An engineering perspective on the Industrial Archaeology of the Purbeck Stone Industry

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A thesis submitted in partial fulfilment of the requirements of Bournemouth University for the degree of Doctor of Philosophy

January 1994

Bournemouth University

SYNOPSIS

This thesis is a study of the industrial archaeology of the Purbeck Stone Industry, set within the context of local social and economic history and informed especially by an engineering perspective on the quarrying and mining operations. A wide range of existing published sources and archive evidence has been evaluated, placing the work in the context of existing knowledge, and an extensive field survey of stone extraction and related industrial sites in the Purbeck area has been undertaken, including the creation of a large photographic archive. Major buildings in which Purbeck stone has been used as a constructional material have also been examined to illustrate the market for the material at various historical periods and to show how the various types of stone were able to be used, and the relationship of potential use to methods of extraction and working.

The study examines all aspects of the extraction and working of the stone in Purbeck, illustrating how masons quarried, dressed and carved the stone before it was transported to its major markets, and examines the techniques of quarrying, mining, working, carving and transporting the stone providing a much improved understanding of this neglected area of the industry. In addition, the effect of the industry on the local community is examined, and the roles of the craft guild, landowners and stone merchants evaluated and explained. The importance of transport is also stressed, and the changing technical approaches to the movement of this heavy raw material are considered.

Finally the thesis explores some important aspects of twentieth century stone production, noting the importance of changes in planning laws, apprentice training and stone conservation and how these relate to the future prospects for the industry.

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ACKNOWLEDGEMENTS

In appreciation of the assistance given to me in compiling this thesis I wish to record my thanks to the following individuals and organisations:-

The staffs of the Dorset County Council Reference Library, Records Office and Planning Department, English Heritage, Southampton Records Office, Southampton University Library, Portsmouth Reference Library, Dorchester Museum, Purbeck District Council,Bournemouth University Library, Swanage Tithebarn Museum, Swanage Town Council, Dorset Industrial Archaeological Society, the Ironbridge Institute, the Department of Conservation Sciences, Bournemouth University, Weymouth College, Dorset Natural History and Archaeological Society, Somerset and Dorset Notes and Queries, Langton Matravers Local History and Preservation Society and the Coach House Museum, Langton Matravers.

For allowing me to incorporate published material my thanks are due to all the authors and publishers who granted me permission, acknowledgement given in bibliography.

For taking time out to show me round their quarries and explain the whole process I thank Mssrs. Lovell (Hardens Quarry) Landers (Landers Quarry), Ford (Swanworth Quarry), Haysom (St. Aldhelms Quarry), Suttle (Swanage Quarries) and Bonfield (Blacklands Quarry).

For depositing papers with Dorset County Records Office I record my appreciation to Thomas Coombes and Son (Solicitors), Filliter family archive, Mowlem of Swanage archive, Ryder of Wareham, Rempstone estate archive, Neville-Jones and Howie (Solicitors), Dorset Natural Hiistory & Archaeology Society, Corfe Castle P.C.C., Swanage Town Council and the Ministry of Agriculture, Food & Fisheries.

For their help and encouragement I thank Prof B Brown, Prof J Ashurst, Dr J Beavis, Dr P Stanier, Mr F G Dimes, Mr A J Burt, Mr. A G L Hardy, Mr R J Saville, Mr D.Lewer and Mary Spencer Watson.

My special thanks are due to Mr Brian R Bugler for taking me down a stonemine, allowing me to quote from 'Purbeck Shop' and allowing me to draw and reproduce his underground surveys.

For typing the thesis from my hand written draft and making it legible, I thank Lindsay, Pamela, Maureen and Clare.

Finally my apologies to anyone who should have been included in these acknowledgements and has inadvertently been overlooked.

In gratitude for all her help and support I dedicate this thesis to my wife Rita.

'Attempt the end, and never stand to doubt; Nothings so hard, but search will find it out'
Herrick

'Rude as I am in speech and little blessed with the soft phrase of peace, yet, by your gratious patience, I will a round unvarnished tale deliver'
Othello

An engineering perspective on the Industrial Archaeology of the Purbeck Stone Industry

Introduction

The County of Dorset is situated on the south coast of England and covers an area of 2655 sq km (1025 sq. miles), its coastline running for 142 km (88 miles) along the English channel. It is predominantly a rural area of rolling hills and valleys, often pictured as the landscape of Thomas Hardy, but with a modern urban concentration in its south east corner based upon the nineteenth and twentieth century growth of the holiday industry in Bournemouth, Poole and Christchurch.

Within the county the Isle of Purbeck is a distinct entity with a clear geological basis. It is not a true island but a peninsula of some 155 sq. km. (60 sq. miles) historically relatively isolated from the rest of the county by water and heathland. It forms the present basis of a local government District Council, and retains by virtue of relatively restricted road access (and vehicle ferry access from Poole) a degree of isolation and relative economic difficulty which is in sharp contrast to the relatively prosperous, metropolitan and industrial conurbation with which it shares the shores of Poole Harbour. A map defining the Isle of Purbeck is shown in Fig 1.I, and on the south side of the Purbeck Hills lie the deposits of stone which are the focus of study of this research.

This thesis is a study of the Industrial Archaeology of the Purbeck Stone Industry informed from an engineering perspective and has been designed to develop an increased understanding of the historical identification of resources, techniques of quarrying, mining and extraction, and of the treatment and use of the stone. It builds upon previous work on the general historical development of the Purbeck Stone industry by a number of authors: Roman uses for example are covered by Dunning (1948) and Beavis (1971), medieval events by Hutchins (1861-74), and medieval stone usage by Leach (1978). The life of a medieval mason has been discussed comprehensively by Knoop and Jones (1967) and the usage of Purbeck paving stones in the 17-19th century is covered by Jeffery (1988). A study of redundant Purbeck quarries was undertaken by Mason (1984) and Cockburn (1973) carried out a more general study of Dorset quarrying, with both

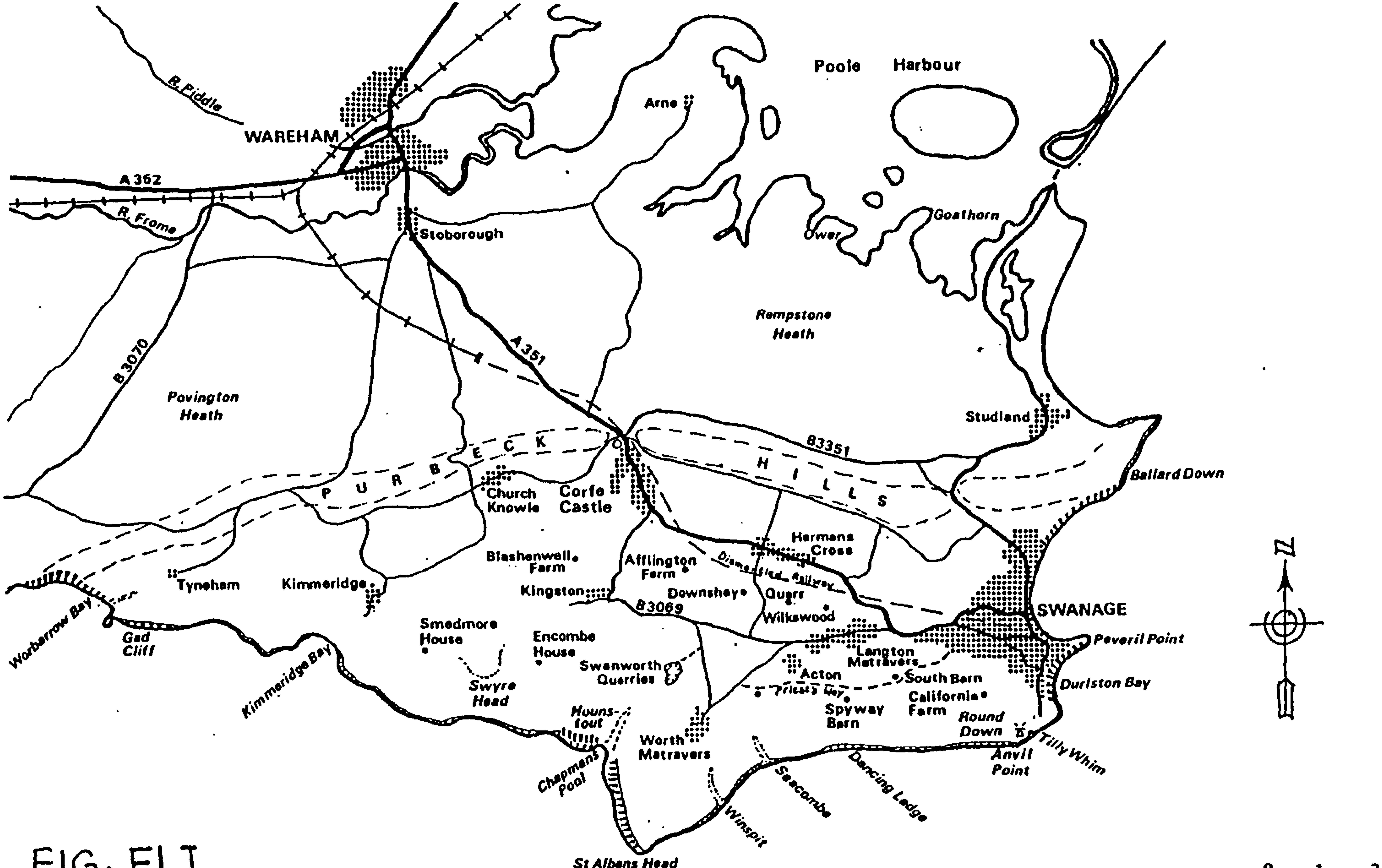


FIG. F1.I

THE ISLE OF PURBECK.

authors giving a general history of the stone industry. Benfield (1990) gives a graphic account of the traditions, craft, work and life of a Purbeck quarryman and Legg (1989) gives a general history of the industry. In addition the historical importance of the product in the national building heritage is already well understood (for example Salzman 1968, Clifton-Taylor 1983, Davey 1976, Leach 1978).

