

## The Extractive Industries of Kentmere Lead—Slate—Diatomite

By Christopher Gregory October 2000

### A. Lead Mining

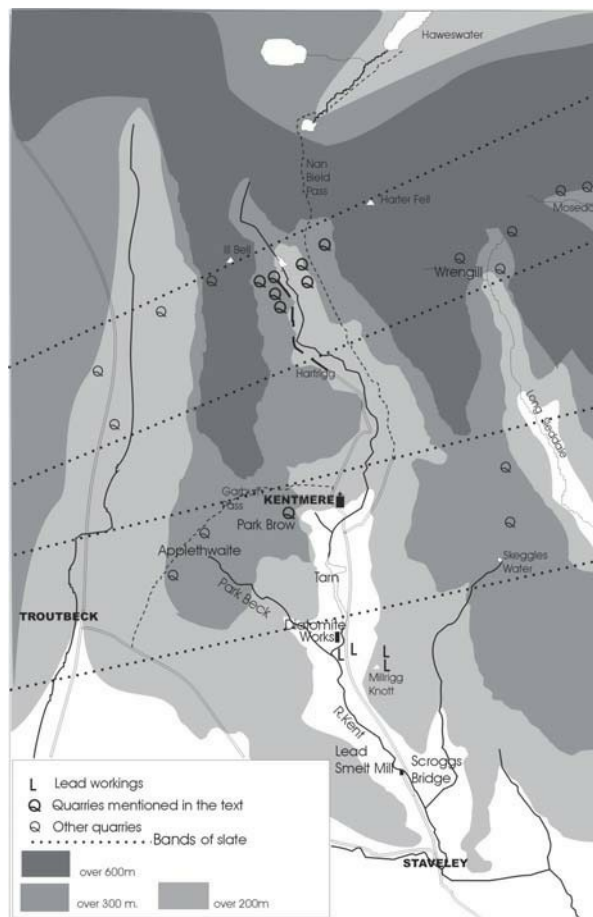
Throughout the eighteenth century there was considerable prospecting for lead, copper and other minerals all over the Lake District and Pennines. Coniston, Borrowdale and the Skiddaw areas are well-documented centres of successful activity. Our local records begin in 1753 when a John Davies of Windsor, who owned lead mines in the Staffordshire Peak district, formed a company to prospect the Staveley, Kentmere and Long Sleddale area.

One of his partners was Thomas Robinson, a farmer of Crosthwaite, who supervised local operations. In 1755 sufficient evidence was found for Antony Houghton, an experienced miner whom Davies had brought from Staffordshire, to sink a shaft on the east bank of the Kent opposite its confluence with Park Beck (NGR 454015 – *see map right*).

From the outset there was, perhaps predictably, trouble with flooding. On 2 December 1755 Davies wrote to the Countess of Suffolk, who owned the mineral rights, that they had "...made great trials, but the waters have overflowed our works. The assay was most encouraging: ... it produces 12 cwt of good lead out of every 21 cwt or 1 tunne weight of oare. So now we are sinking a perpendicular shaft at 6 fathoms from the side of the river. It will be extremely expensive at first but hope we shall have good luck for the sake of Old Levens. ... also tryals at Long Sleddle for copper ... another place found but not in Yr Ladyships manor." He also mentioned the need to purchase timber for the shaft. Davies's detailed accounts are of great interest.

They include: Tools and carriage	2s 4d
Given to the men when working	
in the water	3s 0d
1/2 lb of gunpowder	0s 5d
Powder and candles	0s 10d

However, all was not gloom. He paid 1s 4d for "treating the miners at Kendal fair", and some months later "at Staveley: a treat 4s 0....Board at Staveley for me and my horse cost 10s" (no period mentioned), and he paid 1s 0d to a farrier, and bought a wheelbarrow for 3s 6d. But twelve months later he had to report "No success with the



Staveley mine ... water so powerful ... vein lost." There follows a long sorry tale of disputes about money: "...the men have gone home to Derbyshire...Mr Robinson hired a man claiming to be a miner but he is no more than a day labourer and knows nothing." There was grumbling about pay, and dispute about cutting wood "in Staveley Mannor" There was better news from Sleddale, but bitter comparisons with Derbyshire rates of pay. Davies requested an advance on the Earl of Suffolk's account. Because of the flooding, operations were transferred some 200 yards eastward and uphill, where a successful adit or drift was cut in the face of Millrigg Knott at the site of the present Staveley water supply (NGR - 458017). This mine was to be worked more or less continuously until near the end of the nineteenth century. The very large spoil bank just east of the valley road gives some indication of the mine's extent underground. The original mine

entrance has been rebuilt *in situ* by the water authority, and sealed to the public. One cannot help wondering about the lead content of the water. The successful tracing of this same vein into Milrigg Knott encouraged prospecting further eastward, and shortly after the first, a second outcropping vein was found at an elevation of 950ft on the eastern face of the Knott. Several bell-pits were dug and later a vertical shaft equipped with a horse-gin. In the mid- nineteenth century a drift was made lower down the hillside, very possibly to improve both drainage and ventilation by intercepting the earlier workings and also to aid extraction of material with the help of gravity (a common practice in hill-country mining).

On a bench above the highest workings is a very small reservoir formed behind an earth dam, with clear trace of a leat leading down to an artificial levelled area where the ore must have been roughly sorted and possibly crushed, though the lack of a large stream would have been a drawback.

