, it was Robert Roberts who was the man on the spot and who had his finger both on the pulse of the quarry and also in just about everything else that was going on. By his actions and words at the Arbitration, he had stoutly defended both his company and his master against the W.S.Co.'s insinuations and had demonstrated his faith and knowledge in the rock and his men. Indeed, for the next 17 years or so, virtually he was the Oakeley Quarries in Blaenau - these were the Roberts years!

Many problems faced the enlarged Oakeley Slate Quarries Company Limited when it took over the Welsh Slate Company's workings, the greatest of course, being the Great Fall itself, but there was also the problem of men and machinery.

The Welsh Slate Company's transfer of interest to Cwmorthin, as the "New Welsh Slate Company" was to provide some little headache for Robert Roberts, apart from the continual worry of the Cwmorthin workings affecting those of Oakeley. There had already been litigation over the underground and surface boundaries and W.E.Oakeley had already been granted three Cwmorthin chambers as compensation for "trespass" by the Cwmorthin Co. In addition, the Cwmorthin Back Vein workings had collapsed at around the same time as the Welsh Slate Company's Old Vein, causing an increased strain to be brought to bear in the strata to the west.

Robert Owen seems to have attempted to bribe or otherwise attract his old workforce over the mountain to work at Cwmorthin. Roberts had no time for Owen, he had already had his brushes with Owen over the Middle Quarry Back Vein, and when he saw the state of the Welsh Slate Co. workings, mills and machinery, he was disgusted. He was appalled to find the K Incline, the "K Trwn" without any form of railings, the mill machinery was uncovered and suffering from many years lack of maintenance, statutory notices regarding the Factories and Mines Acts were not displayed, the pumping machinery was, he felt, worn out and ancient to boot, and in any case clearly not up to the task it had to do now that so much of the water was finding its way into the workings. Many wagons were in urgent need of repair or replacement, the Office was in total disarray and the house that Owen had occupied so annoyed Roberts that he ordered it to be completely cleared out, cleaned and re-painted, while Owen himself was to be banned forever from stepping onto Oakeley territory!

The very name of the Welsh Slate Company was exorcised, explicit letters being sent to the Station Masters and Goods Agents of the various railways - L.&.N.W.R., G.W.R. and, of course, the F.R. - informing them that henceforward, the site was to be referred to as "The Lower Quarry of the Oakeley Slate Quarries Company, Limited."

The firm of Dewintons, still engaged in the maintenance and repair of the upper two quarries was called in as consultant on the Lower Quarry problem. Only the C incline seems to have been considered satisfactory, the others all requiring attention in various ways.

The first major problem to be tackled was obviously the Great Fall. This was being handled satisfactorily by the existing incline arrangements, as the Welsh Slate Co. had proved, but nevertheless, the removal of the dead rock took up valuable haulage time and the traffic got in the way of the profit earning traffic from the workings proper. As ever, the problem was one of tipping space, both C Bank and Bonc Siafft had restricted sites available, and the mining waste had to be tipped as well. Little could be sent via Level Galed to Penybont, the space available there was possibly the most restricted of all, and that which was left was required for the waste from the DE Penybont mills. The only solution here was found to be to tip southwards along the eastern bank of the Barlwyd, along the "foothills" so to speak, of the Middle Quarry main tip from the high level bridge. This was achieved without disturbing the Middle Quarry Inclines by the simple expedient of constructing a short slabbed tunnel beneath the lower of the two inclines. It was this tip which effectively buried the hamlet of Rhiwbryfdir at last, only Ivy Cottage, sometime renamed Rhiwbryfdir House after the original was buried, survived into the present century.
The only virgin clear area available for tipping of any extent was that on the slopes of Iwerddon to the north of the bon and Bonc Siafft. This was the area which had figured largely in the various estimates of cost to clear the Great Fall, including Jones "multiplying inclines." The scheme had been mooted earlier than that even, by the Welsh Slate Co. but had not been allowed to proceed. Now there was no problem. A new steam worked incline was constructed from Bonc Siafft to a position about 130 feet higher up the mountain, roughly opposite the west end of the Bonc Siafft mill. This route crossed a hollow in the hillside and so the lower part of the incline was constructed on a built up slab embankment.

The "Mountain Incline" or the Ffriidd Incline, as it was better known, could take the waste from Bonc Siafft and from the mine, as well as providing a means to tip the North Vein at the top of the Bon and dispose of the waste produced by that! It was hoped by this means to relieve some of the pressure on the stubs of the walls, and the bon itself, which was proving difficult to keep up. The incline took a year to build and equip and was described as ". . . it answered well to its task." The untopping was started by a tunnel through the rock outcrop immediately to the west of the Bonc Siafft mill, the track making an end on junction with the mill access tracks at the foot of the new incline. This "untopping cutting" was soon being driven west and sideways into the top of the bon, forming a gallery. Shortly after a second cutting was begun at a higher level.

The incline had two tracks initially, the drums being driven through gearing in the conventional manner from a horizontal engine. Two Cornish boilers supplied the steam, their flues turning into a tubular iron chimney on a brick base, the chimney being stayed by guy wires. In front of the combined engine and boiler house was a walled coal yard reached by a track which curved forward from the crimp of the incline through a gateway. The incline was "driven" in the usual manner from a "stage" in front of the drums and over the tracks.

The arrangement was altered in 1896 to accommodate a third track. This was completed by February 1897, the intention being to relieve some of the congestion caused by the mixing of loads of waste from the Bonc Siafft Mill, waste from the untopping cutting immediately to the west of the mill and also from the second cutting slightly higher up. At some stage an additional boiler, somewhat smaller than the first was added in a lean-to on the eastern side.

The creation of the Ffriidd tip did pose one problem in that it threatened the water course from Llyn Ffriidd y Bwlch to Bonc Siafft. This was solved by driving a level through the hillside from just behind the Vertical balance shaft to a point to the south of the lake, where the original leat could be diverted. The new "water tunnel" was complete and in use by June 1895.

One way in which further ground could be gained was by allowing the Bonc Goedan tip to expand over the old incline connecting the office floor with the end of Lefel Galed. However, Lefel Galed was still in use, carrying slabs to Penybont, so what was to be done? The answer was very simple, Lefel Galed was extended in timbering beneath the tips which the tramway skirted, emerging close by the high level bridge itself near the Middle Quarry inclines. This was completed by mid-1894, two separate entrances being provided, one debouching onto a new weighbridge, the other avoiding it being for returns. The two tracks met some yards inside. The extension was straight, apart from a slight curve at the end where it joined the original level. Once completed, the original site was tipped over and buried.

Another incline taken in hand at this time was that of the Middle Quarry, which had apparently remained virtually unaltered since its construction. The incline bed had become unstable, the iron pegs which had secured it to the rock having rusted away, but, it is also said, the original engine and boilers were worn out. The task of rebuilding was entrusted to Dewintons’ and work was begun on reconstruction in 1888 or 1889 and continued until 1891. The original drums, wooden beams and "stage" where the operators, known as "drivers", stood were removed, new two-piece drums of various weights to suit the different rope lengths and steel "I" beams being supplied. The new stage was at a greater height than the drums, their ropes passing beneath it. Provision was made for fitting up to seven drums on the main shaft, although only four were fitted initially, to allow operations on the existing incline while it was being strengthened and widened. This was done by the simple expedient of building a new retaining wall, pegged to the rock, "outboard" of the existing structure, and then carefully infilling in between so that the new structure supported the old. The cutting of roadways through the bed in recent years has clearly exposed this "double wall" effect.

One or two additional drums were fitted to the incline in 1899 to cater for the eventual extension of the incline down to C and DE floors as the removal of the fall and the uncovering of the floors progressed. At this time, although floors 4, 3 and 2 were served directly, floor 1 was still being worked by a supplementary incline from floor 2, the rope being fed round a horizontal sheave, a particularly inconvenient arrangement. It is not clear exactly how the traffic was handled, but it is thought that the wagons were lowered to the floor 2 landing, slack rope paid out, the wagons turned on a turntable and the slack rope thrown over a sheave. Then they were lowered to floor 1, the reverse process being used for hauling.

No official details of the new engine have ever come to light, although a model built by William Williams, the Middle Quarry compressor attendant was claimed to be based on the design. This was a twin cylinder (duplex) horizontal engine, the cylinders being lagged with wood. A curious feature of the model was that the drum shaft was not geared to the crankshaft at the engine end, but the crankshaft was extended across beneath the drum shaft and the gears fitted at that
end. Certain features of the actual building remains suggest that this is at least feasible! Steam we know was supplied from four Cornish type boilers installed in the original boiler house, each being twenty feet long and 5 feet in diameter the Cornish single flue type favoured throughout the quarry rather than the more efficient Lancashire two-flue type. An iron tubular chimney stack, similar to that at Ffridd, was supplied, stayed with wires. One feature of note was the provision of a large ship's steam whistle, which was to provide the signals for the beginning and ending of the workings day, blasting periods etc.

The problem of water would not go away, and the O.S.Q.C. Board turned it's attention to it. The pumping capacity of the quarry in 1890 was about 40,000 gallons per hour. This was considered far too small and could not hope to cope with any expansion in the workings, or any increase in the water entering the mine. It was therefore decided to adopt a modern high capacity pumping system of at least 100,000 gallons per hour capacity. The only question was what type it should be and where it should be placed.

Mindful of the dangers to any pumping equipment placed directly in the workings and the havoc wrought by the various falls on the Welsh Slate Co.'s pumps, the decision was made to place the pumps as far to the south as possible, perhaps on the surface to the south on or above C floor, as this was the only available ground. Initial thoughts, of which there were many, envisioned various arrangements of surface engines working the pumps by rods in an inclined shaft along the hard at the bottom of the New Vein to floor L, the then bottom floor of the mine. Alternative suggestions involved a vertical shaft down to L and then a tunnel to the workings, this would have had to be driven down through the Glanypwll Trap rock for its whole depth to L and would have proved very expensive and time consuming. A further modification of this was to sink a shaft to the top of the trap rock, and then drive an inclined shaft along the trap to L floor. All of these founded on the problem of the great distance from the surface to floor L.

There were already two shafts in existence from the erstwhile floor A down to the DE tunnel, Lefel Galed. The southernmost shaft had been capped and tipped over long before, but the northern one was still open. Only a few yards further north, a third shaft dropped from Lefel Galed down to Lefel Dwr. Directly under the H & I hauling engine, which was on DE floor, there was a small trial chamber in the New Vein on the G floor, through which Lefel Dwr passed. It was decided to take advantage of these features to sink down for L from the chamber on G, thus considerably reducing the distance that would have to be driven. The exact lie of the Glanypwll trap rock below G floor, although it was intersected by the level some 40 yards or so to the south of the shaft from DE, was not known, nor was the location of the trap on L floor. Thus the only way to determine exactly what work was needed was to begin and determine the location of the trap rock practically.

Work began in January 1889, one gang sinking the shaft from Lefel Dwr, the other driving the connecting level from the L floor main vein level towards it. The shaft was to be 220 feet deep, while the horizontal distance from the main tunnel on L to the foot of the shaft was 490 feet. By July the L level had been driven for 75ft, while the shaft was down 70ft. from the G floor, striking the trap rock. It was then suggested that an inclined shaft be driven from there along the top of the trap rock until it met the level on L floor, avoiding the hard work of sinking and driving through the trap. Robert Roberts voiced his concern in these words: "Can pumping machinery be fixed to work efficiently in a vertical and part inclined shaft?" In fact the matter was worse than that, for at this time it was still intended to fix the pumping engines and boilers on the surface on floor A, working the pumps on L by rodding down the shaft to DE, then along the short section on DE to the shaft to G, down that shaft, then along Lefel Dwr to the trial chamber, then down the new shaft to floor L!!! An arrangement which was described as being of "dubious mechanical advantage."

November 1889 saw the L level in some 60 yards, proving the "A" Vein for a thickness of 17 yards, of a "promising" character. The level was now being driven with some success, for "machine drills" had been adopted. These were supplied with compressed air from a steam driven compressor mounted in the old L floor level, while that itself was supplied with steam from the boiler on K which worked the incline in chamber 2 to L floor, the pipes passing down the side of the incline which was in the "back vein" or, more accurately, the upper part of the Old Vein, above a whinstone which formed the roof of the "main vein". From there, the pipes ran first west to a connecting level and then along the main traffic level east to the compressor. It was little wonder then, that the suggestion that two additional drills be put to work was met with concern that this might cause condensation in the steam main! The drills were said to be working at 5 to 6 times the rate of the manual drills.

The idea of the slanting shaft connection was now abandoned, as it was clear that with the machine drills, the trap rock could be dealt with effectively. By February 1890, with machine drills at work in the shaft as well, though how these were supplied is not clear, presumably from a compressor either in the open on G floor, or in the chamber, steam being supplied from the H & I boilers on DE floor. The shaft was down 142 feet below G floor, 82 feet into the trap rock. The L level had now penetrated 30 feet into the trap rock, with 210 feet remaining. This had proved the "A" or New Vein to be no less than 122 feet thick in this area.

Earnest consideration was now given to the machinery, clearly the multiple changes of direction could hardly be efficient and it was decided to place the machinery in the trial chamber on G, at the top of the shaft. Roberts insisted that if this was to be
done, then the chamber ought to be roofed over with masonry to prevent the heat of the boilers drying out the rock and loosening it. There was also the problem of ventilation.

Steam power had been favoured from the beginning, a plant of about 100 to 150 h.p. being required for the intended capacity. Jones, among others on the Board suggested that water power ought to be considered, as it was cheap and there was a plentiful supply throughout most of the year (at least in the Lower Quarry). Mention was made of the use of Conglog Lake, on Lord Willoughby D'Eresby's land - presumably a reference to the Rhosydd Quarry. On G floor there ought to be a good head of water from Llyn Ffridd y Bwlch, or the Vertical Balance reservoir to drive a turbine. Water, it was felt, was cheaper at first cost and to maintain than steam, the question was, was it reliable?

Rather typically, in May 1890 the Board could not choose which was the better, and so chose both! This made for a complicated design to say the least, and DeWintons were asked to produce a suitable solution. By now the shaft was down 205 feet out of the 220 needed and the level had been driven 370 out of the 490 feet required.

The level from L reached the foot of the shaft in August, 1890 and work could begin on preparing the chamber for the installation of the machinery and the shaft to take the pumps. DeWintons had done their best with the design of the plant and produced a superb hybrid worthy of the original idea. The steam prime mover was one of their two-cylinder compound condensing marine engines, which was to drive a three throw crank shaft via gearing and a standard incline dog-clutch. Steam was to be supplied by a pair of Cornish boilers, mounted in masonry - the idea of roofing the chamber had been abandoned.

The turbine was ordered from Gilbert Gilkes of Kendal, and was to drive the opposite end of the crank shaft through a combination of belt drives, gearing and another dog-clutch. Before the plant could be installed there was a lot of preparation to be done. Work began on a shaft to take the flue gases. This slanted backward and upwards from the chamber as a roofing shaft, coming to the surface at the back of DE floor, close by the entrance to Level Galed, where a slab stack was built. By November the L floor level had been cleared out and prepared for the water channels, the foot of the shaft on L had been enlarged, a sump had been dug and the smoke shaft from G to DE was through.

It took a further 12 months to fix the timber frames in the various shafts, assemble the pump barrels and erect the major portion of the machinery in the chamber. Thomas Jones was now able to report, "the machinery in the pumping chamber is completed as far as steam is concerned & appears to be capable of dealing with any probable inflow of water." The turbine was in course of being fixed. The pumps were conventional "lift" pumps, the pistons and clacks being raised in the barrels by long pump rods which passed down the barrels from three counterbalanced beams on G which were themselves worked by levers from the crank shaft. It was a complex arrangement which was to be the cause of much concern and trouble.

Immediately above the pumping shaft and in line with it was a much shorter one which connected the pumping chamber with the surface, just in front of the H & I drumhouse on DE. The records make no reference to this and it is not possible to say whether it is original or not. It was certainly used in later years to enable the pump rods and barrels to be lifted with the aid of the H & I winding drums, a special sheave being arranged on the surface above the shaft for the purpose.

The turbine was fed with water from a new pound behind the Bone Siafft Mill, the pipe passing through the mill at the position of the water wheel to a point just below the mill where the water could be diverted into the old reservoir above the small slab mill. Thence in a great curve to the east of the sink to keep it clear of the edge, to the top of the old shaft on Floor A. For most of their lives, the pipes were enclosed in wooden boxes, presumably for protection against frost or tipping. In the shafts the pipes were fixed to timber bearers, while at the foot, and on the landing on DE, the bends were later encased in masonry and concrete and chained to the wall or roof to stand the thrust. There were air release valves on DE and along the level stretch to the turbine on G. At the time of installation fears were expressed that the socketted pipes used would not be able to stand the pressure and would become insecure, however, apart from the length on G floor, much of the piping in the shafts at least appears to be in its original form still, so these fears appear to have been misplaced. Certainly the records which speak of the vicissitudes of the "Pwmp Mawr" never mention any problems with the pipework, except on the surface where they were exposed to the elements.

By the end of the Welsh Slate Quarry's tenure, their inclines connecting the workings with the surface had at last stabilised and remained in much the same arrangement for several years into the Oakeley period.

The lowest floor, L, was served by a single track incline in chamber 2 in what was originally part of the W.S.Co.'s "Back Vein", in fact it was in an upper part of the Old Vein, lying between two whinstone dykes. Be that as it may, the incline was steam powered, the boiler, engine and drum(s) being situated in the chamber at the top of the incline. The engine lifted wagons to K floor. This floor was served by the "K Turn", the K "Carriage Incline" in chamber A2 which connected directly with floor DE in the open. At the head of this incline was a massive timber framework which supported the incline sheaves and acted as a landing for the carriages. The ropes passed over the sheaves and then travelled horizontally for about 40 yards or so, supported at mid point by a simple framework carrying two more smaller pulleys, to the drum and engine house proper, safe from any falls from the bon. Operations on the incline were controlled from a small hut by the
Despite the "remote" positions of the machinery working the H, I and K inclines, the inclines themselves were still in vulnerable locations, and as the quarry became to depend more and more on the Lower Quarry's underground floors for working on DE was cut by the fall. Thus traffic to and from DE west had to pass along F floor to a short gravity incline in chamber D4, where it could regain its intended level.

From DE floor, slabs went through Level Galed to the Penybont Mills, or waste up the C Incline for tipping at Boncchamber 14, where it could regain its intended level.

The water balance between F and DE floors served workings on both F and DE, as the old traffic level to the western workings on DE was cut by the fall. Thus traffic to and from DE west had to pass along F floor to a short gravity incline in chamber D4, where it could regain its intended level.

From DE floor, slabs went through Level Galed to the Penybont Mills, or waste up the C Incline for tipping at Bonc Coedan.

Despite the "remote" positions of the machinery working the H, I and K inclines, the inclines themselves were still in vulnerable locations, and as the quarry became to depend more and more on the Lower Quarry's underground floors for slate, so their importance increased - so too did the need to ensure their safety and continued operation. The bon above both chambers was far from secure, although it was far worse above the A1 incline where it was almost vertical than above the K Trwnc. A1 as also in use as the principle path down to H floor from G, crossing the incline by means of a bridge, the main H traffic level burrowing beneath the incline by a timbered level.

By the early 1890's it became clear that the rock in this area was once again on the move and steps were taken to secure the inclines. In the case of the K Trwnc this was limited to the extensive use of chains placed across the walls of the chamber and secured through the old traffic levels, literally tying the whole lot together. The inspection of these chains became a regular occurrence. Due to the size of the incline carriages, little more could be done, due to the large space they required, and it was the avowed intention to replace the K Trwnc with a conventional incline on another and safer site as soon as circumstances permitted.

The H and I inclines were in more immediate danger, however, "ominous" cracks appearing in the traffic level at the foot of the incline in 1892 and also over chamber A3. Fall clearing was thus abandoned in chambers A2, A3 and A4 on I and the working forward of the erstwhile "back vein" chambers abandoned. Where possible the chambers were filled with waste to take some of the pressure. It was clear that the inclines, despite this, needed permanent protection, I being, at this time, the "principle produce floor".

The first stage in the work was to re-arrange the incline and landings on H and I floors. Below H floor the incline bed was re-laid and surrounded by masonry arching which extended from H down to the landing on I. The main H floor level was then also re-laid across the newly formed masonry shaft and itself "bricked in". The lower part of the chamber was then filled with waste, tipped in from H and above, to help fill the void and protect the new arrangements. To replace the old slanting pathway to H down the west side of the chamber, a new stairway was constructed down the east side of the H incline tracks.

At the same time, the level from the G floor landing to the Vertical Balance, which also passed through the danger area, was protected in a similar manner. A massive masonry arch constructed of several layers of brick abutted onto heavy slabwork was constructed over the whole length of the level to where it entered the "bon". A similar retaining wall was thrown up from wall A1 itself to the southern bon, pierced by the new arched level, and the area behind it again filled with waste, presumably tipped from DE floor.

The final stage in the protection operations involved the further enclosing of the H incline and the remaining upper part of the I incline from H floor up to G. The arched masonry was again employed, a massive retaining wall being built across the top of the chamber on G, the inclines piercing it by two "Arches", a name henceforward given to the inclines themselves. The totally enclosed inclines were now further protected by tipping into the abandoned chamber behind the wall. Above the "Arches" a slate tablet was inscribed with the date of completion - "1895".

The new enclosure meant there was no room for the stairway inside the arch, and so a new stairway was constructed in the old "Ashton" incline chamber, which had had to be blocked at its top by a slab retaining wall to support the roof.

The first Mill to be tackled was Bone Siafft, as this was closest to the workings. This had originally been driven by a water wheel but by the 1890's appears to have been driven by a steam engine, possibly mounted outside the south wall, utilising the original shafting. The old iron chimney was pulled down and replaced in April 1896. There is some conflict here, as a
letter in November 1897 refers to the water wheel at the "Upper Mill of the Lower Quarry" being rebuilt as the timber structure had decayed. It was now said to be "good for another 30 years without attention." Perhaps then, both water wheel and steam power were in use, the steam engine supplying power in times of drought or high load? The primary task here was renewing the machinery where necessary and bringing the whole mill up to scratch - after a final extension in 1896, the third in its life - it was about as big as was practicable. It held some 39 saws and dressing machines, arranged in the transverse fashion. The mill structure was a hybrid, originally being built of timber frames with slate cladding on its southern side, the northern side being of slab. The space between the timbers was subsequently filled in with sawn ends to give a stronger structure.

The other main ex-W.S.Co. mills at Penybont were a particular headache. Access to them was by the long and narrow Lefel Galed, which had only a single track and was proving a bottleneck, apart from the limited area of tipping ground still left to that mill. What was required was a new modern mill close to the workings to supplant Bonc Siafft.

Space for a new mill was short, the old W.S.Co. slab mill was being increasingly surrounded by the tips from Bonc Siafft and Bonc Coedan, and would in a very short space of time be completely cut off from Tal y Waenydd, so it was clearly no use, in any case it now had no direct access to the workings, and all the main inclines delivered to a higher level.

The only space available was, in fact, Bonc Coedan itself, which had expanded enormously both to the North and East as a result of the removal of the fall waste. In fact, so large had it grown in the last few years of the W.S.Co.'s existence that it had proved necessary to bridge over the tramway from the F.R. to Bonc Siafft at the Office floor, and continue to tip over it to the east onto Clogwyn Mawr. Now it was beginning to bury the old C floor tip above Pant yr Afon! It was here, therefore, that the new Mill was begun.

Work began in early 1890, preparing the ground by filling in the holes and levelling it. Jones remarked that "much more sawing is needed these days" and suggested that the skylights on the mill should be continuous, not detached. By November the walls were up and the roof partly on. When completed the Mill was equipped with 18 saws and dressers and was laid out to be fed conveniently from the incline. The building was about 200 feet long by 55 feet wide as constructed but was enlarged subsequently, reaching 255 feet in length and housing twenty saws and dressers.

The \( \text{C} \) incline provided a swift route for the slate directly from the \( \text{K} \) Trwnc and the workings as well as the fall waste. As a result more and more importance came to be placed on the \( \text{C} \) Mill, or Bonc Coedan Mill, the names were used interchangeably. In addition to the mill a large smithy and workshop were built at Robert Roberts insistence, replacing those on the old Office floor and fed with steam from the mill boilers.

The only problem was, in fact, the incline, it was the only route to and from the mill! Finished slates initially had to retrace their path down the incline and then through Lefel Galed to Penybont and the F.R. Any accident or misplacement on the incline clearly could lead to a total stoppage of operations. In addition, this once again increased the traffic using Lefel Galed, so the problem of traffic became acute.

Robert Roberts proposed that the mill should be connected directly to the Middle Quarry inclines to the F.R. and a plan still exists showing several of the proposed solutions, the most logical being the direct connection on the level from Bonc Coedan to the intermediate loop between the Middle Quarry inclines which he had suggested. As far as is known this was never constructed, although it would have provided a quick solution. Instead, in 1896 the Bonc Coedan and Bonc Siafft tips met, and slates from \( \text{C} \) Mill could use Bonc Siafft's inclines and tramways to the F.R.. This was only a temporary solution, however, for now the combined tips threatened to cover the route of the tramway on the office floor. The L.&.N.W.R. shaft was also occupying tip room, as the area around it had to be kept clear!

As it was both small, isolated, and old, the W.S.Co. Slab mill was now replaced by a new purpose-built Slab mill on the large Middle Quarry Mills floor, taking advantage of the good slab making qualities of the New Vein which was to be tapped. However, construction of this was delayed considerably as the masons were engaged on another project - Twr Babel. Work eventually began in 1897. The new mill was built at right angles to the existing mills, in the direction that the tip was expanding. It was some 208 feet long by 55 feet wide and was equipped with both Hunters patent replaceable tip saws for large slabs as well as large conventional saws and a number of planing and polishing machines all driven from a steam engine at the northern end.

The last mill to be built in the quarries was back at Bone Siafft, to the east of the existing mill, which promptly became the "Old Bonc Siafft Mill". Work began on the new mill in September 1899. This was of all slab and sawn ends construction, this was steam driven, the engine being installed at the western end and contained 20 saws and dressers arranged in the transverse manner, but with the opposite hand to that of the Old mill.

Underground, things had begun badly, with an accident in the Lower Quarry in which five men were killed. The site of the accident was one of the bridges across the chambers. It was described briefly in the Caernarfon and Denbigh Herald on the 17th. February 1888, the day after the accident and more details were given on the 24th:
"The five men, together with John Roberts, Rhiw, started out of the underground workings for their dinner, taking with them three loaded trucks, which they pushed before them, two men being in charge of each truck. The first wagon was pushed forward by Owen Parry and John Roberts, and when they had reached the bridge which crossed shaft No.1, they appear to have stopped on the bridge. John Roberts, knowing that the other two trucks were following closely upon their track, stepped forward in order to avoid being crushed between his wagon and the next that came up, and this step of his proved the means of saving his life. The other two trucks followed quickly, and all three were massed on the bridge, together with the six men, when suddenly a sound was heard as of timber or iron breaking, and in a moment the bridge gave way, breaking in the middle, and precipitating the unfortunate men and their trucks into the dreadful abyss below, a depth of over 30 yards. John Roberts felt the bridge giving way and clutched an iron rail which ran along the side of the falling structure, and thus he held himself up until assistance came. His feelings at these moments may be better imagined than described, hanging as he was by the arms onto a light rail, which, for all he knew, might give way at any moment and precipitate him after his unfortunate fellow workmen, whose bodies lay mangled in the shaft below him. The sound of falling timber, stone and iron quickly brought men to the place, and they rescued Roberts from his perilous position. Dr. Jones appeared promptly upon the scene, only to confirm the worst fears of the assembled workmen and find that all five men were beyond the reach of all human aid.

The sad news rapidly spread through the extensive quarry, and all work was suspended for the day. The inhabitants of the district generally were thrown into consternation at learning the news, and deep gloom seemed to settle over Ffestiniog as the sad details were made known."

The inquest was held in the presence of Dr. C. Le Neve Foster, the Government Inspector of Mines and the Quarry Manager—presumably Robert Roberts, although the newspaper account says the Manager of the Welsh Slate Quarry (sic). The coroner addressed the jury on the importance of the inquest they were to conduct, saying that he had spoken to Dr. Foster on the subject and would be in communication with the Secretary of State on the matter. He said that one of the most important things they had to determine was the strength of the bridge and went on, "My duty as coroner is simply to ascertain whether there has been any criminal negligence on the part of any party or parties in a case of this nature. For instance, it is our duty to ascertain whether or not the bridge had been so imperfectly erected as to be a source of danger to anyone using it." He went on to warn the jury not to listen to any tittle-tattle they might hear, but to keep their minds clear. After viewing the bodies and adjourning the inquest the coroner praised the jury, saying that he had never had any trouble or bother with Ffestiniog juries.