The first recorded use of Purbeck stone was by the Romans, who used the outcropping polishable limestone known as Purbeck marble for mortars, as grindstones, and for inscribed memorial tablets, examples of the latter having been found in England and France (Dunning, 1966). Following the Norman invasion there was a 'building boom' in castles and churches, and while the Norman masons originally imported their familiar Caen stone they later began to use stone quarried locally. Thus Corfe Castle was built from 1090 using locally quarried burr stone, a hard limestone which lies immediately below the Purbeck marble seam but yields only relatively small blocks.

Medieval cathedral and church building which began in the 12th century created a demand for black and white marble that was used in the interior decoration of Italian cathedrals. As it proved prohibitively expensive to import Italian marble into England pale limestone was substituted for white marble and polished Purbeck marble, darkened with grease, was substituted for black marble. By the middle of the 14th century the industry gradually declined owing to a change in architectural styles, the discovery that Purbeck marble will flake in certain conditions, and the availability of alternative stone from other areas of England.

Following the Great Fire of London in 1666, which brought about changes in building construction and materials, demand for building stone increased steadily into the Industrial Revolution period. Purbeck was able to meet some of these demands by supplying not only monumental materials but a wide variety of smaller but important items including paving stones, gutters, kerbs and stone components for buildings such as sinks, steps, window cills and lintels. Purbeck stone was particularly suited for such purposes as it could be split, relatively easily, into the required thickness.

Following the introduction of tarmacadam and later concrete paving slabs the requirement for 'Purbeck squares", as the paving stones were called, was reduced. At the present time Purbeck stone is only used for walls, fireplaces and crushed stone for roadworks, although the quality freestone is still being used for prestige projects. There is however a requirement for Purbeck marble to replace original components that have eroded over the centuries and as the easily won marble was quarried in medieval times, deeper digging is required to get down to the marble that remains.

Stone was originally quarried from shallow open cast surface outcrops, this was followed by underground mining using adit entrances and sea cliff mining using galleries driven into the cliffs. Underground mining and sea cliff galleries left the overburden intact because removing it would have been uneconomic using the hand tools of the period. With the advent of improved earth moving machinery coupled with the closing of the underground mines on safety grounds from 1947, the present mining method is open cast, which is a return to the original method. Being located on or near the coast the Purbeck quarries were ideally located to supply stone over a wide area by sea transport. Purbeck marble can be found in many churches and Cathedrals in the south, Purbeck stone can be seen in dock quays, sea walls and forts along the coast and also incorporated in the pavements of London and other towns in the South.

Aims and Objectives

The aim of this research is to provide a comprehensive review of the industrial archaeology of the Purbeck Stone Industry, and to set this within a broad engineering context as well as within the appropriate social and economic history. The work thus sets out to define the uses of Purbeck stone, explain the extractive processes, and to relate this to issues of transportation, stone working and use. In order to achieve this aim a programme of research has been undertaken which has been designed to bring together and evaluate as much as possible of the surviving written evidence of the industry in Dorset, to illuminate documentary sources by the detailed field investigation of sites, and to develop greater understanding of the technical approaches developed within the industry by reference to both historical and contemporary knowledge of stone working and the masonry trades, including an examination of the use of the stone in major historic buildings. The work has therefore included detailed investigation of the history of the stone quarrying and mining trades, drawing upon existing published accounts, in order to set a national and international context for the study, supported by historical research in documentary sources, especially those in Dorset archives, and most importantly by a series of extensive site investigations, including the production of drawings and technical illustrations based upon archaeological evidence.

The methodology and approach to the work is derived from the growing body of research and publications in the field of industrial archaeology, and it is useful at this point to note the development of this relatively new interdisciplinary field within which there are a number of divergent views upon methodology and objectives.

The term.Industrial Archaeology is relatively new. Kenneth Hudson (1966) records that the term itself was invented in the 1950s by Donald Dudley (at that time Director of the Extra-Mural Department at Birmingham University), although Neil Cossons (1987) noted that the study of the technological aspects of industrialisation is much older than industrial archaeology, centring especially around the activities and interests of the Newcomen Society, which was formed in 1919. The first appearance of the name in print occurred in 1955, when the late Michael Rix published an article in *The Amateur Historian* emphasising the need to record and preserve the remains of industrialisation before they disappeared (Cossons, 1987). However, as early as 1966 Hudson had noted that since Rix had given the phrase Industrial Archaeology to the world it had been much disliked and strongly criticised, although nobody had yet been able to suggest a more acceptable alternative! Hudson also reasoned that a necessarily hybrid subject such as Industrial Archaeology is bound to be regarded with great suspicion, if not outright hostility, by academics who prefer to see firm and clear dividing lines between different fields of study, and in many ways the subject has still to find a secure location in an academic context in the United Kingdom. Thus the label 'Industrial Archaeologist' has come under equally heavy fire from economists, historians and archaeologists, perhaps partly for reasons of sheer conservatism, partly from resentment against an upstart and partly because of serious and genuine doubts that Industrial Archaeology can be made into a serious academic discipline.

Nevertheless, the sheer volume of publications and the extent of both professional, governmental and public interest in the industrial past and its physical remains is an indication that here is a serious subject worthy of investigation, but the very nature of the objects and events under study necessitate a very broad interdisciplinary approach. The difficulties which industrial archaeologists thus often face derive from this potential diversity, and are illustrated well by the problems faced in defining the historical periods which are appropriate for study. For example, Neil Cossons (1987) stated that the period covered by the Industrial Revolution attracts the Industrial Archaeologist because 75% of the built environment dates from this period and dominated the landscape. Following the second World War the study of blast furnaces, mills, canals, railways and industrial landscapes began to grow which was the beginning of Industrial Archaeology. The Industrial Revolution period (itself the subject of many different definitions) provided the core area or mainspring of Industrial Archaeology, but the evolution of water and wind power in the 18th and 19th centuries can only be appreciated in the context of much earlier developments.

Other authors have argued that the subject should not be wholly confined to industrial activity but should consider both the cultural aspect and the landscape in its entirety. Raistrick (1972) for example makes an eloquent plea that there really should be no limiting dates to the study of industrial archaeology and that Roman lead mining, medieval bloomeries and 20th century cinemas are equally fit subjects for investigation.

In seeking a definition of the subject R A Buchanan (1972) stated that industrial archaeology 'is concerned with examining the process of industrialisation through a systematic study of its surviving monuments and artefacts. It is a study to which everyone can bring some expertise, whether it be the skill of the architect or engineer, the experience of the manual worker or housewife, or the craft of the teacher or historian, and expect to find a useful and rewarding field of investigation. In the best sense of the term, industrial archaeology is thus an interdisciplinary study'. Buchanan's definition is that industrial archaeology is a field of study concerned with investigating, surveying, recording and in some cases, with preserving industrial monuments. It aims, moreover, at assessing the significance of these monuments in the context of social and technological history which call for documentary research and analysis. Furthermore, Buchanan (1968) has also suggested that there are two major incentives which make the study of industrial archaeology worthwhile, the historical and cultural. Future historians will be grateful for the records of industrial relics which would otherwise have disappeared without trace. The cultural incentive involves the preservation of carefully selected industrial monuments as significant elements in our cultural tradition and heritage, the emphasis being on careful selection.

In a similar manner Butt and Donachie (1979) stated that the industrial archaeologist is concerned to use the physical remains to remedy the deficiencies in the existing record, to complement other historical evidence and to assist in the testing of current orthodox interpretation of past cultures. Bracegirdle (1973) commented that in recent years there has been a growing concern with the physical remains of the factories, plant and transport systems left behind by the onward march of progress but there are great opportunities for original research into ports and harbours, the clay industries, quarrying, roads and the smaller workshops and factories.

After several decades of increasing professional and amateur activity, growing government interest in the industrial heritage expressed through the activities of bodies such as English Heritage and the major tourist-related and museum developments of industrial heritage sites in Britain and throughout Europe, it was possible for Crompton (1994), the Association for Industrial Archaeology (AIA) President, to write that industrial archaeology is no longer a fire brigade activity but a contributor to a planned process by which the recognition, recording and protection of industrial heritage has its place alongside all other aspects of environmental activity. Thus the AIA (1991) issued a document entitled 'Working for the Future' which was addressed to those responsible for the disbursement of funds in the public and private sectors. It seeks to recommend priorities in research and conservation which will serve as criteria for the selection of projects to make best use of the undoubtedly limited funds that are available, and illustrates the progress which has been made in the understanding and general appreciation of the industrial past.

The methodology chosen for this thesis follows the approaches taken in other major regionally based surveys which are of a general nature, and is based upon a broad synthesis of the available documentary and field resources which are able to illumine the general understanding of the Purbeck Stone Industry: it has been designed to provide a wide ranging examination of the Purbeck stone industry with particular reference to its technological, historical and social aspects.

Existing Knowledge and Information Sources

The major existing published information on the industry may be divided into two groups, one concentrating on the uses of Purbeck stone and the other on Purbeck's history. Mining and quarrying methods have been mentioned but not researched in depth and the technical and practical problems faced by a quarrymen have not been considered adequately.

Existing literature covers three distinct periods, Roman, medieval and 17th-19th century and references after these dates are fairly sparse. Roman usage is covered by Beavis (1968) and Dunning (1948), medieval events are covered by Hutchins (1861 - 74), medieval usage by Leach (1978) and the life of a medieval mason by Knoop and Jones (1967). The use of Purbeck paving stones in the 17th - 19th century is covered by Jeffery (1988). Redundant Purbeck quarries were studied by Mason (1984) and Cockburn (1973) carried out a more general study of Dorset quarries with each author giving a general history of the stone industry. Benfield (1990) gives a graphic account of the traditions, craft, working conditions and life of a Purbeck quarryman and Legg (1989) gives a general history of the industry.

In addition to the above works there are extensive sources of information, but these are fragmented and comprise references in books not specifically devoted to Purbeck stone. Other sources are census returns, trade journals, directories, historic maps, newspaper reports, archive material and cathedral publications. A comprehensive listing of these primary sources is given in the Appendix, and access to such sources in major archives was undertaken and guided by extensive use of existing index sources, especially in the Dorset County Record Office. Where appropriate field surveys of mining and quarrying sites has been undertaken, and some underground exploration was possible although was not able to produce original survey material for reasons of safety and restricted access. In addition, it was possible to establish an extensive photographic archive of mining, quarrying and working sites, and many of these illustrations are included within the thesis.

