St. Aldhelm Box Ground Stone Mine, Wilts.

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BATH Oolite belongs to what geologists call "Jurassic" formation. When cut in its green state it is of a warm yellow colour and hardens on exposure to the air and evaporation of the moisture. The spherulitic granules or eggs whence its name of which the rock is composed have often been examined microscopically, and usually fail to exhibit any organic structure, consisting merely of concentric films of carbonate of lime.

Nowhere in Great Britain, and probably in Europe are the lower members of the Jurassic group of rocks so extensively developed as in the Bath district. The fine freestone or building beds of the Bath Stone series vary in the number and thickness, and are distinguished from each other by their structural condition. These beds are remarkable from the fact that they exist from 70 to 100 feet under the surface, and are therefore quarried, or rather mined, in long tunnels, and to-day after many years during which the stone has been extracted, the workings of the Bath and Portland Stone Firms, Limited, alone extend to over 60 miles in length.

When the shafts were sunk along the line of the Box Tunnel on the Great Western Railway, they were carried through at several points of the beds of the great Oolite. Clear evidence here was shown of the succession of the strata which led to the re-development of the stone in that district, and as years

went on more ground was prospected through Corsham and as far as Monks Park, revealing the existence of the Oolite formation in varying thicknesses and quality. Indeed we may truly say that Brunel's famous tunnel, which was looked upon as unnecessary from an engineering point of view, not only led to the vast development of Bath Stone, but also enabled the Great Western Railway to reap a rich harvest in freights such as they and Brunel never anticipated.

In quarrying stone the first question is to determine whether it shall be reached by an open or underground working, and this must depend upon the condition of the upper rag stones; they must of necessity be passed through to reach the stone, and tunnelling on the face of an escarpment such as at Box and Farleigh, or sinking a slope shaft as in the Corsham district, proved the best and most economical process. One system of getting the stone prevails throughout the quarries, and this system is an inversion of the mode of working coal. The coal miner in many mines undercuts his coal that the mass may fall and break, but building stones so worked would make a valueless rubbish heap. The freestone miner or quarryman has to commence his operations at the roof of the stone. This picking operation is effected by means of adze-shaped picks, on the heads of which longer handles are inserted as the work proceeds, and the men thus making their driving a distance of six to seven feet back into the rock. The width or span of these stalls must of course depend on the soundness of the rock. At Monks Park they can be driven without danger a width of 25 to 30 feet. In the Box Ground quarries, where the rock is not so sound and the capping or ceiling bed not so regular, the openings are limited to from 12 to 20 feet.

It must be evident to all who witness the process heretofore described that the removal of eight or nine inches of the rock immediately under the ceiling deprives the overlying strata of the support of this area of stone, as effectually as its removal throughout from roof to floor would do; and any tendency for

the ceiling to settle or fall is at once detected and risk of life and limb guarded against. Another process, by a fresh agency, is now called into exercise, for the cutting of the rock into blocks of suitable dimensions; for this purpose a one-handled saw is used. These saws are worked in lengths of four, five, six and seven feet, and are made broad and deep at the head or extreme point, so as to ensure the saw sinking to its work at that point. The saw is worked in first horizontally, dropping a little as the cut goes on, and after the rock is thus opened down to the next natural parting, or bed, the block is thus separated laterally from the parent rock, levers are introduced into the bed at the bottom of the block, weighted and shaken till the block is forcibly detached at the back. It is then drawn away by the crane, and the broken end and the bed dressed with the axe, so as to make the block shapely; placed on a trolley and conveyed by horses to the loading station on the Great Western Railway, passing on tram lines through the fields. After the first block is removed it is evident that the workmen have then access by that opening to the back of the bank of stone, and they avail themselves of this to work the saw transversely, which, separating the block from its back or hinder attachment, renders all further breaking off unnecessary, so the first block of each face is the only stone broken from the rock. To each face or heading of work, a 10-ton crane is erected in such position as to command the whole face. After a block of freestone has been loosened *in situ*, a lewis bolt is let into the face of the block, the chain of the crane attached to it, and the block is then drawn out horizontally. By the removal of the first stratum a sufficient space is obtained to allow the workmen an entrance under the roof; and vertical cuts are again carried through the next bed to the parting below, and tranverse cuts readily made; meanwhile the cutting is continued in the picking bed, the upper layer removed as before, and everything below this point quarried away, with all the sides of the block sawn, except the bed on which it has

rested, and those abutting on the natural joints. Hence each block comes out ready to pass into the hands of the mason and builder.