The dead were: David Jones, 29, a carter of Rhiw - he was buried at Penmachno; Richard Edwards of Penmorfa, 48; Evan Jones of Wesley Street, Blaenau, 30 - he was buried at Capel Garmon; Owen Parry of Gwyndy, Rhiw, 31; and William Lloyd of Park Square, Blaenau, 19. Only William Lloyd was unmarried, the others leaving four wives and nine children behind them. It was estimated that over 1500 people were present in each of the funeral processions.

Significantly, Thomas Jones remarked in his first report of July 23rd, 1889 that the abandonment of the bridges as a means of traffic was to be preferred and that work had started to that effect on DE, which had always had a surfeit of them.
To attempt to describe the state of the underground workings at the time of the amalgamation, one can do no better than to quote Thomas Jones. His report below, while criticised by Dunlop in red ink as containing matters which were "old history" or "well known" or "part of the ordinary management of the quarries", nevertheless is of interest, giving a fairly complete view of the state of things in 1889. Specific engineering matters have been omitted, as they are dealt with under separate headings.

15 Great George Street,
Westminster,
July 23rd. 1889.

To the Chairman & Directors of the Oakeley Slate Quarries Company Ltd.

Gentlemen,

In making my first report upon your Quarry workings, I have at the onset to express my thanks for the honour you have conferred upon & the confidence you have placed in me by the appointment you have given me in connection with your quarries; and to say, that it shall be my earnest and constant endeavour to merit your confidence by an unremitting care of and attention to the safe working of these quarries and by studying how that working can be most advantageously carried on with due regard to the maintenance of the quarries and the safety of those working therein.

I completed my inspection yesterday and as it appears to me desirable that the present position of the whole of the workings should be placed on record in my first report I have briefly described the whole of the floors with such remarks as seem to me necessary & now beg to submit the same for your approval & have underlined those parts which I would more particularly call the attention of the board.

UPPER QUARRY

OLD VEIN

All the workings in the open have been exhausted except for a small corner of floor 9 which will be worked out in the course of a few months.

Floors 14, 13, 12, 11.
The chambers on these floors have all been worked out in this vein, so far as practicable or safe & the communication is now cut off.

Floor 10
Chambers 20 and 21 only are in work, the remaining chambers westward up to the boundary have either been exhausted or abandoned owing to falls from the bevels in Walls 23, 26, 27 & 28 making it unsafe to work.

Floor 9
Chambers 17, 18, 18a & 19 exhausted & large holes above this floor in Walls 18 & 18a. Chamber 20 has a large platform unworked and this should be left as a stay for this part of the quarry to prevent the weakness caused by the collapse of Walls 18 & 18a spreading westwards.

NOTE: There has been within the last two years a fall of parts of Walls 18 & 18a above this floor leaving large holes through them and Wall 19 is now showing signs of moving through the increased weight thrown upon it; constant falls or droppings must be therefore expected here & a large part of the adjoining Bone or cliff will come down before long, but will not require to be cleared as the chambers are all worked out in the vicinity. These 3 walls 18, 18a & 19 were cut during Mr. Hollands time and left very thin in places & the quarry is now suffering in this part in consequence.

Chambers 20a, 21, 24 & 25 in work, Chamber 22 stopped for want of headroom on floor above. Chamber 23 fall from bevel in Wall 23, in this chamber & clearing stopped for the present owing to pieces falling off from the roof. Chambers 26 & 27 abandoned owing to bevel in Wall 27 & general danger in working this part, being as I believe injuriously affected by the neighbouring Cwmorthin fall.

Floor 8.
Chamber 16 exhausted. Chambers 17, 18 and 18a a little rock left to work but stopped by fall from wall & roof above. Chamber 19 stopped to strengthen Wall 19. Chamber 20 stopped through chamber above not being worked. Chambers 20, 20a, 21, 23, 24 stopped until chambers of floor above are advanced. Chambers 22, 25 are in work. Chamber 27 abandoned after leaving stay and re-opening south owing to bevel in Wall 27 & effect of Cwmorthin fall in walls 27 & 28.

Floor 7.
Oakeley Slate -20. The Roberts Years II - The Quarry Underground -1889-1904

Chambers 16, 17 abandoned owing to dangerous condition of Wall 17 above cut by Mr. Holland many years ago. Chambers 18, 20, 20a, 22, 23, 24, 25, 26 in work. Chamber 18a exhausted. Chamber 19 abandoned to strengthen wall 19. Chamber 21 stopped until level can be driven into it & will then be worked into with floor above if not found too dangerous.

A fall from a large bevel in wall 26 has been cleared in that chamber and all the joints and bevels in this part of the quarry have in my opinion been shaken and loosened through the enormous additional strain thrown on these western walls by the Cwmorthin fall.

N.B. New traffic levels through 2 walls are required along this floor from wall 20 westward to enable chambers on floor 6 to advance.

Floor 6.
Chamber 16 exhausted. Chambers 17, 18, 19, 20, 21, 22, 24, 26 & 27 in work. Chambers 23 and 25 stopped as too near floor 7. Walls 17, 18, 21 & 26 are troublesome on this floor through bevels and joints and Chamber 17 will shortly have to be abandoned owing to the bad working by Mr. Holland many years ago. There is a hole through it above this floor.

Floor 5.
This floor as far as the Old Vein (west of chamber 15) is concerned has been merged in floor 4 Middle Quarry & both worked in one from the latter level.

The Old Vein is entirely opened out to the boundary on every floor in this quarry & will be exhausted in the course of the next 8 or 10 years so far as it can be won with due regard to the safety of the lower workings and winning the Back Vein as well as upholding the mountain generally.

UPPER QUARRY
BACK VEIN

Floor 13
This floor is driven to the western boundary and all the chambers are opened. Chambers R, S, T1, T2, V, W, X and Y are in work. Chambers U1 and U2 exhausted. The unworked rock is rather defunicated by what are called "milk spots" or grey splotches in the slates.

Floor 12
This floor, which has materially delayed the development of the lower floors is at last driven to the western boundary and chambers R, S, T1, T2, U1, U2, V, W, X and Y are all either opened and in work, or in course of being so. The rock here is also rather mottled with milk spots. In chambers R & S a whinstone band is being cleared away. Useful traffic levels have recently been driven through the walls which will enable the floor below to advance.

Floor 11
Level driven to western boundary & chambers S, T1, T2, U1, U2, X, Y are opened & in work. Chamber V is now being roofed up for opening & Chamber W is stopped to make the roof safe. New traffic levels are required through several of the walls to enable floor 10 to follow on. One or two chambers may be opened eastward of wall S when trade warrants the outlay. The rock on this floor is only moderate as the cleavage generally is tight & very hard but will improve as they are worked south.

Floor 10
Level driven to western boundary & Chambers S, U2, V, W, X and Y opened but all stopped except S for want of room on the floor above. Chambers T1, T2, U1 not commenced owing to want of headroom on floor 10, the rock being exceptionally steep on one floor close underneat h the other. The base of chamber S is being worked away to take the site of a drumhouse for an underground incline in this chamber down to floor 9, the only access through walls 18 & 18a having fallen with those walls.

Floor 9
Level opened to western boundary. Bed of incline from floor 10 constructed in chamber S, but rails not laid or drumhouse built. New tramroad being laid along this floor to chamber S. Chambers T1 and U1 not opened being too close under floor 10. Chamber T2 partly opened but stopped for the same reason. Chambers U2 and V opened and in work. Chambers W & U fully opened but stopped until previous chambers are worked further forward. Chamber X opened partially but must be re-opened south in better rock.

Floors 8,7,6,& 5
Nothing doing in this vein on these floors until upper workings are further advanced; & the future of this part will require consideration in development owing to the varying position & influence of the hards.
Oakeley Slate -20. The Roberts Years II - The Quarry Underground -1889-1904

The Back Vein from floor 9 upwards is now being brought into practical working shape - the difficulty & delay of opening out the Upper Floors from the south and the steepness of the overlying hards hereto preventing their development in the usual manner & ratio; but some years must elapse before the floors below 9 can be again opened out as the workings in them had already been carried by Mr. Holland as far westwards as chamber V while those from 9 upwards have been entirely started and opened out since the expiration of Mr. Hollands lease.

MIDDLE QUARRY

OLD VEIN

Floor 4
All the chambers up to 17 inclusive exhausted. Chambers 18 to 26 above the whinstone dyke exhausted, but all re-opened underneath said dyke and all in work except Chamber 26 which has been stopped on account of the bevel in wall 27.

NOTE: About 10 to 12 yards horizontal of rock should be left unworked in this chamber so as to support the toe of this bevel where it cuts through the wall & the chamber re-opened up to the south.

Chambers 27 & 28 in work. Chamber 29 (our furthest chamber on this floor) is abandoned owing to the dangerous condition of walls 29 & 30 in the parts cut by the Cwmorthin Co. and Chamber 28 must be abandoned shortly for the same cause. The Boundary crosses wall 30 diagonally.

The Cwmorthin Fall has seriously affected the stability of the walls in the western part of the quarry from this floor upwards & those parts of walls 29 & 30 cut by them in the Oakeley property has thrown an enormous strain upon the adjacent Oakeley walls which is causing them to become dangerous to work under, though of excessive thickness and is entailing the consequent abandonment of the unworked slate rock in the chambers referred to.

P.S. It will be remembered that Chambers 28 and 29 were the trespass chambers opened by the Cwmorthin Co. in the Oakeley property and worked by them for 6 floors in depth down to the Oakeley floor 4. The position on the surface of the eastern cracks of the Cwmorthin Fall in the Oakeley property was surveyed & shown by me on the Old Vein plan in February last, & clearly shows the intimate relation of that fall to the effect of it upon the Oakeley wall underneath, and I examined the said cracks yesterday and found them much enlarged showing that the whole mass is settling down towards Cwmorthin and depriving the Oakeley property & walls of their lateral support on the west side.

Floor 3
Nothing working up to chamber 19 inclusive but 18 & 19 can be re-opened under whinstone and worked farther when floor above is advanced. Chambers 20, 21, 22, 23, 24, 25 all in work (except 25) but approaching whinstone dyke and level is being driven underneath dyke to re-open them to the south. Chamber 26 is being worked north & south of the dyke, Chamber 27 north of dyke stopped, south of dyke in work. Chambers 28 & 29 south of dyke but as they advance south will become dangerous owing to bevels in walls 29 & 30 and the increase pressure on these owing to the Cwmorthin fall; and great care must be taken in working them forward. Chamber 30 is being worked by the Cwmorthin Co. in the Oakeley property by arrangement & 29 is therefore the most westward on this floor.

Floor 2
All worked up to 15 inclusive. Chamber 16 only partly opened & abandoned. Chamber 17 abandoned in poor rock, but must be pushed forward if found profitable on C & DE floors. Chambers 18, 19, 20, 22, 23 all opened & in work but will have to be re-opened after they have reached the whinstone & its accompanying hard which they are all approaching. Chambers 24 & 25 stopped as too close to floor 3. Chamber 26 not opened but will now be opened south of clay slant & bad rock. Chamber 27 opened under clay slant but abandoned for present. Level driven west up to chamber 29, but nothing opened.

This floor should be extended & chambers opened up to chamber 31 without delay, but the greater part of that chamber will be in Cwmorthin property & an arrangement with that Co. and the boundary working should be come to if possible, when this point is being approached. Chamber 30 also runs into Cwmorthin property as it goes south, but an arrangement about this chamber was entered between their manager & myself some 3 years ago - which is embodied in a plan & agreement in Mr. Dunlop's office - of which they have a duplicate.

Floor 1
All chambers up to 15 worked out. Chamber 16 under whinstone opened, but only base worked & then abandoned. Chamber 17 under whinstone partly opened & abandoned. Chamber 18 not opened. Chamber 19 now being roofed up preparatory to widening to give headway for floors C & DE. Chamber 20 in work, 21 & 27 stopped as too near floor 2. Chamber 23 in work, 24 in work, but clay slant roof drops over this chamber and is being made safe. Level being driven north in this chamber to meet roof coming north from C floor. Chamber 25 being opened twice north & south of whinstone, upper opening in work but not lower. Chamber 26 opening under lower clay slant & stopped for last three years. Level ends at west side of chamber.
The north working of chamber 25 should be stopped at once and the level cleared so that the level west of chamber 26 can be at once continued & driven to the Boundary in chamber 31 & chambers 25s, 26, 27, 28, 28, 30 & 31 opened and pushed ahead to enable floor C to be driven west & opened out underneath the clay slant without a days delay, as the whole extension of the Lower Quarry west of chamber 23 depends upon the rapid development of floor 2, 1 & C & any rock left unworked on floor 1 in consequence can be won when the floor C chambers come up to it. This is most important.

**MIDDLE QUARRY**

**BACK VEIN**

Floor 4  
All worked out & floor thrown into floor 3.

Floor 3  
All worked out up to U, no advance possible until the Upper Quarry advances.

Floor 2  
All worked out up to V, with a little in R & U1, no advance possible until Upper Quarry advances.

Floor 1  
All worked out up to Q & nothing driven further west due to posty rock.”

The Quarry plans achieved a fair degree of uniformity with the combination of the Quarries, and from 1889 onwards followed a simple division which dated in fact from much earlier. The Upper and Middle Quarries being shown on one plan, the Lower Quarry on the other. For convenience of reference, a certain amount of overlap was given, the Lower Quarry plans including floors 1 and 2 of Middle Quarry, while the Middle and Upper Quarry plans usually included C and sometimes DE floors of the Lower.

The Upper Quarries plans were further increased by depicting the Old Vein on one and the Back and North Veins on another. The actual area covered by the Back Vein plans overlapped considerably with those of the Lower Quarry, but as there were no Back Vein workings lower than floor 1 for many years this did not matter. The Back Vein plans are very clear, but a surviving Old Vein plan of 1884 is at first glance, almost impossible to reconcile, underground, with one of 1889.

The clue to the solution to this lies in Jones' remarks about the Middle Quarry Old Vein chambers North and South of a whinstone dyke. A whinstone dyke was an intrusive layer or hard which had been forced through the slate in the distant past along a line of weakness. They were usually inclined at a steep angle to the vertical, the slate on either side of the dyke being distorted and of poor quality. Thus, when a dyke was met with, it was treated as a "hard" and the chamber opened up again underneath it, the dyke acting as new "roof" to the chamber.

Thus the 1884 plan shows chambers opened originally under the clay slant, north of the dyke, while the 1889 plan shows the developed chambers under the dyke, to the south, most of the north parts being exhausted and "worked home" to the dyke, their various communicating levels being cut off and therefore not shown by the economical surveyors - to the confusion of later readers. In some chambers, the dyke was worked away, in others left in place, indeed, some chambers wandered into the "Stripy" Vein above the Old Vein, the level passing straight from one to the other, following a suitable line - all most confusing! For this reason, apart from major details, no attempt will be made here to reproduce the workings in toto.

During this period of expansion, the quarry appears to have had a "resident Surveyor" E.T. Morland Johnson who kept the plans up to date, erasing old forebreasts and drawing new ones as the work progressed. he was obviously kept very busy indeed as the heavily corrected and altered surviving plan show. Plans were kept in two main forms, initiated by Thomas Jones; as a single rolled sheet which could be brought up to date only periodically , and on which the exact relationships of the workings depended and copies which were cut up, mounted on cloth as folding plans enabling them to be taken underground so that they could, if necessary, be updated on the spot. This from of plan had first been introduced to the quarries by Thomas Jones and were described by him at the arbitration hearings.

Meanwhile, back to the report;

**FALL CLEARING**

Floor 4  
Nothing.

Floor 3  
4 men working in the old vein at base of wall 8 & undermining it.

Floor 2  
27 men in 7 gangs clearing walls 4 to 7 - trying to get through to the back of the fall.

Floor 1  
24 men in 8 gangs working on walls 1 to 4.
LOWER QUARRY

OLD VEIN

Floor C

All chambers up to 11 worked out & under fall. Chambers 12 to 19 abandoned being worked into posty ground & whinstone, cutting north west from floor 1 but an attempt will be made south of the whinstone dyke (which dies out as it strikes west) to work chambers 16 to 19 if proved to be worth working on floor 1 above. Chamber 20 opened up to floor 1 and in work. Chambers 21 & 22 opened up to floor 1 and in work. Chamber 23 roofed up and partly opened out. Chamber 24 being roofed up & widened but not yet through to floor 1. Level now at west side of chamber 24.

The opening level on this floor is at last getting in advance of those on the lower floors & should be pushed to the west with all possible speed up to the boundary in chamber 31 (or possibly 32 on this floor) and the chambers opened up to floor 1 and worked forward so as to get the floors below extended in proper notation and order, one chamber in advance of the next lower all the way down.

Floor DE

Worked out up to chamber 15. Chambers 16 to 21 worked into whinstone and abandoned and access cut off by floor F but can be worked further when south level is driven on the floor, should the chamber on floor C above also be worked, to make headroom. Chamber 22 is stopped until floor C advances. Chamber 23 partly opened & being worked. Chamber 24 opening level driven to west side and chamber being roofed up.

This level should be continued westwards to follow that on floor C as soon as the latter gets one chamber in advance. The boundary on this floor will be in chamber 32. A new level to avoid the bridges & then changing the method of working this floor is being driven westwards along the south side of the vein from chambers 15 to 22 to follow the whinstone, a course which I have advocated for the last 12 years; this will be a valuable level as it will render the dangerous and injurious bridges unnecessary & will enable all of the slate rock left unworked in the south part of the vein on this floor in the above series of chambers to be won. Access is via the underground incline in chamber 14, floor F.

Floor F.

All exhausted & under fall up to chamber 11. Chamber 12 a little left, but abandoned for the support of the large bevel in wall 12. Chamber 13 not worked out owing to another large bevel in wall 13.

NOTE: Part of this wall has slipped off the said bevel into this chamber and floor from above & the upper part of the wall must be nearly gone, leaving the ground above unsafe & weakened vide remarks on G, H & I. Chamber 14, a portion left unworked for the incline from DE floor. Chamber 15 exhausted. Chambers 16, 17, 18 and 19 worked to whinstone dyke & stopped for the upper floor to proceed. Chambers 20, 21, 22 stopped for DE floor to proceed. Chamber 23 opened to DE and in work. Opening level stopped here but must be driven on to follow the upper floors as they proceed westwards to the boundary in chamber 32.

Floor G

All worked out and under fall to chamber 11. Chambers 12 & 13 not worked out but abandoned because of bevels - not to be further worked. Chamber 14 - little left to support incline above. Chambers 15, 16, 17, worked out. Chambers 18, 19, 20 a little left but stopped waiting for floors above. Chamber 21 stopped in very jointy rock. Should be left unworked to support wall 22 - bevel and full of joints & re-opened south. Chamber 22 stopped as too close to F. Bevel runs across this chamber through to wall 22 & into chamber 21 - this is the great one. The opening level is stopped at west side of chamber 22 & must be proceeded with as floor F to chamber 32.

Floor H

All under the 1883 & 1879 falls up to chamber 11 & what little rock is left unworked in chamber 11 will be won when the fall is cleared. Chamber 12 nearly exhausted - but abandoned owing to dangerous condition of walls 12 & 13. Chamber 13 abandoned owing to large bevel in wall 13, slipped - what is left is very thin if not clear through at old level under clay slant on C. Should not be worked again but left as stay.

Chambers 14 to 23 all opened & in full work in various stages of existence and the opened level is stopped at west side of chamber 23 until the floors above are extended, the boundary on this floor will be in chamber 33.

During the last 10 years I frequently remonstrated with the late manager of this quarry as to the way he was undercutting the walls 14, 15, 16 & 17 on this floor and the one above and also cutting levels in them above their western sides; the mischief of this undercutting is now made apparent by the working of the forebreasts southwards, and these walls have been much weakened in consequence. In fact wall 17 is now only 28 feet thick on this floor at its most vital part, where the last new level has pierced it. I have therefore recommended to the manager to narrow these chambers as the forebreasts in H and I...
are worked forward under the weak part, and not to cut away the platforms of the levels cut along the west side of the walls by his predecessor.

This floor is in the best working condition & profit of all the three quarries but the forebreasts are working rapidly forward & as the chambers get exhausted eastwards, it becomes all the more important to extend westwards. The Boundary is in 33 as the surface boundary heads north west of about where this floor will come.

Floor I
All chambers A3 - 9 worked forward into the bases of the fall & benches left on west side for future working except no. 4. Chambers 4, 5, 6, 7 & 9 bridged over K floor. Chamber 10 just holed through to H & being widened. Care is needed not to disturb the big bevel in wall 10. Chamber 11 worked into base of 1879 fall on H. Chamber 12 worked up to large bevel from 13 into 12 - abandoned. Chamber 13 in work, but must be abandoned when the forebreast reaches that on H. Chambers 14 to 21 in work. Chamber 22 being opened, the level is stopped in the west side. Further extension depends on the floor above. The floor west of chamber 12 has been working up to the posty & inferior rock, but as the forebreasts are being advanced south, the rock is greatly improving & this floor will improve in value very much within the next 12 months & will gradually take the place of H floor in importance.

Floor K
Chambers A3, A4, A5, 1 to 7 all filled with fall and worked into the base of the fall on the floor above, benches being left for the future working over floor L in Chambers 5, 6 & 7. Chamber 8 being opened but not yet through to I. Chamber 9 just opened and the large bevel in wall 12 has now been reached & cuts across this chamber into wall 9, which will enable a narrow chamber to be opened for some distance. Chambers 10, 11 & 12 not opened owing to the large bevel & the worthlessness of the rock and the policy of opening them at any future time must be fully weighed before hand. Chambers 13 to 20 inclusive all opened or in course of being opened and in work, but rock very posty & inferior so far & will continue to be so for a considerable time. Opening level in chamber 21, the boundary on this floor being in chamber 33.

Floor L
Chamber A3, vein too thin to work. Chamber A4 under fall. Chamber A5, 1, 2, 3, 4 all stopped being close to base of fall on floors above. Chambers 5, 6, 7 being worked towards base of fall. Nothing opened yet west of 7 but level driven under clayslant to chamber 13 & will be continued to chamber 15 when it will meet a shaft sunk down from K which will ventilate it. It may be advisable to open chambers 8, 9 & 10 as they are pushed forward on K, but as to 11, 12, 13 & 14, it will only be a waste of money to open these under the clayslant & levels must be driven south in each of these chambers when the floors above are worked forward enough and the chambers opened south of the posty and worthless rock. I am afraid this will apply to all the chambers on this floor up to 21 or 22 to a greater or less extent as the post cuts through the vein in a westerly direction extending up to chamber 33 or 34.

The level being driven eastwards from chamber 1 for opening chambers A3, A4 & A5 (or new trial) on this floor has not yet cut into the clay slant as I expected it would when recommending it to be driven 6 months ago, and the hard whinstone dyke over chamber 1 has been found much thicker than I calculated, but very nice slate rock has been cut into above the dyke. A second but thin dyke has been cut through further north above which the rock is hard & stripy, I have ordered the manager to drive eastwards under the upper dyke."

Jones ended his report with these words: "There is a marked difference for the better in the general character & condition of the workings all through and about the quarries since they have been under one management & much greater care is being taken to preserve the stability of the walls." This drew a red-inked comment, presumably from Dunlop or Oakeley himself "No doubt from this report entirely due to the suggestions of Mr. Jones." Clearly Jones was not held in universal acclaim, one wonders if perhaps Dunlop was concerned lest his one time assistant was intending to supplant him?

November 1889 found the collapse of walls 18 & 18a in the Upper Quarry much extended, and Jones was predicting a large fall. Floors 8 and 9 were both stopped. A timber level across chambers 17, 18 & 18a had been smashed, cutting off all access to the west. Chamber 18a was blocked on 8, but in the process of being cleared. Some rock had rolled down to floor 7. It was impossible, Jones thought, to prevent the collapse of the old weakened and badly cut walls.

Credit was given to Mr. Roberts for his work in bringing the floor 12 Back Vein into full production, floor 11 was also now in full work, although 10 was awaiting access.

In the Middle Quarry, the floor 2 level had reached wall 30, while that on floor 1 was in chamber 27. Water was becoming a problem, running down the Cwmorthin cracks and into the workings, Jones wanted an official communication be made with the "New Welsh Slate Co." requesting them to take steps to stop it. He also went over the Cwmorthin fall with Robert Roberts and was struck by the marked increase in the depth and extent of the cracks.
On floor C in the Lower Quarry, the level west was 26 feet into chamber 25, but had "lost" the clay slant! DE was stopped in the west side of chamber 24. No further bridges were to be put up on the floor.

A large drop in the clay slant on K indicated that new traffic levels would soon be needed on I. Jones wanted to put a traffic level under the chert up to 14 by turning south along the west side of wall 9, then in the solid ground up to 14, leaving K free to work into the chambers and leaving the I floor traffic out of the way. This was thought to take 6 to 7 months to drive. The walls below I from 13 westwards would have to be thicker, he thought.

On L floor, the elusive clay slant was soon found again and the rock looked promising.

As will now have been gathered, the supply of rock was becoming a problem. The Upper & Middle Quarries were running short of good quality rock, and the workings of the Lower Quarry were not going to be an immediate salvation, not with a poor area of rock in the middle of the quarry to avoid. One recourse was to sink deeper into the vein, with all the problems that would produce, another was to try for a new vein...

The only light lay in the "A", "New" or "Deep" Vein, which lay beneath the Old Vein and which was virtually untapped throughout the quarries. It had proved to be the salvation of the Votty Quarry in the late 1860's when their Old Vein had virtually been exhausted, but in Oakeley land it had only been worked to an extent beneath the Middle Quarry Incline, where in any case it was narrow, and in one or two trial chambers such as the pump chamber on G. It was not quite as fine as the Old Vein at its best, but it was strong and fair and showed good promise. In due course of time it was to become the mainstay of the quarry and proved a temporary salvation to the Middle and Upper Quarries which would otherwise have had to close down.

The driving of the drainage level through the New Vein described earlier proved, Jones said, "there is a large body of the vein to work. It is not quite so fine in cleavage & grain here as in the Middle Quarry. It forms the bulk of Messrs. Greaves output." He proposed that trials should be made to test the extent of the vein and its quality.

By May 1890, Jones opinion had become reinforced by a visit to Greaves' Llchwedd Quarry in his position as Oakeley's Agent. He said "I have been much struck with the great development of the New Vein in that quarry & would like to submit to the Board the question whether the time has now arrived when a concerted effort should not be made in developing this vein in the Oakeley Quarries where it has been proved to exist of an excellent thickness & is known to have the same characteristics as in Messrs. Greaves Quarry where they make slates from it in considerable quantities."

This received practical attention by November the following year when a new level was driven for testing the vein on floor 2, this was another location where the machine drills were used, the access being from the old chamber under the Middle Quarry incline. Jones suggested that if the vein was proven, then chambers 30 yards wide with 30 foot walls might be opened. The supply of Old Vein was diminishing and the New Vein was therefore important. Unfortunately this trial proved abortive, the level meeting a whinstone dyke and the hard, the vein being too thin to work. However, further trials from floor 5, east and west of Lefel Fawr proved the vein was workable there, as it was from Lefel Gale. By late 1892, so rapid was the development that Jones was suggesting that separate plans should be kept for the New Vein, to avoid further increasing the complexity of the existing plans. Certainly, this writer can vouch for the need!

Interestingly enough, despite all that had happened over the Welsh Slate Company and their scheming, Jones and Roberts proceeded to fall out over something similar....

This began in 1890 when Roberts began operations in the Middle Quarry and started cutting into and removing part of wall K in the Back Vein between floors 3 and 4. Wall K was only 25 feet thick. Jones thought the attempt to turn this into a pillar dangerous as the area was unsafe in any case, and the work could only weaken it. He predicted a further collapse of the area. He also felt that Roberts was now opening chambers too quickly on floors DE, F, G and H and predicted constant trouble from the walls as a result. This was denied vehemently by Roberts, who clearly felt Jones did not understand the matter.

On the matter of Cwmorthin, however, both were agreed... In the February of 1890, it was decided to open chamber 30 on floor 2 into chamber 19 of the Cwmorthin Company, "so as to detect any tampering in the boundary walls". Subsequently Jones reported "As I learnt from Mr. Roberts, that wall 30 (or 21 of Cwmorthin) which is in Oakeley property was being thinned by that company, after the chamber had been abandoned by them in consequence of their fall & that the roadway had been re-laid for the purpose of getting at this wall, I went over there on Friday the 31st. with John Parry & met their manager, Mr. Robert Owen, (and) his foreman Humphrey Roberts. I went with them to the spot indicated, which I had previously surveyed in 1875 & from the measurements I took in their presence informed them that the wall has been (either by them or their predecessors, the old Cwmorthin Co.) most seriously thinned, & that at one point, somewhere between the level of their floor 3 and floor 4, it has been reduced to something like 8 or 10 feet in thickness. It is extremely difficult to ascertain correctly to what extent it has been thinned owing to the fall filling up the chamber on one side & the Oakeley Quarries floor 4 being cut away all communication on the other.... A most unfair
advantage has been taken & a most important support of this part of the quarry has been improperly removed. Robert Owen pointed out he had only blasted 3 holes. Robert Owen undertook to remove his roads & crane at once on my leaving & promised no-one should go over it any more. I shall make a point of inspecting it again.” Clearly, Robert Owen had had enough and did not want to run foul of Thomas Jones again!