*The mouth of one of the bell pits at map ref. 463015*

## Mining Leases

A number of leases still exist in the Levens Hall estate records:

1755 - 1775 The original lease to John Davies

1776 -1792 To the John Davies Partnership

1812 – 1826 To George Sayer of The Heights, Hugill

1865 - 1870 To Nathaniel Caine of Broughton

1870 - 1895 To Walter Eddy of Llangollen together with James Nancarron of Liverpool. These extant leases do not cover the period continuously. It is believed that Captain John Barrett, the chief developer of the Coniston copper mines between 1830 and 1860, leased the Staveley Head mines sometime between 1825 and 1865, employing 16-20 Cornish miners (he himself was from Cornwall).

As mentioned in Part C below, in

1865 the Over Staveley Mining Company bought lintels, blocks and other cut slate from Park Brow quarry for the construction of a new wheel-case at Staveley Head mine. This purchase in itself suggests available capital and confidence in the future, as does the new 25-year lease in 1870.

However, the price of lead was falling as foreign imports from Spain and elsewhere increased, and working probably ended in the late 1880's. One last lead miner appears in the 1881 census, together with a "lead mineagent" aged 71, born at Gwennap, a notable Cornish mining village.



## Lead Smelting

A smelting mill is known to have stood on the west bank of the Kent just above Scroggs Bridge. This appears to have been demolished about 1865 and the material used to build the three cottages now standing along the Brow Foot road. It can be assumed that the small quantity of ore from the mines could be more conveniently and more efficiently taken elsewhere for smelting once the railway had reached Staveley.

## Other evidence of lead

The success of the mining led to renewed prospecting in the early nineteenth century, and a level was cut in the face of Pool Scar, half a mile due south of the first mine, but was soon abandoned. It can still be seen above the valley road (NGR 459009). During the construction of the Windermere branch railway in 1846, a vein of lead ore was discovered in a shallow cutting to the south-east of Staveley station. Robert Harrison of Hundhowe formed a prospecting company to explore this but, although further veins were found in a series of trial levels across the river, notably between Piked Howe and Frost Hole farms towards Potter Fell, there was nothing to justify further development.

*Tips below the bell pit shown opposite. The ruined building in the foreground was probably a blacksmith's shop. The entrance to the drift is just off to the left. The piece of machinery is a derelict bracken cutter, not old mining machinery.*





**B.SLATE**

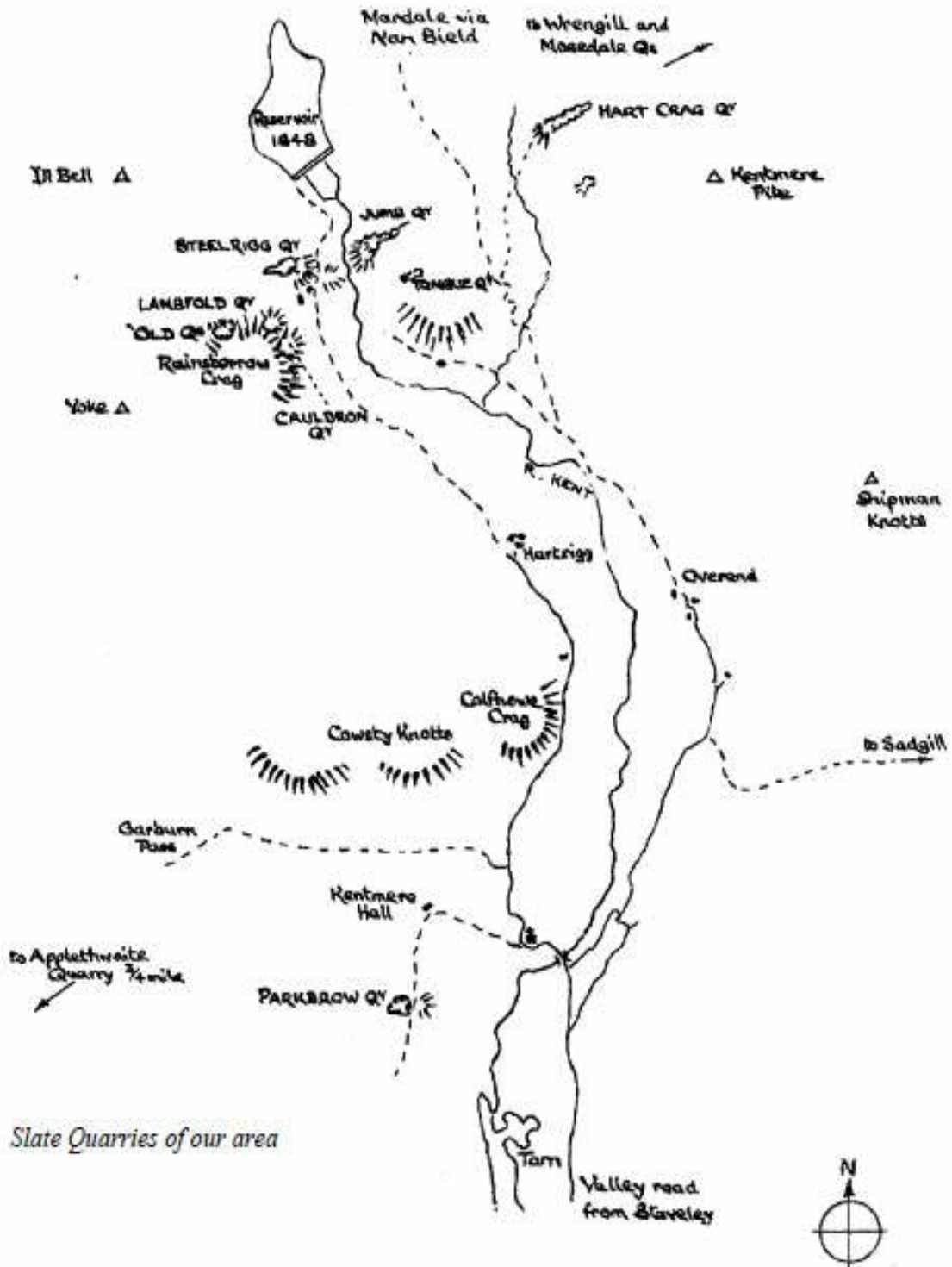
The quarrying of slate in the Lake District is known to be of ancient origin, but suffers from the lack of detailed records - unlike, say, the slate of Cornwall or Wales, where records go back to the 15th century and earlier. It is known that Wren specified Westmorland slate for both Chelsea Hospital and Kensington Palace, so its reputation must already have been high; but the main demand resulted from the Industrial Revolution.