This thesis thus examines and syntheses evidence of various types on the techniques of quarrying, mining, extracting, working, transporting and treatment of stone to obtain a better understanding of these operations. In addition, the effect that the stone industry has had on the community is examined by reference largely to published and archive materials, including landowners papers and quarry leases, and a variety of published material which considers the influence of the local craft guild, the creation of a 'stone economy', role of the stone merchants, effect of transport, improvements and the rise and fall of the industry. In addition, the thesis examines the effects of new techniques on the industry and economy.

Previous research on the Purbeck Stone Industry appears to have placed little systematic effort into developing an understanding of the engineering and technical aspects of the physical operations. In consequence the archaeology of the industry, especially in relation to the understanding of the industry within the Purbeck area and the surviving underground and surface remains from all past production periods, should benefit from a new and extensive investigation of the historical and archaeological evidence which places an emphasis upon the processes and methods as well as its social and economic history.

Chapter 1:

The Geology of Purbeck

An understanding of the geological conditions is an essential underpinning for the consideration of the development of the stone industry in Purbeck. In the Isle of Purbeck the geology is varied and complex, the beds are faulted and folded and the same bed of stone may be easy to quarry in one area where it is near the surface, but not in another where it is deep underground. The intentions of this chapter are to give a general picture of the geology of Purbeck in the quarrying areas, and to explain the difference between Purbeck-Portland and Purbeck stone along with the geological definitions and local names for the more popular stones that are, and have been, quarried.

The oolitic limestones of England are very important in the development of English architecture and in our townscapes. These stones are a product of the Jurassic age, and were laid down in fairly shallow warm sea conditions. They are called oolitic limestones because the most characteristic look to the naked eye to be composed of masses of small round eggs like fish roe (Shore, 1957) Ooliths are radial and concentric build ups of calcium carbonate which was deposited either as loose particles from the skeletons and shells of living organisms or chemically. The calcium carbonate is built up in concentric layers around a grain of sand or piece of shell which acted as a nucleus and formed loose particles. Additional calcium carbonate was slightly dissolved by the action of acidic water containing carbon dioxide and this dissolved calcium carbonate was then deposited amongst the loose particles in patches, cementing them together and ultimately producing the beds of stone. All this deposition took place at the bottom of the sea and when formed the stone was further compacted by both the weight of further sediments above and pressure caused by movements of the earth's surface.

Limestones are sedimentary rocks deposited in layers which are known as beds, laid down in parallel bounded top and bottom by a bedding plane which indicates where interruptions occurred in the laying down of the sediment. The depth of each bed is the distance between the bedding planes which are very important when the stone is being quarried because they indicate where one bed can be separated from the adjoining beds. Vertical joints are also very important in quarrying and these joints were caused as each layer of sedimentary rock dried out causing shrinkage cracks or joints (Leary 1983).

Sedimentary rocks are a layered structure and this must be borne in mind when placing stones in buildings: a bed of stone is rather like a ream of paper and should be restrained to prevent layers separating and being lost. Thus stones should be placed on their natural bed so that each layer is horizontal, just as they were laid down geologically, exceptions to this rule are negligible. Placing stone on beds applies a limit to the depth of stone available, and this in turn governs the height of courses in a building, which again may be less than the total depth of the stone bed when wastage occurs. Purbeck-Portland stone is classed as a freestone as a result of its property of carving well in any direction, and the oolitic structure is not pronounced.

In the limestone system there is great variety in the colour and texture of the stone quarried and the English oolitic limestone area from the Jurassic period is shown in Fig 1.1. A geological map of the county of Dorset is shown in Fig 2.1. The geology of Purbeck is shown in Fig 3.1, showing the upper, middle and lower Purbeck beds and the Portland stone beds which are discussed in detail below.

Purbeck stone of the upper, middle and lower beds are freshwater and marine limestones from which are quarried general building stone and Purbeck 'marble', whilst the Purbeck-Portland beds are fine marine limestones . The natural bedding planes have over the centuries been allocated names by the Purbeck quarriers to distinguish one bed from another and are the basis of geological definition. Hutchins (1861-74), with Bonfield's assistance, set down the names allocated to the beds of stone and indicated the stones most commonly used and these are shown in Table 1.1.

The four seams of stone that are quarried are the Lannen, Freestone, Downs Vein and New Vein seams and these, along with the type of stone they yield are shown in the table. All the examples given by Hutchins (1861-74) refer to the kinds of stone quarried at Swanage and neighbouring districts and it can be seen that the Freestone seams lie 60ft below the surface of the ground which required an inclined shaft to be sunk to this level in order to quarry the freestone.

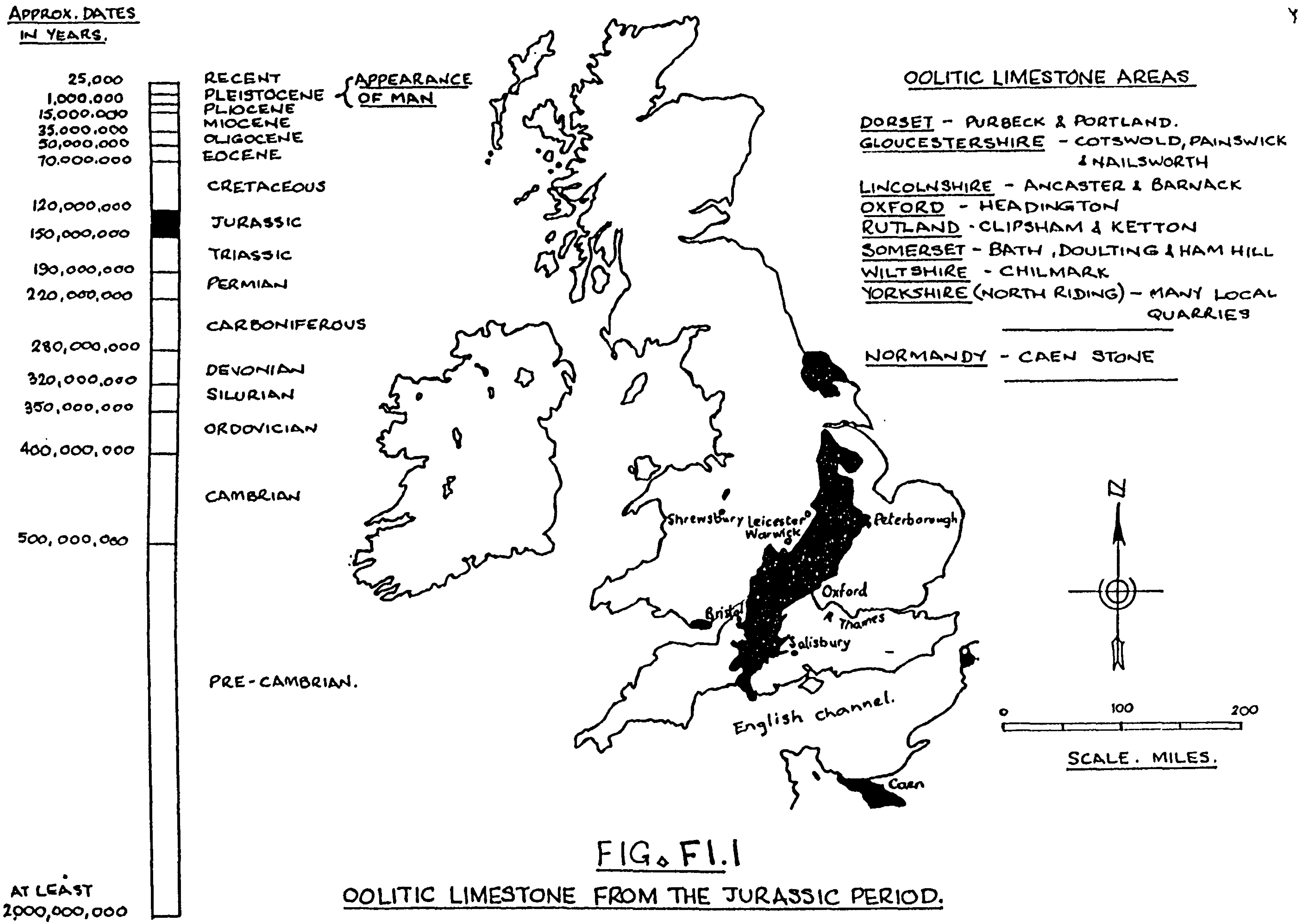


FIG. F1.1

OOLITIC LIMESTONE FROM THE JURASSIC PERIOD.

STONES OF BRITAIN BY. B.C.G. SHORE.