August 1890 brought more worries, Jones wanting the Back Vein of the Middle Quarry "worked out as soon as possible because of the Cwmorthin fall.” He was concerned that Robert Roberts wanted to "pillarise", to coin a phrase, more walls like K. He put it this way: “It may have been safe & practical for Mr. Holland to cut wide chambers with narrow walls in the Back Vein (where the walls were short & of no great depth) but it must not be forgotten that these were cut when there were no other veins or workings underneath.” Roberts disagreed, saying that there was no point in waiting for a fall to come down and crush the slate and then to try and get it out, far better, he felt, to work the slate away while it was still possible, and make what money could be got before anything happened.

In February 1892 another source of friction emerged when Roberts abandoned the machine drilling as too expensive, especially in slate rocks and narrow headings. Jones was “disappointed.”

Jones held his peace, for a while but in his August report for 1892, felt compelled to put his thoughts in writing.

"Back Vein: The upper part of Wall U, Back Vein, Upper Quarry, is being won from an old traffic level on floor 7 & I learn that it is intended to win it down to floor 5. This part of the wall is immediately over chamber 22, floor 2, Old Vein. Were one vein only concerned I would advocate as well as the Manager this method of cutting portions out of the walls, & converting them into pillars after the chambers are worked out, but I cannot alter the opinion I have formed after earnest consideration that it is unwise to accelerate the probable collapse of this part of the quarry by a redistribution of the strains upon the supporting Old Vein walls which must be affected injuriously notwithstanding the strata of 90 feet more or less intervening between the Back and the Old Vein walls, those in the latter being approximately twice the excavated depth of the former at right angles to the plane of the roof.

I fully admit there is a large mass of valuable and cheaply accessible slate in these walls which would be crushed & probably lost, were a collapse to take place, but I submit that the process of working for a collapse is undesirable at present, & that anything tending to it should be postponed until it is seen to be inevitable within an appreciable period.”

His advice was ignored and November found him complaining that preparations were being made to deal with wall T in a similar manner to those going on at U. He was also concerned about walls being cut "too perpendicularly." His predictions came all too true, and it was not many years before the whole of the Upper and Middle Quarry old workings became inaccessible through a series of falls which brought down the old western "bon" and reduced the area to what was later described as a "honeycombed mass."

While all this had been going on new problems were emerging in the Lower quarries. Jones remarked that he had complained in the days of Rees Roberts about the thinning of the walls around 23 and 24.

On floor C, the level had reached wall 26, the level to turn south to follow the drop in the clay slant. This was so that "the old vibrating bridges under the clay slant on the tops of the walls may be removed."

Considerable movement was now going on in the big bevel, "should walls 12 & 13 go, the strain will be transferred to 14 & 15 which are ill able to bear it... they have been much thinned on C, DE F & G." On I floor ominous cracks were found in the traffic level at the foot of the incline and over chamber A3. A new bridge on I floor over chamber 9 was not liked as one end was near the large bevel. Down on K he found a "formidable source of weakness" in walls 19 to 22 in the form of pillaring joints.

In November 1890 wall 14 was actively breaking up above the clay slant on C and DE floors. This resulted in the incline across chamber 14 from DE to F having to be removed. A shaft was sunk diagonally across wall 20 to replace it. The reason DE had no direct access from the surface was of course that all the old routes were filled with fall, and so it had to be accessed from F floor, until the sink was cleared to a point where the floor could be entered again on the level. This was completed by February 1892 but was "rather expensive”.

Finally the idea of sinking to new floor was broached: "Due to problems with the cross fault west of chamber 25 dividing the Middle Quarry from the Lower Quarry I suggest the time has arrived for commencing operations to sink & open out another floor below L." Jones suggested a convenient place was in either chamber 6 or 7 on L floor. He referred to an idea of sinking for 18 yards measured vertically & then opening east and west under the clay slant instead of the whinstone. Chambers A4 to 7 could be quickly opened and an incline worked by steam from the boiler which was to be put up for the new L to K incline in chamber 3. This, Jones felt, would only make it necessary to fix up an engine and drum for the incline from the new floor to L, however he did think that perhaps two boilers might be necessary to cope with the pumping load.
By November the Board had adopted the idea of the new floor to be called "M", but had decided to continue the new incline in K.3 down to M floor. Jones wrote, somewhat piqued: "I should have suggested it, had I not understood it was desired to remove as soon as possible the L incline in chamber 2 to the new bed in 3, which could not be done until the extension was completed."

This was Jones' summary of the situation in July 1892:

**BACK VEIN**

<table>
<thead>
<tr>
<th>Floor</th>
<th>Chambers worked out</th>
<th>New Chambers</th>
<th>Number yet to open</th>
</tr>
</thead>
<tbody>
<tr>
<td>13</td>
<td>R S T1 T2 U1 U2 V W X Y</td>
<td>-</td>
<td>Floor worked out.</td>
</tr>
<tr>
<td>12</td>
<td>-</td>
<td>Q</td>
<td>All opened.</td>
</tr>
<tr>
<td>11</td>
<td>S</td>
<td>V</td>
<td>ditto.</td>
</tr>
<tr>
<td>10</td>
<td>-</td>
<td>T1 T2 U1</td>
<td>ditto.</td>
</tr>
<tr>
<td>9</td>
<td>-</td>
<td>X south</td>
<td>three to open.</td>
</tr>
<tr>
<td>8</td>
<td>-</td>
<td>U2 V W X Y</td>
<td>four to open.</td>
</tr>
<tr>
<td>7</td>
<td>-</td>
<td>-</td>
<td>nine to open.</td>
</tr>
<tr>
<td>6</td>
<td>-</td>
<td>-</td>
<td>five to open.</td>
</tr>
<tr>
<td>5</td>
<td>-</td>
<td>W</td>
<td>four to open.</td>
</tr>
<tr>
<td>4</td>
<td>-</td>
<td>-</td>
<td>ditto.</td>
</tr>
<tr>
<td>3</td>
<td>-</td>
<td>-</td>
<td>five to open.</td>
</tr>
<tr>
<td>2</td>
<td>-</td>
<td>-</td>
<td>probably none.</td>
</tr>
<tr>
<td>1</td>
<td>-</td>
<td>-</td>
<td>probably none.</td>
</tr>
</tbody>
</table>

**OLD VEIN**

Floors 13,12,11 worked out before 1889.

<table>
<thead>
<tr>
<th>Floor</th>
<th>Chambers worked out</th>
<th>Number yet to open</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>20a 21</td>
<td>floor abandoned.</td>
</tr>
<tr>
<td>9</td>
<td>20a 21 22 23 24 25</td>
<td>floor abandoned.</td>
</tr>
<tr>
<td>8</td>
<td>20a 21 22 23 24 25 27</td>
<td>clearing falls from walls. Chambers all opened but cannot be worked further.</td>
</tr>
<tr>
<td>7</td>
<td>20a 21 22 23 26 27</td>
<td>opened to boundary.</td>
</tr>
<tr>
<td>6</td>
<td>up to 20 abandoned</td>
<td>ditto.</td>
</tr>
<tr>
<td>5+4</td>
<td>28 29</td>
<td>ditto.</td>
</tr>
<tr>
<td>3</td>
<td>20 to 27 N.of whin</td>
<td>20 to 29 inc. S.of whin.</td>
</tr>
<tr>
<td>2</td>
<td>18 19</td>
<td>26 27 28 29 30</td>
</tr>
<tr>
<td>1</td>
<td>20 21</td>
<td>27 28 29 30</td>
</tr>
<tr>
<td>C</td>
<td>20</td>
<td>24 25 26 27</td>
</tr>
<tr>
<td>DE</td>
<td>-</td>
<td>21 24 25</td>
</tr>
<tr>
<td>F</td>
<td>-</td>
<td>24 25</td>
</tr>
<tr>
<td>G</td>
<td>-</td>
<td>24 25</td>
</tr>
<tr>
<td>H</td>
<td>14 15 16 17</td>
<td>24</td>
</tr>
<tr>
<td>I</td>
<td>13 north 9s 10s 11s 13 22 23</td>
<td>ten to open.</td>
</tr>
<tr>
<td>K</td>
<td>-</td>
<td>8 9 21 22 23</td>
</tr>
<tr>
<td>L</td>
<td>5 6 7 up to face of fall 19 20</td>
<td>14 15 16 17 18</td>
</tr>
</tbody>
</table>

**NEW VEIN**

<table>
<thead>
<tr>
<th>Floor</th>
<th>Chambers worked out</th>
<th>Number yet to open</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>-</td>
<td>two.</td>
</tr>
<tr>
<td>2</td>
<td>-</td>
<td>two.</td>
</tr>
<tr>
<td>DE</td>
<td>-</td>
<td>two.</td>
</tr>
</tbody>
</table>
In 1893 a Committee was appointed by Parliament to inquire into the "Dangers to Health, Life and Limb of the Workmen employed in the Merionethshire Slate Mines." In pursuit of this aim, it called for evidence to be given by both employees and employers at the mines to the Committee when in session. Some of the men had meetings and sent representatives, others came as individuals. Some, it was claimed, were picked by the employers to give a good impression, but this was strongly denied.

Of the witnesses who appeared concerned with the Ffestiniog Mines, 3 came from the Oakeley Upper Quarry; 6 from the Middle Quarry and 7 from the Lower Quarry; 3 came from Votty, 2 from Llechwedd and 5 from Cwmorthin. 6 others did not explicitly state their place of work. The other workmen witnesses were from the Corris area and do not concern us here.

Apart from the workmen, other important witnesses from the locality were:
- Dr. Richard Jones: Blaenau Ffestiniog.
- T. Evans: Manager, Croes Dwy Afon Quarry.
- J. Lloyd Jones: Agent for Votty & Bowydd Quarry.
- Dr. R.D. Evans, Blaenau Ffestiniog.
- Robert Roberts, Oakeley Quarry Manager.
- William Owen, Oakeley Quarry Under-manager.
- Moses Kellow, Manager of the Parc Quarry, Penrhyndeudraeth.
- Charles Warren Roberts, Manager of Llechwedd Quarry.
- Nathaniel Francis Robarts, Managing Director of the New Welsh Slate Co., Cwmorthin.
- Eleanor H. Russell, Cooking Instructress, Ffestiniog Board School.
- Ann Wilson, Assistant Cooking Mistress, Girls Higher Grade School.
- Henry Percy Maybury, Surveyor of Ffestiniog Local Board.
- W.M. Treglowan appearing for Ingersoll-Sergeant Drill Co.

The Committee consisted of:
- J.E. Greaves J.P.
- E. Parry Jones, J.P.
- J.J. Evans, F.G.S.
- Mr. John Jenkins.
- G.J. Williams acted as Translator & Interpreter.
- Colonel C. LeNeve Foster, H.M. Inspector of Mines, took the chair.

Space does not permit of anything but the evidence directly connected with the Oakeley Quarries, and the report of evidence should really be read in full, but a number of points are worth mentioning.:

Dr. R. Jones gave evidence about the temperature in the mines as follows: "On Saturday last, for instance, it was freezing, and I sent a thermometer down to floor L., as it is called, in the Oakeley Quarries and I found that it registered underground 46 deg. F., and above ground 32 deg. F. I took the temperature again yesterday when it was raining, and down at the bottom it was 46 deg. F., and above ground 45 deg. F.; so that there was a difference on Saturday between the above-ground temperature 14 degrees, whereas, yesterday it was only one degree."

He also quoted from the Oakeley Quarry Hospital records in the following manner: "I have taken the Oakeley Hospital figures for the last 20 years - from 1873 to 1892 - and have taken out the number of men who were brought into the hospital from the Oakeley Quarries only. Years ago there were men taken there from all the quarries, but for the purpose of these tables I have only taken the Oakeley men into account. I have classified the accidents into five classes:

1. Sprains, bruises, contusions etc.;
2. Head injuries;
3. Fractures & dislocations;
4. Injuries due to blasting; and
5. Internal injuries.

During the first 10 years - from 1873 to 1882 - there were 206 cases brought into the hospital, and in the last ten years from 1883 to 1892 - 178 cases. During the last five years men have been going to the hospital who did not go there in former years, because two other firms of medical men send their patients there. That is a point to be considered in regard to the number of men treated, as only one firm was allowed to send patents there up to five years ago....

There are two hospitals here. One belongs to the Llechwedd Quarry and the other to the Oakeley Quarries, where all accidents are taken to. The patients are attended to, and fed and nursed at the expense of the owners of the quarries, and there is no doubt they are a great boon to the neighbourhood."
He emphasised that they were the only hospitals in the area, and that the other quarries sent their injured home, but he had seen cases otherwise: "Men who were injured and who lived outside, have been taken to the Oakeley Hospital and a fixed fee paid for their maintenance while they were there; but these cases are not frequent.

The Rhosydd, Cwmorhinh, Oakeley, Llechwedd, and Diphwys Casson, and I believe the Votty and Bowydd, and nearly all the quarries in the district used to subscribe towards the Oakeley Hospital years ago, but at present that is not the case."

John Owen, who had worked for 35 years as a slatemaker at the Middle Quarry, said that he did not think there was any danger from the machinery in the mill. He suffered from indigestion, but after being questioned, it emerged that he virtually lived on tea, which he admitted the doctor had warned him would bring on indigestion. He described his "eating house" at the quarry in this fashion: "It is a building with a stove in it to boil water, and there are three or four tables in it, with men to sit upon. We range ourselves in parties around these tables.... As the number of men is large, we put the tea in the kettle, and if it is there for half an hour before we drink it, of course it stewed a good deal... the water is put on the stove two hours before the time, and the place is open about three-quarters of an hour before dinner time. .... The water is put on the stove about 10 o'clock in the morning, or earlier than that sometimes. The time varies. It depends on the time the stove takes to heat."

In a rare reference to the old type dressers he remarked; "When the vertical knives were in use there used to be a good deal of dust, but with the circular machines there is not so much."

On being questioned he stated that he had not offered to come to give evidence, but the manager had asked him to!

Richard Jones, from Capel Garmon, above Bettws y Coed, and who also worked at the Middle Quarry as a rockman and had done so for some 18 years, gave evidence that the workings were inspected from time to time by the management with a "Wells" type of oil lamp. He also stated that the men were not allowed to work in any dangerous places that the management knew of, any defects being attended to at once. He stated that there had been a great improvement in the care taken by management within his memory, but not so much in other quarries as in the Oakeley.

He was unaware of any unwillingness on the part of men to come forward because they feared "the displeasure of the agents or owners." He had come, he said, because the workmen and masters had asked him to, although he did not represent any particular group or party.

Robert Davies, who worked in the Lower Quarry referred to the fixing of ladders for inspecting the roof of chambers. He stated that the longest they had at present was 34 yards long! He had worked in the Lower Quarry for 34 years and he also mentioned the change in approach: "They used to try to look into the matter (of things coming down), but not with such care as is used now." He believed the improvements which had taken place had tended to reduce the number of accidents, and he felt that the workmen in general would agree with him. He too was unaware of any fear among the workmen which might prevent them coming forward.

William Cadwaladr Williams, a rockman from the Upper Quarry, also stated that conditions had improved and that accidents occurred in every occupation in the quarry. Asked if he told the officials of any danger that he found he replied: "Yes, we do that at once. I consider that unless we tell them we are not in our proper senses. I myself would not think of working under what is dangerous, and I have never seen anyone who expected me to do so." Regarding the officials attention to complaints, he continued, "They are very willing to attend to anything to which we call their attention, and they always warn us that we are not to remain at our bargain work if we think there is any danger." He felt that proper supervision was carried out by the management in the quarry, as far as he could judge. One telling comment, which still applied many years later was this, on the subject of what other people might do in their workplace, "I cannot say whether it is usually done or not in other places. I never go anywhere except to my own chamber, and I do not question anybody either." In the labyrinth which was Oakeley, perhaps one should not be surprised.

David Davies, a slatemaker for 29 years in the Lower Quarry remarked on the dust in the mills as follows: "If it could be lessened it would be a very good thing, whether it is dangerous to health or not. There is a good deal of dust in the summer. I believe there is more in summer than in winter, or at all events we see more of it. There is one thing which I believe would lessen it a little, and it is in use in some places. Some of the mills are provided with a door where the waste from the slates falls from the dressing machines, and if these doors were adopted in every mill it would be a great improvement, in my opinion." On the subject of a water spray he said, "It would keep the dust down. I have been watering the place myself when it is very hot in summer. I have been watering the place all round with a pail of water, and I found it very useful."

By the third day, something new turned up. As Owen Rowland Jones, another slatemaker in the Oakeley put it, "Since this Committee was appointed the workmen have had a meeting to consider the matter, and Richard Griffiths and myself have been requested to attend to lay the following suggestions before you:
1) Underground dangers
-(a) We recommend that no work be commenced in a new chamber until the inspectors of the company certify it as a safe place to work in.
-(b) That periodical inspection be made of every chamber in the mines, and that a record of the same be entered in a book which may be seen by the Government Inspector whenever he wishes....
-(c) That some plan be adopted to prevent the water from trickling down the fore-breasts of the rock, which makes the ropes and the surface of the rock itself very wet. This makes the man's body also wet. We consider the mischief could be avoided by making dams.
-(d) That a wall be built in the middle of disused levels instead of fences, as is the case at present.
-(e) That there be some effectual provision to regulate the wheel of the crane.

2. Inspection
-(a) That the area under the inspection of the Government Inspector is too great, which makes his visits too infrequent.
-(b) That we ask the Government to appoint a sub-inspector possessed of practical knowledge and a knowledge of the Welsh Language.
-(c) That the inspector should have an account of the accidents from the workmen apart from the agents. What we mean there is this: When an accident happens, Dr. Foster, the inspector, visits the quarry, and he is always accompanied by one of the agents, who, if necessary, acts as interpreter between Dr. Foster and the men. If the accident has been brought about owing to the carelessness of an agent I do not think the present mode is the best one for getting at the truth.

-(a) That suitable eating houses be provided.
-(b) That water closets and a better supply of water should be provided.

4. Inquests
-(a) That it would be desirable to have among the jury persons having a practical knowledge of the occupation of the person concerning the circumstances of whose death an inquest is being held.
-(b) That more care be taken to ensure accurate evidence. The jurymen at inquests, under the present system, are made up of shopkeepers and other tradesmen, who are not familiar with the terms in use in the quarries. In our opinion, these men cannot possibly grasp the facts of the case, as those familiar with the occupation could. I may say that it was stated at the meeting at which these suggestions were framed that several fatal accidents had happened at the Ffestiniog quarries, and that when the inquests were held the man or men who first saw the deceased after the accident were not called to give evidence."

Greaves, the J.P., wanted to know who had made the statement at the meeting, but Jones claimed not to know. He was asked just how many men did he represent? He replied "I should like to explain that. Notice was sent to every quarry asking them to send delegates from above-ground and under-ground to a meeting to be held to consider these matters. I cannot say how many men were present at the meeting, I attended the meeting because I had been selected by the men of the Oakeley Middle Quarry...." Both he and Griffiths felt they represented the feelings of the men employed at the Middle Quarry, but it would appear that in fact, the grievances they were putting forward were more from the other quarries than their own, as shall be seen. Regarding these other quarries, he said, "There were representatives from the Llechwedd, the Votty and Bowydd, the Cwmorthin and the Upper and Middle and Lower Oakeley Quarries. I am quite certain of these, but there were also many men present whom I did not know." He did think there were men from all the principal quarries in the district, but he was uncertain whether there were any from Maenofferen. He represented the slatemakers of the Middle Quarry, "and I put these suggestions before them, or rather they gave me the suggestions and requested me to lay them before this committee. I ought to explain that I was only asked to tender evidence concerning the mills at Middle Oakeley, and not the underground workings."

On the subject of eating houses he said this, "There is one on the floor where I am working, but there is only accommodation for about 56 men.... There are about 150 working on that floor, so that there is only accommodation for about one-third of the number. Some of the men go to the place where they sharpen the saws, and in my opinion that is a very unsuitable place.... The company provides coal, and we pay for cleaning and lighting the fire."

Drinking water was a sore point, "I should like to add that the drinking water ought to be seen to. It is very essential we should have a proper supply. The water we have at our quarry is such that the manager has warned us not to drink it without boiling it.... I believe it comes from the reservoir in the Upper Quarry.... I have never seen the reservoir, but it was in the summer when we were told to boil it.... It is not good water at any rate. It tastes of peat... it is quite common to see bits of peat coming down in the water." Curiously, for all his concern, he admitted never having seen the kettle except when it was full, nor to using soap...!

He complained that there were no sanitary arrangements of any kind at the quarry.

On accidents he repeated his complaint about the agents, "When an accident happens through the negligence of an agent, the men do not care to give a proper account of the matter in the presence of the agent... It would be a rather difficult matter for
the men to accuse the agent in his presence, I mean to incriminate him.... What I should like would be to see the Inspector go there to inquire directly how the accident happened, without taking the agent with him."

It was pointed out to Jones that up to 1880, they had had an inspector who spoke Welsh, did he think that the inspection was now less effective than it had been before? He replied to the contrary! Questioned further, he admitted that in his quarry, the management did much more than the special rules required, and that they were carried out strictly.

Richard Griffiths gave evidence next. He said, "Most of the suggestions I had to make have already been made by the last witness. He was the secretary of the committee of workmen appointed to consider the matter, and I was the chairman." His evidence was curious, and seemed to be aimed elsewhere than at the Oakeley Quaries. He put it this way, "If the Agent at present does see that everything is done properly, and that the rules are carried out, I do not think it is done elsewhere, and perhaps the present Agent's successor may not do it." He suggested that the Government Inspector should be a practical man, he went on, "I do not consider that any man is competent to make inspection unless he is a practical quarryman, and I believe that there ought to be in every quarry one Agent, at least, who is an experienced man... There ought to be one such man on the staff of every quarry."

Asked about his own quarry he replied, "There is one at least in each part of the quarry, if there are not more. There are perhaps two or three.... As far as I know there is only the Llechwedd and the Oakeley quarries where there is a rockman as Agent. It is not only of advantage to the workmen, but to the master as well, that there should be a man of that kind on the staff." Asked if it was only at Llechwedd ad Oakeley that there were competent staff able to make inspections he said, "Yes, I believe that is so. It is in the Oakeley and Llechwedd Quarries only that there are men who are able, in our opinion, to carry on these inspections as we should like them to be carried on. That is our opinion." Clearly, he was representing more than the voice of the Oakeley men here.

He put the responsibility entirely upon the owners to make the place safe, but at the same time said he would not take any responsibility away from the men, merely that, "Every inspection of the rock by a practical man would enable the Agent to find out where any fault lay, and to enforce discipline, and it would accordingly make the men themselves more careful. He admitted that at the Oakeley the present Agents were able to do this work, "As far as I know they are satisfactory. There is a rockman who is an Agent, and he assists the other Agents to do the work thoroughly. He did think that the present Agents could improve and do the work even more carefully.

Returning to the business of juries and accidents he had this to say, "I believe it would be a very great advantage to have men on the jury of the same occupation as the deceased. It would help to arrive at the truth with regard to the cause of the accident. The questions sometimes asked of the witnesses are rather irrelevant, and a man who does not understand the work may ask questions in a way which is not intelligible. It is very often difficult to get at the truth in such matters, and the presence on the jury of a few practical quarrymen would be of very great assistance."

Asked if there was a considerable reluctance on the part of the men to give evidence, he agreed, and under pressure gave an example, though he would not name names. "It is quite a common thing to hear men say "I don't wish to go and give evidence." They are weak men, and they are afraid that it will affect their circumstances.... One was in the case of the Welsh Slate Quarry... about 8 years ago, or perhaps it is more.... The family of the deceased were asking for damages. There had been a fatal accident, and there were witnesses who were to be called, and they came forward to give evidence, and they say that they had to suffer for so doing to the end of that management.... It is a difficult matter to get them to attend to give evidence even before this committee, and for the same reason. The best proof I have is that the men are afraid to come forward and give evidence, and the reason they give is that they are afraid they will have to suffer, the same as their leaders have had to do. The statement I have made was made at the committee meeting of the workmen. It was said that no men would come from some of the quarries, and some of the men who have been appointed to give evidence on behalf of the men refuse to come for the same reason. I should like to add that that statement does not apply to the Oakeley Quarries."

It is thought that this was a lightly veiled reference to the North Wales Slate Quarrymen's Union dispute at Llechwedd, in which men were dismissed and all the quarry owners closed ranks.

Roberts gave evidence that he lived at Blaenau Ffestiniog and that he was the resident manager of the Oakeley Quarries and had been a Quarry Agent or Manager for about 21 years. He agreed that the Oakeley Quarries were the largest in the district and that they employed about 1,650 people, which was very nearly half the quarrymen at the underground quarries of Merionethshire. He had drawn up some notes for the Inquiry Committee and arranged the information under different headings.

Prevention of falls:
"In my opinion," he said, "the best means of preventing falls from the walls and from the roofs is for the management and the workmen to exercise all the care possible, the workmen on all occasions to make safe their respective working places before they leave them; frequent inspections to be made both by the management and the workmen; in fact the special rules should be carried out with care and attention by both the management and the workmen, special attention being paid to rules 48, 82, 83, and 85...." He then read out the rules.
He went on, "But to stop falls altogether is, in my opinion, impossible, because they are brought about by natural causes and forces which are, in my opinion, inherent in underground mining. For instance, the output from underground operations alone at the Oakeley Slate Quarries since the amalgamation in January 1888 amounts, in round numbers, to 4,500,000 tons. This, in my opinion, must of itself be a disturbing element within the mountain, because the method of working means removing (roughly speaking, 60% of the mountain) that which nature has provided for its support, and which is inseparable from the chamber and wall mode of underground mining. I am of opinion also that no better mode of underground mining of slate quarries can be adopted with the slate formation lying at an angle of 30 or 31 degrees in the Oakeley Quarries and its pillaring line bearing about 13 degrees east of north.

Each chamber, in getting deeper (by "deeper" I mean being wrought towards the underlying "hard"), and longer, would tend to cause a movement; but more especially in faulty ground, jointy rock, the faces of "bevels," and at and around the faces of all "slants"; and, moreover, the pressure or weight of the mountain above, which the walls have to carry, would tend to and bring about "scribing" or scaling of "walls," aggravated by vibrations, brought down by blasting."

Inspection:
On the subject of inspection, he had this to say: "The inspection of slate quarries should, in my opinion, be left to the supervision of one department, and not as at present. At present the supervision of Dr. Foster and Mr. Richmond, the Factory Inspector, overlap and tend to misunderstanding and some confusion. With a slight re-organisation, I fail to see why the Factory Inspector, the Explosives Inspector, the Inspector of Weights and Measures, and the Detonator Inspector, should not be merged into one, in so far as the Slate Quarries are concerned, i.e. under the Mines Regulation Act." Clearly a policy of full employment at the Board of Trade!!

He suggested that special rule 73 should be modified, so that the rockmen were not compelled to use wooden rammers, except when using gun cotton or gelignite.

He gave the greatest vertical height of chambers as being about 22 feet and the greatest thickness of the Old Vein, the principal vein in the Oakeley Quarries as about 180 feet. He pointed out in regard to alleged undercutting, that if the walls were cut on the natural line of pillaring, then their inclination would be 1 in 4 or 1 in 5 from the vertical line.

In order to give some idea of the extent of the honeycombing of the mountain which had gone on, he gave the total number of chambers as 569 with 149 actually in work. The platforms on each floor varied, he said, in breadth from nil to about 100 feet. The walls varying in length from a few hundred to 1,000, 1,500, 1,800 and 2,000 feet.

Accidents and the Special Rules:
He tabulated the accidents in the quarries over the last three years, as during that time he had entered them in a book "where I can always get at them easily."

He was of opinion that slate quarry managers should be allowed to attend inquests and be allowed as a matter of right to put questions to witnesses in the same manner as Colliery Managers were.

He stated that the quarry hospital was kept up at the expense of the company, the workmen who met with accidents at the quarries being admitted free of charge. There were twelve beds.

Printed notices, both in Welsh and English were put up, he said, and gave the text of those on bridges and on inclines as: "Not more than one loaded truck at a time will be allowed to pass over any one of the bridges." and "No one is allowed to be on the incline whilst it is working."

He had, he admitted, experienced a great deal of difficulty for years in carrying out the special rules, but lately, he was pleased to say, the special rules were respected and adhered to much better. From 1891 to 1892 he fined the men 2/6d. for breaching the rules and in 1893 had advanced the fine to 5/- as he did not feel the lower figure had the desired effect. As a rule, he gave offenders the option of either being fined or summoned by him. The fine money was distributed at the end of the year between the widows of those men killed in the quarry. A list showing the distribution was put up in the dining rooms - i.e. the cabannau.