Even then, the output of North-West England never approached that of North Wales.

Comparative figures are interesting:

	1793	1898
North Wales:	26,000 tons	521,000 tons
NW England	6,000 tons	29,000 tons

The Welsh output in the late nineteenth century accounted for 78% of the UK total, whereas NW England at its peak reached only 6%. Nonetheless, quarrying was an important local occupation.



*Slate Quarries of our area*

From the early eighteenth century there was considerable rebuilding of farmhouses and barns by prosperous yeomen, together with village churches and town houses. From this time there are relatively detailed records of quarrying and mining in the three eastern valleys of Troutbeck, Kentmere and Long Sleddale.

Workable slate occurs in our locality in a band running from SW-NE, part of the Borrowdale Volcanic geological series (*see map p.1*). A ruler placed on the 1:25,000 (2½ inch) map at an angle of 65° east of grid north will be found to cover no less than 18 separate quarries from Kinggate on the main A592 road above Troutbeck Park to Mosedale, a distance of 6 miles. (Extended south-westwards, this alignment leads to the extensive Tilberthwaite quarries north of Coniston.) A secondary line 2 miles SE of this, lying at 80°, covers 5 more quarries eastwards from Applethwaite on the Garburn Pass track.

## Upper Kentmere

There are 8 distinct named quarries in the valley.

### On the west side

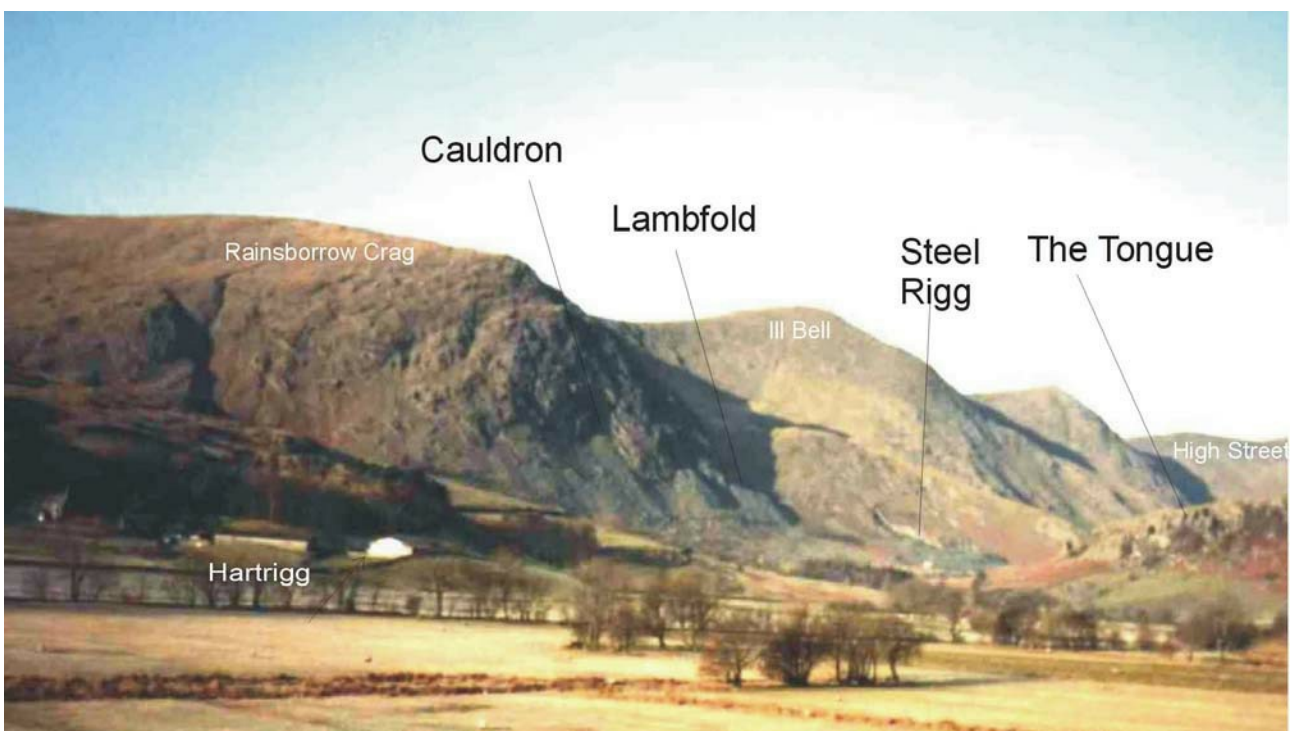
**Steel Rigg**, an extensive working on several levels above the present buildings had the longest life closing only in 1953. The Barracks, where miners lodged, has been restored as a Field Studies Centre for Lancashire schools, but a two-roomed miner's cottage has recently been demolished. A rail track-bed runs from a low-level adit to the spoil tip near the river. There are concrete



