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# THE KIMMERIDGE SHALE INDUSTRY, DORSET

*John Parkins*

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It is a sad but true fact that there are seldom sufficient raw materials to meet all of societies' needs. Whilst there is sometimes local excess in one place, it is certain that somewhere else, often not too far away, someone is improvising or trying to find a substitute. An early example of this occurred in the Southeast China Neolithic. This was a materially poor culture situated to the south of the rich Bronze Age culture of China proper, the Shang and Chou periods. By exploiting the local geology, this Neolithic culture used polished quartz as a substitute for jade and green glazed pottery in place of the magnificent northern bronzes. In England, Kimmeridge Bay in Dorset provides a very good example of an industry being established to exploit available resources as an alternative to others in short supply.

KIMMERIDGE Bay, on the Dorset coast, has in its time presented different faces to different writers. Arthur Mee writing in 'The King's England', saw it thus:

"A small village of stone walls and thatched roofs. Steep hills rise like ramparts behind it, a little bay sparkles before it, and there is a magnificent view from its hilltop."

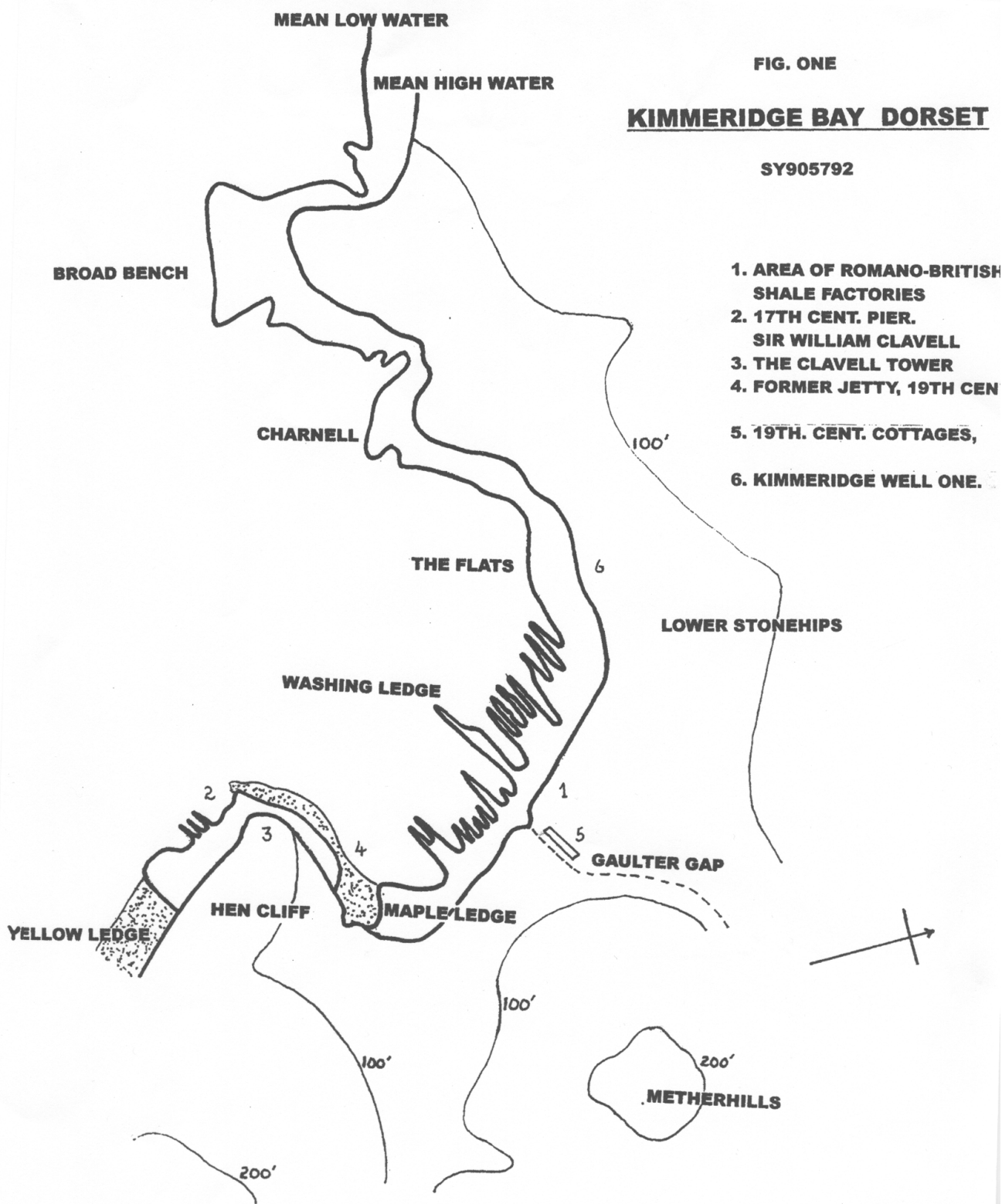
Frederick Treeves, writing in 1906, saw it differently:

"A rough road leads to a bay surrounded by low, earth coloured cliffs. But for a ridiculous tower, a lifeboat shed and a coastguard station made of unpleasantly formal houses, the place is as desolate as it is dingy." *See fig. one (next page).*

It is these, low, earth-coloured cliffs, alternate bands of clay and shale, that have formed the focus of industrial attention for the last two thousand years, containing as they do a one-metre band of bituminous oil shale.

The Dorset coast presents to the geologist a justly famous panorama of Mesozoic rock formations, from the Cretaceous Chalk east of Swanage to the Blue Lias at Lyme Regis. The Isle of Purbeck, upon which Kimmeridge is situated, is towards the eastern end of the sequence and the cliffs in this area present a cross section of Upper Jurassic beds. The formation in the bay itself consists of alternate beds of limestone, shale and clay that are rich in marine fossils. Kimmeridge has provided the type site for these beds. At sea level in the centre of the bay, they have the appearance of soft, crumbly shale dotted with crushed ammonites. In the high cliff to the east can be seen the overlying Purbeck and Portland Beds, but it is a lower bed that has proved to be the focus of attention.

This is the one-metre bed of bituminous oil shale, known locally as Blackstone. On the western side of the bay it is at sea level and rises eastwards in confirmation with the inclination of the strata. The first exploitation of the shale, however, was more general and occurred with the arrival of the Iron Age people in the area. Elsewhere they had used jet as an ornamental material, cutting and polishing it to make jewellery. Jet is not found on the Dorset coast but it was found that if shale is polished with beeswax, it takes on an appearance closely resembling jet. A jet substitute had been found. An Iron Age shale working was established in the bay to produce bracelets. The discarded cores were once common on the beach and were known as Kimmeridge coal money. The advent of the Romans made little difference to the industry. The demand was still present and the workings now became Romano-British. By this time, two factories were working and bracelets from Kimmeridge have been found as far afield as Corbridge, on the Roman wall. Flint tools were used throughout the period, again exploiting the local geology, although in later times iron tools were used for the first rough shaping. Two sizes of bracelet were produced; thus two items could be made from the same core without removing it from the lathe. Other, more sophisticated items from Kimmeridge include gold-studded mace heads and table legs. At a more prosaic level, a



third-century woman's grave contained a spindle whorl. The museums at Dorchester and Christchurch hold collections. The black shale was also used to make tesserae for use in the mosaic industry. A production workshop was located at Corfe Castle.

The market for luxury goods was extinguished with the departure of the Romans and it not until the 17th century that industry returned. The key to this next phase can be found in the use that local people found for the shale. On cold evenings they burnt it on their fires and although it did give warmth, it spluttered badly and gave off highly poisonous fumes. However, it did burn and as there are no local coalfields, it was as a substitute for coal it was next used.

Sir William Clavell was an outstanding figure by any standards and one wonders where he might have gone if his energies had been directed elsewhere. As it was he concentrated his energies on trying to develop an industry at Kimmeridge. His grandfather had purchased the manor in 1554 and it was here that Sir William joined battle with the cut-throat speculators of James the First. The first venture involved the production of alum. This contemporary account refers to the bituminous shale:

"The old Lord Mountjoy about forty yeres past discovered that the land of Kimridge was full of allom myne, and laboured with John Clavell, owner of these landes to joyne with him in his pattent to make allom in England. And tryalls were made on those landes, the mines of which worke, or some other of antiquitie yet remaynes. About ten yeres past Mr. Clavell acquainted his sonne Sir William Clavell with those proceedings, who thereupon laboured to find out coles neere adoiyning, knowing it behovefull for such his purpose; with much cost and labour hee atteyned. Whilest these things were in practize, some got from his majestie a pattent to make allom alone, wherein yet there was an exception to my Lord Mountjoys heires in all places put in tryall for making of allom, whereof Kimridge was one."