He felt that all future applicants for slate quarry management should be certificated, the examination of candidates to include "practical knowledge of quarrying, some knowledge of surveying, of physics, and of practical geology." He went on to quote Fanning Edwards, previously mentioned, in support of his argument. He was, however, careful to point out that he cast no reflection on the present quarry managers, because until recently, education had been very much neglected in those parts of Wales.

Roberts explained that all the boilers at the quarry were insured by the "Boiler Insurance Company Limited", and gave their manner of examination and inspection.
Regarding the Cabannau, Roberts put it this way, "At Lower Quarry there are three dining rooms to accommodate about 80 men each; and below ground there are three eating places; one of these will accommodate about 60, but at present only 55 men who use it; another will seat eight and another will seat seven men. Two are on K floor and one on I floor." He then gave a sketch of the K floor one which seated 60.

"This eating place is warmed by means of exhaust steam passing through a pipe along the length of it. The floor is of concrete. The number of cubic feet is 3,356, and it is well ventilated at the three ends." This Caban was in fact part of the old level to the "Back Vein" on K, just to the west of chamber 2, the steam came from the winding engine which worked the incline in chamber 3.

"At our Middle Quarry, there are two dining rooms above ground, to accommodate from 60 to 80 men each, and one eating place, to accommodate 30, below ground."

"At the Upper Quarry there are five dining rooms, all above ground."

In answer to a question put to him later, he agreed that there was not enough accommodation in the eating houses for all the men, giving the reason that they would not make use of them if there was. "For instance," he said, "there is one on the C floor which is not full. There is room in it for more. If we knew that the men would make use of them I do not think that the Company would hesitate for a moment to put up more of them, but the men have never represented the matter to us in any way. There are many men in the quarries who will not avail themselves of what we have there at the present moment. They prefer to eat apart from the rest of the men. What their reasons are, I cannot say. Their tea, and so on, they prefer to warm over a candle underground, rather than come to the dining room. Many of them prefer that, and they do it."

Rooms for Drying clothes:
On this subject he was a little more forthcoming, giving us another glimpse of his character:

"For the men who work above ground - in the "fall," for instance, and at the tips - we have cabins for drying clothes; but we have not provided for those who work underground, and in the sheds above ground.

A deputation on behalf of the men in the two sheds at the Oakeley Middle Quarry came to me some time ago, consisting of Owen Parry and William Lewis Jones, with the request that they should have their clothes dried in the dining room. I replied: "Certainly not, because if I allow it you will inhale impure air at your meals, and possibly germs of infectious diseases."

I was next asked to put up a cabin for drying clothes. In reply I said: "Permit me to relate to you my experience with regard to the question of drying clothes. About two years ago water in large quantities percolated through the roof of chamber Y on floors 11 and 12 of the upper quarry. I noticed one day that the workmen in these chambers had wet clothes on. I spoke to one of them, the name of William H. Williams, who took the subject and reminded him that if he did not take more care he would certainly undermine his health. He replied, "But we cannot help ourselves, the chamber is so very wet." I said, 'most certainly you can; and' I added, "will you and your comrades undertake to bring your clothes down to the round cabin on the tenth floor if I put a fire there to dry your clothes?" The reply was "yes." The workmen brought their wet or damp clothes there for a short time and then discontinued doing so. However, I said to the deputation, 'if you, by way of experiment, will wall up a small cabin, I supplying the timber and fuel, and a man to see to the fire, and if I further see that you will make use of it and appreciate it, I will undertake to put up a more elaborate building for you.' The walling for the hut, or cabin, has not been put up yet, and I suppose never will be put up."

Privy accommodation:
A delicate matter perhaps, but Roberts admitted that the nine privies they had was not, he felt enough. "Below ground," he said, "exhausted chambers, away from the working places, are used by the workmen, above ground the tips, which cover an immense area, are used, and with the heavy rainfall we have, amounting to about 100 inches a year, the excreta are quickly washed off, so that practically we suffer no nuisances."

Questioned about drinking water, he said that the felt the men had a sufficient supply of drinking water, that they were not obliged to drink the water trickling down the quarry, or dropping from the roof. He agreed that for those underground it was the only water available, unless they went outside. He said that he felt the water that came from the surface to be of good quality on a par with that supplied to the town from Llyn Morwynion. He admitted having told the men on one occasion to boil the water before drinking it, but that had been during a drought when the water level in the reservoir was low, and he knew the condition of it, whatever that meant.

On the subject of inspection of the rock, he explained that he and his officials went round and made frequent examinations by means of the Wells light, which was the best light they knew of. "...And in case we find anything that looks suspicious to the eye, or that is considered dangerous by the men, we put up ladders forthwith, and have a thorough examination, not only by means of the Wells light, but by means of ladders as well.
Asked if the inspections took place at fixed intervals or only when the men complained, he repeated with emphasis that they inspected the rock as a matter of course. "We make independent inspections apart from any complaint brought to our notice by the men," he said.

He gave the following account of an inspection by ladder:

"COST OF SECURING THE ROOF OF CHAMBER 16 ON FLOOR K."

(Square yards inspected and secured, about 200.)

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<td>Preparing ladders and raising same,</td>
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<td>4 men for 4 days, at 5s. per day</td>
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<td>30 men for half hour, at 4s.6d. per day</td>
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<td>Stoppage indirectly of 100 men for half hour</td>
<td>2</td>
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<td>16 days inspecting and securing, for 7 men</td>
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<td>Wells light oil</td>
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<td>Rope sold at half price</td>
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<td>30 men lowering and raising ladders</td>
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45 17 9

"The cost of inspecting 200 square yards was therefore 45l. 17s. 9d., which is equal to 4s. 6d. per square yard."

Roberts kept a diary of each inspection that was made. He considered the type of bridge they then had to be the most secure. That was trussed with iron rods underneath rather than hung from the clay slant roof. He stated that both types were in use. The longest bridge was about 55 feet long, the maximum load allowed on them being 3 tons.

On the subject of dust in the mills, he had this to say; "You might run a pipe along the length of the shed and cause a spray to play on the dust, but personally I think I would rather have the dust than work in a damp place. There would be dampness produced by the spray."

Once again the matter of the form of the workings came up, as it had done at the Arbitration hearings, and once again considerable discussion as to the thickness of walls, and the strain on them was brought out.

On management, he stated that there were eight people at the quarry who could give direct orders to the men as to what they were to work, two at each of the Upper Quarries, three at the Lower, and himself.

He emphasised that in the matter of witnesses to accidents, the management had absolutely nothing to do with their selection, they sent down whoever the police required.

Finally, he avoided the question of wages, as he did not think them relevant to the inquiry. However, he was prepared to state that among 1,600 workmen you were bound to find some black sheep, but as a class, he considered them a very sober class of workmen.

David Griffith Williams, with experience both as rockman and slate maker referred to ventilation in the mills. "If the doors are left open there is often too much air or wind, and there is no provision except by means of doors... I would suggest something similar to what they have at the present time at the Penybont Mill at the Oakeley Quarries. There is ventilation through the top of the roof.... They have fixed proper ventilators.... Another advantage is that the dust can pass out better." He also advocated the fitting of doors to the dressing waste openings.

William Williams of Penrhyndeudraeth, who had worked underground for 26 years in the Lower Quarry had this to say, "I would also suggest that the recent improvements we have had at the Oakeley Quarries should be introduced into the other quarries. For instance, the roof should be inspected periodically. If the same care had been taken for the last 15 years as has been taken during the last 2 years, accidents would have been much less frequent."

William Owen, the Lower Quarry Manager stated that he had been a quarry agent for 16 years, before that he had spent five years in the office and three as a quarryman working above ground. He considered it his duty to inspect as well as to see after the men, and he did so every day. He gave evidence that the chief engineer made a periodical inspection of all the incline ropes and chains and the machinery, keeping a record of what he did. He stated that they had changed ropes and other things at his suggestion, and he did not think that they had had a single accident since he had commenced. All the books were open to the inspector should he wish to see them. The foreman carpenter looked after the bridges. He gave the area excavated underground to be about 220,000,000 cubic feet, over an area of 450,000 square yards.
He stated that they had means for preventing the water from going down over the forebreasts: "We have troughs at every possible point we can put them on the surface, and ditches, and so on, to keep the surface water as far as we can on the surface, but there is always water percolating through and we cannot possibly avoid that. Dams are made wherever they can be constructed, and troughs and so on are made underground. It is to the interest of everybody to keep the water high up and we do all we can in that way."

He took exception to the complaint against the old Welsh Slate Company, "It was given in evidence yesterday that a certain witness had been intimidated, that the management of the late Palmerston quarry did not act fairly towards a certain witness in legal proceedings taken by the Government Inspector against the company. I happened to be one of the officials of the late company, and to-day I am ready to prove that there was no intimidation whatever exercised towards that witness. He had exactly the same rights and the same fair play as every other man in the quarries during the time that the Welsh Slate Company worked that quarry. I think I ought to say that, in fairness to the management of the late company."

He added that whatever the general impression was, he dealt with facts, not impressions.

Regarding the suggestion that walls should be built across abandoned levels, he said this, "It might be advantageous. I can say that our experience is that walls have been built in that way, and always taken down by the men themselves afterwards. I do not know why they do that. The fences that we put down are very much more substantial, and they are not taken away. It would, of course, prevent what you seem to wish to guard against, that is, the possibility of a blast throwing from one to another... We intend to leave a chain at each of the disused levels, so that we may be able to go up the chain to examine the place. It is the duty of the men to warn the men in the next chamber when they are in the vicinity of an entrance to a level. I only know of one accident of that kind that has taken place during the last 17 years."

John Parry was a slatemaker in the Middle Quarry mills, and had this to say, "One thing is that we are called to our work very early and before it is light enough for us to work, especially during the winter months when the weather is cold and damp, and, in my opinion, this must be detrimental to the health of the men." He was then questioned further:

"What time have you to be in the mill at the present time?"
"At 7 o'clock."
"And at what time do you leave work in the evening?"
"Last week we left off at 4.45, but this week, I believe, it is 5 o'clock."
"And how soon are you able to begin work after that time?"
"We are not able to commence work until about 8 or 8.15, just as the day happens to be."
"Then you are half an hour or three-quarters an hour in the mill doing nothing?"
"Yes, simply waiting for the sawing machine to cut through the blocks."

"Eight hours," he said. "I believe, would be enough for any man to be in the quarry. Eight hours excluding meal time." He did not remember coming to work at 6.30 in the morning, but thought he remembered working from 6 till 6 in the past. Asked what he thought the point of the long hours was, he replied, "Of course, it is impossible for me to know what my master's views on that subject are, but I do not think the object is to bring us there to do nothing. There are some of the men, possibly, who can do some work or other as soon as they reach the quarry in the morning, for instance, those who work outside can commence work earlier than the men who work under cover, and as those men can work, they call us all there at the same time because they must have a rule which will apply to the men throughout the quarry, and not to a portion of the men only."

Mr. W.W. Jones, a slatemaker in the Lower Quarry, also complained about the hours, saying that they ought to be shortened.

"They vary at different times of the year. For the greater part of the year, that is from about the middle of February to the end of October, the hours are from 7 to 5.30."
"And have you sufficient daylight during these hours?"
"Yes, during the summer months."
"Therefore you are not complaining that you are kept doing nothing at the mill, waiting for daylight?"
"No, there is light there then, I believe that we are in the habit of working very hard, and as we have to work in an atmosphere in which there is a good deal of slate dust, I consider the hours are too long."

Robert Roberts was re-examined, as he wished to refer to the question of the water at the quarry, saying that he wished to reply to a complaint by Dr. Evans that the water was bad, and that Evans had said that the officials did not drink the same water as the workmen drank from. "At the Oakley Upper Quarry the two assistant managers and the two slate inspectors do drink the same water as the workmen. At the Oakley Middle Quarry the two assistant managers and the two slate inspectors drink of the same water as the workmen drink from; and at the Oakley Lower Quarry the three assistant managers and the four slate inspectors drink of the same water as the workmen drink from; but the clerks at the office and myself drink from another source, although personally, and putting together the time spent by me at the Middle and Upper Quarries, I have drunk of the same water as the workmen of the above-mentioned two quarries for about thirty years."

"The second charge, no doubt founded on gossip, was a most undignified and a most unprofessional charge for a medical man to make, unless, of course, the charge was well founded."
To refute it, Roberts had three samples of water taken and sent to Professor Thomas Stevenson at Guy's Hospital, London, for analysis. All were found to be admirably suitable for drinking.

When a question was put returning to the water again, he explained further, "Soon after the amalgamation we were knocked around a good bit from one office to another. We shifted from the Upper Quarry Office to the office of the late Welsh Slate Company. Mr. Robert Owen is present, and he will bear me out in this. We occupied the same office as they did, and it appears that the office-man employed by the late Welsh Slate Company went for drinking water for the officials to Talywaenydd, and he continued to do the same after we took possession of the office. Previous to that I drank of either the water of the Middle or of Upper Quarry."

The question of having to boil the water came up again. Roberts explained emphatically that it was solely due to the drought of that year and the reservoirs being low that he had told the men to boil it, the only occasion he had had to do so. On the subject of privies, he had this to say, "Dr. Evans told you in his evidence that his visits to the quarries were like an angel's (a fallen angel, I presume) visits -few and far between, and yet he undertook to tell you that the few privies at the Oakeley Quarries were filthy. Within the last few years I have built three privies, one at the Lower Quarry in the pit, to seat four, which is flushed every evening; another has been built to seat two, in the pit at the Middle Quarry, and a stream of water passes underneath it; and another as been built in the pit of the Upper Quarry, with a stream of water passing underneath it. These privies are all clean and free from any offensive smell."

He admitted that there were no privies underground, and that to some extent he had noticed offensive smells in some of the disused chambers, but far enough from the working places of the men. He admitted that he had considerable difficulty in preventing the men "committing a nuisance" in the disused chambers.

Regarding the issue of hours of work, he felt that the time they worked at present was about reasonable, when all the deductions were taken into account.

"Of course," he said, "we ring or whistle in the morning at 7.30 at present, and we go on until it is more or less dusk.... It is 5 o'clock this week, and last week it was 4.45, but the men are not in their working places by a long way when the bell or whistle goes... They are on the quarry premises, which of course are very extensive. It is the rule (and we say nothing to them), for the men to take sometimes 15 minutes to get to the various dining rooms, and they cannot do it in less time and to walk the distance most of the underground men have to do from their working places.... they do not leave the dining room again until the whistle goes, and it takes them about the same time to return to their various working places."

"What time do you usually allow for dinner ?"
"Half-an-hour, at the request of the men."
"and do you consider that sufficient ?"
"I have endeavoured to show you that it is not half-an-hour that they take"
"But do you consider half-an-hour sufficient ?"
"For them to eat only, do you mean ?"
"No, the whole time?"
"No, they cannot do it, and they do not do it."
"So that the half hour is only a nominal allowance?"
"Yes, that is it."
"In reality they get more than that ?"
"Yes, about an hour, as regards the pitmen, but as Regards the shedmen they work close to the dining rooms and it is only a matter of a few minutes for them to get to them."

"Some of the men said yesterday that they had to arrive at the mills half an hour or three quarters of an hour before they can commence to work?"
"They can surely put the tables in motion to saw the blocks."
"It would take that time to put the table in motion?"
"No, but a circular saw will take about 20 minutes to saw a table load of blocks or slabs."
"Can you put blocks on the table during that time?"
"Not very well. The quarriers are very much in the minority. For instance last pay, if my memory serves me right, they numbered 476 as against 1,176 who use artificial light. To my mind the majority is a very big one - 1,176 against 476 - and surely they ought to rule and govern in a matter of this sort, I should say."

"Is it the practice of the men to put the slabs on the table the night before... and then start the tables in the morning ?"
"Yes it is"
"They cannot do anything else except wait for the sawing machine to start?"
"They can carry the blocks to the heap ready for splitting."
"Have they anything to do with the waste?"
"They have to carry the waste within reach of the clearers."
Altogether, considering the evidence both from men and management, the Oakeley Quarries came out of the inquiry quite well. Although there were differences in method, a number of men from the other quarries were of opinion that they wished their quarries followed the Oakeley pattern.

The recommendations of the inquiry came under 4 main headings:

i) Prevention of Accidents.
   (a) Falls of ground:
       - Periodical Inspections were to be recorded.
       - Continuous barriers between walls should be left to stabilise the ground.
       - Robbing pillars and walls should be forbidden.
       - Mechanical cutters to cut sides of chambers would be advantageous.
   (b) Explosions of gunpowder etc.
       - Iron & steel rammers should be prohibited.
       - Mixed explosives were undesirable.
   (c) Inclined planes:
       - Riding on wagons to be prohibited.
       - Special pathways separate from the inclines should be provided where possible.
   (d) Machinery underground:
       - All cranes to have brakes.
       - Special rules should be the same for all quarries.

ii) Care of injured persons:
    - Ambulance classes should be provided.
    - The Coal Mines Act should apply, requiring managers to have a St.John's Ambulance Certificate.
    - Appliances for First Aid to the injured should be available.
    - Hospitals and nurses were worth encouraging so girls should be given the rudiments of nursing.

iii) Promotion of Health:
    - Unsanitary dwellings should be condemned by the local authorities.
    - Instruction in cookery should be extended.
    - Public baths & instruction in hygiene should be made available.
    - Improvement might be made to the railways for travelling!
    - The experiment of dressing rooms at the mines might be tried, dining rooms should be universal.
    - Closet accommodation should be provided above and below ground.
    - Underground paths to and from the working faces should be kept dry.
    - The dust should be kept down by watering.

iv) General matters:
    - The Metalliferous Mines Act needed amendment.
    - The definition of non-fatal accident needed changing to reportable accident.
    - Technical instruction should be provided.
    - Two Welsh-speaking inspectors of mines should be provided.
22. THE LAST LEASE 1895-97

The final lease of the Oakeley Quarries was drawn up in 1896 and completed on the 23rd of March 1897. This was for a term of 100 years from the 31st December 1895 to 31st December 1995. With the passing of the Welsh Slate Company, one could be forgiven for expecting some simplification in the terms, given that only one company was to be dealt with, and that company had the landowner on its Board of Directors, but this was not the case. In the intervening period several things had changed.

William Edward Oakeley and his wife, the Hon. Mary Russell, had had two children. The son, Edward de Clifford William Oakeley had been born on the 21st November 1864, and whose birth possibly precipitated the involvement of W.E. in the Oakeley Estate and Quarries as mentioned previously. While the daughter, Mary Caroline, was born on the 14th November 1865. Both were significant for the development of the quarries and estate, though in different ways.

Something started to go wrong with the Estate from the late 1870’s onwards, possibly initiated by the problems with the re-entry of the Upper Quarries, this by itself was not sufficient, for, with the formation of the limited company and the various payments to William Edward, resulting from the W.S.Co.’s arbitration, there should have been no money problems. William Edward's behaviour before and during the arbitration suggests that he was not a particularly good businessman, and while this may be significant, it does not altogether explain the fact that in 1897 the whole estate was mortgaged to the Rock Insurance Co. The Oakeley papers, now at Dolgellau, contain references to a large number of mortgages and various other papers suggesting that money was scarce - this in a family whose quarry income alone amounted to some 30,000 per year during the period in question. It seems likely, although there is no hard evidence, that this may have been due to gambling losses by some members of the family, the most likely candidate being Edward de Clifford, though some have suggested Mary Caroline and William himself as possible debtors. The latter in particular seems unlikely.

Mary Caroline married William Frederick Inge, of Thorpe Hall, near Tamworth in Staffordshire. She bore him three daughters, Margaret Ethel, Hilda Mary and Edith. Unfortunately there was a history of insanity in the Inge family which William inherited, committing suicide in February 1903.

Edward de Clifford himself never married, and lived most of his life away from the Plas and the Oakeley's Midlands property, evidently preferring the brighter lights of London, while his father and mother spent most of their time in the Midlands, at Atherstone in Warwickshire, although much work was done for the Estate and Maentwrog even into the late 1890’s. The Plas was treated, perhaps, as were many distant homes at the time, as a "summer residence," a place to get away from the heat, sights, sounds and smells of the cities in summer.

As a result of these losses the new lease included new parties, primarily concerned with the mortgages. The parties to the new lease were: Joseph Gurney Barclay, Rt.Hon. John George Baron Monk Bretton and Wilfred Arthur Bevan, the Trustees of the Rock Life Assurance Co, of the first part; William Edward Oakeley and Edward de Clifford William Oakeley of the second part and the Oakeley Slate Quarries Company Limited of the third part.

It referred to an indenture described as follows; "Whereas under and by virtue of the Indentures of Mortgage and Further Charge and Transfer of Mortgages mentioned and referred to in or by an Indenture of Further Mortgage and consolidation of Securities date the 9th. Day of August 1894 and made between the said William Edward Oakeley of the first part the said Edward de Clifford William Oakeley of the second part and the Mortgage Trustees of the third part and of the said indenture of the 9th. day of August 1894 the quarries lands and hereditaments firstly hereinafter described and expressed to be hereby demised are (with other hereditaments) vested in the Mortgage Trustees in fee simple as security by way of Consolidated Mortgage or otherwise for a large sum of money now (with the current interest thereon) owing to the Mortgage Trustees."

It recited the will of W.G.Oakeley of the 13th January 1835, and the Indenture of disentailing assurance dated the 21st November 1885 between William Edward Oakeley of the first part, Edward de Clifford William Oakeley of the second part and Henry Cunliffe Shawe and Lewin Charles Cholmeley of the third part and Bartle John Laurie Frere of the fourth part.

This put aside the terms of W.G.’s will which had entailed the land to W.E. as tenant for life, to be followed by his son and his son after him. This overturning was a necessary prelude to any mortgaging of the estate, but it does leave the question in the mind that by it William Edward was making no provision for a son of his own, unlike his actions on Edwards birth... so was there something else about Edward de Clifford which history has kept quiet about, or did William Edward merely not care about the future any longer?

Apart from this, it referred to the fact that William Edward was still tenant for life of the Tan y Bwlch Estate and owner in fee simple of the "Haygarth" lands purchased in 1896, not included in the mortgage. Among others, an important part of these lay to the south east of the Ffestiniog Railway, in the triangle formed by the L.&N.W.R. and the F.R.
The land demised by the lease comprised parts of Rhiwbryfdir Farm, Tal y Weunydd and Llyn y Gell Farms amounting to "767 acres 2 roods 22 perches "or thereabouts" and the 11 acres 3 roods 5 perches which comprised the Haygarth lands. These were conveyed by indenture dated the 25th July 1896 between the Rev. Henry William Haygarth of the first part, Rev. Charles James Wynne and George James Browne of the second part and William Edward Oakeley of the third part. The clauses were similar to those of the previous leases described earlier:

Clause 4: The new lease was to be subject to existing leases of buildings, to easements and to the rights of the Railway Companies and to Mr. Haygarth.

Clause 5: These were powers to the lessees to quarry etc.

Clause 6: Powers to the lessees to build.

Clause 7: Powers to the lessees to remove buildings.

Clause 8: Powers to the lessees to make roads, construct railways, watercourses, inclines etc.

Clause 9: Powers to the lessees to divert roads.

Clause 10: Powers to deposit rubbish or spoil, "...but not upon any land immediately under which there shall be any vein of slate actually proved to be capable of being worked at a profit."

Clause 11: Reserved to the reversioners walls of rock at least 40 feet thick "where practicable" to support the 3 main quarry tunnels and the L.&.N.W.R. tunnel.

Clause 12: Reserved the walls and pillars then "that now and at any time hereafter sustain the roofs of the said mines or quarries so long as such roof shall be allowed to remain unless the reversioners shall consent to the removal..." the Reversioners did not, however, have powers to work the walls.

Clause 13: Gave powers to the lessees to penetrate the walls "at floor level only" with openings and passages which were not to exceed 15 feet wide and 10 feet high and were not to be nearer to one another than 50 feet and at right angles to the walls.

Clause 14: Reserved the right of entry to inspect the workings etc.

Clause 15: Reserved the game.

Clause 16: Reserved the right of the reversioners to take "gratuitously" from the waste tips any rock needed for building, repairs, road making etc., but they were not allowed to take any rock and subsequently sell it.

Clause 17: Habendum - that is, "to have and to hold..."

Clause 18: Redendum - that is, "Yielding and paying..."

Clause 19: Set the surface rent at £200 per annum.

Clause 20: Set the royalties at 7/-d per ton for slates of the 1st quality, as defined by an attached schedule, and 2/6d per ton for slates of the second quality similarly defined.

Clause 21: Exempted slate employed for building from royalty, provided it was not subsequently sold when royalty became due on it.

Clause 22: Defined the ton.

Clause 23: Gave the payment days for royalties etc.

Clause 24: Set the annual minimum royalty to £4,875, this to be paid even if the actual royalties from production fell below this figure.

Clause 25 & 26: These stated that rents and royalties were to be paid to the reversioners until notice was given by the Mortgage trustees and specifically that they were to be paid to William Edward Oakeley during his lifetime. Suggesting that perhaps Edward was only to receive any money at his father's discretion?
Clause 27: Confirmed the clauses nos. 123 & 124 of the Oakeley Slate Quarries Company Limited Articles of Association as to the "B" share.

Clause 28: Gave powers to the lessees to determine the lease.

Clauses 29 to 34: These were covenants by the lessees to pay rents, rates and taxes, to maintain boundary fences, to fence pits and to work quarries etc.

Clause 35: Specifically, “To work continuously and work out each floor and gallery (unless hindered or prevented by overflowing of water or other inevitable accident or war insurrection or civil commotion or by strike general lock-out or combination of quarrymen or workmen).”

Clause 36: Referred to the walls and chambers, “…the same mines or quarries shall be worked and carried on in chambers with continuous walls of sufficient thickness having regard to the nature of the vein between such chambers and the superincumbent weight which each of such walls respectively shall have to support and such chambers shall as nearly as may be found practicable be of the same form dimensions and construction and shall be of the same internal plan and arrangement in all respects as the chambers now used for present underground workings in or upon the hereby demised premises and all walls except walls in the north vein shall (as far as practicable) be left in continuation of or vertically above or below an existing wall and its longitudinal centre line of the wall of which such wall to be hereinafter left shall be a continuation and all walls to be hereafter left in veins vertically above or underneath the existing walls shall have their central longitudinal line vertically above or underneath such existing walls.” Phew!! - but notice no mention of thicknesses, or measurements.

Clause 37: The walls or pillars left were not to be removed or thinned and were to be preserved - but not so as to restrict the right of the lessees to uncover the workings and work in the open.

Clause 38: Allowed for as much wall to remain as was required to support the roof in partially opened workings, the ends of walls to be finished off as nearly as possible at right angles to the undersurface of the roofs.

Clause 39: In fully open working, a practicable roadway to all working faces had to be left on each floor. In other words, an exhausted gallery could not be worked away.

Clause 40: The lessors were allowed to relax the covenants.

Clause 41: No premium or fine for consent was to be taken, so long as the quarry remained as security to the Trustees, without the Trustees consent.

Clauses 42 & 43: The lessees further agreed not to deposit rubbish or spoil on veins of marketable slate proved to exist.

Clause 44: A covenant to remove falls, “…as to provide proper access to all working faces and so that as far as practicable no slate capable of being worked at a profit shall be lost…”

Clause 45: To leave and protect a wall of slate 40 feet thick at least under the old limit level tunnels so long as they remained necessary and also under the L.&N.W.R. tunnel, these only to be pierced by passages at floor level only 15 feet wide and 10 feet high in the north vein and ten feet wide and 8 feet high in all the other veins - again no closer to one another than 50 feet, and as nearly at right angles as possible to the walls.

Clause 46: To work all profitable slate ad not to throw good slate onto the spoil banks.

Clause 47: To keep the works clean.

Clause 48: To leave at the end of the lease or sooner, all forebreasts clear etc. so that the reversioners could resume work without delay.

Clause 49: This was to keep accounts which would distinguish all the slates of the various sizes.

Clause 50: Gave the lessors power to inspect the accounts.

Clause 51: To keep working plans, drawings and sections on a scale of not less than 1 inch to 1 chain and to allow the reversioners to inspect them and make copies.

Clause 52: To put up a weighing machine.
Clause 53: The make of each year was to be kept distinct.

Clause 54: Gave powers to the lessors to check weights.

Clause 55: Permitted the lessors to enter and inspect and make plans and 
"...for that purpose to have all reasonable assistance of all managers and workmen and the use of all and every the shafts levels tunnels bridges inclines water balances windlasses ropes chains engines trucks machines and other articles then in use or being upon or about the said demised premises..."

Clause 56: To repair or remove rubbish etc. upon notice being given.

Clause 57: To provide new buildings for others removed.

Clause 58: Power of distress for rent etc. not paid.

Clause 59: A provision for re-entry.