*Steel Rigg Quarry*

foundations of the compressor which, from 1928 until the war, supplied fixed 3 inch air lines and was powered by a 60hp oil engine. The latest mining building is a powder store built in 1947 (by John Williams - see p.7 below). Reservoir Cottage (white building, restored) was built to house the caretaker of the dam, and had no connection with the quarries other than its location. In the river between here and Jumb quarry opposite, a rough rock barrier was built to filter out most of the mud and fine spoil and thus avoid silting further downstream. A violent flood in 1997 breached this barrier, eroded an impressive gorge in the level 'plain' upstream, and carried a vast quantity of material as far down the valley as the tarn. Following this event, a new barrier was constructed below the wash-out, although this was soon almost filled with detritus. At the same time the owners of the reservoir

*Below - Kentmere Head Quarries looking north-west from near Overend*



(Croppers, the Bumside paper-makers) temporarily drained the reservoir and carried out extensive re-facing of the dam and other works.

**Lambfold**, in the sheer face of Rainsborrow Crag, produced long lengths of slate, as can be seen in its smooth sides. It was opened to supply material for constructing the reservoir dam, and a level trackbed can be clearly seen running northward from Steel Rigg to join the line of the present road to the dam. Lambfold has remains of three sheds and terrace walls.

**Cauldron**, adjoining Lambfold to the south, has a large underground chamber with two supporting pillars left unquarried. The slate here was a deep olive colour. It operated from 1845 to the late 1880s. There are remains of a riving shed and a small reservoir with a dam, probably built for use with a small short-lived copper mine adjoining the quarry. There appear to be no records of this, but green staining can still be seen in the gill.

**"Old Quarries"** (no other name on OS map or locally) High up in the cirque and difficult for access and transport, this open quarry has the best preserved, though roofless, buildings, one even having a wooden lintel in position (1993).

**Parkbrow Quarry**, separate from the others and just south of Kentmere Hall, produced blue slate. There are full records of sales from 1852-1884, with names and locations of customers for gravestones, dairy shelving, urinal panels, lintels, mantels, etc. These included material for a wheel-case for Staveley Head lead mines in 1865. In 1872 Sedgwick gunpowder works bought 17 tons of slate. Other orders went to Lancaster, Tebay, Keswick, Cockermouth and even Edinburgh, all by rail from Staveley. The owners were the Cowperthwaite family, and Edward Cowperthwaite's blue slate gravestone in Kentmere churchyard (1894) may reasonably be assumed to have come from Parkbrow. In 1864-71 material was supplied for the restoration of Kentmere Church and the addition of the tower. It was billed to the Rev Gerard Hayton (of Long Houses - the vicarage was not yet built):

To 30 ft of window soles	5s 0d
Belfry windows	£1 8s 6d
Flags for porch	2s 0d
1½ tons slate	£2 5s 0d
32 carts of stone	£3.2s 4d
1½ days dressing stones	6s 0d

On the east side:

**Hart Crag**, on the NW flank of Kentmere Pike, was worked in the eighteenth and nineteenth centuries. It forms an impressive rift of more than 200ft vertical extent, with large spoil tips below. A well-engineered access path can be followed.



*Hart Crag Quarry*

**Jumb**, a large working on several levels, produced silver-grey slate with distinctive bird's-eye markings. The main level extended as much as 100m. inside the fell. Production ceased in 1938 and the lower levels are now flooded. There are foundations visible of a riving shed and another building.

**Tongue**, on the west of Tongue Scar, operated in the late nineteenth century only.

## The Quarrymen

Our earliest precise record is of a John Whinfield, quarryman, "killed in the quarries" and buried in Kentmere churchyard in 1801. "Slategetters" occur in the church records from 1805. It was common for workers to combine quarrying with other work, especially farming, according to demand and scope for profit. As an example, the Edward Cowperthwaite mentioned above described himself in 1854 as quarryman, 1856 as farmer, 1871 as farmer and slate dealer, 1879 as quarry owner. (He farmed at Nook and Scales.) In 1881 Edward Bland of Townhead, Troutbeck,





*Jumb Quarry from Steel Rigg*

described himself as farmer and quarryman. Even in areas such as Langdale quarrying never dominated communities as it did in North Wales. There was no company-built housing, and the barracks at Steel Rigg were for the lodging of migrant workers on a monthly basis.

Some men with homes in Staveley may also have lodged there. (There was a similar 'barracks' at Wrengill, an even more remote quarry at the head of Longsleddale.) In later years, as transport improved, a number of workers lodged at the Fat Lamb pub near old St Margaret's church in Staveley. Even Kentmere men who worked fairly steadily in the quarries tended to move house; between 1812 and 1829 a John Harrison, quarryman, lived at Fold Howe, Hallowbank, Scales and Rookhowe. Some would of course be unmarried lodgers.

The maximum percentage of Westmorland workers engaged in quarrying (including stone) never exceeded 1.1% (1911), whereas farm work claimed between 17 and 36% at various times.