In the neighbourhood of Box Hill, both above and on each side of Brunel's famous tunnel, Oolite has been extracted in large quantities, even so far back as Saxon times. Haselbury "*Quarre*" or *Quarry*, a little to the south of the entrance of the St. Aldhelm Box Ground Quarry, has been identified as the place where the stone was taken out for building Malmesbury Abbey, nearly a thousand years ago. It was taken from land belonging to the Prior of Bradenstoke, but is now part of our company's workings, and it is an interesting fact that stone from the same strata was quarried for the purpose of its recent restoration. This is truly remarkable evidence of historical continuity so far as stone is concerned.

The tradition of the discovery of the famous stone at Box, known as Box Ground, is not generally known. According to the legend, St. Aldhelm, a man of distinguished piety and virtue, being about to found this Abbey at Malmesbury, indicated, by throwing down his glove, the spot where stone might be found, or, to use the words of Aubrey, the learned Wiltshire antiquary: "Haslebury Quarre (i.e. Box) is not to be forgot; it is the eminentiest freestone quarry in the West of England, Malmsbury, and all round the country of it. The old men's story that St. Aldhelm, riding over there, threw down his glove and bade them digge and they should find great treasure, meaning the quarry." Little did this learned prelate think that the great treasure which Brunel also assisted to discover should still be worked after a lapse of eleven hundred years. St. Aldhelm also built the little church of St. Lawrence, at Bradford-on-Avon, probably the most perfect specimen of Saxon architecture in this country, of which Professor Freeman says:—"This, the one surviving old English Church in the land," and probably the oldest English church in the land. It seems only natural that such a keen observer

as Leland should note the existence of these quarries, for in the account of his itinerary, he says "I left the left hand on the toppe of a little hille a hermitage; withyn a little I turned down to Hasilbyre."

The quarries near Box have supplied stone for the erection of many other noteworthy and historic buildings. Among them are Lacock Abbey, and mansions at Shockerwick, Bowood and Corsham Court. The Augustinian Abbey of Lacock is situated in an old Wiltshire town about three miles south of Chippenham, on the high road between Bath and London. Lacock Abbey is of historical importance. It was founded in 1232 by Ela, daughter and heiress of the Norman Earl of Salisbury. Seven years after its foundation she herself became its abbess. When Queen Elizabeth visited Bath in 1574, she stayed at the Abbey on her way thither. Lacock Abbey was fortified and garrisoned for the King during the great rebellion; it was besieged in 1645 by Parliamentary troops, and the garrison was forced to surrender on honorable terms. This structure is one of the best examples of a building of Bath stone, though much of the present building, and surrounding out-buildings, are 16th century work. Mr. Harold Brakspear states that the Abbey buildings were constructed with rubble walls of hard stone, and dressings of freestone, and was supplied from the Haselbury Quarre in the Manor of Box. In the Lacock cartulary, preserved at the Abbey, "Henry Cook or Crook gives to the Convent the quarry between the lands of Sampson, Lord of the Manor of Boxe, and Walter Campedene, with the liberty of ingress and egress so long as it lasts."

This quarry, in 1241, was an open one with an adit or tunnel into the sides of the hill over the present Box Tunnel. Probably this portion of Henry Crook's domains became worked out, for one, Robert Abbot of Stanley, in Wiltshire, whose abbey was built with stone from the same quarry, gave to the said convent one part of his quarry "at Haselburry, being, in

length, 76 feet, and in width that which was theirs, and they may take as much stone as they can from that place in exchange for that other quarry that the Convent bought of Henry Crook."

A stone trough is to be seen in the refectory at Lacock Abbey, which must have weighed, before cutting, at least 10 tons, and it is remarkable that so large a stone could have been conveyed so many miles from the quarry. The beautiful renaissance mansion, "Longleat," the seat of the Marquis of Bath, was built with Box stone in the 16th century, John of Padua being the reputed architect. Sir John Thynne, an ancestor of the present Marquis, purchased an acre of quarry land at Haselbury, and it was from here the stone was taken to build this stately residence.

Henry VII Chapel of Westminster, parts of Windsor Castle, and Apsley House [the gift of the nation to the Great Duke of Wellington] were cased in Box stone, while portions were used in the construction of Lambeth Palace.

To-day many thousands of tons are sent out from this famous quarry for building work, not only in this country, but in Canada also.