Clause 60: Provision for bankruptcy of one more of the parties.

Clause 61: The lessors could take the machinery etc. at the end of term at a valuation, but not the buildings which were to be left without any compensation.

Clause 62: The lessees might remove the machinery, "rails chains pins blocks water balances wheels timber trucks carriages horses tackle implements tools articles and things..."

Clause 63: Arbitration clause, to comply with the provisions of the Arbitration Act of 1889.

Clause 64: A covenant by the Trustees, lessors etc. for "quiet enjoyment."

Clause 65: Gave the interpretation of the term reversioner. This was to be William Edward during his lifetime, then Edward during his, his heirs or assigns etc., until notice was given otherwise by the Mortgage Trustees.

The "First Schedule" of "1st. Class Slates" included: 26x16, 26x15, 24x14, 24x12, 22x12, 22x11, 20x10, 18x10, 18x9, 16x10, 16x8, 16x8, 14x12, 14x10, 13x10 "and all other sizes larger than 14x8"

The "Second Schedule" of "2nd. Class Slates" included: 14x8, 14x7, 13x7, 12x8, 12x6, 11x6, 10x8, 10x6, 10x5, "all other sizes not included in the 1st Schedule; and slabs of all sizes and descriptions."
23. TWO "MIGHT HAVE BEEN" 1895 & 1903

Thomas Jones was what one would call a diligent man, he was always trying, as he averred, to work for the best interests of the quarry and the safety of the men. In the case of the former, he was always on the lookout, as was his son after him, for ways of making things better, of increasing output, for the long term production of the quarry. In this he was not always appreciated or his advice heeded by the company to which he gave his service. Two major schemes, one partially adopted and the other totally rejected are typical of the thoroughness and consideration with which he approached his work, one referred to in passing earlier was his scheme for untopping the Oakeley Quarry and forming a new deep bon, the other was more cosmopolitan, a proposal to drain all the major Ffestiniog Mines by means of a tunnel.

The Great Untopping. Scheme came about as the result of instructions sent to Thomas Jones by J.G. Ashmore, the Company Secretary on the 1st. February 1895. Reading between the lines, an outline suggestion was probably given to the Board by Jones in one of his quarterly reports or separately.

It was the 25th. July in the following year before he submitted his report for the Board's consideration. To accompany the report he had prepared a new survey of that part of the Quarry which was to be affected by it together with a number of geological sections, all to the constant scale of one chain to an inch. Unlike the normal quarry plans, all the surface features were detailed, along with water courses, fences, old workings normally not shown and some tramway trackwork where essential - mostly on inclines. He had had a full conference with the quarry management and the work required to produce the surveys, cross sections etc. had taken up a longer period of time than he had expected, but he had felt that it could not be done hurriedly.

The plan was prepared from an actual survey of the quarry carried out in June 1895 and showed the state of fall clearance at that time. It also showed the top and bottom of the proposed "new bon" together with the face of the walls in the Old Vein which would be left when the uncovering (as he called it) was completed.

The walls, he said, were very important factors, as they were only the existing walls cut through at the new line of bon, so their small thicknesses were not deliberate, but were simply the existing thickness, so he was concerned that they should not be made any thinner or weaker until the decision was made whether to proceed or not. In his opinion they were barely of sufficient strength to stand the weight which would be thrown on them. He referred particularly to Walls 20, 21, 22 and 23 North Old Vein (the old W.S.Co. "back vein") at the east end of the quarry and Walls 1, 2, 6, 7, 13, 15 and 16 Old Vein in the middle and "weak western parts of the quarry."

The uncovering was limited to east and west by the strength of the walls to support the side bons, only Walls 17 North Old Vein in the east and 19 Old Vein in the west being, in his opinion strong enough. The working away of the Back Vein walls was an enormous weakening agent in the west, and he felt unable to take any responsibility for the western bon standing, as a result. Shades here of his earlier row with Roberts over the same removal!

The back of the new bon was also governed by the strength of the walls to support it, and so he felt that it was as far south as possible.

He had found it necessary to take 29 cross-sections to enable him to arrive at the various calculations involved, and it was the preparation of these sections, which had involved "going up into old plans and workings to trace the various hards and the extent of slate worked out and the filling up of so many of the chambers by the existing fall." In all his calculations, however, he had estimated on the low side, so as to allow for any error in the measurements or estimations. It should, perhaps, be pointed out that he himself later admitted that he had erred on some of the cross sections in his assumptions about the lie of the veins and hards.

As his calculations related to a specific date, however, the continued working of the lower floors would obviously reduce the amount of slate to be recovered by the uncovering by the same amount.

The result of his calculations was that "the total rock to be dealt with in the uncovering scheme is 38,121,036 tons. Of workable slate rock in this there is North Vein 6,590,534 tons, Back Vein 1,411,648 tons, Stripy Vein 1,297,518 tons, Old Vein walls and chambers 7,950,134 tons, or a total of 17,249,834 tons, which after allowing for various proportions of yield as shown in the summarised statement I estimate will produce 1,790,366 tons of marketable slate which I estimate will be won at a total nett profit over actual working cost of the slate rock itself at £2,282,994."

"The worthless topsoil, debris, rock, bastard and hards to be removed comprise a total of 20,871,202 tons which I estimate will cost in actual removal 978,313 added to which there will be the important work of clearing and making the 151,189 square yards of the face of the new bon safe and regular as it goes down which I estimate will cost £45,356. Plants and appliances for dealing with these hards and bastards £43,482. Four new inclines and lifting power £20,000. Forming a total cost of total cost of £1,195,866. Deducting this from the estimated profit value of the marketable slate leaves an estimated net profit of £1,087,128 of which the summary gives the necessary details." These were good old fashioned pre-inflation 's too, not today's debased money!
Jones had ignored royalty in his calculations, as it did not come into his instructions. To arrive at the estimated yield, he had had to be guided by past and present practise at the quarry, and had arrived at his figures "after long and careful consideration and conference with the manager and his assistants upon each item."

The profit per ton had been arrived at by a similar process involving Mr. Ashmore as well as the quarry staff.

The existing fall was excluded from the calculations and the New Vein had also been excluded, "though when the veins above have been worked out, the cost of further uncovering the New Vein will be comparatively trifling but the exploration of this vein is as yet so little and uncertain any calculations at the present time of the slate to be obtained from it would be most unreliable..."

The bulk of the profit lay in the Old Vein, the North, Back and Stripy Veins not paying for their own uncovering. However, as it was likely that some of the upper parts of the Old Vein would be got at before the lower parts were reached, it did not mean that they would have to wait until the whole of the Old Vein was uncovered before they could start to realise on the enterprise. It was, he felt, impossible to put any reliable figure on it, however.

He had to admit that with improved appliances the cost of clearing the hards etc. might be reduced, mentioning "pneumatic winches, electric power, improved drills, lifting machinery etc." he also thought that a cheaper method of winning the slate involving machine cutting and channelling might also reduce the cost per ton of manufacture a point brought up at the 1895 Mines Inquiry.

Disturbing factors included labour questions, dullness in markets, foreign competition and "the possibility of other roofing materials being introduced but so far as can be foreseen at the present moment I have used figure in my calculations which leave a margin for such contingencies."

The waste was to be tipped on the large area at the back of the new bon, and on the ground at Glany Pwll - part of the Haygarth lands - which had recently been purchased.

He was concerned, however, because, "the exhaustion of the profitable workable slate rock in these quarries is within a measurable distance of time as not only are the slate veins diminishing in thickness as they go down and deteriorating in depth is attained and the walls must sooner or later attain a limit of their supporting strength to the mountain above."

He had provided in his estimate for four new inclines, one from Twr Babel, which was then in course of construction and another at the east end of the quarry, exactly where he did not know yet! The other two were to be constructed as the works progressed and the fall was cleared.

As a result of the amount of rock to be cleared, he felt that it would become necessary to raise the Twr Babel incline to a greater height while the Middle and Lower Quarry inclines could be extended lower. It would also be necessary to provide new mills and machinery as the bon would cut through the Bonc Siafft site, but this might be avoided as the Upper and Middle Quarries would then have exhausted their own rock and be available to handle that from the uncovering.

The Ffridd incline would serve for a time, but eventually that too would be worked away at its foot. The abandonment of Bonc Siafft "must be boldly faced" he declared, if the Board took up the uncovering scheme.

Water and drainage was "the imperative necessity". His greatest concern was for the eastern end of the workings as he was unable to determine the ground contour beneath the old tips. "There is... a ponded body of water somewhere in this debris coming from the north of the quarry and from the eastern valley up to the Ffridd reservoir."

He felt that extreme care had to be taken in this area and a level ought to be driven to investigate this and so as to provide a drainage level clear of the new bon. This too was to be brought home to the quarry in the future.

With regards to time, he reckoned that the removal of the fall was proceeding at about 250,000 tons per year, which he now considered would take about 11 to 16 years to clear the remaining fall. With three four-road incline going, and the Upper Quarry level (floor 8 ?) after three years with "improved appliances in every way" he estimated that it would be possible to deal with 10,000 tons per week or 500,000 tons per year. This would mean it would be 42 years before the Old Vein was reached!!! However, as the slate veins were incline, the upper parts of the Old Vein would be accessible within 15 years, and then profitable working would proceed until the whole was recovered.

He suggested that a significant improvement, in the case of removing the top and worthless rock, might be made by using a wide gauge system with the present gauge "interlaid", so making possible the use of more powerful appliances.
No official reaction has been found so far, but one can imagine it somewhat. One suspects that the long time and enormous outlay before profitable working was reached, which would have to be subsidised by the normal production of the quarries, at a time when the "boom" was beginning to fade gave many second thoughts. From events afterward, it would appear that the principle of the uncovering was accepted in a limited sense. Work being done at the foot of the Ffridd incline, from Twr Babel and on floors 5 and 8 of the Upper Quarry, it being the intention that all three sites should eventually meet, the southern side of the quarry then being worked gradually downwards in a series of terraces. Unfortunately, the ground to the south was found to be far more badly damaged by the great fall than they had realised and, especially in the "weak" middle and western end of the quarry, the newly formed bon and galleries broke and collapsed down into the sink, covering the areas cleared at great labour from the earlier fall. It was this sort of happening which, as Robert Roberts put it "settled the uncovering scheme for ever."

The Deep Level Drainage Scheme was another Jones' scheme. Alarmed by the problems of pumping - especially as the quarries were driven deeper and deeper below the water table, the Directors of a number of the quarry companies - Oakeley, Greaves, Votty & Bowydd and Maenofferen, possibly at the instigation of the Oakeley Company's Secretary, J.G. Ashmore, considered the possibility of having a deep level drainage tunnel driven below their lowest projected floors and which would remove the problem of pumping forever. Interest was high, and Ashmore, acting on behalf of the group instructed Thomas Jones on the 17th November 1902 to prepare a report on the question of possible routes, levels, cost etc. Thomas Jones, apart being from the consulting engineer to the Oakeley Quarries, was also acting as Oakeley's agent as lessor with respect to the other quarries as well as an engineer and surveyor in his own right.

He reported on the 9th. May 1903. He had consulted with Mr. Francis Fox, who was the English Commissioner for the construction of the Simplon tunnel, in Switzerland, and together with Ashmore visited the tunnel then being driven - particularly interesting was the use of hydraulic rotary "Brandt" dills (what about Kellow's drill ?). The method of driving the Simpion was thought to be most rapid and economic.

Jones proposed two alternative plans, the deepest debouching at Rhydsarn, roughly half way to Maentwrog and the second somewhat higher up the valley and closer to the quarries at Cymerau. The tunnel in either case was to be 10 feet wide in the construction of the Simpion tunnel, in Switzerland, and together with Ashmore visited the tunnel then being driven - particularly interesting was the use of hydraulic rotary "Brandt" dills (what about Kellow's drill ?). The method of driving the Simpion was thought to be most rapid and economic.

The Rhydsarn tunnel was to be driven straight from Rhydsarn to the bottom of a proposed extension to Greaves' Main incline, in order to get the shortest and quickest way through to effective ventilation, it was also thought to pass entirely through solid rock. A branch to Oakeley could be started immediately the main tunnel was through to Greaves, the Votty branch would follow, after Oakeley was completed as the continuation of the Votty incline would take the longest to reach the drainage level. Maenofferen would be driven through a connecting level to the Votty Quarry.

The Greaves' incline would have to be continued for another 110 yards, Oakeley's 130 yards and Votty's 245, at the end of the latter a vertical shaft 61 feet deep would also be required. The cost of the incline extensions would have to be borne by the various quarry companies but he proposed that the cost could be charged to the Drainage Co. and repaid from time to time as the quarries opened a new floor.

The branch tunnels could be of smaller section, but the saving in cost was considered to be trifling and of no advantage. Most of the rock was thought to be igneous - "Syenite" - and was not thought to be as "difficult" as the Simpion rock.

He planned for 3 x 8 hour shifts per day, 7 days a week (!), this, he thought, would give 7 to 8 yards driving a day. Assuming 350 days per annum, this would give 2,600 yards per year. This gave a timetable of Greaves in 2 years 3 months, Oakeley in 2 years 8 months and Votty 3 years 3 months. However it was pointed out that no part of the tunnel could be effectively used until all was complete, so it might be thought worth while to start the Votty branch immediately the junction point was reached and leave the Oakeley branch to be constructed after the "trunk" was through to Greaves. In this way the whole scheme would be complete in 2 years 8 months. However this increased the estimated costs by 3,580.
The tunnel would have to be driven from one end only, upwards, and would require forced ventilation to supply something like 40 men or even 60, if the double driving was adopted.

He had obtained tenders from Sulzer Bros. of Winterthur, Switzerland, for drilling plant and from Robey's of Lincoln for engines. His total estimated plant and machinery costs came to £13,000, driving would contribute £44,770 in total £72,345, the plant could be sold off afterwards at 1/3 cost - £4,332, giving £68,013. This was exclusive of the quarry incline costs, the Maenofferen connection, wayleaves, easements etc. The tunnel waste was to be disposed of on about 5 acres of ground using a 100 foot incline.

The Cymerau scheme was similar, the trunk being 4250 yards. The Oakeley branch was to be 1100 yards and Votty's 1483. The gradient this time would have been 1 in 500. The first 400 yards would have to be in open cutting, the rest in rock. Greaves would be reached 53.6" above 1 floor, Oakeley 20.6" below N floor and Votty 119 feet below K floor. Thus Oakeley would have to sink a shaft to the level of the tunnel while Votty would have to extend their incline 116 yards below K floor. Oakeley would get no new drainage free floor, Greaves would get 1, and Votty 2 (? - one can only assume Greaves were not yet down to H floor at this time ?) However, the scheme would be cheaper and take less time. Greaves would be reached in 1 year 9 months, Oakeley in 2 years 3 months and Votty in 2 years 10 months. The total cost for this would be £62,470, or £58,504 after selling the plant.

He had made a preliminary arrangement with Douglas & Francis Fox, by which it was proposed to form a Drainage Tunnel Company and obtain an Act of Parliament, with statutory powers to collect from the quarry companies the rents or royalties for the use of the tunnel. The proposed capital was £100,000 to meet all possible contingencies. A suggested royalty of 1s/ton of production (based on the last 6 years output etc.). 1s.3d per ton would give an 8% return on capital for the Rhydsarn scheme, while 1s.1d. would give the same for Cymerau.

The reasons for the scheme, especially Rhydsarn were:
1) without it the cost & difficulty of pumping would increase as each lower floor was opened.
2) the scheme would give a prolonged life to the quarries.
3) the problems of collapse and related flooding would disappear.

To raise the capital it was suggested that the quarry companies themselves could invest in the Tunnel Co. Oakeley contributing 1/2, Greaves 1/4, Votty 1/8 and Maenofferen 1/8, these figures being based on the "make" of the 6 years ending in 1902.

The scheme failed, despite an attempted resurrection in 1904. There were disagreements over the type of rock to be met with. Jones and Robert Roberts finding themselves in opposite camps again. One can also perhaps see conflicting interests in the various quarries - no doubt Greaves would want the tunnel in operation as soon as possible, yet the largest shareholders would be the last to benefit - how would the others fare if Oakeley had control of the tunnel - which the suggested division of capital suggested - trade was on its way down, not up and the directors were basically unwilling to risk capital on something that would not produce an immediate or evident return. There may have been other problems. Like the untopping the bulk of the task was shelved, especially with the advent of the North Wales Power & Traction Co.'s advent. The lure of cheap electricity, the only capital cost being the plant, proved, perhaps, too tempting. If the quarries could only have foreseen the crippling cost of electric pumping with which they were to be saddled then the £70,000 or so of the Drainage Co. would have been worth it. Then too, if the tunnel had been driven, how much more of the quarries workings we would be able to see today! Alas for hindsight!
The years from 1896 to 1903 were to prove the most demanding and innovative of Robert Roberts years with the Oakeley Quarries. His vigour undiminished, his letters written in his characteristic copperplate script and direct brusque manner showed him to be a man who did not suffer fools gladly. Above all, a man in charge of things - in this he seems to have had an excellent working relationship for most of the time with J.G. Ashmore, the Oakeley Company secretary in London, and with Colonel C. le Neve Foster, even if, occasionally, he took matters into his own hands as “the man on the spot” which exceeded his brief and annoyed the London directors who thought, for some reason, that they were in charge of the Oakeley Quarries!

The problem of waste, and where to tip it, was a constant concern. The Middle Quarry in particular was becoming a chronic worry. Tipping eastwards was restricted by the need to give the lower floors tipping room above the Barwyd and so most of the tipping had been directed in recent years towards the land below Hollands old Lower Mill. This tip, in view of its height - about 400 feet above the river - had necessarily a very wide base and was beginning to threaten the old Holland incline from the F.R. Clearly a solution was needed quickly. The old Penybont Mills were also short of tipping room, and had been for some time. A temporary solution previously mentioned had been found by constructing a short slabbled level under the lower of the two old Middle Quarry Inclines, and forming a tip at DE floor level "on the side" so to speak, of the Middle Quarry tip, above the west bank of the Barwyd. This tip completed the process of wiping out the old hamlet of Rhwbryfedir on the west bank, leaving only the old "Ivy Cottage" renamed "Rhiwbryfedir House" to stand for a while as a reminder of what had gone before. Photographs show it standing isolated, surrounded on all sides by the encroaching mounds of waste.

The purchase of the "Haygarth" lands by William Edward Oakeley has already been mentioned. These included part of what was known as the "Glan Y Pwll Estate" A low lying bog like area which formed a triangle between the F.R.’s two branches and the L.&N.W.R. It formed an ideal spot to tip waste over, but lay on the wrong side of the F.R.

The solution was to move the F.R., and in 1896, the Quarry put forward a plan in which the F.R. and the river would be diverted. A new section of track would be constructed close by the existing L.&N.W.R., rejoining the original branch into the town at a new "Dinas Junction." The original track across the triangle of land, and the old river bed would thus be cleared for the Middle Quarry tip to advance and obliterate the hillside further south.

Boyd, in his account of the Ffestiniog Railway, recounts an "ingenious plan" put forward by the Oakeley solicitors which involved authorising the deviation after it had been built, the Quarry building the new line using the railway as their Agents! Despite misgivings at the Board of Trade, the idea was accepted and work began in 1898. The quarry was supposed to have the track on the disused length of railway, but one of Roberts letters refers to the F.R. "stealing" track from the old section! The "deviation" cost 361/16/8d. being brought into use in February 1900.

The Middle Quarry could not wait on legal judgements, however, and in 1897 the Holland incline was finally abandoned and the rails lifted so that the tip could cross it with impunity. This, of course, isolated the old Lower Mill, so, in order for production to continue, a new tramway was constructed from the rear of the mill round the edge of the Upper Mill tip up onto the Middle Quarry mills floor, allowing finished slates from the mill stacking yard at the southern end of the mill to be handled by the Middle Quarry inclines. In March the incline from the Upper Mills on floor 8 to the Lower Mill was "re-aligned slightly" as "it was no longer required to send manufactured slate down it." Slates from the Upper Mills passed down the short gravity incline to the Middle Quarry, bringing this into proper use at last. At the same time a new compressor house was erected next to the Middle Quarry incline boiler house and supplied with steam from it.

From what scant evidence is provided by maps and plans, it would seem the re-alignment of the incline mentioned above referred to the track, rather than the incline bed, and it seems equally likely, though no references have been found that it was used to lift waste from the mine which had arrived via Lefel Fawr up to floor 8 for disposal over that tip, there being no connection between the "bastion" and the Middle Quarry tip, except via a long circuitous route via the Middle Quarry mills. The surviving structure of the incline drumhouse is distinctly odd, and a pipe appears to be marked on some ordnance survey plans from the drumhouse to the Upper Mill engine house, which may have been a steam supply to a small steam winder housed in the drumhouse.

This re-arrangement coincided with a need for greater capacity at the Middle Quarry Mills, primarily due to the opening up of the New Vein, in consequence, a short gravity incline was constructed from the Middle Quarry tip to feed blocks in at the northern end of the Lower Mill, thus reversing the original movements. This Mill must have been running well below capacity, for Roberts remarked that "This will allow six saw tables to be brought into use."

The Twr Babel rises again. 1896 also saw the start or work on the "Twr Babel Scheme", which had been under active consideration for some time. This involved the construction of a new incline to the west of Ffridd on the old Twr Babel site, the principle purpose of the incline being to uncover or untop the area between Hollands old Back Vein open workings and the cuttings worked from Bonc Siafft to the east and from floors 5 and 8 in the west. Waste from this uncovering could be
disposed of over the Ffridd tip without difficulty. Eventually it was hoped the incline could be extended down into the sink proper, which would relieve the other inclines of the waste load.

Initial plans called for four boilers and a four road incline. It was also suggested that the K Trwnc incline engine might be used, but as became the usual reaction, Roberts thought this too small and under powered for such a task and suggested a new or second hand one be obtained for the job, so that it could handle the eventual extension to C or DE floor. At this time, April 1896, he also was concerned about the old F and G water balances, referring to them as "too slow and out of character with the age we live in" - they were to outlive him, but not by many years.

By June, however, he felt that the uncovering east of Bonc Siafft Mill should be left alone for fear of disturbing the water drainage in that area. A "pro-temp" boiler shed and steam engine was being erected at Twr Babel and a tramway had been laid to connect it with the Ffridd Incline. The initial engine was to lift materials up a short incline from the tramway to the elevated position where the ultimate engine and boiler house was to be constructed. July brought a change of ideas, Roberts now suggesting that provision should be made for 6 boilers, rather than four, as compressed air would be needed at the uncovering site and the two additional boilers could supply a compressor. His suggestion was adopted to a certain extent as was a later alteration to the angle of the incline to make its extension easier. Tenders went out for the first four boilers, which were to be in sections which could be riveted up at the spot!

Slating on the Twr Babel engine house was completed on the 20th. October 1896 and tenders had been accepted for four boilers, two from Dewintons and two from Latham & Co. of Chester, a wrought iron chimney had also been bought at a cost of 35. The masonry and boiler beds were completed by December and Dewintons men were at work putting together the boiler shells as were Latham's men.

The following February Owen Isaac & Owen of Porthmadog were supplying a shaft for the Twr Babel engine while it was suggested that the Ffridd tip be expanded across the valley to the east so as to dam Ffridd Y Bwlch up completely and form a reservoir. The idea was not proceeded with! The Vertical Balance Lake - Llyn Newydd - was temporarily drained while its dam was reconstructed. The Twr Babel incline finally began work on July 29th, 1897.

In July Roberts was "adamant" about building a new smithy and carpenters shop at Bonc Goedan to replace the older ex-W.S.Co. one on the "office" floor. It had to have the best and most modern equipment. He asked Ashmore to look into "modern lifting appliances" for him, as well as "Barnes patent Heating and Forging Furnaces," which he had heard about. Travelling overhead cranes, he thought, would suit quarry purposes very well. (It may be that the Middle Quarry stores crane had its origins in this event.)

In the same month a stern warning was sent to an erring merchant in Blaenau, Robert Hughes of Leeds Street; "Sir, Take notice that if I find your boy, Thomas Hughes at the Quarries again selling drinks, I shall summon yourself to appear before the Magistrate." Whether the drinks in question were alcoholic or not was not stated!

Technical matters were always his concern, and he wrote in August to his engine oil suppliers in this vein; "We have gone in for air compressors recently somewhat extensively... we are using engine oil to lubricate the pistons and would like to know the flash point and ignition point as sometimes the air receivers explode, or sometimes the air pipe leading from the air cylinder to the air receiver...this I must endeavour to guard against." Nothing more is recorded of this problem, so it was presumably solved - but it can hardly have made the compressor attendants lives a peaceful one while it lasted!

In the same month he thanked on C.H.H. Walker of Wakefield for his "valuable information" with regard to electric lighting and portable hand lamps, he also attended a slate splitting and dressing competition at Port Dinorwic as adjudicator.

Dewintons’ were the next firm to arouse his ire, he ordered two semi-Hunter saw tables from them in October, and gave them 3 weeks to deliver or he would cancel the order. The effects were less than satisfactory, for on the 19th of November we find him asking acerbically "Are you trifling with us?" and threatening damages unless delivery was forthcoming immediately.

In November a letter referred to the waterwheel which worked the old Bonc Siafft Mill, whose timber structure and beams had decayed and were replaced, Roberts saying that they would stand "another 30 years without attention." Which begs the question as to whether the wheel was still in use, aiding the steam engine which was certainly there.

Letters of the same period reveal the extent of the "extensive" use of compressors; "We are using two piston-inlet cold air compressors Class CN and one of Class CP, 9-inch Baby drills, 3 Class C and 5 Class F, 2 channellers - the makers are Ingersoll-Sargent Drill Co." and "We have a spare compressor of Schaum's make, we use it now and again, No.1 Class B - we do not need another." London thought otherwise and Roberts found himself writing, "...before the compressor is bought.... Compressed air, I understand, is in its infancy." So the total rose to four. The two Ingersolls in the Middle Quarry compressor house by the chimney stack, one Schaum at Twr Babel, where the other was is not at all clear, possibly in the sink, on DE?
The beam pump - Pwmp Mawr in the vernacular - was mentioned almost continually for one reason or another. In January 1898 it was the "rivets" holding the pistons onto the 2.5 ton pump rods which were causing trouble. On opening up the "clack box" at the foot of the shaft on L, it was found in one case that no less than a dozen were broken...

The electric firing of shots was introduced in early 1898, when Moses Kellow (presumably) was given an order for a 20-shot exploder and a galvanometer. Ashmore seemed concerned about something, a surviving remark on the subject reading, "If Kellow has not actually been straight with you..." On the whole it seemed to work well, although during the first trials some pellets of Gelignite were found intact among the rocks after the detonation, which can not have made the rock men's tasks any easier.

Electricity was one of the coming things of the time, and both Roberts and Ashmore were interested in it. One Mr. Goolden, who was then in association with Easton Amos and Anderson, of Erith, Kent, a mining and haulage equipment manufacturer, famous for their stationary steam engines and pumps, visited the quarries and prepared a report on the possibilities of using electric haulage at Oakeley.

"I am much obliged," wrote Roberts on March 23rd 1898, "for the perusal of Mr. Goolden's report which is interesting at all events. The plan does not show the incline I spoke to you about. At present I do not want to interfere with either the existing L or M inclines, on the contrary what is wanted to be done is to equalise the work of the K and I inclines up the Arches, vide my last report. The plan was prepared and sent away during my absence in London, so I had not seen it."

On who should supply the electricity, Roberts was in no doubt, as he wrote to one W.P. Adams on a scheme for lighting the town using Cwmorthin as a source of power; "I am of the opinion that an important Company like the Oakeley Company should be independent of outsiders for their motive power. I cannot therefore look with much favour at the Cwm-Orthin Power Scheme, whereas there is a certain amount of uncertainty attached to your scheme." Prophetic words which were to echo down the years long after Roberts passed on. It seems likely that the scheme referred to was one of those which eventually became the Yale Power Company, who used both Llyn Stwlan, high in the Moelwyns and also Llyn Cwmorthin as reservoirs, although their arrangements to draw water from Cwmorthin were strictly controlled.

On the 25th April he was complaining to the F.R. "re Slate wagon 888 - this has been reported defective and chalked, despite this it keeps turning up in the same state." The following month he wrote to Park Collieries, Garswood, "We bought the first compressor from the Ingersoll-Sargent Drill Co. in 1894 - the cost of repairs is NIL, we have never had a breakdown."

Accidents on the inclines were more frequent, one happened on July 6th. 1898 and was reported as follows: "At 4.15 p.m. a link of a wagon broke in the I & H Arched Incline, the wagons went down to K. 4 wagons smashed and the Incline stopped. We are now using the old K Incline." Presumably he meant the K Trwnc Incline which had been temporarily out of use.