The above extract is from a work by Sir William entitled, "Arguments on behalf of Sir William Clavell, to prove hee ought to bee allowed to make allome, or well recompensed for his workes, to his content."

When this plea failed, he converted his industry to the extraction of salt which, another contemporary source tells us, "is made in great abundance, by boyling it out of sea water." Here again the constituents were available locally, seawater and bituminous shale for the fires. Once again he fell foul of patent holders. What happened next is best told in his own words:

"Sir William Clavell, unwilling to oppose his majesties perogative sat quietlie downe, and converted his courses to the making of salte, untill the Marchuante Patentees carried with the rumour of Sir William Clavells endeours sought him oute, and came in their persons 100 myles to compound with him: who took composition for his houses furnaces and cole pits, and agreed for £1000 per year rent.

After one yeare the said Marchuantes broke from all their bargaynes, ruined and ransackes all the allom houses, sold Sir William Clavells stocke of cattell from his ground to his infinite prejudice and for his recompense left his worke in disgrace."

The king granted him the right to restart his alum works but the drain on his finances had proved too great and he finished with a debt of £2,000. Part of this was due to him building a quay to enable small ships to call and export his products, thus overcoming the difficult land journey from his isolated position. The dimensions are given as '100 foote long and 60 foote broad', a size made possible by the high quality building stone adjacent to the site. This stood until 1745 when it was completely destroyed in a great storm.

Converting the alum works back into full production was his last and most ruinous undertaking. To it he added a glasshouse for the production of glass. This, like the alum works, relied on bituminous shale for the furnace. The Survey of Dorsetshire, published in 1620, gives a graphic description of the scene:

" ..... on the east side a hill yeelding myne (as they call it) for the allom works and a kind of bluish stones that serve to burne, for maintaining fire in the glasshouse but in burning yeelds such

offensive savour that the people labouring about those fires are more like furies than men.”

Once again trouble arrived in a familiar form. In 1614, a group headed by Admiral Sir Robert Mansell obtained a patent for making glass by coal. They persuaded the King to forbid the making of glass by wood, an easy task for an admiral in a navy of wooden ships when deforestation was becoming a worry. In 1617 Abraham Bigo obtained from this group a concession to build one glasshouse on the Isle of Purbeck to make green glass for the supply of the southwest. He went into partnership with Sir William who provided finance, land and fuel in the form of Blackstone.

It was now Sir William's turn to behave like his former adversaries. First he tried unsuccessfully to get the patent extinguished in Parliament and when this failed he fell two and a half years in arrears with the rent. Next he began to sell the glass in London, in direct contradiction to the concession. As a result, on August 23rd 1623, he was committed to the Marshalsea prison and his glassworks were closed down. After being released on a petition of ill-health, he reopened the works and promptly found himself back in the Marshalsea. The final act took place in 1626 when he agreed to foreswear glassmaking in return for an absolute pardon for any crimes he may have committed, including witchcraft! This was the final act of this industrial phase at Kimmeridge. Sir William's debt now stood at £20,000, ten times his previous one and it took three generations of careful husbandry to clear it.

For the next two hundred years the shale was confined to use as a local domestic fuel and also in bread ovens. Hutchins' History of Dorset, published in 1774, quotes the price for Blackstone as nine pence a hogshead or six shillings a ton. It was not until 1848 that the next enterprise got under way. For some time there had been awareness that by-products from coal could be profitable. The presence of oil at Kimmeridge is obvious to anyone who has seen it oozing out of the rocks and staining the sea. It was therefore as an alternative means of obtaining coal by-products more usually distilled from coal that the next episode of industry arrived. In 1848, The Bituminous Shale Company opened a factory at Weymouth to process shale from Kimmeridge. The shale was heated in distillation retorts. The products of the company included naphtha, paraffin, paraffin wax, lubricating grease and pitch. Unfortunately the high sulphur content of these products gave them an unpleasant smell. History then repeated itself with unerring accuracy. Two years after the company began production, Dr. James Young took out a patent for:

“Heating bituminous coals in such a manner as to obtain therefrom an oil containing parafine from which oil I obtain parafin wax” (*sic*).