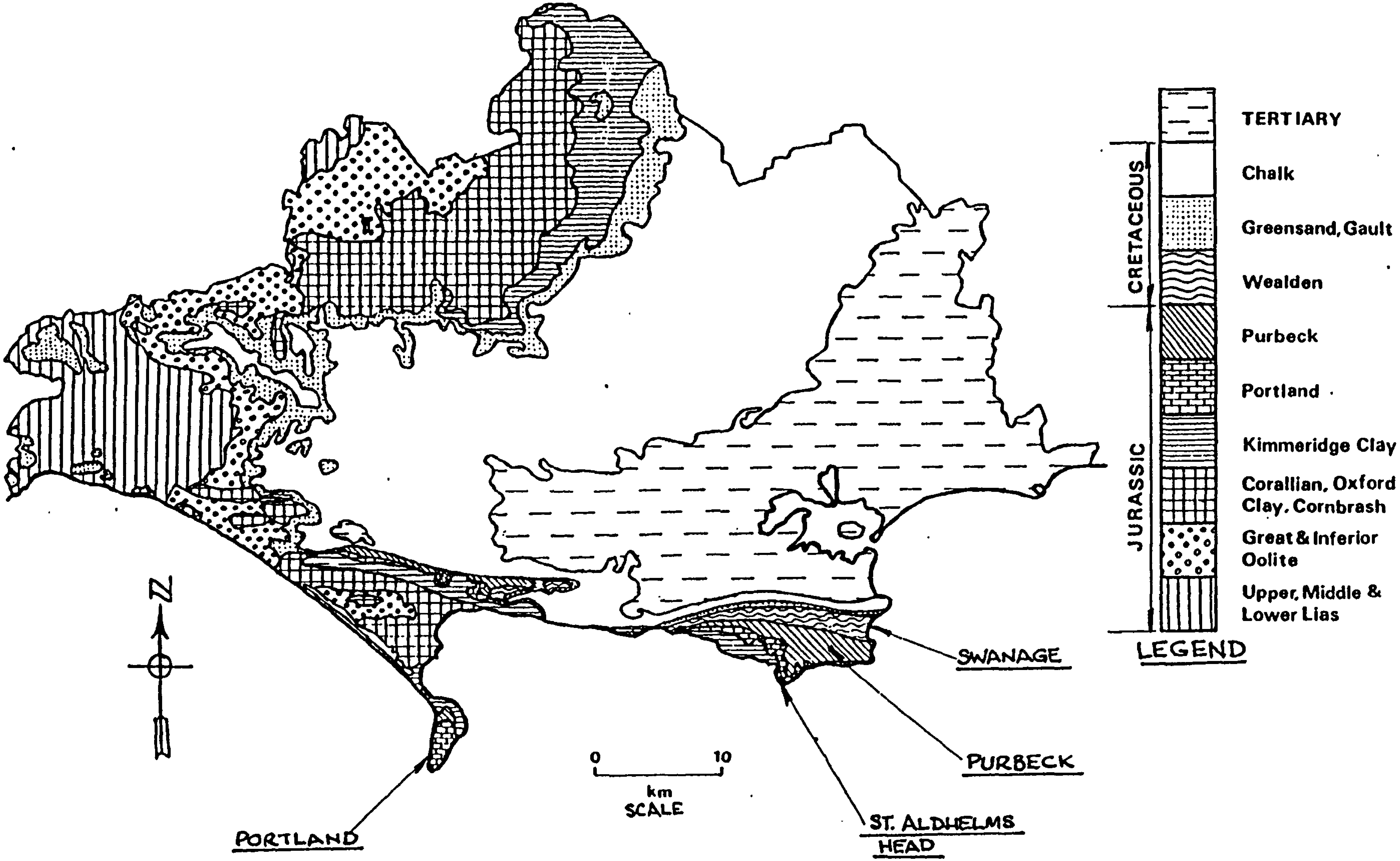


FIG. F2.1
GEOLOGY OF DORSET.

FIG. F3.1
PURBECK GEOLOGY.

TABLE 1.1

	FT	IN	
Surface earth	3	0	
Leper Stone (good)	0	9	
Single Leper stone (good)	0	9	
Earth	2	6	
Step bed stone	0	6	
Earth and hones	9	0	
White rag	0	7	
Earth	0	6	
Blue bed	1	8	
Earth and hones	6	0	
Red rag	0	3	
Earth	2	0	
Toads eye stone	1	0	
Thick rag above the lane and end vein stone, which is the ceiling of the lannen vein	1	1	
Earth	0	6	Lane and End (lannen) vein seams
Pitching stone bed	0	8	
Tombstone bed	0	8	
White roach (good)	1	1	
Earth that quarrymen undermine	0	9	
Leper stone (the best quality)	0	11	
White bed (ditto)	0	11	
Sat bed (ditto)	0	7	
Hard bed (ditto)	0	8	
Mock hard bed, the bottom of the lane and end vein stone	1	0	
Earth	1	6	
Backing bed	0	10	
Earth	2	6	
Ryall	0	10	
Earth	3	0	
Devils bed (good)	0	6	
Earth	2	0	
Freestone rag (good)	6	0	
Lid bed	0	7	
Shitte bed	1	6	
Shingle, above the stone called freestone, which is the ceiling of the freestone seams	1	0	

	Grubb earth	1	0	
	Thick grubb stone	0	3	
	Thin grubb stone	0	2	
	Son roach (good)	0	10	
	Thick bed	0	4	
	Pink bed	0	8	
	Grey bed	0	8	
	Thornback (exceeding good stone)	1	0	
	Freestone cleaves into the following beds called			
	White bed			
	Freestone bed			
	Under freestone bed	3	6	Freestone
seams				
	White horse			
	Dun cow			
	Hardback			
	Under-picking earth	1	6	
	Lias bed, the bottom of the freestone quarry	1	0	
	Lias rag	2	3	
	Hones in two beds	1	0	
	Grey bed	0	6	
	Hones in three beds which is the ceiling of the downs vein seams	1	3	
	Hone	0	7	
	Leper		4	
	Undermining earth		6	
	Grey bed		4	Downs Vein seams
	Downs vein stone cleaves into the following beds called:			
	Pond bed			
	Mangy bed			
	White bed			
	Pond and undersat bed	3	6	
	clear all			
	Pond bottom bed			
	Under bottom bed			
	Earth, the bottom of the downs vein seams	0	6	
	Cinder, resembles burnt coal	12	0	
	Button stone	0	6	
	Pond feather bed	0	8	
	under feather bed	0	6	
	cap	1	4	
	Flint stone, the ceiling of the new vein seam		8	

undermining earth	1	0	
New vein stone cleaves into			
the following beds called:			
Pond five bed (good)	0	7	
under five bed (good)	0	7	New
vein			
Five bed-shall	0	4	seams
Pond white bed (good)	0	9	
brassy bed (good)	0	6	
under-white bed (good)	0	8	
Tombstone bed	1	1	
Pudding bed	0	6	
Sheer, the bottom of the new vein seams	0	6	
Earth	2	0	
Flints	2	6	
Earth	15	0	
Iron bed	0	8	- 120ft below ground level

Although the beds of stone were laid down level and parallel to each other in the Jurassic period, subsequent upfolding and land movement has caused distortion, and examples of this occur where beds of lower Purbeck stone and Portland stone over-lie Portland sand and Kimmeridge clay. From the headland at Gad cliff the Portland stone runs eastwards and then moves inland occupying the summit of the range of hills inland from Kimmeridge. Near Swyre Head a fault throws it northwards where it forms the high land south of Kingston to Downshay barn. Turning south it touches the coast at Emmets hill forming the upper part of St. Aldhelms Head.

Along the four and a half miles between St. Aldhelms Head and Durlston Head the Portland beds form a vertical wall rising from the sea. These beds of Portland stone overlie the Portland sand beds of the cherty series which consist of black sandstones, marls and cementstones and these in turn rest on Kimmeridge clay. Arkell (1935) described the Portland beds at Winspit as follows:

		Ft	ins	
	Shrimp bed	10	0	
	Titanites bed	10	6	
	Pond freestone	7	6	
	Chert vein	4	0	
	Listy bed	1	0	
	House cap (gallery ceiling)	8	0	
	Under picking cap	4	6	Freestone
quarried from				
	Under freestone	5	6	sea cliff
galleries	Cherty series (bottom of the sea cliff gallery)	66	0	
	Kimmeridge clay			

The sea ledges are 42′ 0 from the base of the sea cliff gallery and this is shown in Fig 4.1. A photograph of these conditions at Winspit is shown in Plate 1.1, the sea ledges, cherty series face and the overlying freestones can be seen along with a sea cliff gallery and piles of old quarry waste. Sea cliff galleries were driven into the cliff to win the under freestone, the underpicking cap being discarded. This gave a gallery approx 10ft high with a ceiling of House Cap stone which the quarrier supported on stone legs as stone was removed. Winspits sea cliff galleries are shown in Plate 2.1
and this illustrates the beds of Portland stone with their bedding planes, vertical joints or shrinkage cracks, the under picking cap and under freestone quarried from the galleries and a supporting leg of stone.

A description of the individual freestone strata is given by Townson (1975) and they are as follows:

Under or bottom freestone

Fine cream coloured oolite, an excellent quarry freestone, and the stone for which the quarries were originally worked. Shells nearly all comminuted, partly false bedded used for sinks, kerbstones, etc.

Under picking cap

Hard stone cut to waste to allow access to freestone below

House cap

A hard, grey, shelly limestone, not very workable but has been used for breakwaters and similar structures. There is a band of thin lenticles of white chert and silicified oolite within the stone and the under surface of this particular bed forms the roof of all the cliff galleries and it contains large shells.

Listy bed

A grey limestone with a ready vertical and horizontal fracture which breaks easily.

Chert Vein

Limestone with dense nodular Chert in the lower 0.6m and sparser Chert in the upper portion.