Several proposals now cropped up. Goolden's report had apparently suggested the electrification of the Vertical Balance shaft, but his suggestions of using a single drum met with Roberts' scorn, it was "impracticable" he said, "Could not Goolden apply electrical power to the existing arrangements?" Two different sized drums were then suggested, but Roberts said that that would not put enough difference in the height of the floors. The counter balance would have to be sacrificed and the Vertical shaft worked by the separate drums. One suspects that perhaps Goolden was suggesting trying to convert the Vertical Balance into the principal means of access, as in a colliery, with which he would be familiar. Roberts, on the other hand, clearly was aware of the need to have an electrically powered version of the conventional inclines, which were better suited to the inclined veins of the mine. A report of this period gives the maximum amount of work which could be done by the Vertical Balance as 12,000 tons in 4 weeks. The same report gives the life of the C and DE tips as only about 6 to 8 years at the then rate of tipping.

Roberts ideas won out, and attention was now given to the possibility of using electrical power for a new incline in chamber 9. The power was to be supplied by a dynamo on DE floor. The first suggestion was that this should be powered by the K Trwnc Incline engine, as one other proposal then in the wind was to fill up the K Trwnc chamber to stabilise that part of the workings which had always been a weak spot, which would have rendered the engine redundant. Roberts was opposed to this scheme, as it would leave them dependent on the Arches Incline alone for access to K floor, and a second route was essential, as the recent accident to the Arches had shown.

On the 6th. July, Roberts sent a tracing to London of the path the cable for the incline would have to follow to link a dynamo on DE floor with an incline in chamber 9 on floor I. Then on the 11th. August he further aired his ideas; "The electric plant should do the pumping from M and N floors in addition to working the proposed incline in Chamber 9. This is most important in my opinion, do not forget the fact that if the old K incline is to be improved, the steam engine etc. will have plenty to do."
Nor was he above taking advantage of the situation, on the 15th of November he made this contribution, "I would like a small dynamo to light the smithy, fitting shop etc. We have the steam... and the cable from the fitting shop to the office could not be very much, so include the office as well."

He was obliged for all the trouble Ashmore was taking over the "dynamo machine." "You now understand," he wrote on the 20th., "all about what we require... send it all complete ready to be fixed in position by your London friends who know all about it - we do not."

At the same time he was looking into the possibilities of using Holdens' patent liquid fuel firing for the boilers and bought a set of equipment, experimenting with it in one of the mills - possibly C mill - during November 1898. He gave it up, however, after using 40 gallons in 7 hours at a cost of 13s.8d., whereas in coal fired use the same boiler only used about 7 cwt. costing 4s.8d., about a third as much.

In the event the dynamo lighting proved effective, the engine and dynamo being installed at Bonc Coedan, probably in the mill, but he felt it too expensive to light the pumping chamber and the vertical shaft approaches as well, another of his expressed intentions. "I had no idea it was so expensive," he wrote in February 1899. One can only assume it was the lamps in use which were expensive, as he said they had plenty of steam!

As the electric hauling plant was supposed to be ready for July, he requested that Mr. Goolden be asked what power would be required for the engine to drive the dynamo, the size and type of engine that would suit it best etc.

Shortly afterward, work on the electrical plant was stopped until a definite decision was made by the Board between an incline Thomas Jones was putting forward and the chamber 9 project.

The hiatus was short lived, it having been decided at last not to fill in the K Trwnc chamber. This being the case, a new engine and boiler would be definitely needed for the dynamo, as the K engine would be fully employed.

A steam engine was promptly ordered from Messrs Phillips & Co., the machinery merchants of Monmouth. This was an 18" x 30" machine, numbered 10008 and cost 87.10s.0d. The engine was "on the road" by the 18th, and Roberts ordered a flywheel from Phillips at the same time. This engine seems likely to have been intended for the new Bonc Siafft Mill, rather than the dynamo, as the boiler and shafting tenders for the mill were also sent out in May, along with enquiries to Hudswell Clarke and 23.5 inch gauge locomotive to run on 30 lbs rail.

Mr. Goolden was now involved in promoting and demonstrating an electric drill(!), and it was decided to try the drill in the open part of Middle Quarry. The distance to the working place of the drill was 360 yards. Roberts commented, "We can supply Mr Goolden's people with plenty of steam... but to connect to our steam engine would be impractical." This was followed by a rare reference to the quarry steam plant, "The winding engine stops every two to three minutes, the working speed is 52 r.p.m.," the driving shafts being eight and eight and seven-eighths inches in diameter. This reference to two shafts might possibly confirm the idea of the drums being driven from the far end of the shafts, outboard of the engine, but it could equally well indicate a conventional gear drive at the engine end of the drum house. "...it would be an inconvenient place to put a counter shaft and pulleys.... The steam engine which works part of the shed has about 90 r.p.m. It is 12 h.p. and drives a shaft three and seven-eighths inches in diameter. We could put up a counter shaft here, but would have to wait until Saturday - or stop the shed!"

The slab mill engine was described as 18 h.p. of 44 r.p.m., driving a four inch shaft. This had a counter shaft to increase the speed of the "emery wheels" to 130 r.p.m., but this would mean another 240 yards of cable.

It was decided in July to use the Slab Mill engine drive, the work being done on a Saturday afternoon to avoid disturbing the work of the mill. It was feared that this would be insufficient time, Roberts also worrying about the dangers to the cable from blasting, saying that there was nowhere in the "pit" to place insulators, which suggests that bare wires, rather than a true cable was being considered.

Meanwhile, a plan of the chamber 9 incline had been received from Easton Amos & Co. and the "standard" quarry incline winding drums measured and the dimensions sent to Erith.

Goolden was to come to the quarry in August, Roberts now suggesting that rather than have a steam engine and boiler to drive the dynamo in the pit, "We had better run the cable to Twr y Babel, where we have any amount of steam power."

The next set of plans to arrive from Erith incensed Roberts, the plans which he had sent to Erith had been, he complained, disregarded. The landing had been shortened by seven feet. "They do not seem to understand anything about this practical plant at Erith," he wrote, suggesting in no uncertain terms that "they" ought to come up and see the place so that he could explain it to them - and why using their plan an empty truck would not pass through the access to and from chamber 9! Goolden and Mr. R. Isaac of Isaac and Owen, Porthmadog, arrived two days later.
The visit proved positive and Roberts was soon writing again, "Will the electrical generating plant as it now stands with no alterations allow of a larger driver in order to increase the speed somewhat?" It was now decided that a plant of some 65 h.p. at 800 r.p.m. was needed to drive the dynamo. Owen Isaac and Owen of Porthmadog had a 65 h.p. condensing engine which had worked at various flour mills available for 350. The Twr Babel engine was considered satisfactory as it provided 800 r.p.m. On the 9th. Phillips of Monmouth offered a similar engine for 265, the Porthmadog engine was not available for less than 300. Owen Isaac and Owen were evidently enthusiastic, for Robert Roberts had to write to them on the 7th. September saying, "Until we get over the experimental stage, it is no use to put up more than one plant."

By the 12th. Roberts was able to report that the bed of the incline was "practically ready from I to K" and that it was "all that will be needed for some time to come." However he was unable to proceed with the drumhouse until a diagram of the girders needed to support the platform etc. was supplied. Evidently there was still some internal disagreement, for he also wrote to London emphasising that the K engine could not possibly be spared and a new one was essential.

The necessary drawing arrived on the 19th. September - it was dated the 14th! Roberts objected to the drawings which depicted the "stage" some considerable distance in front of the drums, demanding that they should be next to one another so that the "driver" could work the individual clutches and brakes. Once again, in his opinion, Erith had completely misunderstood the practical operation of an incline. He did, however, accept Easton Amos & Co.'s tender for supplying the girders.

The use of Twr Babel as the source of supply meant that 650 yards of extra cable would be required, the holes for the poles to be driven in rock. These were completed by September 27th. The work in the chamber taking the rest of the year.

The electric drilling demonstration was a success, holes of over 16 feet in depth being drilled. Roberts commented, "It is no joke to change 29'6" of drill on a forebreast at an angle of 45 degrees - we did it this morning. Just you fancy a fishing rod 29'6" long - that would be quite unwieldy, but a steel rod of this size is quite another matter." The exact location of this remarkable trial is something of a mystery.

The flywheel, which had been ordered from Phillips, now became the focus of a very acrimonious dispute involving the G.W.R., F.R. and the quarry. The steam engine had arrived and had been forwarded to the quarry in the usual manner, via the G.W.R. and the F.R. The flywheel, however, after being despatched from Phillips' seemed to have vanished off the face of the earth. After discreet enquiries, it was "found" resting in the G.W.R. goods yard at Blaenau Ffestiniog, it being consigned to the quarry in a similar manner to the engine, but the F.R. refused to touch it.

The Goods Manager now said that he was nothing to do with the delay. "I am surprised at you saying such a thing," Roberts replied, "You surely ought to bring pressure to bear on the Ffestiniog Railway, or say the F.R.Co. failing to carry out the contract, arrange with William Williams for the traction engine and put the flywheel within our reach at Talwaennydd."

At the same time he wrote to Crick, the F.R.'s General Manager, "Will you kindly take up the question of the flywheel which is now stranded at the G.W.R. Station in Blaenau. There should be no difficulty in bringing it round, at all events I cannot see it!"

The following day, having had no satisfaction from Blaenau, he wrote to Phillips & Co requesting the consignment note and demanding that the L.&N.W.R. should be used for all future shipments.

On the 3rd. October he wrote to Hughes, the F.R. Secretary, at Porthmadog, "I am very much surprised at Mr. Crick's note of the 3rd. ult. It's a great pity that the F.R. & G.W.R. do not understand one another a little better. The two lines have lost our coal traffic for want of proper management. This incident will not be forgotten again - how can it? Bad - very bad!" A similar letter went to the G.W.R. To round off this correspondence, his final report to London on the matter contained the following remark, "Hughes and Crick should be put in petticoats."

The K incline headgear was "replaced" in early October, presumably by a similar, if not identical pattern of timber work, as photographs taken before and after this date show only minor changes. Further minor matters cropped up, Erith were informed that the ropes of the chamber 9 incline should coil over the drum, not under, though it is difficult at this distance to say why as both methods were in use in the quarry at the time.

On November 2nd. Roberts wrote "We are now ready, send us the electric plant as soon as possible." Whether he was referring to the chamber 9 plant is debatable, for in December he reported that "the dynamo and motor are being kept in a
London wrote on the 5th. January 1900, "When do you think you will be ready to have the electric plant put up?" and again on February 14th., "Please let Messrs Easton Anderson & Goolden know when you will be ready for their fitters, they would like to get this plant up as soon as possible," and yet again on March 6th, "Goolden will be glad to know when the roofing is up in chamber 9, the fixing of the motor will only take a short time (& he has lots of jobs to do)."

Roberts said in late February that he had "no better place to put the dynamo and motor in, but I can have hot pipes and fix a heater about them where they are and will do so at once - in fact we are at it."

Goolden's visit in March irritated Roberts, "It is not my intention to put up the timber protection to the motor before it is fixed and shall not do it. The electrician will have to fix the motor up first so the timber protection will follow."

Meanwhile, a new locomotive was obtained from Bagnalls, who had won the last tender. They had been instructed on September 12, 1899 to put the name "Snowdon" on the locomotive, which was despatched to Oakeley on the 8th. December, arriving on the 13th. "Damaged", Oakeley claiming off the L.&.N.W.R. this time. F.W.Harper, their Goods Manager, being reminded in typical Roberts style that, "Boilers & all machinery are to be consigned to Dinas Station." Thus invoking the F.R. as intermediaries again. The damage to the loco was confined to a pipe which connected the tanks, this had been full of water and had frozen and burst in the winter conditions. Further minor problems occurred in the new year.

A side note gives another glimpse into the Lower Quarry's boiler plant. "We started rock drilling in the Fall with steam as the motive power, some time afterwards we introduced compressed air, so 3 small rock drill boilers were put off five years ago." This was in relation to the boiler insurance list. Another note refers to two elephant boilers, 3 rock drill boilers, reports one at each of the Bonc Siaffit Mills and 4 boilers at Twr Babel, confirming that the full complement of 6 was never installed.

Another electric drilling demonstration was set up at Votty in March 1900, this time by Goolden and a Mr. Hopps. Goolden appears to have left Easton Anderson & Co. soon after. Roberts reported twice on events, once to say, "The electric drill did its work very well in my opinion, the principle of the drill is simple and good." and the second time, "Drilling was no better, if equal, to our drilling by compressed air." Which was a reference to the new trial and which to the experiment at Oakeley, it is difficult to say.

Yet another rock drilling plant, this time from British Thomson Houston Co. Ltd arrived on the 7th. April, but on May 15th. Roberts reported that the engineers had failed to give holes 9ft by 2.5 inches, so how were they to give holes 27 ft by 3.5 inches? He said, "the principle is right, but the blows feeble."

On March 19th the electrician has said that he would not be ready to start the incline within three weeks, so it was April 5th. 1900 before Robert Roberts was able to report that the electric winding plant was at last being put down, and recommended that it be extended to L and M floors. The plant was an initial and immediate success, "The haulage plant worked for six weeks without a hitch," Roberts reported on the 5th. May, "the pump for 8 or 9 months," which suggests that the dynamo had been at work for some time previously and probably explains the conflicting remarks about being ready and not ready during the previous year.

The location of the dynamo is confused, for a letter of April 30th. refers to "the length of cable from the I incline to the shed where the dynamo will be fixed 366 feet; from the shed to the lump of chert at the foot of the C incline about 180 ft." Yet a letter of May 1st. reports that, "The plant should be in full swing in the next fortnight... but we need a telephone line from Chamber 9 to Twr Babel." Thus it seems possible that there were three dynamos at work, one on Bonc Coedan supplying the fitting shop etc. with light, one in the sink, and one at Twr Babel. A photograph taken at about this time shows what certainly appears to be a steam pipe - it is too large for compressed air - running from the K Trwnc engine house to a building on the west side of the K Trwnc sidings, perhaps this is the location of "the shed where the dynamo will be fixed"? It is not clear from the letters whether the dynamo installed in the Slab Mill for the drilling experiment was retained or not, it was presumably taken away for the trials at Votty.

By May 12th. Roberts was recommending modifications, "the drum," he wrote, "is a little too small" and suggested adding a 6-inch thickness of timber lagging to increase the diameter. The brake wheel at the circumference of the drum also needed increasing to give a better grip. However, he averred that these were minor problems. Clearly, he was pleased with the installation, now it was in operation.

However, some problems soon arose. Smart, the fitter, examined the "regulator switch" and found that the materials had worn very much, and by August needed replacement, but Roberts wrote, once again, "the hauler works very nicely." The switching arrangements do not work as they should, ...the man at the brake is made uncomfortable from the frequent shocks he suffers from the
current and moreover fails to put the hauler in motion with the ease he was once able to. Evidently the electric current has ceased to be under the control it once was. I fear we run some risk of setting the timber work on fire." The driver's name was Morton.

Further investigations during September and October led to the discovery that the contacts in the main switch box had "completely burnt out," resulting in further plain speaking between Roberts and Erith.

Despite these initial teething troubles, which Roberts considered could be remedied by the application of some practical engineering knowledge, he recommended once again on October 8th. that the extension to L be expedited. K floor was now almost entirely being wound by the new incline, thus relieving the Arches Incline of some 2,000 to 2,500 tons per month.

The incline was still not free of incident. Following an unspecified happening, he wrote, "We need an engineman used to electric power... the whole concern must have been extremely well constructed or it would never have stood the strain it did." he suggested that they contact the Yale Power Co., who might know of someone, it was another year before the extension to L was completed.

A fall in December 1900 "did no harm to the hauler as the retaining wall answered its purpose very well, ...but will have to be strengthened."

The Welsh Slate Company's transfer to Cwmorthin as the "New Welsh Slate Company" did not serve them as well as it might have. The Cwm Orthin itself, early spellings give Cwmoroden, is a hanging valley to the south west of Blaenau Ffestiniog and on the western side of the ridge of R'Allt Fawr which separated the Cwm-Orthin freehold estates from the Tan y Bwlch Estate. The quarry's complex history is described in the author's "Cwmorthin Quarry" book and will only be summarised here:

Although begun by one of the Casson brothers, and acquiring the cognomen "Casson's Pit"; real development of the quarry did not begin until the 1840's, following the completion of the Ffestiniog Railway. Direct connection was made by means of tramway and incline in the 1850-60 period, the site changing hands in 1859 and 1861, the latter title being the Cwm Orthin Slate Company. After a period in the doldrums, it was working in 1875 when it was the subject of the test case under the new Metalliferous Mines Act, as mentioned earlier. Subsequently various agreements were entered into with William Edward Oakeley as to the boundaries both on the surface and underground.

The workings in 1884 consisted of two distinct sets of chambers in the two principal veins, the Back and Old Veins, although in Cwmorthin these were complicated by the presence of a large drop fault which ran across the site from east to west. Both veins had apparently been worked on the surface in the "North Sink" and the "South Sink" respectively, although by 1884 the "South Sink" had vanished beneath the tips and the "North Sink" had been abandoned, all the workings by then being underground. Both names were carried on in the workings, the Back Vein being referred to as the "North Vein" and the Old Vein as the "South Vein". Under these circumstances, it is hardly surprising that there is a degree of confusion in correspondence on the subject. Some additional working was carried out in the Stripy and Narrow Veins which lay between the Back and Old Veins.

The upper workings of the Back Vein were the subject of a serious collapse in 1884 which destroyed the access to most of these workings from the "Lake Level" - the principal adit alongside Llyn Cwmorthin - upwards and to the east, although the Old Vein workings were relatively unaffected. The floors were numbered in a similar manner to those at Rhiwbrwydir, the Lake Level being floor 1, those above being numbered in increasing order, while those below were lettered A, B, C and so on.

Unfortunately, the Old Vein workings were virtually exhausted, chambers having been worked as far as the Oakeley boundary, and thus the only areas available for development lay below lake level. Work had begun by 1884 in the Old Vein and a floor A had been opened there, with a steam engine installed in a chamber to lift produce to the adit level. Work had also begun to sink below in the Back Vein, which was of comparable quality to that obtained in Hollands Quarry. The cost of these extensions, together with the reduced output caused by the fall, led to the quarry company going into liquidation in 1888, just in time for the Welsh Slate Company to buy it up.

The new company had a capital of £65,000, and the directors included, not unexpectedly, the Hon. Evelyn Ashley, with Robert Owen as Manager. By 1895, the Managing Director was Andreas Robarts. The new company proceeded to expand the workings below lake level considerably in both veins, although the underground winding engine for the Old Vein Incline was a source of great trouble due to the fumes and smoke.

The Back Vein workings were all accessed by a long incline from floor 5 on the surface where a Lancashire type boiler supplied power to a twin drum winding engine in the same building and two steam pumps below ground. The pumps and the steam were a source of some trouble, and together with the somewhat twisted and crooked shaft got a bad mention in the 1895 Inquiry.
The lowest floor in the Back Vein was floor E, and was the least developed in 1890, with only one chamber opened. Floor D had 9 chambers, 2 west and 7 east of the incline. The first three were bridged by floor C, to give that floor access to its working chambers known as 5 East to 8 East, there being two separate numbering sequences, one on each side of the incline. Three other chambers on C had been opened west of the incline. Floor B was mainly to the west of the incline, the chambers to the east being very shallow as they adjoined the fault line. For this reason there was a second series of chamber on B floor, south of the fault line, but these had, for the most part, been filled with waste by 1890.

There was no floor A north of the fault on the east side of the incline, although there was to the west. Only floor 1 of the upper Back Vein floors underground was in use at this time, communicating with the "Lake Mill" by a long level, the end of which was closed with slab arching where it passed through the tips.

From the floor 1 landing to the surface on floor 5 the incline passed through solid rock and then more arching supported by rails before emerging just below floor 4. As has been remarked the shaft below floor 1 was crooked, having three distinct gradients between floor 1 and the eventual foot on E. There had been landings above floor 1 on floor 2 and possibly floor 3, but these had been blocked off before 1890.

From chamber 1 east on floor 1 a long level led east and then south to gain access to the clay slant level of the Old Vein and the head of the Old Vein Incline. Here were a second 24 h.p. engine and boiler, which also supplied steam to pumps. The incline was conventional, with two tracks eventually running the full distance to floor E. In 1890, the deepest floor was only at C level, with 4 chambers west and seven east of the incline, some also being worked in the Narrow and Stripy veins. The fumes, smoke etc. from the engine passed up to an old level on floor 2, "The Smoke Level" and passed out along it to the surface - or at least that was the idea!

By 1900 the Back Vein workings stretched on E floor from chamber 6 west to 11 east, the Old Vein was most developed on C floor, stretching from 7 west to 12 east, the workings on D and E being somewhat less developed, as might be expected. There was a connection to the Oakeley workings on floor 2 in the Cwmorthin wall 15 east, with a similar connection on floor 1.

This, then, was the situation in 1900 when Cwmorthin, as the New Welsh Slate Company, found itself in receivership again, although still being worked...

As has already been remarked on, the Cwmorthin Back Vein Fall of 1884 had had its effects on Oakeley, and was continuing to do so, so when Robert Roberts saw Andreas Roberts, "Late of Cwmorthin", on the 19th January, 1900, he remarked, "I told him he had shifted the whole mountain in our direction."

J.G. Ashmore wrote a month later to tell Roberts that "The Directors seem inclined to make a bid (for Cwmorthin) with limits." He also told Roberts, who was wanting to "go see for himself", "It would not be policy for any member of our staff to visit the Cwmorthin Quarry until after the sale."

Roberts was more concerned that work was still going on which was endangering the Oakeley, and wanted it stopped, but Ashmore replied to his wishes thus, "Now the Mortgagees are in Possession, it might be policy to go for an injunction but as the damage is done it will be no use throwing good money after bad."

Roberts was still insistent about seeing the place and on March 1st, Ashmore arranged to go and see Mr. Crewdson Howard, the Receiver for the New Welsh Slate Company to get authority for Roberts to see over the quarry. In the meantime he took matters into his own hands, drawing a rebuke from London to the effect that they were sorry he had had communication with the local people at Cwmorthin, as the Board was dealing with both legal and political points. All communication was to go through the London end alone. However, authority was given for T.J. Williams or Thomas Jones to accompany Roberts on an inspection.

A fly now appeared in the ointment as on March 7th, Andreas Roberts alleged that the Oakeley walls were pulling Cwmorthin down, whereas Robert Roberts, of course, maintained the opposite stance. Ten days later found Roberts writing to London again, saying that "It seems imperative that operations on the Cwmorthin side of the boundary should not be allowed to proceed a single day longer than we can help."

London conceded and on the 26th. an ultimatum was issued to Cwmorthin that "either all working in the fall and walls is to stop, or the Oakeley Slate Quarries Company will issue a writ." The Cwmorthin sale by auction was now announced to take place on the 4th. April, 1900, by Messrs. H.E. Foster and Cranfield of 6, Poultry, London E.C. The particulars were published in two large booklets describing the "Valuable and Important Freehold Estate known as the 'Cwmorthin Quarries' extending to about 382 acres together with numerous Workmen's dwellings, Ground Rents, and Leasehold Offices and Wharfs at Portmadoc and Minffordd."
Oakeley Slate -24. The Roberts Years III – Innovation and Experiment 1896-1903

It was described as having "abundant and unfailing water supply, believed to be more than adequate to provide motive power for all purposes of the quarry, including pumping, haulage, electric lighting etc." The "Estates as now offered presents an unusual opportunity for investors or speculators for the profitable utilisation of capital in further development with the certainty of immediate return."

"The entire property will be offered in one lot as a going concern, with Possession on Completion of the Purchase."

"The Plant, Machinery, Rolling Stock and Loose Plant, as described in the Second Schedule hereto, will be included in the sale, but the purchaser will be required to take, at the current price for the time being fixed by the Efestiniog Quarry Owners Association, less a discount of 15%, all the Manufactured Stock at the Quarry and Wharves on the Completion of the Purchase, the Stock of Blocks at the cost of quarrying and the Stores at cost prices."

On March 29th, the application for a summons was carried out, but the New Welsh Slate Co. Receiver said that he could not act. Then Roberts informed London that the N.W.S. Co. advisers had reported that the trouble had been "brought about by our 'modern' system of quarrying with 'very large blasts' whereas they go on in the 'old and safe lines.'" They also suggested that the Oakeley Company was taking the action so as to spoil the sale. Roberts commented, "Should the property go to an outsider, I don't envy him his bargain."

On April 4th there was "Not a single bid at the sale today."

Two days later Thomas Jones valued the place at £8,000 and Ashmore suggested £12,000! Roberts commented, "I do not think there is a man in the land who would pay the N.W.S. Co. £8,000 or anything like it and see it back again."

His and Jones' comments were ignored and on the 17th. April Ashmore informed him, "(We) expect to secure the property for £10,000 with lock stock and barrel & from the importance of getting the water & as well as stopping the further operations on the boundary, I should be satisfied if we can square the matter at this figure."

Meanwhile, Cwmorthin was still working - after a fashion - on the 24th. Roberts reported, "The Lake Mill at Cwmorthin has stopped due to insufficient blocks to pay for fuel."

On June 1st, Roberts wrote requesting leave of absence, which was refused as Ashmore wanted him on hand for the take-over. This can only have been an application in advance, for the following day he was instructed, "Don't touch anything at Cwmorthin at present. Messrs. Frere are to take possession of the Quarry and works from 12th. December next.

By November, Roberts was of opinion that "The quarry must be driven from our side." While on the 10th. December, he was informed that, "The general view of the Board is that this plant should be taken over, not as a going concern, as we may as a result of your report decide to stop all operations except the pumping." The following day he was told, "The Quarry is to be entirely closed."

Roberts commented, "The only point is that I do not think it is fair to Mr. Oakeley to treat them as merely of breaking up value. They are there for any operations we may subsequently undertake and whenever the Quarry is driven thro' our DE floor, it is quite possible that working may be restarted either on the outcrop or to work out the open floors."

On the 26th. A boiler failed in Cwmorthin, E floor soon disappearing under water for some depth. The boiler had had its working pressure reduced from 70 to 50 p.s.i., but the stoker objected! The "elephant" boiler was leaking and when T.J. Williams inspected it, he found it was past repairing. London commented, "No doubt everything had been allowed to go to the dogs the last year or so."

On the 29th. December, Robert Roberts passed through from floor 1, Middle Quarry into Cwmorthin to floor C, "In comfort" had a look round and found "five suspicious looking bridges, resting on suspicious looking walls with visible cracks in them... the collapse of several is not far off." He suggested allowing the D and E floors of the Old Vein to flood up to the level of the Oakeley floor 1 to help to keep the walls up. The water would then be drained by driving a level through from Oakeley on floor 1 into the Stripy Vein chambers of Cwmorthin on floor C, and allowing the water reaching that level to come through to Oakeley, into the floor 1 main drainage channel, which would be extended to the area, and the water would then join the normal Oakeley Middle Quarry drainage.

Thomas Jones, by now in the partnership of T. Jones & Arthur Tapp, telegraphic address "HANAMEEL" London," reacted to Roberts report in this manner, "rather disconcerted, as if your suggestion to drive along floor 1 is carried out, as is the present drainage, it will practically mean locking up the Cwmorthin property 'en bloc'; for it would never be safe to open chambers above our H floor with an enormous pond of water (100 feet deep in the Old Vein and about 200 feet deep in the Back Vein) above us as the two veins are not connected below the Cwmorthin floor 1 and the water which would accumulate in the Cwmorthin property would be bound to find its way through the loose posty ground into any chambers
Oakeley Slate -24. The Roberts Years III – Innovation and Experiment 1896-1903

that may be opened below. Moreover, we could have done what you are now suggesting any day without purchasing the Cwmorthin property as their Stripy Vein chamber on floor C which you are driving into is in the Oakeley property and there was nothing to prevent our driving into that at any time. I do hope the Company will not leave that £11,000 lying fallow. Is it necessary to drive for wall 13 on DE, why not the whinstone level south in chamber 22?"

Jones was overruled, and Roberts plan adopted, with all its misgivings, Ashmore wrote to Roberts on the 31st. December, "You have soon knocked daylight through into Cwmorthin," anything further from daylight could hardly be imagined, as the point in question was deep under the mountain! Ashmore thought Roberts' suggestion of letting the Old Vein flood to keep the quarry up, "Quite original, I can understand the bridges floating more safely than if they rested on the walls such as you describe." Roberts final remark was to say "Anything to pull down the cost of pumping so long as we do not get the water in our lower workings."

On the 4th January, 1901, it was suggested that the Cwmorthin catchment area could supply water to save on coal, perhaps by way of generating electrical power:

Thomas Jones was quite willing to admit that he was not particularly 'au fait' with electricity, despite his advocacy of its adoption, and so, in 1901, one J.P.Osborne of Sale, Cheshire, submitted a report to the Chairman and Directors of the Company outlining a scheme to harness the water power of Cwmorthin Lake to provide electricity on a D.C. system.