Demand for slate, and therefore employment, reached its peak in the years before the First World War. In 1896/7 and again in 1903 there was serious unrest with strikes in the North Wales industry, notably at Penrhyn, and a number of Welsh families (Owen, Thomas, Williams) moved to this area seeking work. One notable offcomer was John J Thomas (JP, FGS, M.I.Min.E) who became manager of the Kentmere Head quarries

in 1905. He was a qualified geologist and mining engineer, evidently with a shrewd sense of marketing, for he lectured the Manchester Society of Architects on "Westmorland Slates". Among other works, he improved the road from The Grove to the quarries, introduced compressed air drilling (which had been in general use elsewhere for some 40 years), and during the war he stockpiled 600 tons of slate to be sold at a good profit when building began again. He became Mayor of Kendal, and died in 1942.

Lords of the Manor were the Wilson family of Rigmaden, Kirkby Lonsdale, and in 1919-20 there is a record of £13 16s 0d annual rent being paid to them by the Tilberthwaite Green Slate Company.

Between the wars work continued sporadically, but there was never enough investment to modernise the methods. William Williams, son of Hugh who had come from Penrhyn to work at Honister, became manager in the 1930's. Born in Borrowdale, he lived first at Scales and latterly at Bridge End House. His nephew John worked in the quarries from 1946-52 for the Kentmere Green Slate Company, and thereafter as a lease-holder. (Living at Low Holme 2000) Ten men were employed in 1939, but with the war quarrying dwindled and ceased. It began again in 1947 as the Kentmere Green Slate Company, with William Williams, and two other family directors. Two major rock falls, one during the war and one in 1951, put an end to underground mining, and commercial production ceased in 1953. A little free-lance working continued for 3 or 4 years.

## Output and Products

The bulk of the production of all the quarries was roofing slate, with certain quarries able to supply special products. Roofing slate was of four qualities: Best ("London"), Seconds, Thirds and "Toms". Most slates were used in the north-west, but there was a valuable trade with Edinburgh in two sizes of small slates known as "peggies" to be used over boarded roofs. From 1877 the quarries were owned by Thomas Field of Leith but in 1881 his executors advertised for re-letting them.

Wealthy Victorians delighted in constructing garden terraces, steps, walls, pools and edged flowerbeds with neatly cut slates. Production of dressed slate (all types) from Kentmere reached a peak of 229 tons in 1878. In 1905 Jas Stephenson & Co, Quarry Owners, Stramongate Kendal advertised in the Westmorland Gazette (7.1.05)

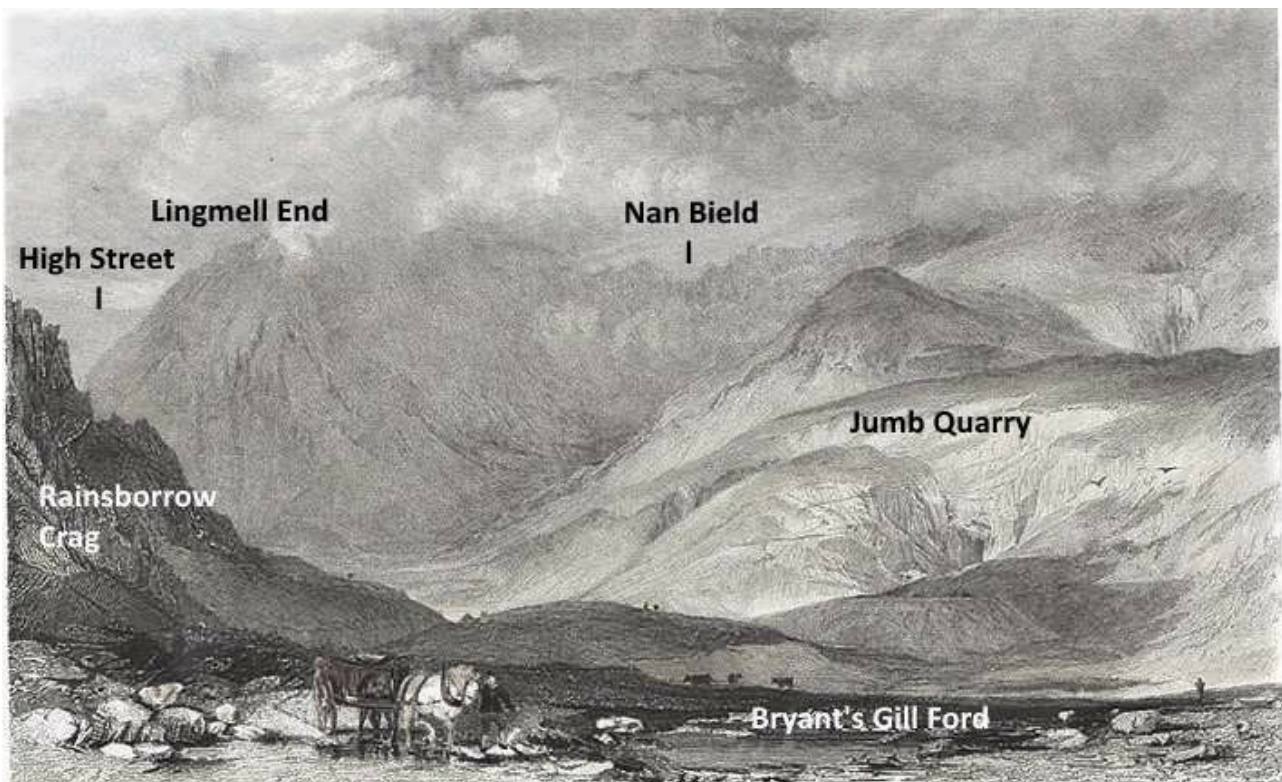
“slates, tabling, throughs, flags, lintels, quoins etc.” Gravestones were another regular product, Park Brow sending regular supplies to Cockermouth, Kendal and Lancaster.