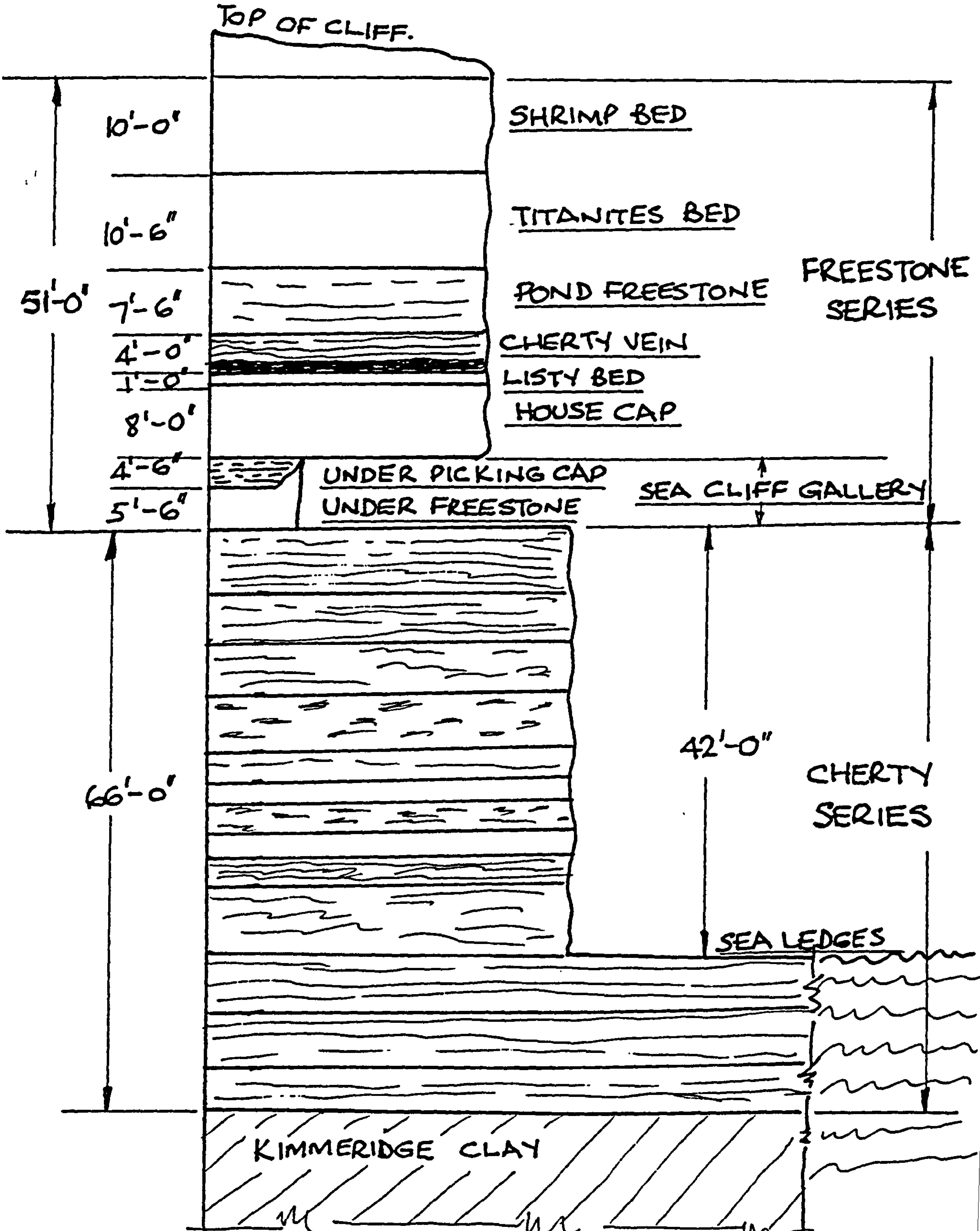


FIG . F4.1

PORTLAND STONE CLIFF AT WINSPIT

ARKELL. 1935

Plate 1.1 Sea ledges and stones at Winspit

Plate 2.1 Winspit sea cliff galleries

Pond Freestone

A good oolitic freestone, fossils nearly all comminuted, infiltrated by calcareous matter and occasionally marred by lenticles of white silicified oolite.

Titanites bed (Blue stone)

A hard, greyish, shelly limestone especially so at the basal 0.6m. The source of nearly all the giant ammonites.

Shrimp bed

A white, fine grained sublithographic limestone constant in appearance from Durlston Head to Lulworth Cove, contains many bivalves, the 'shrimp' refers to a primitive crustacean and the stone was formerly burnt for lime.

At different parts of the Isle of Purbeck the thickness of the beds vary, west of St Aldhelms Head the freestones deteriorate in a south westerly and westerly direction, becoming thinner and more cherty.
At St Aldhelms Head the under freestone has been replaced by thin limestone bands with chert nodules and only Pond Freestone is quarried. At Lulworth both the freestones have disappeared, but the favourable qualities of the Purbeck-Portland stone which include slight absorption, close grain, hardness and durability increase in an easterly direction thus Tilly Whim cliff quarries yield the most durable stone. Overlying the marine originated Portland beds are the Purbeck beds which are mainly of freshwater origin with abundant freshwater and estuarine fauna, but include estuarine and even truly marine strata. Despite the transition being from the purely marine Portland beds to the freshwater Purbeck beds, the exact plane of separation is not always obvious; both groups of beds include massive, light-coloured limestones, both are sometimes oolitic and they are virtually welded together. The upper junction between the Purbeck beds and the Wealden beds, is also unclear and has been the subject of considerable debate (Arkell, 1933).

Within the Isle of Purbeck the Purbeck beds run from Peveril Point to Worbarrow Bay. East of St Aldhelms Head the beds turn northward to Afflington Barn, skirting the north side of the Encombe and Kimmeridge range as far as Gad Cliff, the beds being lost beneath the sea at Worbarrow Tout.

The Upper Purbeck beds are of freshwater or brackish water and include the fossils Paludina, Unio and Cyrena. Middle Purbeck beds are part brackish, with Cyrena, Hydrobia and Limnaea and part marine with Corbula, Pecken and Ostrea. Lower Purbeck beds are of freshwater or brackish origin and contain insects in addition to the shells named above. Among the Lower Purbeck beds are the dirt beds with the stumps and prostrate trunks of coniferous trees, each dirt bed being overlain by an almost continuous mass of calcareous tufa, the individual masses of tufa being known as "burrs". Above the tufaceous cap the Lower Purbeck beds show brecciation, the rock bands breaking into separate blocks embedded in a calcareous cement largely composed of smaller fragments of the 'broken' limestones.

The coastal section around Durlston Bay exposes the entire Purbeck formation which Arkell (1947) described as follows:-

Purbeck marble beds and ostracoid shales Unio beds broken shell limestone (Burr)	UPPER PURBECK (20 metres)
Corbula and beef beds Upper building stones Cinder bed Lower building stones Flint bed and black shale Mammal bed	MIDDLE PURBECK (50 metres)
Marles with Gypsum and Insect beds Broken Beds and Turfaceous Caps	LOWER PURBECK (50 metres)

These Purbeck beds overlie the Portland beds and details of individual strata are as follows:-

Mammal Bed (0.3m; 1 ft)

A carbonaceous earthy layer of 'dirt bed' suggesting an ancient soil, bones of small mammals have been found.

Lower Building Stones (10m; 33ft)

Varied series of beds of freshwater origin, upper part has workable beds of cream coloured stone, lower parts are shales and marls.

Cinder Bed (2.5m; 8ft)

The most conspicuous and consistent bed in the Purbeck series, made up almost entirely of a compacted mass of Ostrea distorta and other shells. Represents the first evidence of sea invasion in middle Purbeck times, also known as Oyster bed. Upper Building Stones (16m; 52ft)

Limestones with shale partings, fossils suggest brackish water and estuarine conditions. These stones have been quarried at the cliffs but have been more extensively worked around Swanage.

Corbula and Beef beds (20m; 66ft)

Layers of shelly limestone, shales and marls with "beef"and selenite, partly of marine origin. The "beef" beds consist of light and dark shales with Cyrena and Cyprides, beneath are the "Corbula" beds with Corbula and other marine fossils. Near the top is a prominent band of broken shell limestone with yellow, sandy seams.

Broken Shell Limestone (Burr) (3m; 11ft)

A hard, massive, limestone made up of fragments of Cyrema, with Unio, Viviparus and fish remains.

Burr stone is durable but occurs only in small blocks it has been used for the construction of Corfe Castle, Swanage Church and the restoration of Wimborne Minster.

Unio Beds (1.5m; 5ft)

A thin limestone with Unio fossils.

Purbeck Marble beds & Ostracoid Shales (14 m; 46ft)

Purbeck marble occurs at the base of the shales as two bands of hard limestone with Paludina carinifera, the bands being 3.5 m apart, the upper blue, the lower red. These limestones are interstratified with shales containing Cyprids and layers of fibrous calcium ("beef"). This seam of Purbeck marble runs with the other Purbeck beds from Peveril point to Worbarrow Bay, a distance of some 11 miles, and passes through Afflington, now a farmstead, but at the height of its marble days in 1270, Henry III granted a market and a fair (Legg, 1989) and the remains of the medieval hamlet lie across 10 acres of pasture. Examination of the cart track running through the old quarries revealed two seams of stone running diagonally across it one was burr and the other marble. It should be noted that this is not a metamorphic marble, but a sedimentary rock to which the name has been applied.

Chapter 2:

The Extraction Processes:
Quarrying , Mining, Working and Transporting

This chapter aims to provide an introduction to the methods of extracting stone in the Purbeck area, and of the approaches which have been adopted to its processing and transportation. The general historical context is first established, and this is then set within the details of the historical activity patterns in the Isle of Purbeck. The chapter is based on a number of existing historical texts supplemented from documentary sources located in the Dorset County Record Office, and upon detailed examination of the remaining quarry and mine sites by the author during 1991-93.

(a) Quarrying

The general historical framework for the working of stone has been well documented by Bromehead (1965), upon which the following account is essentially based. Collecting natural stones and boulders that lay on the surface of the ground was how early man utilised stone for his benefit and to form it into the shape required, he later began to dress it using chert, a substance closely allied to flint. Quarrying that comprised extracting blocks from the solid rock required the use of metal tools, first of copper, then of bronze and finally iron and steel, this beginning around 2,800 BC, but evidence of quarrying techniques used in the past is rare because natural weathering erodes tool marks on the remaining quarry faces when stone has been extracted.

Thus for direct evidence we are almost confined to Egyptian work in the desert where as a result of the dry weather conditions there are quarries there that have remained largely untouched since 1000 BC. At Aswan for example much has been learned from the study of the incomplete obelisk, a block of granite 42m long, which if it had been successfully extracted would have weighed about 1200 tonnes - in comparison Cleopatra's Needle is 22m long and weighs 190 tonnes, while two obelisks preserved in Rome each weigh 1160 tonnes. The Aswan block had been abandoned because it was cracked, but the quarrying method has been established: the top surface was cleared and then dressed flat by pounding with balls of dolerite, 12 to 30 cm diameter, of average weight 5.5kg. A metre wide trench was then pounded all round the block using dolerite balls almost certainly shod on rammers. When the trench was deep enough the block was undercut by the same method and then the block was raised to the surface using wedges and blocks in progressive lifts.

Although chisels and plug and feathers were in use in the quarry at the time the obelisk was quarried, there are no chisel or wedge marks in the trench, although wedge and chisel marks are to be seen on the top of the obelisk.

The Egyptians sometimes worked limestone blocks in the same way as the granite obelisk: by trenching round they took out stone in regular lifts and made galleries in those of the best quality. Cracks were not followed but a layer of stone was left on each side of the crack and these now stand up as walls with fissures along them.

Saws were also used, these being copper blades fed with sand or set with emery teeth, and faced stones could be dressed with marvellous accuracy, a granite sarcophagus of 3350 B.C has a surface like ground glass and a high degree of parallelism. The Egyptians also used limestone roof slabs and these date back to 3000 BC. For limestones and softer stones it was possible to use a heavy quarrymans pick, this too was a crushing rather than a cutting implement. The characteristic traces that remain in an Egyptian quarry are a series of oblique pick marks on the vertical faces. There are also, where the stone is really compact, a series of shallow horizontal ledges or grooves where the trench cut to free a stone has been progressively deepened.