This was one of the key patents in the developing coal industry. The Bituminous Shale Company fought the patent but it was ruled that shale was not a coal and that:

“The manufacture of offensively smelling and unmarketable oils from Kimmeridge Shales should not be held in anticipation of Dr. Young's patent”.

On top of the heavy costs of the action, the company was indicted as a nuisance, no doubt due to the sulphurous fumes, and was wound up in 1854.

A year or two after this, Messrs. Ferguson and Muschamp established a factory at Wareham to extract fertiliser from the shale. When this failed in short time, it was taken over by Wanostrocht and Co. who, with the assistance of the French Ambassador, secured the contract to light Paris. The firm, under the title of The Wareham Oil And Candle Company, flourished for several years. During this time the average monthly production was 50 tons of shale oil, a large but unspecified amount of gas and 200 tons of fertiliser, the latter sold under the name of Kimmeridge Guano. At the height of its prosperity it was exporting to America as well as France. Eventually it suffered the same fate as the Bituminous Shale Co. and was forced out of business by coal derived products.

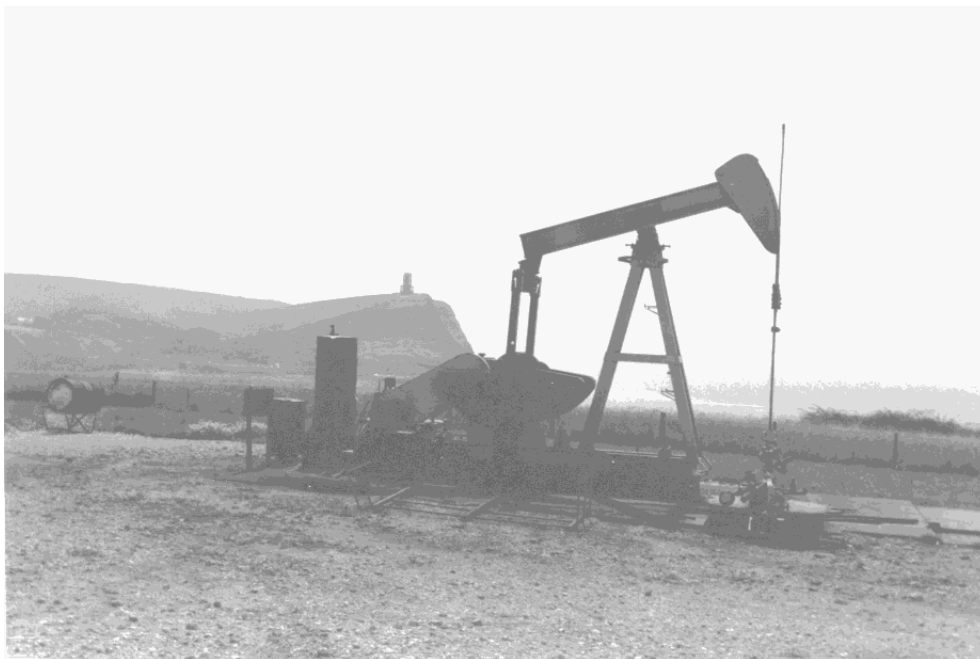
When Frederick Treeves visited the bay in 1901 the remnants of this industry were still visible, as he recorded in his book, Highways And Byways In Dorset:

“There are still to be seen in the corner of the cove the ruins of their abandoned pier, the rails they laid down from the quarry to the sea, and on those rails the skeletons of the trucks which helped them to fortune. Grass and weeds have nearly obliterated the remnants of the quay, which when

last tenanted rang with the valediction of French oaths.... About the ruins of the port of Kimmeridge the nettles have grown, many blackberry bushes thrive among its stones, and under the shelter of its dwindling walls are unheeding thistles in flower."