### Production Methods

There is no detailed account relating to Kentmere, but the methods of the Troutbeck quarries were described. Usually four men, two rockhands and two splitters, formed a “company”, and would employ their own labourers as required. Shot-holes were drilled by hand, and saltpetre gunpowder (normally from Gatebeck) used to break up the rock. When Gelignite became available, it was used for rapid blasting of access levels, but gunpowder, with its slower explosion, was retained for producing less fractured slate. In the present century (earlier elsewhere) two men would use a 40lb pneumatic jackhammer, powered at 90psi by a Sentinel compressor through 3in pipes, to drill the shot-holes. (Some smaller drills used in Kentmere needed only one man.) Rivers (long 'i') split the slates by hand, usually working in a shed as close as possible to the quarry face. Final 'dressing' was done by a craftsman employed by the “company”, often itinerant. One such famous character was Jim Brownlee, who moved between the three eastern valleys. Slates were then brought out by horse and cart (as in the 1830s print) or by sledge from the higher levels.

Transport down the valley was done by contractors, often themselves farmers. Carts usually worked in pairs, so that there were two, or even three, horses for the steep or bad stretches of road. A cartload was typically 10½ cwt to allow for breakages en route. Thomas Benson of Low Fold was a carter in the 1850s, as was William Hutchinson, keeper of the Temperance Hotel (now Bridge End House) Kentmere, in the 1870s. Another was Thomas Brocklebank of Goose Howe, Staveley, who eventually became reservoir keeper and also tended the compressor oil engine. Haulage was normally to Staveley station, but between the wars, when motor lorries appeared, Burnside was often used because it had a larger weighbridge.

*Kentmere Head and Slate Quarries - engraving from a painting by Thomas Allom, by S. Bradshaw, published 1834*





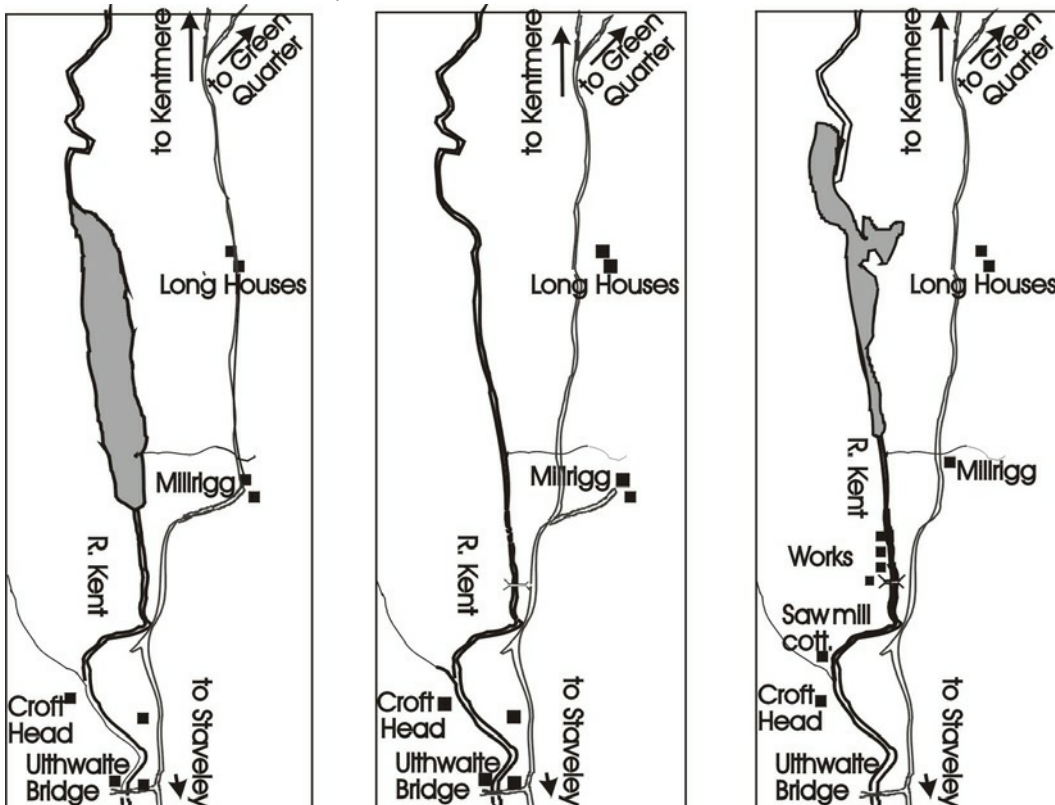
### C. DIATOMITE

The lake which gave Kentmere its name is not the one to be seen today, although both occupied broadly the same part of the valley floor. The Ordnance Survey did not map the valley in detail until 1860, so there exists no official survey of the original mere - though its former shoreline is not hard to trace along an almost continuous declivity in the fields. It would have extended a little more than a mile from north to south, and a quarter mile at its greatest breadth.

#### Draining the Mere

The date of this operation is unclear, and several writers admit failure to find any reliable records from the usual sources (county archives, newspapers, etc.) A survey made for Christopher Wilson in 1802, and another by Hodgson in 1824, both show broadly similar outlines of a lake wider and longer than the present tarn, the former with its boundaries labelled "boggy ground". The Corn Rent map (1836-38) in the Kendal Archives clearly shows the river -and nothing wider - flowing due southward through the site of the present tarn. Land on each side is divided and numbered and the ownership listed.