For softer stones, such as the tufas of central Italy, there was a whole range of quarrymans axes and adzes which cut the stone instead of having to pound it and very much the same tools might be used to dress it after quarrying. In Malta the implements for dressing a block of soft stone were a set square, a template and a broad bladed axe. For the harder stones, such as limestone, the surfaces would be dressed after quarrying with a course metal point and a mallet and even today these basic tools of the masons craft would be used to roughout the first stage of the work. Where stone was required to have a smooth surface, such as the flesh surfaces of a figure, it was smoothed with pumice stone or abrasive sand.

Where sedimentary rock was quarried nature had produced blocks, of various sizes, separated by vertical joints and horizontal bedding planes and these were extracted by using a stepped quarry face. Blocks were obtained by splitting with wedges and levering the block free from its neighbours.

Such in essence were the tools and methods of quarrying throughout antiquity and the two instruments for more recent change were gunpowder and the application of mechanical power. Gunpowder was however not often used in a quarry producing dimensioned stone and as mechanical power arrived late at individual quarries it would be true to say that quarrying methods remained unchanged from 2,800 BC to 1900 AD in a limestone quarry and other quarries producing dimensioned stone (Ward-Perkins, 1971).

From 2000 B.C. the Egyptians began to use large blocks of stone for building or for statuary but the Greeks, who inherited their quarry practices directly from Egypt, at quite an early stage lost interest in the characteristically Egyptian element of sheer size. It was left to the Romans after the annexation of Egypt to resurrect the Egyptian taste for the colossal and to reintroduce the techniques for handling large masses of stone represented by the columns of the Pantheon or the great granite obelisks.

In their techniques and tools the Romans were heirs to a long tradition but it was the way that they put them to use wherever they went that made them such an important historical force. Caesar began to open up new quarries to meet the demand for stone including the marble quarries at Carrara which for 200 years was the principal source of Rome's white building marble while Augustus and Tiberius maintained the vast building programme, importing coloured marble, granite and other stones from all parts of the Roman empire (Ward-Perkins, 1971). Much of the excellence of Roman building stone is attributed to care in selection at the quarry and to leaving it at the quarry for preliminary weathering.

Following the invasion of Britain much quarrying was done in Roman times and Hadrians Wall, which traverses the country from Bowness to Wallsend, is the most obvious source of information. The ashlar of the wall was of grit because it was hard and its roughness gave a good key for the mortar, and behind the ashlar facing blocks is a rubble core embedded in mortar. Stone exposed to the weather is cut across the grain so as to avoid the scaling off by the lines of stratification and the stone tapers towards the end which is set in the wall. Stone was thus being quarried and dressed in large quantities, in convenient sizes for ease of transport and the quarries furthest away from the wall were in Cumberland, a distance of eight miles.

In York magnesian limestone was brought from Tadcaster by river transport, and at Bath the Roman quarries adjoined the Fosse Way, allowing it to be transported to Silchester (Reading) and Colchester where Bath stone from Roman Times has been found. The Romans used nearly every one of the English building stones and tufa, so familiar in Rome, was quarried in Maidstone, Dursley and Walton. Slates from Cumberland, Leicester, Oxfordshire and Wales have been found in Roman remains throughout the country.

In Purbeck the Romans quarried in shallow pits for the limestones known as marble and burr which outcropped on or lay just below the surface. They were used either as mortars for grinding or for inscribed memorial tablets. When the Romans departed the technique of stone cutting fell at once into decay and Bede relates that St. Benedict of Wearmouth crossed into Gaul in 650 A.D. and brought back masons to build a church (Bromehead, 1957).

In Saxon times, from around 675 AD, the oolitic rocks of Bath and the Cotswolds were being worked, but in general the pre-Norman masons worked relatively little limestone which needed a saw, hammer and chisel to work it whilst grit could be carved elaborately with primitive tools and abrasives. Following 1066 masons from Normandy, who were experienced in carving Caen limestone, were brought to England, and stone quarrying for castle and church building began to expand rapidly. There was an increasing demand for decorative stone, and the first to achieve a national reputation in this country was the dark Purbeck 'marble' which, starting about 1170 AD, was soon being shipped all over England and occasionally abroad. Purbeck marble led the field until the 14th century when fashion changed and it was supplanted by alabaster quarried in the North Midlands. Nevertheless it was from this Norman period that the extraction of stone on Purbeck began, initially from surface quarries and later from underground workings. As can be seen on the map of limestone quarries produced by Davey (1976) (Fig 1.2), in Purbeck there are at present only 20 limestone quarries operating, but this current situation represents only the end of a long and complicated pattern of working which has seen many successive cycles of activity reflective of local and national demand.

The Purbeck Land Quarries

The Purbeck marble seams run for 11 miles across the Isle of Purbeck. Along this length are the remains of many marble quarries typified by that in Plate 1.2, which shows one of the more recent quarries from which marble was quarried to build Kingston Church in 1876. All the marble quarries have in the main been hand dug and this puts a limit on the depth of the quarry of about 20 feet. Fig 2.2 has been created to illustrate a cross section of the ground before marble quarrying commenced (1) and shows the marble seam outcropping at the surface and then sloping away underground. Next (2) is shown how the ground is left when the

BUILDING STONES OF ENGLAND
BY N. DAVEY.

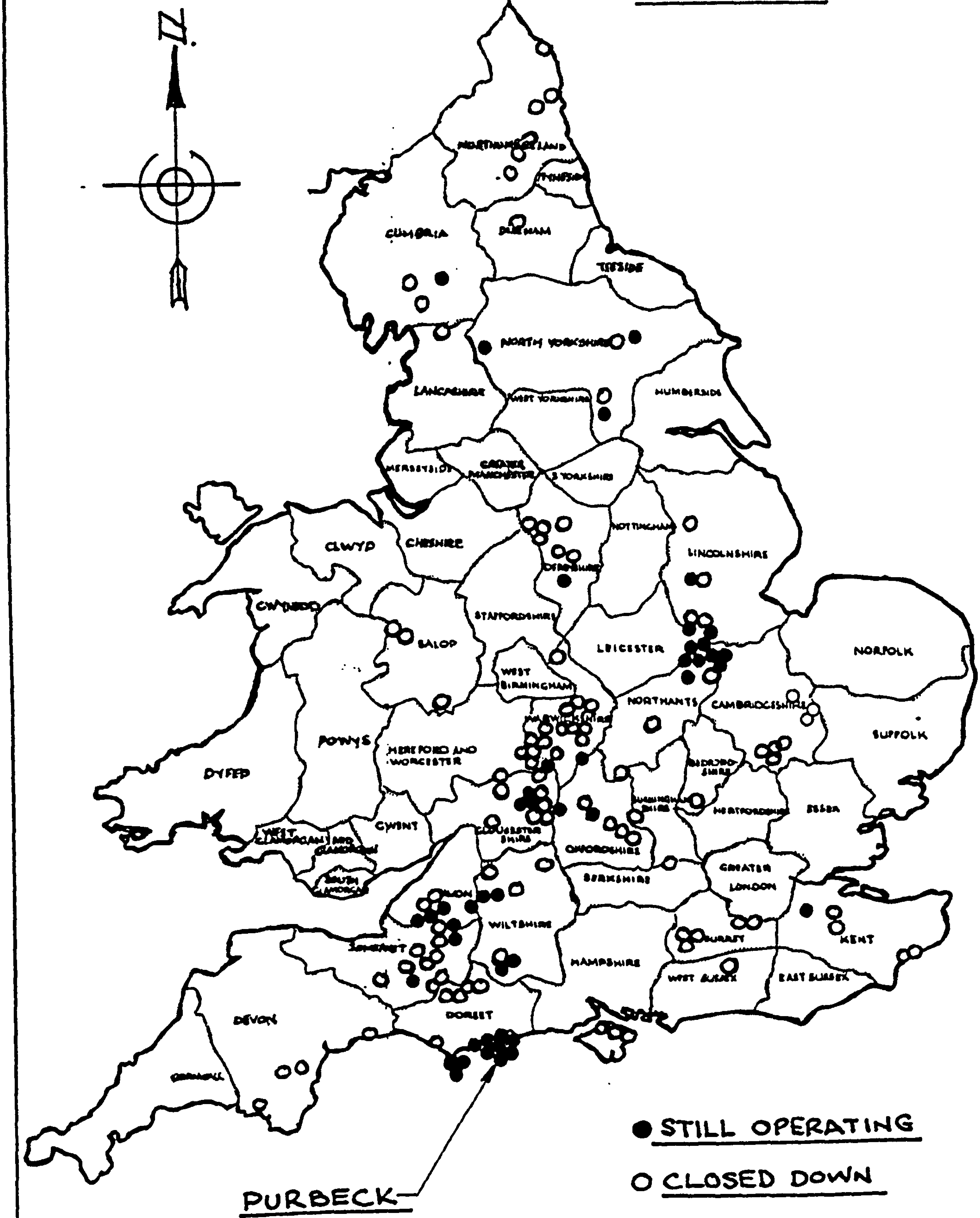


FIG. F1.2

DISTRIBUTION OF PRINCIPAL LIMESTONE QUARRIES..

FIG. F2.2

MEDIEVAL PURBECK MARBLE QUARRYING.

marble has been removed by hand digging. At 20ft deep the dig stops and spoil has been thrown backwards into the quarried area and forwards onto the unquarried surface of the land. Over the years such a profile is smoothed out and slight depressions are all that remain. It was impractical to mine the Purbeck marble that remained in the ground because of the loose overburden and the height of the marble seam. In order to quarry the marble today the overburden has to be removed down to 20ft plus, and Plate 2.2 shows this being removed by a bulldozer and a back acting digger. Plate 3.2 shows the marble that was quarried from this trial hole at Blashenwell during 1992. This is the method by which Purbeck marble will be quarried to meet the future requirements to replace medieval components used in cathedral building that have suffered weather erosion over the centuries.

Thus in contrast to the historical methods when a quarry is opened today in Purbeck on unquarried land to obtain stone the method adopted is as follows:-

1. Topsoil is cleared from the area to be quarried by a back acting excavator or power shovel and stored for future quarry reinstatement.