He considered the existing flow from the lake never to be less than 140 cubic feet per minute, at 130 c.f.m. this would provide 7,800 cubic feet per hour or 1,310,400 cubic feet per week (!). He reckoned that the lake should easily satisfy the normal working day, or 56 hours per week. The water could be stored when not required, "It is a pity," he wrote, "that the late owners of the Cwmorthin Quarry should have been so short sighted as to tip rubbish into it." The present area of the lake was 21.85 acres and he proposed a siphon to act at least 13 feet below the present water level to provide for 11 weeks of drought. He also suggested that a dam should be built to raise the water level by two feet. The gross head from the high level water mark to the water level under the railway bridge near the old foundry in Tan y Grisiau, which was the most favourable site for a power house, was 446 feet, giving an effective head of about 360 feet, which would supply about 367 h.p.. He allowed 6% loss in generation and a further 20% in transmission, giving 345 h.p. & 276 h.p. respectively. This would give 250 h.p. for motors, which he thought could be increased to 300 h.p. by the use of a battery. This would be needed for starting up the siphon, smoothing out demand etc. Typical savings would be coal, he gave the current usages:

Middle Quarry Main Mill 360 tons.
Middle Quarry Small Mill 180 tons.
Upper Quarry Lower Mill 225 tons.
C-DE winding Engine 225 tons.
Bonc Goedan Mill 225 tons.
Pen Y Bont Mill 270 tons.
Total 1635 tons.

The period is not stated, it can hardly be per year. He estimated the cost of the scheme to be about 14,000, with running costs of about 500 per annum. Giving a gross saving of 2,000 per annum easily.

Roberts remarked, "The mouth of Cwmorthin must not be closed, you cannot raise the level an inch." As with several schemes, it was still born, much to the chagrin of later generations, for in 1904 Llechwedd built their own independent power station at Pant yr Afon, just below Pen y Bont, but that's another story.

On the 26th. February Roberts referred to the intention to cut a water channel from chamber 30 to the pump at the foot of the Cwmorthin Incline on C being too risky due to the walls. The pump, however needed repairs, and would take up to 6 or 7 weeks (months?) to be fixed, an oil engine, it was suggested by Roberts, would be cheaper than steam, failing electricity.

It seems clear that the Cwmorthin pumping plant, at least in the boiler department, would have needed replacement, and the cost of haulage of fuel from Tan y Grisiau over the tramway, purely for pumping, would have been exorbitant.

Under the circumstances then, the decision to shut down carried a modicum of sense. In March 1901, a catalogue of plant at Cwmorthin was prepared for disposal. The Lake mill was stripped of machinery and dismantled. The other Mills known as the "Cross Mill" and the "Lower Mill", were shut up with their machinery more or less intact for the next twenty years or so. The winding engine and drums etc. which had worked the Back Vein Incline fro floor 5, were, however, retained by the Company for use at Oakeley, as is related below. The tramway was left in place, but no further maintenance was done on it. So Cwmorthin slept, for a while.

During the Cwmorthin affair, the Penrhyn Quarry, whose strike/lockout etc. was a great event in quarrying history, but whose principle effect in Ffestiniog was to produce some additional trade for a while, was commented on by Ashmore in this fashion, "Penrhyn: Young seems to be making a bid for the men to come in again. His interview with the Manchester Guardian comes out much in his favour, but his is not in personal touch & sympathy with his men & from what I have..."
hearing, never will be, therefore we may always expect a return so long as the existing arrangement continues." Again, "I hear the Penrhyn Trouble has been settled Pro-Tem, from what I have heard there will never be peace so long as Young is supreme manager."

As the Bone Siafft tip and the Bone Goedan tips had met, forming a continuous link, a new gravity incline was constructed down from the high tip on top of Clogwyn Mawr to near the foot of the old incline from the "office floor". This did away with the need for the old tramway route and its several inclines. The former route could now be tipped over, for although it had been intended for the Fridd Incline to take the waste from the Bone Siafft Mill, it was inconvenient, requiring a certain amount of "cross-flow" traffic. The new Incline was known as both Clogwyn Mawr, after its location, and also "Spion Kop" following the patriotic fervour of naming places after the current Boer War, in which Roberts' son, Miles, played a part, returning, as Ashmore commented in one letter, "with honours heaped upon him." Surprisingly, the old powder magazine was retained on the old outcrop below Bone Goedan, a pathway being constructed down to it from the C mill. This was to restrict the waste tipping from the C mill without real cause for many years.

The "leave" which Roberts had requested had been initiated by Colonel C.LeNeve Foster, the Government Inspector, who had observed the wire saw in use on the Continent, and passed on a report to Ashmore which he, in turn, passed on to Roberts. "The notes you sent me," he wrote, "are most interesting, it reads almost like a fairy story,... and if it can be applied to our veins. I agree with Dr. Foster that it will open up a new vista in Slate Quarrying in our district. I only wish we had knowledge of it 50 years ago, the old shop would not now be tumbling about our heads." This was, of course, a reference to the great fall, a further continuation of which westwards had just occurred.

Thus, at the request of Foster, Roberts then went abroad himself, and visited the Pyrenees and Germany to see for himself. On his return, in November 1900, an order was placed for 3 steel wires, 16 gauge, forty feet long for trials.

The experiment was begun on February 16th, 1901, but not before Ashmore had reported to William Oakeley himself on a visit he had made to a Belgian Quarry and the "pulley" he had seen in use there, recommending that it be tried at the Oakeley.

Robert Roberts initial experiments were limited to attempting to "cross-cut" a slate block. The wire was put in motion at 2.20 p.m., the wire snapping at 9.55 a.m., presumably it had run all night. Sand was used as a lubricant, and to provide the cutting 'edge'. The wire was "practically worn out although well provided with sand and water. The cut was only 7 inches deep. The whole thing was "much too slow" Roberts commented. The rope speed was 6 yards per second, but the cut with no guiding force on the wire soon went out of perpendicular. Further trials were equally unsuccessful, and in June Roberts wrote that what he needed was an expert to come up, set up a wire saw and demonstrate it properly as the Quarry did not have the necessary expertise.

A demonstration of the Belgian "pulley" was promptly arranged and the plant arrived in the first week of July, 1901, and the Quarry eagerly awaited the arrival of the Belgian demonstrator... and waited... and waited. "The Belgian has still not arrived," Roberts wrote on October 8th. November came and went without sign as did December...

A letter arrived from 'The Belgian' in January of 1902 which Roberts described as "unbusiness-like," February came and went also. An exasperated Roberts wrote on the 17th. March, "The Wire Saw plant is still not unpacked, we are still awaiting the Belgian - if he ever comes." Then on the 21st. - Hurrah! - "The Frenchman has arrived!" there was clearly some problem with Geography in the Oakeley office at the time. However, the new arrival, whose English was not too good, intimated that it would take about 3 weeks to set up.

Within the week more problems arose, Roberts complaining that progress was very slow as time was being wasted due to the lack of a proper interpreter. He solved it in characteristic fashion, writing to the wharf manager at Porthmadog to find the one he was about to commence on, "I should like to see you cutting the base of the chamber, for I attach no
importance to the one you are about to cut.” In reply he said, “I cannot do it because I have only one penetrating pulley, but had I two with me, I should have done it.”

This, as a matter of course, stands to reason, because the penetrating pulleys were supposed to save the cable to be driven on either side of the chamber, which is of course the whole thing. In order to demonstrate what I meant by base cutting, I took the Belgian to chamber 4 on M floor, where we had a channeller at work. In chamber 4 the Belgian said, “I cannot compete with this,” meaning the channeller. It took him 18 hours to drill with the penetrating drill 13 feet, say, of about 2 inches diameter. The other day we drilled in 14 hours, two drills to one bar and a miner to each drill, with one attendant, 198 feet. I trust I have made myself understood to you with this accounting of these interesting facts.” Clearly, Roberts was not unduly impressed with his continental visitors work.

On the plant itself, he commented, “The plant he has put up commands a platform 78 feet long by 38 feet wide, (it is seldom we have such a platform at our command) protected somewhat fortunately by a “head bon” otherwise some of the plant would have been shot to pieces long ago by shots fired in the chambers above.”

“The wire saw operation so far in my opinion is a failure,” he wrote on the 16th. May, “The wire we started with has worn very much and in another day would certainly snap and as a matter of course a new wire is of no use because a new wire would not enter the cut made by a much diminished wire. The Belgian, finding the difficult position he was in came to see me this afternoon for further instructions.”

“I reminded him that the experiment was not at an end until he made an attempt at cutting the base of the chamber. This he cannot, of course, attempt without another pulley. He wrote to his people on Thursday last for another pulley but his people have not replied yet. Under the circumstances I advised the Belgian to wire his people this afternoon to reply “Yes” or “No” I should say the wire got fast about 3 p.m. on Thursday last and remained fast until about 10.30 a.m. on Saturday morning. Since then the wire has been fast several times. The wire evades the sulphur nodules which probably accounts for the wire getting fast in the groove it cuts...I am sorry to say that in my opinion, the whole, not only the side, but the base too will prove to be a failure.”

Evidently the Belgians “people” thought so too for on the following day he was packing his things to take away, Roberts commenting, “He did his very best to carry out the experiments.” The plant was “in the way” still on the 28th. but was not referred to again. The idea of the wire saw was one, however, which the Oakeley was unable to resist, and it raised its head again in the 1920’s and 30’s, with similar problems. It was only to be applied with any success in the closing years of the Quarry and found real success only under the new post-Oakeley company.

The matter of lighting was one which taxed Roberts somewhat, having reluctantly given up the idea of electric lighting due to cost, he nevertheless expressed his intention, in February 1901, of lighting the Pumping chamber on G floor, the level from the G landing to the Vertical balance shaft, a at the siding and at the foot of the H-I-K Incline. He now thought of gas, to cost, he nevertheless expressed his intention, in February 1901, of lighting the Pumping chamber on G floor, the level from the G landing to the Vertical balance shaft, the whole being protected somewhat fortunately by a “head bon” otherwise some of the plant would have been shot to pieces long ago by shots fired in the chambers above.”

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The steam locomotives were also a cause for concern. In April 1901, Adamsons were to overhaul those of their building – named William, Algernon and Mary Caroline, and in July Roberts was asking them anxiously “Is the loco worn out?” referring to William. He wrote to Ruston Proctor on December 18th, requesting details of engine no.14482 and referring to an engine wanting a high steam pressure, this may be an oblique reference to the engine driving the infamous dynamo(es). In March 1902 he was able to inform Ashmore that Charles required a new boiler shell, new furnace tube plate, smoke box and chimney, being "absolutely worn out."

It was at this time that the Middle Quarry Main Incline was connected directly to floor 1. Up until now, floor 1 had been served by a subsidiary incline, using a sheave just below the floor 2 landing. This allowed the rope to be diverted round it to lower wagons, after reversal, to floor 1, a similar process being used to raise them. It was clumsy and awkward, but until room had been cleared for a proper landing and continuation of the incline it had had to be put up with. The materials were not disposed of, however, for a similar, if not identical method was used to access floor C from floor 1 until the incline was extended to that floor!
In order to continue the untopping to the west effectively, it was decided to erect a new incline on Pen Balance, where the old drumhouse was incomplete on the 25th, awaiting a decision. The die was cast for steam. More economic thoughts prevailed and the Cwmorthin boiler and engine were erected on floor 8 in March, 1904, however, the floor 5 incline engine and boiler which was in store, making the cost of the incline only £40 to £50. Further correspondence considered alternative power sources - gas engines and even the electric plant at the Fron Goch Mine, in Cardiganshire which was up for sale.

In September compressed air was supplied to the smithy and fitting shop.

In order to continue the untopping to the west effectively, it was decided to erect a new incline on Pen Balance, where the old floor 8 level came out into the Back Vein. This would re-connect floor 8 and floor 5. It was intended to use the ex-Cwmorthin floor 5 incline engine and boiler which was in store, making the cost of the incline only £40 to £50. Further correspondence considered alternative power sources - gas engines and even the electric plant at the Fron Goch Mine, in Cardiganshire which was up for sale.

More economic thoughts prevailed and the Cwmorthin boiler and engine were erected on floor 8 in March, 1904, however, the Board vacillated as usual and the drumhouse was incomplete on the 25th, awaiting a decision. The die was cast for steam and the boiler installed on the west side “in the same arrangement as at Cwmorthin.” In fact at Cwmorthin, the boiler had been on the other side!

With Roberts “passing,” much of the spirit seems to have left the company and labour problems start to be mentioned more frequently. Whether he had suppressed mention of them, or that they had been insignificant prior to this time is open to question. One authority has recently referred to the “relative quiescence of the Oakeley workforce” in trades union matters and to the fact that a committee of workmen had existed at Oakeley for some years and was able to air grievances with the management - in other words Roberts. The other side of the coin is revealed in a letter to Roberts (in Welsh) now in the possession of Gwilym Humphreys, the penultimate Oakeley manager in which Roberts was accused of tyranny and oppressing the workmen and starving their children, among other things, and warning him that he would be blown up one night with explosives. The writer did not give his name, but gave his address as the Explosives Magazine. The letter, Mr. Humphreys says, was not badly written grammatically or otherwise and may well have been written on behalf of a number of men. He himself had heard many references to him and about his dog “Piper” which accompanied him to his quarry daily. Mr. Humphreys also suggests that from what he had heard, most of the men were in awe of him, and that he may well have been an autocratic despot in the quarry. That seems to fit in rather well with his style!

His own words, “In 30 years, I have taken little interest in trades disputes,” may well sum him up. He had “grown up” as it were with the Oakeley Quarries and had amassed an encyclopaedic knowledge of the workings. Certainly his practical skills...
were not doubted and referred to in the 1895 Inquiry. He had an experience of management and was certainly held in considerable respect, perhaps with awe too, at Boardroom level. Certainly he was the "man on the spot" and his letters and general outlook show he had little, if any, fear of the Head Office in London, he clearly believed that his responsibility towards the men was just as great as to the company that paid his salary. Later managers were wont to confess that they "had not the overall knowledge of the geology and extent of our predecessors." The quarry was not to see his like again.
Robert Roberts was replaced by his assistant and chief clerk, Owen Jones, who seems to have acted previously as an agent for William Edward, for many of his letters were addressed to him, during the time of Robert Roberts he repeated much the same information. Unfortunately, from the reader's point of view, his writing was much smaller and more scrawled than Roberts', with hardly a break between words. However, the events he had to record were, the electrification apart, of less moment than those Roberts had...

Mention has already been made of the alteration to the Middle Quarry main incline, a short "back incline" worked by a sheave connecting its foot on floor 1 to floor C. This was formed on a ledge cut in the solid rock and delayed the masons from taking up another important job, that of dealing with the output from the Middle Quarry.

As related in the last chapter, the opening up of the New Vein had increased the pressure on the Middle Quarry mills to such an extent that some of their load had been transferred to the old Upper Quarry Lower Mill. However, while this dealt with the production, it did not deal with the despatch of the finished slates! With the abandonment of the old Upper Quarry incline to Dinas, the whole of the output from the two undertakings was having to be despatched down the old Middle Quarry tandem inclines to the F.R. at the foot of the high level bridge. A double handling arrangement that slowed down the despatch and was prone to problems. What was needed was a single incline from the Middle Quarry to the F.R.

The site for the new incline was decided on as diagonally down the Middle Quarry main tip which had now stabilised, the end of which had crossed the old Holland Incline site, partially burying it. The drum house was to be sited on the tip edge, just to the south of the new Slab Mill, close by the path from Dinas which zigzagged its way up to the tip of the timekeepers hut. The foot of the incline was to be at Dinas, allowing a junction to the F.R. there. The new incline was to be over a thousand feet long. Work began in 1905 and it was finished by January 1906 at a cost of over £509/8/5d., the delay being caused by the considerable extra work the masons were apparently doing at the time. The new incline caused a rearrangement and reversal of the traffic flow and routes through the Middle Quarry mills yard and several alternative schemes were considered before the final one was adopted. Unusually for the quarry, the proposed layouts were drawn out and the plan has survived in the archives. Most track alterations then and subsequently were carried out by the platelayers and engineer in a less formal manner and the only evidence for them today tends to be photographic, or such sketches as were incorporated in the main surveys. The new incline was sometimes referred to as "Inclin Dinas Mawr."

While this was going on Owen Jones was primarily concerned with making a breakthrough between the Bonc Siafft uncovering cutting at the foot of the Ffridd incline, which Roberts had wanted left alone because of the drainage problem, and the Twr Babel uncovering operations, thus doing away with the Twr Babel incline, which he said had "All along proved such an expensive white elephant," clearly his opinions were at a variance with Roberts in several ways. The need for the connection was further shown by the failure of the quarry to permanently form a connection between the Twr Babel uncovering and the operations in the Back Vein on floor 5. From time to time they were connected by tunnels driven through the intervening promontory between floor 5 and the Tan yr Altt Ffridd, but on every occasion, the galleries and promontory had given way, taking the tunnel with them, a firmer connection obviously being wanted.

A "valveless" pump was fixed in N floor, while the "unproductive" chambers to the west, numbers 16 to 19 were now in use as reservoirs or "looms" the Welsh being "Iwm". To replace damaged rubbish wagons, he ordered six dozen new ones.

He appears also to have been going through the old papers and reports for he commented in a letter to Ashmore in February 1905, "I came across a copy of minutes of the Board dated August 11th, 1896 to Mr. Robert Roberts... authorising him to proceed with the uncovering scheme, vis. the uncovering of the portion between the Ffridd Incline on the east to the line of chamber 12 in the west, the expenditure not to exceed £10,000 per annum until further notice." he commented, "I don't know how it was that the above was not carried out... the result is that we are crippled with our workings on C, DE, F, G and H."

The beam pump was also mentioned frequently, receiving new working barrels in late 1905.

The Electrical Review described the origination of The North Wales Power & Traction Company as follows:

"Unlike our Continental and American friends, we in Britain have few natural water-powers which offer facilities for commercial development on any extended scale. A noteworthy exception, however, must be made in the case of the North Wales Power Company.... This hydro-electric plant, situated as it is on the eastern slope of Snowdon, amongst the wildest and most rugged of Welsh scenery, has a charm and interest far beyond that which attaches to the usual run of electrical work in this country. The feasibility of carrying out such an undertaking was, we believe, originally mooted by a well known engineer at present located in the colonies, who, during the course of a holiday tour in the neighbourhood, was much impressed by the potential possibilities of the two small lakes, Glas-Lyn and Llyn Llydaw, situated in a declivity about halfway up the eastern side of Snowdon."

Be that as it may, this scheme, which promised cheap (?) electricity to the slate quarries and also appeared to enable them to do away with coal shipments etc. proved attractive to the Oakeley Board, who disregarded, at their eventual cost, the word of Robert Roberts who had warned against them becoming dependent upon a single supplier for their power. With
coal, at least they could use the competition between suppliers to control prices, with the North Wales Power & Traction Co., that competition was non-existent. There have been persistent suggestions in the area for many years that the reason that the Deep Level Drainage Scheme was dropped and the Power Co.'s scheme accepted was due to members of the Oakeley Board having a financial stake in the Power Co...

In view of Thomas Jones' unfamiliarity with the subject of electrical power, mentioned before, though he was a strong advocate of it, the Board decided to appoint a separate consulting engineer to advise and draw up the specification for the electrification of the quarry, in conjunction with the supply which was to be obtained from the Power Co.

One Maurice Georgi, of Newcastle on Tyne was chosen, and subsequently drew up a specification, a draft of which has survived. This may well have been subsequently modified, as the actual installation was somewhat different. It laid down the essential requirements and the basic scheme, as well as giving the essential specifications for the plant. The Draft Specification.

The extent of the contract was "To supply all necessary materials and erection for a complete working scheme... starting from and including the secondary switchboards in the transformer substations together with all motors, cables and other apparatus..." The contractor was to supply all skilled labour, the Quarry supplying rough labour, lifting tackle and the necessary foundations. The contractor, of course, was to supply "all foundation bolts, nails, underbeds and templates for fitting." The whole of the system was "to comply with the rules issued by the Home Office in February of this year as to regulating the use of electricity in mines."

The system to be tendered for was to be Alternating Current of 3 phases and 50 cycles per second, the distribution supply to be 500 volts between phases. The option was given of tendering for a distribution at 2000 volts, but this seems to be mere kite flying. All the motors were to be of the "asynchronous induction type" and had to be able to withstand a battery of tests before being accepted. The contractor had to supply a curve representing the efficiency he was prepared to guarantee for each motor as well as the corresponding power factors at the various loads. This latter was not taken too seriously, by later accounts, as it turned out to become a major problem.

Haulage motors in particular had to meet stringent requirements. All were to be controlled by liquid resistance starters, the starting switch to be separate but linked to the controller so that both were operated by the same lever. 10% margin was allowed on guaranteed figures, but above 30% the quarries reserved the right to reject the motor concerned. The importance of the haulage motors was emphasised:

"Very much depends on the satisfactory working of all the haulage motors about the quarry, many of these depending on one another so that the stoppage of one only would affect the general working of the same. The Oakeley Quarries will require of the contractor to whom this contract is let that he shall give rigid guarantees as to the proper working of this particular portion of the plant, supported by a deposit to be agreed upon to indemnify the Company of all stoppages etc. which may occur. Note: The haulage engines, with one exception, do not generally reverse." Despite this, all were installed fitted with reversing switches!

Details were given of the haulage engines required. Curiously, it was proposed to work the Middle Quarry main incline and the Bonc Goedan to DE incline (the C Incline) by an indirect method, using D.C. motors, these being supplied by two motor generators installed at Middle Quarry. This may have seemed obvious at the time, these two inclines carried the heaviest traffic, and a D.C. motor had the ideal torque characteristics required. The motor-generators were to be of 175-200 h.p. each, the haulage motors to be also of 200 h.p. "on the brake" they were to run at up to 200 r.p.m. with a torque of 5,000 ft-lbs, but with a starting torque capacity of no less than 12,500 ft-lbs. A spur wheel of 8 feet in Diameter and a six foot shaft was to be supplied with each engine to go with a 19 inch pinion fitted to the motor shaft. Alternatively, the contractor could tender for a direct drive system using 200 h.p. induction motors, this latter being, in fact adopted, and it may be that the final specification was for this alone.

The Ffridd, Twr Babel and I-H-K Engines were to be driven by induction motors of 200 b.h.p., their maximum speed being 200 r.p.m. and a maximum starting torque of 10,500 ft-lbs. The controllers for these were to be capable of starting the motors twice in succession in three minutes. It does not appear to have been emphasised subsequently that this was the normal working pattern, not merely a test condition. This had the unfortunate result that the controllers supplied, though meeting the specification, were of lower capacity than that required. An alternative in the case of these haulages was to tender for two speed motors, again, it is felt that this was probably dropped in the final specification, so that the conditions etc. were the same for all the five haulages; Middle Quarry, C Incline, Twr Babel, Ffridd and the H-I-K Arches Incline.

The remaining haulages were described as the "Upper Quarry Engine", which is clearly the ex-Cwmorthin untopping incline, the "Underground Engine on K floor" and the "Water Balance Engine on DE Level." Assuming that the D.C. driven incline on floor I in Chamber 9 was to remain, for the time being, the K floor Engine is presumably the K.3 Incline engine. The Water Balance Engine is a puzzle, and the details only add to the confusion. "For the Water Balance Engine: one spur wheel ten feet diameter and a spur wheel 20 inches diameter on the motor shaft, should be in two halves..."
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(electrical engine to replace the present D.C. motor operating the engine at 60 h.p. motor 1000 r.p.m. at no load i.e. is to be provided.)” What are we to make of this? Logically, the K Trwnce engine would have to be electrified if the haulages were to be complete, so does it refer to this - or the G balance? A drawing survives showing the arrangement for the electrification of the G balance, but it is undated. As far as we can tell, the F and G balances survived as true water balances until the late 1920’s, although they are never explicitly stated to be using water! So, could it be that the K Trwnce had, in fact, been electrified, its steam engine driving the dynamo, which in turn supplied a motor for the Trwnce and the chamber 9 incline? Thus, was the a.c. motor to be supplied to do the same job?

The diagram of the controllers eventually supplied refers quite clearly to "75 h.p. Water Balance Engine, Upper Quarry Engine & Underground Engine also 60 h.p. Electrical Engine" This suggests the answer, there being separate provision. Though whether the 60 h.p. was intended to drive the incline or the dynamo is not stated, the latter seems likely from the wording given.

These haulages were to have 500 r.p.m. motors, with a starting torque of 1,640 ft-lbs.

The motors to drive the mills were given as 14, distributed as follows:

Bonc Goedan 1 25 h.p.
Bonc Siafft New 1 25 h.p.
Pen y Bont 2 25 h.p.
Bonc Siafft Old 2 20 h.p.
Middle Quarry Large 2 20 h.p.
Middle Quarry Small 1 20 h.p.
Middle Quarry Slab 1 20 h.p.
Upper Quarry Upper 2 15 h.p.
Upper Quarry Lower 2 15 h.p.

It may be that these mixed sizes reflect the relative sizes of the steam plant for the mills. In fact, the final installation used but a single size of motor, the largest mills, at Middle Quarry and Bonc Siafft requiring additions to power them, their line shafting being split into roughly equal sections of around 10 saws and dressers per 15 h.p. motor..

Two pumps were also to be provided for, one on L and one on N. The L pump was to have a capacity of 800 gallons per minute, that on N being 500 gallons per minute against a 200 ft. head. The pumps were to be of the “multiple stage centrifugal type.”

Two alternatives were given for dealing with the air compressors. The first was “to utilise the compressors at the present time at work at the quarries and to arrange them for an electrical drive. They are, or will be, four in number of two different sizes and will be driven in pairs.” The first pair was to be driven by a 175 h.p. motor via ropes and a flywheel which was to be provided by the contractor, this being 12 to 14 feet in diameter and the rim weighing 5 tons. The second group was described as having about half the capacity of the first. The motor being about 90 to 100 h.p., all other requirements being the same.

The second alternative was to tender for a standard electrically driven compressor to take the place of the first group. The capacity was to be of between 800 to 1000 cubic feet per minute at 90 p.s.i., of the two stage inter-cooled type and driven by an appropriate motor.

The workshops were to be driven by a single 10 h.p. motor. While four 1kVA transformers were to be provided for lighting. Each was to supply three circuits of a maximum of ten lamps each, the transformers to be connected to a single phase only. “The contractor is required to wire and erect twenty incandescent lamps within 50 yards radius from each of the transformers.”

There were to be two transformer sub-stations, one at Middle Quarry and one at Lower Quarry, though its site would appear to have been changed in the final specification from Bonc Goedan to Bone Siafft. These were to be connected to the various machines by both overhead and armoured cable, where appropriate, the overhead transmissions being: “From C sub-station a line to Twr Babel, Ffridd, Bonc Siafft, this line is 600 yards long and will consist of two wires per phase... supported by 15 poles. A line to DE level; 600 yards, wires 1 per phase. From Middle Quarry sub-station a line to Upper Quarry to be 1,500 yards long and to consist of 1 wire per phase... supported by 40 poles. A line to C floor to be 250 yards long, 4 wires... for the D.C. circuit feeding C floor winding engine. From the motor generator on Middle Quarry Level, 2 wires... for the excitation. In the case of direct drive 6 wires...are to be erected, total run of wires 900 yards single length.”

The armoured cables were described as, “from C to Lower Quarry, One 3-cored cable... 800 yards long. From Middle Quarry to Lower Quarry one cable of same length and dimensions. From Middle Quarry to compressor, Cable 200 yards long...From Lower Quarry to underground; a board for these circuits is to be erected in the Lower Quarry for feeding the underground workings. From this board 3 cables will start; One 550 yards long to K floor engine... One 480 yards long.
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to I floor ...One 250 yards long to the pump at L floor, armoured for shafts. On K floor a switch box is to be provided for a cable... 140 yards long going down to the pump on N floor.” From this it is clear, whatever the confusion elsewhere, that the chamber 9 incline was to be supplied with A.C., which begs the question again, was the intention to replace the D.C. motor directly with an A.C. one, or to drive the dynamo with the motor?

The tender was divided into four sections;
1) Transmission Lines and switchgear in sub-stations.
2) Motor generators for Middle Quarry & C engines.
3) Haulage Motors and Accessories.
4) Mills and workshops, motors pumps and Lighting.
5) Gearing shafting and accessories.

The tender was won by Bruce Peebles & Co. of Pilton, Edinburgh, who were also the prime contractors to the North Wales Power & Traction Co., with Siemens & Co. as sub-contractors for wiring, small switchgear etc.

By December 1905, the "main transmission line from Beddgelert" as Owen Jones described it, had been completed to the quarry substations. Plans had been received from Bruce Peebles for the motors and their foundations. The masons were thereupon directed to start work directly the Dinas incline drum house was completed. Siemens had started work the previous week.