This evidence would put the drainage in the early 1830s; but Paul Wilson, Lord Lieutenant of Westmorland, whose family owned Kentmere



*Kentmere Tarn  
Far left - in 1802  
Centre - in 1836  
Right - today*

Hall and extensive land (and still own the mineral rights) puts the drainage nearer 1840. This would accord with the construction of Kentmere Reservoir in 1845/48, designed to regulate the river and keep it flowing during summer droughts for the benefit of the numerous mills downstream (notably James Cropper's paper mills at Burneside, which still control the reservoir). The new reservoir would not have been needed while the original tarn existed. The 1840 date is supported by a technical article by D Walker in 'The New Phytologist' 1955. Several independent local sources agree in supporting a second date some thirty years later for the drainage. In the 'Westmorland Gazette' of 18 Nov 1871 tenders were "invited for ... diversion... and deepening... of the Kent at Millrigg bend... (for) drainage of Kentmere tarn meadows." A very clear diversion channel, excavated partly in solid rock, is crossed by the road entering the diatomite works, and appears to have been used while the main river channel was lowered and widened. Mrs M E Hayton (née Mattinson) of Brow Top, Kentmere, who died in 1957 aged 87, recounted in detail how, when she lived as a child at Sawmill Cottage (a short way downstream of the tarn) workmen lodged "in the big room" at the sawmill (now a pottery studio). She owned a photograph of Isaac Coward of Kendal, the contractor for the drainage. Her family's moving house would put the drainage in 1876. It seems reasonable to believe that an operation as large as draining a valley floor, with

an element of trial and error, could well have been found to need a second stage of improvement thirty years after the initial work.

## Diatomite or Kieselguhr

Whatever the date(s) of the drainage, the fact is that much of the reclaimed land, especially at the southern end, was a disappointment for farming purposes, remaining swampy and acid. However, an unexpected bonus was the discovery in the 1920s by two geologists on holiday of a huge deposit of diatomaceous earth, technically known by its German name Kieselguhr. The material consists of the microscopic skeletons of water-plants, as many as 60 million to a cubic inch, which flourished in clear cold water at the end of the Ice Age. It has remarkable insulation properties, especially for very high industrial temperatures when calcined and ground, and it has other uses as an inert filtration medium, for industrial filling and polishing, and in the manufacturing of explosives. No records or dates have been found for the discovery or first commercial development - the parent company no longer exists, and the recent manager believed the records to have been destroyed in Scotland. The deposit was worked on a small scale in the 1930s by Kencert Products, which later became part of Cape Asbestos, a South African mining organisation. Despite local beliefs, based on the firm's name, no asbestos was ever processed in Kentmere.

### Method of Working

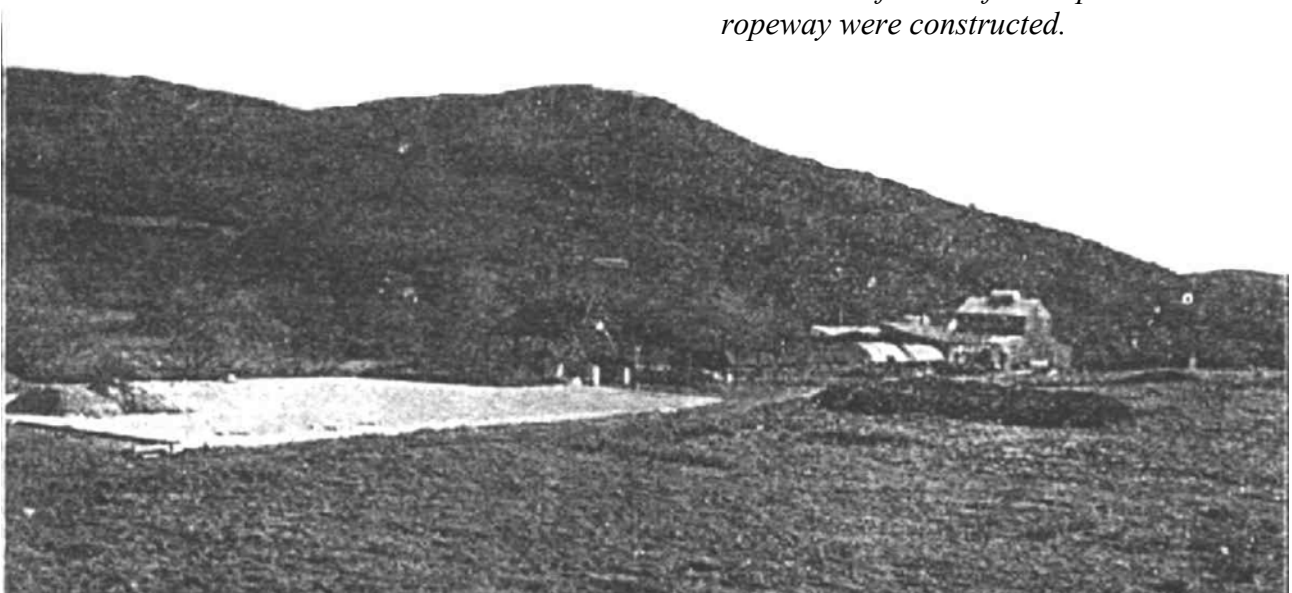
The earth was excavated by a large 'wet dragline' operating radially up to 600ft from a tall lattice mast which stood on the west bank. The outer end of the dragline could be moved in an arc as work progressed, producing a broadly fan-shaped excavation. (Some of the anchor-cables on the