The most recent and continuing phase of industry at Kimmeridge began early in the last century. Once again it was an energy source that was exploited, this time oil. It was not to seek a substitute but a more stable source of supply than was available from other parts of the world. The search was to go deep into the Kimmeridge Anticline before it was successful. Oil seepage in the area of the coast first drew the interests of the petroleum companies. In 1918, Strahan and Pringle carried out a survey, but the thinness of the seam and the high sulphur content prevented any further action being taken. In 1935, Dr. G.M. Lees, chief geologist of the Anglo-Iranian Oil Company, carried out a survey of oil production prospects in Britain. Following this it was decided to drill at Kimmeridge. This was begun in December 1936 at Broad Bench but after making only 60 feet in three weeks the hole was abandoned. A second attack was made on the anticline in the following April, again at Broad Bench. At 827 feet the drill entered the Corallian and showed signs of a light oil, but at 943 feet, still in the Corallian, the drill broke, leaving both the drill pipe and core barrel in the well. As fishing attempts to recover these were unsuccessful, the borehole was abandoned.

During the war, the area of Broad Bench became part of the Lulworth Firing range and when the search was resumed in 1957 it was necessary to drill closer to the centre of the bay. This was called Kimmeridge Well One. The target of the new well was the Corallian but when this was reached nothing was found. The borehole was continued through the Oxford Clay beneath and into the Cornbrash at 1,790 feet. Here the drill struck oil and, in the words of the Guardian, Kimmeridge One became Britain's first gusher. On October 21st 1968 it became the first English oil well to produce more than 100,000 tons of crude oil, the equivalent of 28 million gallons, *see fig. two*. Well Two was sunk one mile to the east of Well One, but it entered the Cornbrash too low and yielded only reservoir water. Well Three, to the west of Well One, located oil in the Cornbrash but productivity was low so it was maintained as an observation well. Well Four was an information well to the northwest of Well One and established that the reservoir lay beneath the sea. As a result for a while drilling rigs appeared off the Dorset coast. Results did not justify further exploration at that time.



*Figure Two: The Nodding Donkey of Kimmeridge Well One, April 1970.  
In the background on Hen Cliff is the Clavell Tower, built by Sir William Clavell.*

For over two thousand years the geological resources of this quiet Dorset bay have been exploited according to the needs of the moment. In doing so, industry has completed a physical circle from the centre of the bay during the Iron Age, out to the eastern cliffs to extract the Blackstone and finally Kimmeridge Well One was sunk a short distance from where it all started.

#### AFTER WORD

Between the speculative ventures of earlier times, the local people would have had to survive as best they could, often amid the wasteland left by the previous undertaking. Evidence of one way that they did so is to be found in 'The Calendar of Dorchester Prison' for the year 1834. Page five of this book records the deportation of the Tolpuddle Martyrs, but it is page four that provides our evidence. It concerns six men, one of whom was only 16:

"Committed by the Rev Nathan Bond and the Rev. George Pickeard Jun. Charged on the authority of Lt. H. John Carr, chief officer of coast guard stationed at Kimmeridge on the Isle of Purbeck and others, of having been found with divers others unknown, armed with sticks, at a place called Gadcliffe in the parish of Tyneham on the said isle, on the evening of the 31st January, they being then and there assembled in order to be aiding and assisting in the illegal landing, running and carrying away of prohibited goods.

Warrant dated 10 Feb. 1834 Death recorded."

It is fanciful to suppose that the contents of these and similarly 'imported' bottles may have started life as grapes growing on the Kimmeridgian of France.

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## GEOLOGY SOCIETIES AND LOCAL GROUPS - CLARIFICATION

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*We are often asked to explain so - - -*

The *Geologists' Association* has members which range from professionals to amateurs. Anyone can join by filling in an application form. It is based at Burlington House in London. Our nearest local group is the *West of England Geologists' Association, (WEGA)*, based in Bristol. Occasionally we have joint field meetings with this group. *Bath Geological Society* is affiliated to the Geologists' Association.

The *Geological Society*, also based at Burlington House in London, is for professional geologists. You have to be nominated to become a Fellow. Our local group is the *Western Region* whose members frequently join our activities.

There is also the Geological Section of the *Bristol Naturalists' Society* and, again, we share a number of field trips.