The "Electrical Review" reporting in December 1906, went on to describe the scheme and the Oakeley connections as follows:

"The scheme...utilises the 1,100 ft. drop from the lakes into the valley below, where a Power Station has been built and includes a series of H.T. transmissions, which pass over the mountains and supply energy to the very extensive slate quarries for which North Wales is famous."

"But as an electric railway, to jointly benefit the quarry owner and tourist is progressing towards completion, and many much needed electric lighting schemes are on foot, prospects of development in other directions are very promising. The consulting Engineers for the scheme were Sir Douglas Fox and Partners and Messrs. Harper Bros., and the whole of the work has been carried out by the well known engineering firm of Bruce Peebles & Co, Ltd. of Edinburgh and London."

"One three phase line, consisting of three 8mm. wires, makes a bee-line over the mountains in an easterly direction to a point near Roman Bridge, where it turns to the south, terminating at the Oakeley Quarries, Blaenau Ffestiniog, a distance of 7 miles."

"No account of this undertaking can be considered complete without reference to the utilisation of the power, and the cases in point - the Welsh Slate Quarries -the installations are of a specially interesting character. The magnitude of the quarries, and the possibilities which they offer of extensive power contracts, will be matters of surprise to those unacquainted with the neighbourhood. Thus, although the initial supply - the company commenced operations early this year - only comprises the three quarries Dinorvic, Penyrosedd and Oakeley, and these are by no means fully equipped, the power installed up to the present is 250 h.p., 750 h.p., and 1900 h.p. respectively for the three undertakings."

"The Oakeley Quarries at Blaenau Ffestiniog are very extensive, employing some 3,000 men, and comprise a series of underground workings to which access is by inclined shafts, necessitating powerful haulages. From the Power Company's point of view they are most important, as a very complete equipment consisting of some 1900 h.p. of motors is installed."

"These comprise five 200 h.p. motors, which supplant the lately discarded steam engines for driving the haulages; two 150 h.p. motors for driving an air compressor and pump respectively, and a further motor of 60 h.p. for the latter purpose; a 40 h.p. and three 85 h.p. haulage motors; 23 15 h.p. motors for driving the sawing and trimming machinery in the mills; and a 10 h.p. motor in a repair shop. In addition there is about 10 kW of underground lighting."

The account went on to describe the transformer sub-stations, confusing matters by actually describing and illustrating the Penyrosedd sub-station rather than the Oakeley ones!

Reference was made to 1,500 yards of rubber covered cable and 200 yards of armoured cable underground. The lamps were on wooden bases covered with glass.

The mills were described as follows, "The mills are throughout operated by squirrel cage motors with a speed of 600 r.p.m., and bolted on the wooden tie beams of the roof; the group system of driving is adopted, through back gear, belting and shafting. The motor leads are bare cables run on bobbin insulators along the roof beams to the end of the building, where the
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*Motor control apparatus is fixed.* Needless to say, the presence of live bare 500 volt wires in the roof space, into which the men were accustomed to climb to change belts, or similar matters added to the everyday hazards of the mills!

The second alternative for the compressors had been taken up, a new plant being installed in 1908 on C floor, close by the landing of the “C” incline and at the foot of the old disused water balance. *This includes an Ingersoll-Rand compound air compressor, belt driven from a 150 h.p. Bruce Peebles induction motor with a speed of 500 r.p.m.* The other steam driven compressors, two by the boiler house at Middle Quarry, remained in use. What exactly happened to the other, smaller pair, is not known, but presumably they were scrapped with the other redundant steam plant as described later.

The inclines were thought to be particularly interesting; *Turning to incline haulages, in which the haulage drums are arranged according to circumstances, one which we had the pleasure of inspecting, had the drums with the engine man’s platform and controlling levers, fixed overhead at the top of the incline. The driving motor, one of five 200 h.p. 30 pole induction machines with a speed of 200 r.p.m, now occupies the place of honour in an adjoining engine house and drives - through a flexible coupling - a horizontal shaft which actuates the winding drums, through clutches.*

*The motor is of Messrs. Bruce Peebles standard type, with a wound stator - the slots being of the semi-closed type - and bar-wound rotor built up on a spider. The slip-rings are mounted on the shaft beside the rotor, and on the end of the shaft is the emergency air brake drum.*

*The motor can be supplied with energy from either sub-station, i.e. a three-core cable runs in one direction, and an overhead transmission enters from another.*

*The motor control gear is installed beside the motor, and includes a Bruce Peebles liquid controller, main and reversing switches, which are worked by levers from the drivers platform outside. The liquid controller permitting of exact speed control... The Reversing switch is seldom used, as the trolleys can in any case run back on the brake; the other switches are worked by means of suitable mechanical leverage from the driver’s platform. The switch gear etc. is protected by lightning arrestors hung from the roof.*

*It only remains to refer to the prospects of the undertaking, which are, commercially, of a very hopeful character. The normal price for this class of supply averages 7/8d. on a sliding scale, and considering the cost of delivering coal to these somewhat inaccessible situations, and the many well-known advantages of electrically operating isolated machinery, little doubt can exist as to the ultimate success of the scheme. In the case of the Penyrosedd Quarry, the company made a sporting offer to operate at three-quarters of the previous cost by steam driving, and we understand that this arrangement has proved extremely satisfactory to both parties - it is even suggested that the Power Company regrets the existence of the aforesaid sliding scale in this case.* One wonders what “sporting offer” was made to the Oakeley Board to induce them to accept?

The Slate Trade Gazette described the official opening of the Oakeley plant, we would call it a commissioning ceremony today, in these terms:

*The opening ceremony ...was carried out in the presence of Mr.William Edward Oakeley, Chairman, and his co-Directors Messrs. Edward de Clifford Oakeley, Mr.James S.Belle, Mr. Algernon Strickland, and of Mr.J.G. Ashmore, Secretary and General Manager, Mr.Owen Jones, Chief Manager at the quarries, Mr. Georgi, Consulting Engineer to the Quarry Company; Mr.M.V. Waite representing Messrs. Bruce Peebles & Co., the electrical contractors; and Messrs. Budd & Hart representing Messrs. Siemens & Co., London, sub-contractors.*

*The formal switching on was performed by Mr.Wm. Edward Oakeley.*

*All the power required to drive the machinery in the Quarries, comprising a total of 1950 horsepower is generated at the Cwm Dyli Power Station, belonging to the North Wales Power Distribution Co. by means of water taken from llyn Llydaw in Snowdon, the head being over 1400 feet and utilised in Pelton turbines driving three-phase alternators generating at 10,000 volts. The energy is conveyed to the quarries by means of an aerial transmission line which goes over the mountainous country between the power station and Roman Bridge station in nearly a bee-line and at that point turns and follows the road to Ffestiniog right into the quarries.*

*All the work of transformation and control is conducted from two centres, known as sub-stations and situated at Bonc Shaft and Middle Quarry.*

*There is a distribution centre in Lower Quarry controlling the cable going underground, three in number. The cables used are of Messrs. Siemens Bros. make and are insulated with pure manila paper strip well impregnated. They are made water proof by means of a lead sheath and the whole cable is further protected against mechanical injury by means of two layers of heavy steel wire covered over with impregnated jute. Underground these cables are supported by hooks fixed to the natural stone by means of expansion bolts. Every cable, motor and apparatus is protected against atmospheric discharges by means of forty lightning arrestors.* They meant altogether, of course.
"The mill motors are of the squirrel cage type which is an ideal one for the purpose as it contains no slip-rings or brushes etc. and further, all switching in-and-out operations can be performed from a centre in every mill where the switchgear is placed out of the dust and in an inaccessible position to all unauthorised persons."

"The hauling motors constitute the first attempt, on a large scale, to drive quarry inclines by means of electrical power. The motors are each of 200 b.h.p. normal rating and run at the very moderate speed of 200 revolutions per minute."

"The underground inclines have also been converted and the existing electrical engine at "I" floor has been equipped with a new motor which has increased the speed of a journey three times what it used to be. A centrifugal pump has been installed on "L", which is capable of dealing with eight to nine hundred gallons per minute. Further a compressor built by Ingersoll Rand & Co. is being erected, this compressor can deal with and can compress 960 feet of air to a pressure of 90 lbs. It is driven by a 150 b.h.p. motor and provided with a patent regulator which only admits a quantity of air inside the cylinder equal to the demand on the compressor from outside."

"Messrs. Siemens Bros. were ably represented by their engineer, Mr. Hart and great credit is due to Mr.T.J. Williams (Chief fitter at the Oakeley Quarries) for the assistance he has rendered the contractor and for the speedy and business like way with which he has proceeded with the accessory work."

"Mr. Owen Jones (the chief quarry manager) has had many difficult problems to solve in the course of the installation, more particularly in providing for the safe housing of the various sections of this valuable plant, the probable future development of the property and last, but not least, the general traffic arrangements throughout the extensive workings."

"The power distribution scheme was planned throughout by Mr. Maurice Georgi, electrical engineer of Newcastle on Tyne."

"All the various plant worked without a hitch and gave great satisfaction to the Directors and to all those connected with the undertaking. It is hoped that by the introduction of this power - which is the largest of its kind in Great Britain - to secure economies which will still better enable the Company to meet the keen competition which they now have to combat."

"At the luncheon which followed the opening ceremony, the Chairman, on behalf of the Directors, expressed high appreciation of the work done by the contractors and engineers connected with the undertaking."

"Mr. J.G. Ashmore also spoke, remarking that they ought to be very proud of the fact that the Oakeley Quarries had the biggest installation of the kind in the country and he hoped trade would sooner or later justify a considerable extension of operations in the quarry."

In the course of further remarks, the Chairman made special reference to the manner in which Mr. Owen Jones had carried out the buildings for housing the valuable plant."

In the case of the Ffridd, Middle Quarry and C Inclines, the electric motors etc. were housed in newly built "motor houses" on the opposite side of the drum house from the steam engines, thus facilitating the continued operation of the inclines during installation. In the case of Twr Babel, the Arches and K Trwnc inclines, the motors replaced the steam engines in their own houses, requiring the inclines to be stopped for the changeover.

Bruce Peebles must have been very proud of their work on the N.W.P.Co. project, for a large number of photographs were taken of the construction, as well as the quarry installations. Fortunately, the collection has survived intact and gives a fascinating and detailed view of the Oakeley (and Penyrorsedd) Quarries at the time. Some of the photographs were used to illustrate the Electrical Review article. Four were views of the sink, showing the complex arrangements of the C incline and its sidings on DE, the heads of the F and K Trwnc inclines, the complex of air, water and steam pipes, and the state of the fall clearance. Those taken from the other end of the sink showed the Middle Quarry incline at its greatest extent and, in the distance, the shadowy outline of the Vertical Balance headgear.

There were close up detailed photographs of one of the sub-stations and its equipment: the ferocious looking hand changed 500 amp fuses, the fabric insulation on the switchgear buss-bars, the intermingling of 500 volt and 10,000 volt leads in the towers, about which future Electrical Inspectors were going to have something to say.

The inclines were given prominence, all the 200 h.p. motors being illustrated, along with the stage of the Middle Quarry incline. Only two photographs showed the mills.

The Chamber 9 incline did not last long in its "improved" form, being stopped in mid 1906, as work on L floor ceased. The "pwmp mawr" was not electrified under the scheme, but continued to give trouble, the cause now being centred on the main three-throw crankshaft. The original had been a single casting. This, however, broke, and was replaced by a built up one.
This proved an error, as the strain meant that the bolts holding the parts together frequently sheared. It was finally replaced by a second casting, which proved to be badly balanced, or something, for it caused frequent damage to the main girders, bearings or gears. The turbine too had its own share of problems, though what exactly is not clear.

A third electric pump was installed on M floor where a new lwm was brought into use. At the same time it was proposed that the Upper Quarry should be closed, but this was rejected on the grounds of the effect such a closure would have on the men's morale. Owen Jones was still demanding what had happened to the £10,000 per annum and whether it was still available. The Board seems to have remained obstinately silent on this matter.

The years between the electrification and the "War to End Wars" became a constant battle in themselves to keep the quarries working effectively, yet with economy. The electrical installation, with its high capital cost, did not prove the godsend which it clearly was imagined to be. The accelerating decline in the slate trade coupled with a monopolistic energy supply were to have effects undreamed of in the heady opening days.

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Trade was undeniably on a downward slope, cut backs were essential and men were now dismissed from work in increasing numbers.

1907 brought falls from the broken area, in the usual western area, and also affecting walls 16 to 22, as Roberts had feared, putting back once again the clearing operations and severing yet again the tramway between the Back Vein untopping on floor 5 and the Twr Babel uncovering at the same level, thus forcing the Twr Babel engine to remain at work - much to Owen Jones' annoyance.

Ashmore wrote in the Slate Trade gazette in 1908 that the outlook was of the gloomiest; the wage bill had dropped £1,538 in 4 years and stocks of unsold slates were piling up. The quarry like many another in the Ffestiniog district went over to a four day working week the same year.

The four day week lasted until 1910, when trade looked up for the first time, but the men did not return as they might have been expected to. There were many reasons, war clouds were gathering in Europe, the armaments industries were awakening, higher pay elsewhere and an increasing distrust of management devoted to economy lured the men away from their traditional devotions and their regard for the quarries.

Nevertheless, 1910 was a renewal of hope, and several experiments were tried. Both Ingersoll-Rand's "New Century" rock drills driven by compressed air and Moses Kellow's revolutionary hydraulic drill, driven by a 700 p.s.i. water turbine were tried. The former were much liked by the men and adopted by the quarry but the Kellow drill...

The Kellow drill required high pressure water to drive its turbine, usually from a centrifugal pump, at Oakeley pipes were laid down the Vertical shaft to the new workings in the "North Vein" on floor G, supplying water from Llyn Iwerddon. It is thought that these early trials were with the original patent drill, whose turbine discharged directly, to the discomfort of the operator. In order to use the drill, a template was used to mark out the positions for the drill hole and two short additional holes. These had to be driven conventionally, which proved to be badly balanced, or something, for it caused frequent damage to the main girders, bearings or gears. The turbine too had its own share of problems, though what exactly is not clear.

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Following the work on the dams, the summer of 1910 was very dry, the water balances, even the vertical balance almost being stopped, but were saved "by showers". A happier note was struck in December when floors L, M and N were restarted, along with the K Trwnc, traffic having been light enough that the Arches Incline alone could handle it. Despite hopes to the contrary Penybont remained closed.

In 1910, Thomas Jones was at it again, this time suggesting a major incline to the west in chamber 22 from DE floor down to K. His son, Percival Everley Jones, now in partnership with him, prepared a report which shows the change in thinking from the heady days of the "Great Uncovering";

"The principal factors which make the construction of this incline so important and essential to the development of the quarry westwards underground in both Old and New Veins are mainly:
Mrs. Inge, was left the left bank including Maentwrog. Edward inherited the property on the right bank of the Dwyryd, which included the Plas, while the widowed Mary Caroline, probate to Edward de Clifford William Oakeley, his son. His wife died two years later on the 13th of September, 1914. Six months later negotiations over the sale faded away. Despite this, William Edward left an estate of £41,461 with however, although the sale was held, for a number of reasons, the tenant farmers were prevailed upon not to bid, and some six months later negotiations over the sale faded away. Despite this, William Edward left an estate of £41,461 with probate to Edward de Clifford William Oakeley, his son. His wife died two years later on the 13th of September, 1914. Edward inherited the property on the right bank of the Dwyr Yad, which included the Plas, while the widowed Mary Caroline, Mrs. Inge, was left the left bank including Maentwrog.
Edward sold the estate to his niece in September 1915, all the mortgages then being paid off, as she had come into money. Edward died in March 1919, and Margaret in September of the same year. Margaret left the estate to her sister Hilda. To bring the story of the Oakeley family to a conclusion, for the later "Oakeleys" came from a different line of the family (in fact they were descended from William Edward's uncle Herbert Oakeley), Hilda never married and died in 1953. Her sister Edith had unfortunately inherited the mental instability of the Inges and was so unable to inherit. The estate was thus left to her mother. Estate Duties were apparently postponed until after Mrs. Inge's own death, when a double payment came due. She died in 1961, at the great age of 96, and with her the last connection between the Oakeley Quarries and Plas Tan y Bwlch ceased to be, the estate being sold the following year.

1913, with its rumours and counter rumours of war in Europe, found the quarry trying to find suitable guards for the rotary dressing machines at the insistence of the Mines Inspectorate, whose comments on the amputatory "finger slicing" machines were heard in every report. It was no small task, Oakeley had more than 130 dressers at work and a further 62 idle. One of the Middle Quarry mill motors was stopped and letters refer to the need to "reduce the make."

One consideration was to shut down the New Vein operations as the slates from them brought in less money than Old Vein slates of the same size.

The promontory above the H-I-K arches incline was once again giving cause for concern, and to further protect the incline the gap above the Arches was filled in with masonry and tipped over - presumably this refers to the remains of the top of the chamber which contained the incline, for this was already enclosed and infilled from F floor downwards.

By November, work was going on at the foot of the Middle Quarry main incline to prepare for its ultimate extension down to DE floor, while the "quarry fitter" had found a design of guard satisfactory to the Inspectorate and had made up 16, the Inspectorate demanding that all machines be fitted as soon as possible.

The overall economy measures proved their worth, the electricity bill for 1913 coming to 351 less than in 1912. prospects were improving, a trial chamber was opened in the South or GlanyPwll Vein, near to the eastern end of Lefel Fawr. After some experimentation, a steam injector was used to raise water from floor H to G, the motive force being provided by high pressure water, not steam, supplied via the pipeline from Iwerddon that had been used to try the Kellow Drill. The trial was so successful, although only capable of 100 gallons per minute compared to the 500 of the electric pump, that the old H floor pump was removed and a larger injector installed on a permanent basis.

May brought additional thoughts, the idea now being mooted that perhaps the open quarry could be worked on a regular basis. The quarry was now connected to the "National Telephone network, which now has a day and night service."

A report survives from Maurice Georgi, on his inspection of the electrical plant on the 24th. June, 1914, and contains several interesting pieces of information.

The whole plant was "in a very satisfactory condition and is working smoothly and well, no breakdowns or stoppages have occurred this last quarter, and the maintenance and general upkeep of the plant continues to be quite satisfactory."

He inspected the Middle Quarry main incline, C Incline, K Trwnc, Arches Incline and the K.3 Incline, suggesting that the windings should be varnished occasionally to prevent any deterioration of the insulation - he pointed out that it was quite inexpensive. Ffridd and Twr Babel were not at work, but "everything is being done to prevent these machines from deteriorating during their long spell of idleness."

There had obviously been some problems with the mill motors, "fibre or paper pinions" having been used, the pinions wearing away "too rapidly to be of much use," but cast iron pinions were being fitted and there had been no trouble with those.

Four centrifugal pumps were in use by this time, and were in good condition, apart from "the 125 h.p. Bruce Peebles Motor driving the pump on L floor,... (it) has suffered considerably with the surrounding dampness, and the windings I found to be quite damp and slimy. This machine should be overhauled, dried and well varnished over-all as soon as possible, as it cannot last for long in its present state without breaking down."

T.J. Williams was proposing adapting one of the air pumps to electric drive, which Georgi thought a good idea, "as this will enable all the pumping to be done electrically thus relieving the compressor."

It was proposed to run an additional cable from the C Incline hauler to the C compressor to strengthen the network, Georgi strongly advising its completion.

By this time, Oakeley was not the sole user of the N.W.P.Co.'s current in Blaenau, and the sub-stations' load was increasing - "The Power Co. have not as yet carried out their proposals in regard to isolating the branch line to Maenofferen as it
appears that the material they ordered to carry out this work was not suitable and new parts had to be ordered. This should be attended to as soon as possible in the meantime the arrangement such as it exists is not satisfactory."

“There is only one transformer at work at Bonc Shaft Sub-station, should it break down there will be some difficulty in keeping the plant running from the other sub-station. The Agreement, I believe, provides for a duplication of the transforming plant at both points of supply. I think the Power Co.’s attention should be drawn to the fact, as they appear to be taking no steps to replace the transformer at Bonc Shaft removed by them some time ago after it had collapsed.” The mind boggles!

In July 1914, it was thought that 30 more men might be taken on, and a new lwm was brought into use “opposite chamber 3 to take water from O floor and below.”

By October 5th, the manager was writing to London to tell of the adoption of the “short time system” of 3 day working. Already 130 men and boys had left, others were “dribbling away” every week and he proposed that the floor 8 open working should be stopped.

The idle weekend time was being used to advantage, the "pneumatic winch" which was working the incline from O to N floor in chamber 4 was tedious and slow, and so the miners were working to extend to the K.3 incline down to O floor, so that the haulage from O could be done directly from K in one lift instead of the two currently in use.

It is not entirely clear from accounts exactly when the L floor Old Vein workings were dammed up to provide a large storage area for water, possibly as far back as 1906, although ’08 seems more likely. To do this, the main level had been blocked by a brick and mortar dam in wall 12, the roofing shafts between M and L floors also being dammed up in a similar manner, though without valves. This gave in theory the full depth between K and L floors to hold any flood water and control its discharge to the looms which fed the pumps. A low dam on M controlled any water on that floor.

However, by November 1914, it had been discovered that the roof dams on M leaked badly when the water on L was above 17 feet deep. No sooner was one leak plugged than another one appeared. It was now decided to dam up M completely at walls 10 and 14 to avoid the problem, a valve giving the same form of control as on L floor. A new pump was being installed to help cope with the water, but the number of men who had left had risen to 155. At some stage N floor was also dammed in wall 10. This resulted in all the chambers on these floors L, M and N west of chamber 10 being flooded up. An additional dam in the main level on floor M in wall 17 and wall 20 gave divided up the waters so that the M lwm consisted of chambers 11 to 16 and could be drained independently, chambers 17 to 26 on M formed part of the L floor lwm, the L floor lwm itself stretching to chamber 32 in the Old Vein. Thomas Jones objected to the whole damming up, as he was concerned for the effects this would have on future development. However, it was thought that there would be little loss of output as the slates produced were only of small sizes.

The first winter of the war brought an influenza epidemic and further crippled the quarries' slowly diminishing labour force. 250 had now left, of which only 62, it turned out, had actually joined the forces, the others apparently going to work in the iron and steel works of the midlands and some of the open ironstone quarries further east.

The new year brought no respite and the depredation was very evident. By June 4th, 1915, the Upper Quarry was shut entirely, while at Middle Quarry only floor 1 was at work. The Lower Quarry gave these returns:

DE floor : New Vein only, 2 chambers.
F floor : No workings.
G floor : 3 O.Vn.+ 3 Nth.Vn. - no New Vein.
H floor : 3 New Vein chambers.
I floor : 4 New Vein chambers.
K floor : 3 chambers in all.
L floor : 6 chambers in all.
M floor : 5 New Vein chambers.
N floor : 1 chamber in work.
O floor : 4 chambers in work.

This gave a total of only 31 chambers in work! This vast reduction in work led to an alteration in the times of blasting in the quarry which had previously consisted of eight periods of eight minutes spread throughout the day. This was now reduced to four periods of the same duration, this being considered more than ample to do the work in.

March of the following year found the G pump once more in trouble, this time with loose foundation bolts - vibration of the crank shaft was suspected to be the source. To cater for an increase in slab production(!) the redundant slab mill boiler house at Middle Quarry, now cleared of machinery, was fitted up as a planing shop. In this context, it would appear that the quarry, satisfied with its electrical plant, was gradually cleared of the old steam plant, which may have been maintained for some time as standby - where it had not already been removed in the electrification process. Some of the old boilers were
taken up as air reservoirs for the compressors, others as water tanks. Some were sold either for scrap, or for re-use at other quarries, one buyer being the Dorothea Quarry, in Nantlle, thus keeping up the old connection. The "New Mill" boiler, by Tinker & Shenton No. 4291 was inspected by the Dorothea on site in March 1912 with a view to possible purchase, while a second was purchased from Oakeley in May, 1913 via T.W. Jones of Nantlle, a dealer, this was a Cornish type, 20 feet long and 6 feet in diameter, but its original location was unknown. The clearing of the plant at Oakeley was let to one Carr, of Manchester, among others.

To solve the problems of the pump, once again, the company tried to obtain a new forged one-piece crankshaft, the source of the problems was once again traced to the built up crankshaft that had been used.

During 1916 the "jackhammer" type of compressed air drill was introduced to the quarry. The men again were favourably disposed towards it, and the management were high in its praise, mining work being "doubled" to 6 or 7 yards per month for a two man team. The boilers and old machinery were still being removed in September. The cost of maintaining the mine for the small output was praying on the management and it was suggested in December that all underground workings should be abandoned below G floor, i.e. below the natural drainage level. At the same time it was suggested that "The C incline can be extended down to G as was intended long ago." This is sketched in as fact on some of the quarry surveys of the period, but was not, in fact, carried out.

Men continued to leave the quarries although the numbers were now being affected by another cause; the manager wrote in May 1917, "Many of our men have dribbled away ONE by ONE in a gradual manner for months past owing to the high wages and offers. Then came the Military Service Act into force and many of the men were compelled to leave us in BATCHES causing much disorganisation and before we really had recovered ourselves from this shock comes the demand for volunteers for the National Service, more particularly for the Iron Ore Department, and it appears that the North Wales Quarrymen have been put out as men particularly adopted for this kind of work, hence the visit of the Commissioners and staff to all the quarries in search of men, the offers to the Quarry Proprietors being that if the Slate Quarries released 15% of the total employees we would graciously have the privilege of being placed in the "Essential" list in the category of occupations and thereby have the privilege of taking men on, now prohibited."

This was bitterly resented by the manager who pointed out that all the experienced men had already left and the only recruits the quarry was likely to find would be completely inexperienced and therefore of little use. Twenty three more men left Oakeley as a result of the visit.

In the same month the Manager wrote to the Secretary of State for Home Affairs requesting permission to change rule 40 of the Slate Mines Special Rules which forbade all but Management, Inspectorate and Visitors from riding on the inclines. He wished this revoked and permission given to carry the men, as many now had to climb 670 feet down and up from their work.

London suggested again that H and I floors be stopped, as this would enable the H-I-K Arches incline to be stopped, saving power. The G balance could then be brought back into use for G floor traffic, along with the Vertical Balance. There is a contradiction here, as the Arches incline only raised traffic to G floor, so from there it had to use either the G Balance to floor DE, or the Vertical Balance to Bonc Siafft, so neither could be said to be out of use.

The class of men in the quarry was now officially confirmed as "below 31 years of age." The Manager pointed out that it was not possible to stop H floor east, as I was the main floor in that part of the quarry. This period also brought the cessation of pumping from K floor, when the last pump, a 500 gallon per minute centrifugal, was removed to work the O floor lw. K floor had been a pumping floor for some forty years. Now the rising mains by-passed it on their way from L to G and any water reaching K was allowed to drain into the vast storage areas on L.

Considerable work was entailed in July 1917 when a gale damaged the old Lower Mill of the Upper Quarry and it was found necessary to build buttresses to support the walls at the eastern end of the mill, as they were showing signs of movement due to pressure from the Middle Quarry tip. A suggestion again to close the Middle Quarry, although felt to be a useful economy measure was not proceeded with as it was "not a good idea, psychologically," coming so soon as it did after other various reductions in work and might give the impression that other closures would follow. Men were very scarce and some were still leaving, now to go to Dolgarroeg(Aluminium Works), Cae Coch(Iron Mine) and the Moelwyn Mines(Zinc).

The high level bridge underwent repairs in July 1918, but the problems from drainage and pumping, especially the costs and the cost of the air compressors, whose consumption of electricity was prodigious, now made the quarry fall back on the old steam compressors at Middle Quarry, which were restored to working order, along with the old Middle Quarry Incline boiler plant to supply them. They were, it was said, "to assist in emergencies."

1919 brought a measure of relief at last, it was hoped that with the end of the war and the need for slate that the trade would see a new spring. Proposals once more blossomed, this time to construct an incline far to the west in chamber 34 to raise the
produce from the lower floors F, G and H up to the wide DE traffic level. Work began again in the North Vein on G floor, accessed by a "bridge" over the Vertical balance sump. Coal problems, however, brought the steam half of the “Pwmp Mawr” to a halt. From now on the turbine was to be the main prime mover, the steam plant only being retained on standby for emergencies, a situation which merely confirmed what appears to have been the mode of working up till then! Work also began in the "Peak Quarry" - the eastern end of the main quarry sink, above the Arches Incline drumhouse, where the ruins of the old W.S.Co. slab mill still stood. The intention being to work this part of the Old Vein and eventually “uncover” the tops of the eastern Old Vein chambers and recover the walls.

Once again, a fall, or rather collapse, from wall 9 carried away the re-connected tramway from Twr Babel to floor 5, the rock falling close to the foot of the Middle Quarry main incline extension on DE. However, as the uncovering operations, and Twr Babel were both stopped, the loss of the tramway was not considered important.

To end this gloomy phase of the quarry on a brighter note, in May 1918, the quarry had acquired a typewriter, and from then on, the Managers letters and reports became increasingly typewritten, making the readers task far easier.