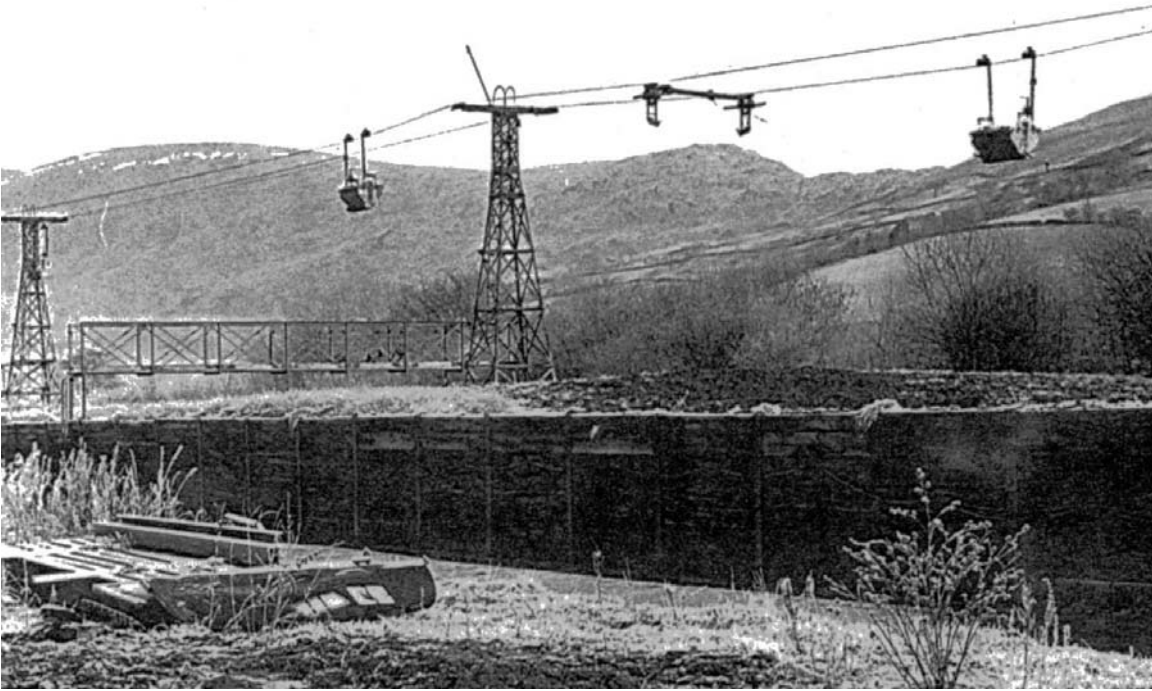
east side, and the base of the mast on the west, together with a landing wharf can still be seen.) The earth was transferred to an overhead ropeway and carried to extensive concrete floors bounded by massive sleeper fences at the north end of the works (see photograph) where it was left to drain. Later, inside the works, it was calcined in a coke-fired rotary kiln (in the manner of cement), ground and bagged, or some of it compressed into special bricks. At its maximum, annual production reached 10,000 tons and about 40 men were employed, together with office staff.

Power was electrical, at first generated by the company until the public supply reached the works after the war. (It was not extended to homes in the upper valley until 1963.) By 1960 excavation had reached the limits of the dragline, and the method changed to a floating diesel-powered grab dredger, which loaded alternately two hopper-barges moved by tug (*photo p.11*). In this way the lobed extension to the tarn was created (*map 3 p.9*) but work ceased about 1980. The deposit was by no means exhausted, but overseas sources and alternative materials had made the product uneconomical. The works continued to operate as a research centre for its present owners, Hepworths, and now produces a specialised high-grade breathing filter which is exported to mines and quarries world-wide. Diatomite was also discovered in the bed of Skeggles Water to the east of Kentmere, but permission to extract it was refused about 1960.

*The diatomite workings in about 1930.*

*Looking SE. The white area is drying diatomite before the fenced pens and ropeway were constructed.*





*The overhead ropeway in operation*

*The dredger and barge at work*





*The diatomite workings uncovered this 13<sup>th</sup> century boat, which is now in the National Maritime Museum. Les Ridding who worked there and discovered the boat is on the right of the picture.*



#### **Access**

All the workings described are on private land. There is a marked footpath from just north of Ullthwaite Bridge to Long Sleddale which passes close to the lead mines. Another from Croft Head, through the rebuilt works buildings to Kentmere Hall gives a good view over the tarn. (the private footbridge at the north end of the tarn was once part of the ropeway installation (*see photograph on p.11* ) The private road from Hartrigg to the reservoir can be used on foot to inspect the slate quarries. **These can be dangerous to enter!**

*Looking north up the tarn from the landing wharf showing the foundations of the ropeway*

#### **Sources**

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**M Davies-Shiel and JD Marshall** *Industrial Archaeology of the Lake Counties* 1969

**John Adams** *Mines of the Lake District Fells* (Dalesman)

**Dr Stolterforth** *Geology of the Country round Kendal*

Thanks are also due to John Williams, retired quarryman, Clara Black, farmer and landowner, Dr Sam Murphy, metallurgist, William Wilson of Rigmaden, and the late Leslie Ridding who discovered the boat.