2. Overburden is then removed down to the first layer of useable stone, the overburden being tipped down previously excavated quarries from which all saleable stone has been removed.

3. A back acting excavator then removes the stone, a layer at a time, and loads it into a dumper to transport to the stockpile. At the stockpile the particular beds of stone are placed in segregated piles because generally each type of stone is used for a different purpose.

4. As the beds of stone are removed and the quarry deepens the excavator cuts a sloping track to the top of the excavation to ensure that it is always resting on firm ground and not working near an unsupported quarry edge.

5. Finally the base of the quarry is cleared of debris that fell into the quarry when the stone was being removed from above. Plate 4.2 shows a quarry in the various stages of development: at the far side a step can be seen where the topsoil and overburden have been removed down to the first bed of stone prior to its removal. Below this level can be seen the quarry face comprising the individual beds of stone and at the bottom of the face is the debris that has fallen into the quarry. At the base of the quarry is the access track and on the

Plate 1.2 Blashenwell Marble Quarry

Plate 2.2 Digging for marble

Plate 3.2 Purbeck marble quarried at Blashenwell

Plate 4.2 Landers Quarry

left of this track is old backfilling and on the right new. This sequence continues until all the saleable stone is extracted and the quarry backfilled and levelled with the stored topsoil finally replaced for revegetation. (Information from a personal interview with Mr Lovell, Hardens Quarry, 1992).

Plate 5.2 shows quarrying at Acton where an excavator and loading shovel are working at the top of the quarry face, with a further two loading shovels working at the base of the quarry, where the stone is piled for collection. In this case the shallow quarry face is being cut into the hillside and the base of the quarry is at road level.

Quarries of the open cast type in Purbeck are always worked from the top downwards to prevent the face collapsing and falling onto personnel and equipment below. A particularly fine example of a quarry face is shown in Plate 6.2 and on this 30ft deep face, below the top overburden, can be seen 7 beds of stone separated by bedding planes and these are, from the top:-

Blue Rag	-	walling stone	
Grub	-	paving and walling	
Roach	-	white paving	
Thornback	-	monuments and head stones	
			FREESTONE
Whitcham bed	-	monuments and head stones	SEAM
Free stones	-	carveable stone, bird baths, etc.	
Downs vein	-	splits into paving slabs and	DOWNSVEIN
		roofing tiles	SEAM

Before modern machinery made it possible to economically work quarries of this type opencast, the stone was mined for the freestone seam and the downsvein seam and this quarry face illustrates what was above the stone miner working below ground. When opencast quarries are dug today old unrecorded mines are sometimes found and this is a serious loss to today's quarryman who having bought or rented land for quarrying discovers that the prime stone has been removed previously by mining.

Plate 5.2 Quarrying at Acton

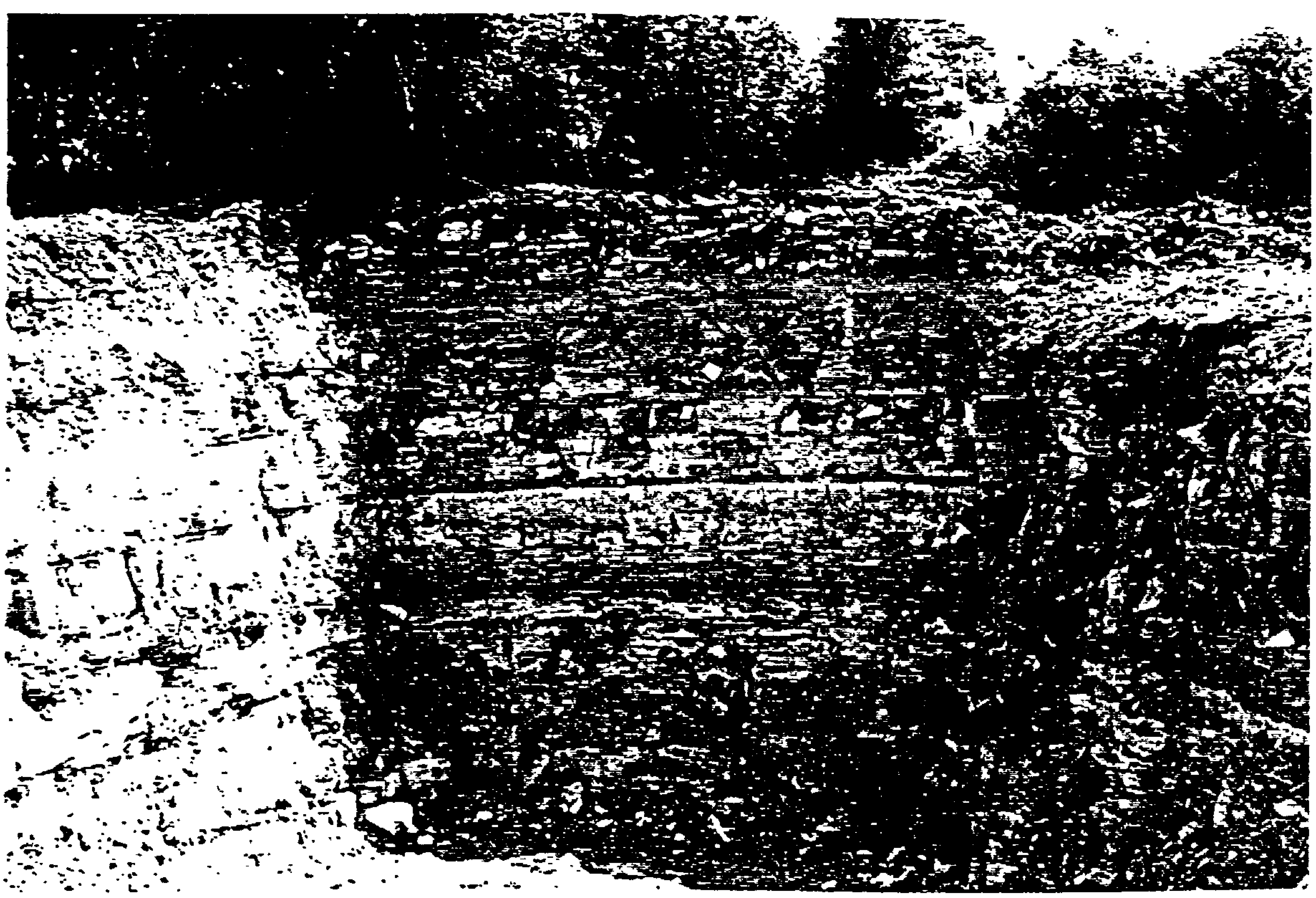


Plate 6.2 Hardens Quarry

Small quarries are to be found in the Acton area and piles of quarried stone can be seen there conveniently placed for collection. Plate 7.2 shows the beds of stone at St. Aldhelms quarry where there is heavy equipment including cranes to lift the large blocks of stone (shown in Plate 8.2 along with the quarry workshop in the background). Further inland at Swanworth quarry roadstone is produced and the quarrying technique is different because as the product is crushed stone and not dimensioned stone, blasting is used. In this quarry the face is drilled from the top as shown in Plate 9.2, explosive charges are then inserted in the drilled holes and the front of the face is blasted down. Fallen stone is then loaded at the bottom of the face and taken to the crushers, any large blocks weighing from 1 to 4 tons are however reserved for sea defence work and blocks from 6" to 8" are segregated for heavy foundation work. All the rest is sent for crushing by a primary jaw crusher and a secondary impact crusher into sizes ranging from 6m/m to 75m/m. The plant at the quarry comprises of screens, belt conveyors and hoppers, etc., and the crushed stone is loaded onto motor lorries for transport to sites within a 30 mile radius. A general view of the quarry with its plant and associated stock piles is shown in Plate 10.2, the large scale of the operation can be gauged from the size of the lorries at the bottom of the quarry. Finally, at Cucknowle there is a chalk quarry, which supplies around 500 tons per annum to the ball clay processing plant at Furzebrook. In the late 19th century it supplied chalk to Powells cement works at Ridge (which has now gone), the chalk being transported at the quarry by an inclined plane (Legg, 1989).

Benfield (1990) shows the popular beds of stone that are dug in Purbeck and illustrates how they outcropped when upfolding of the land thrust the beds upwards (Fig 3.2). As the seams which outcrop at the surface near the sea cliffs travel inland they were extracted by mining and now by opencast quarrying. Portland stone was previously quarried at the cliff face and now at two inland quarries , St Aldhelms and Swanworth. Beyond that the Portland seam is overlain by the Purbeck freshwater beds which makes mining Portland uneconomic.

Sea Cliff Quarries

In Saxon times the south side of Swanage bay from Peveril point to the pier toll house was a solid mass of rock varying between 6 to 8ft in height. In fact the whole of the Hotel field, including the Grosvenor Hotel, was one huge quarry from which Purbeck marble and burr stone were obtained. The few inhabitants were fishermen

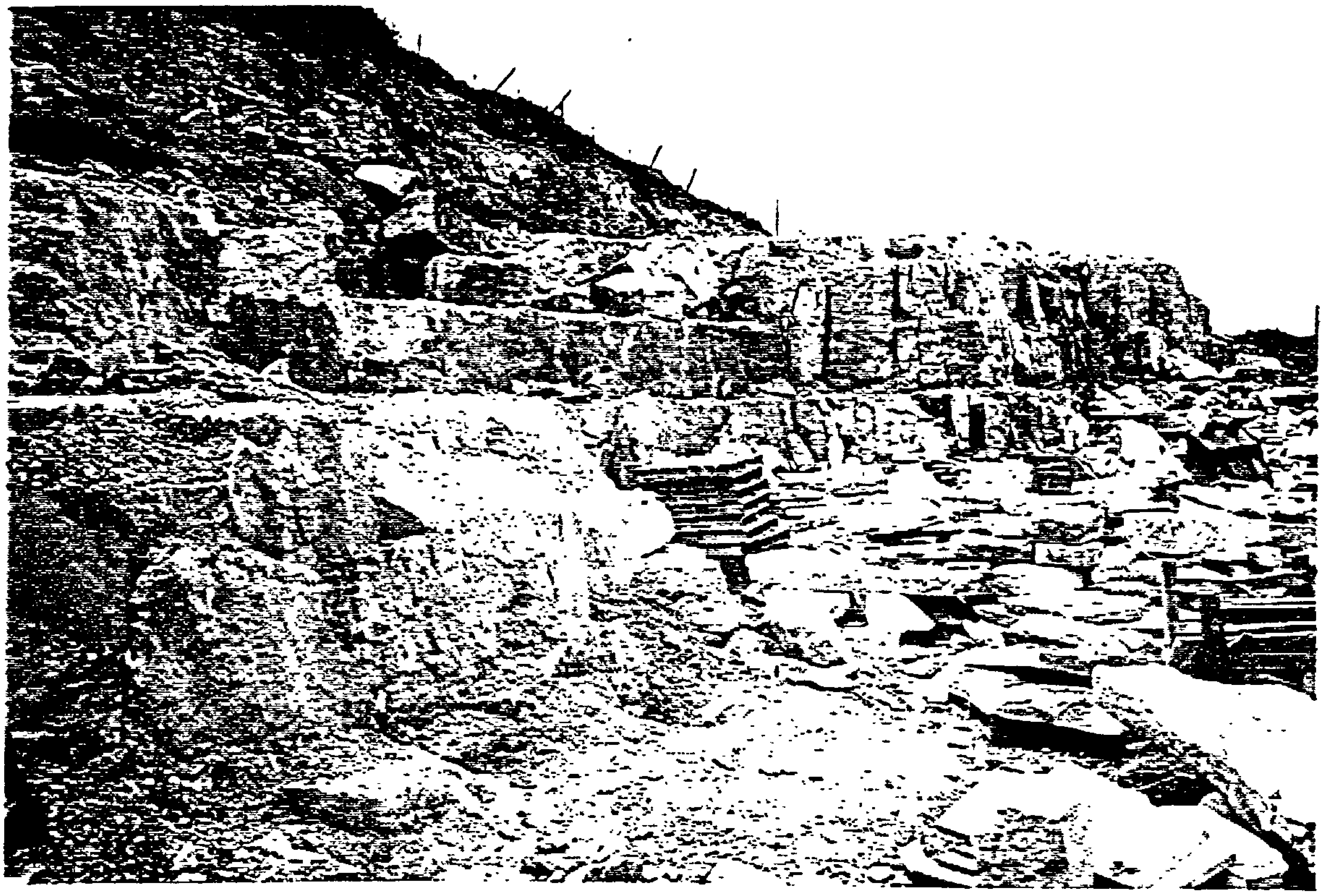


Plate 7.2 St Aldhelms Quarry (1)

Plate 8.2 St Aldheims Quarry (2)

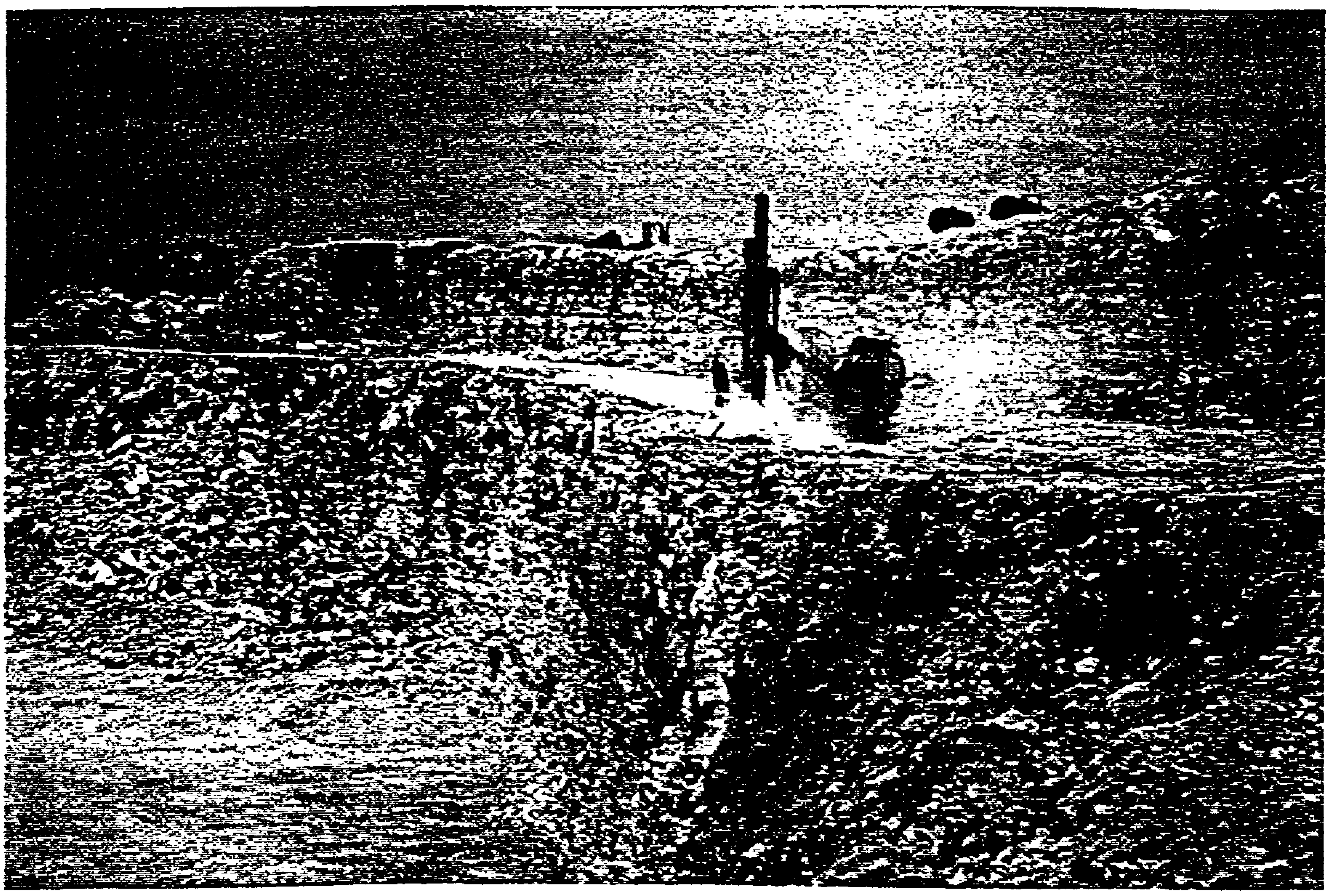


Plate 9.2 Drilling face for explosive charges

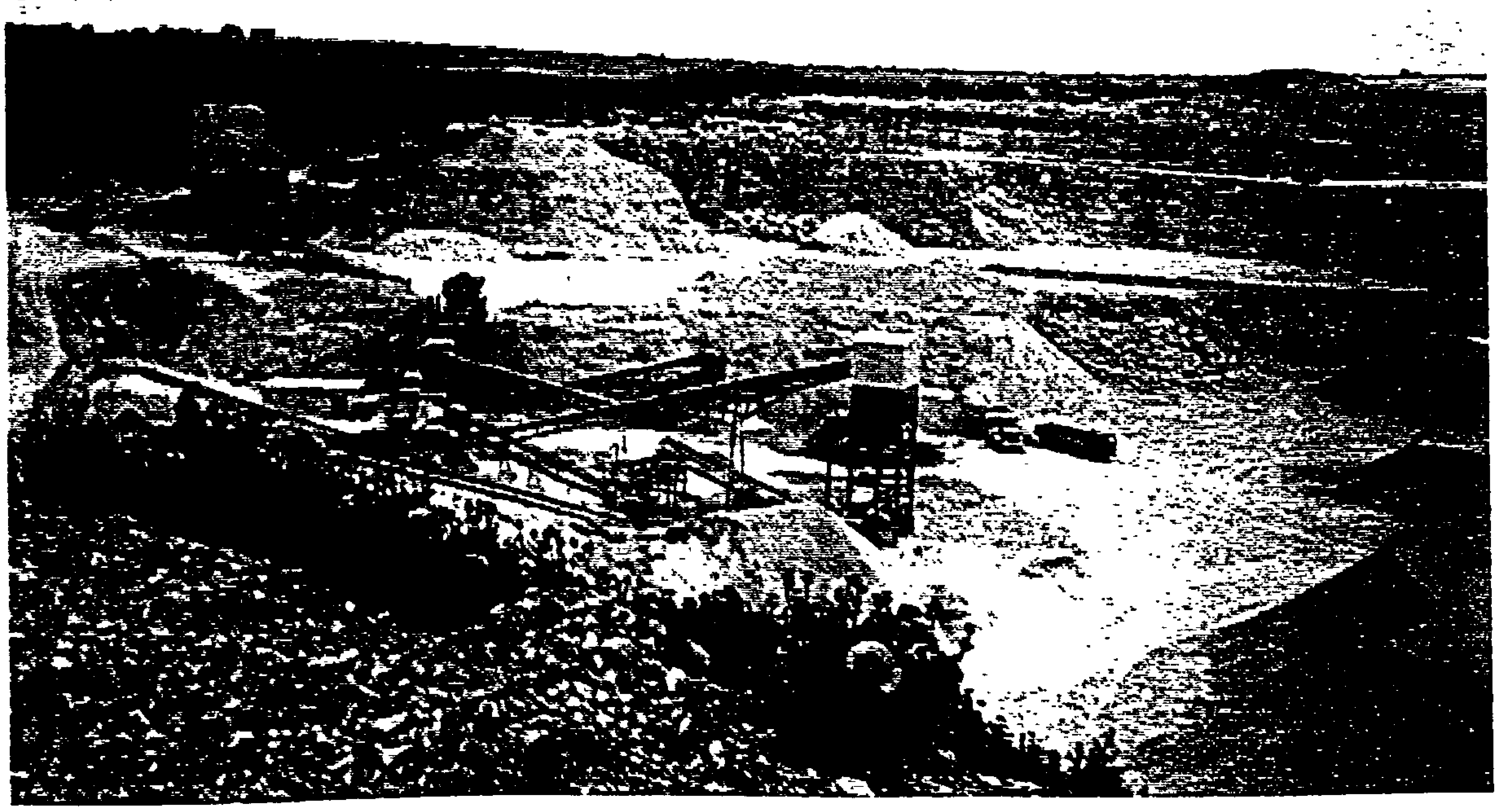


Plate 10.2 Swanworth Quarry

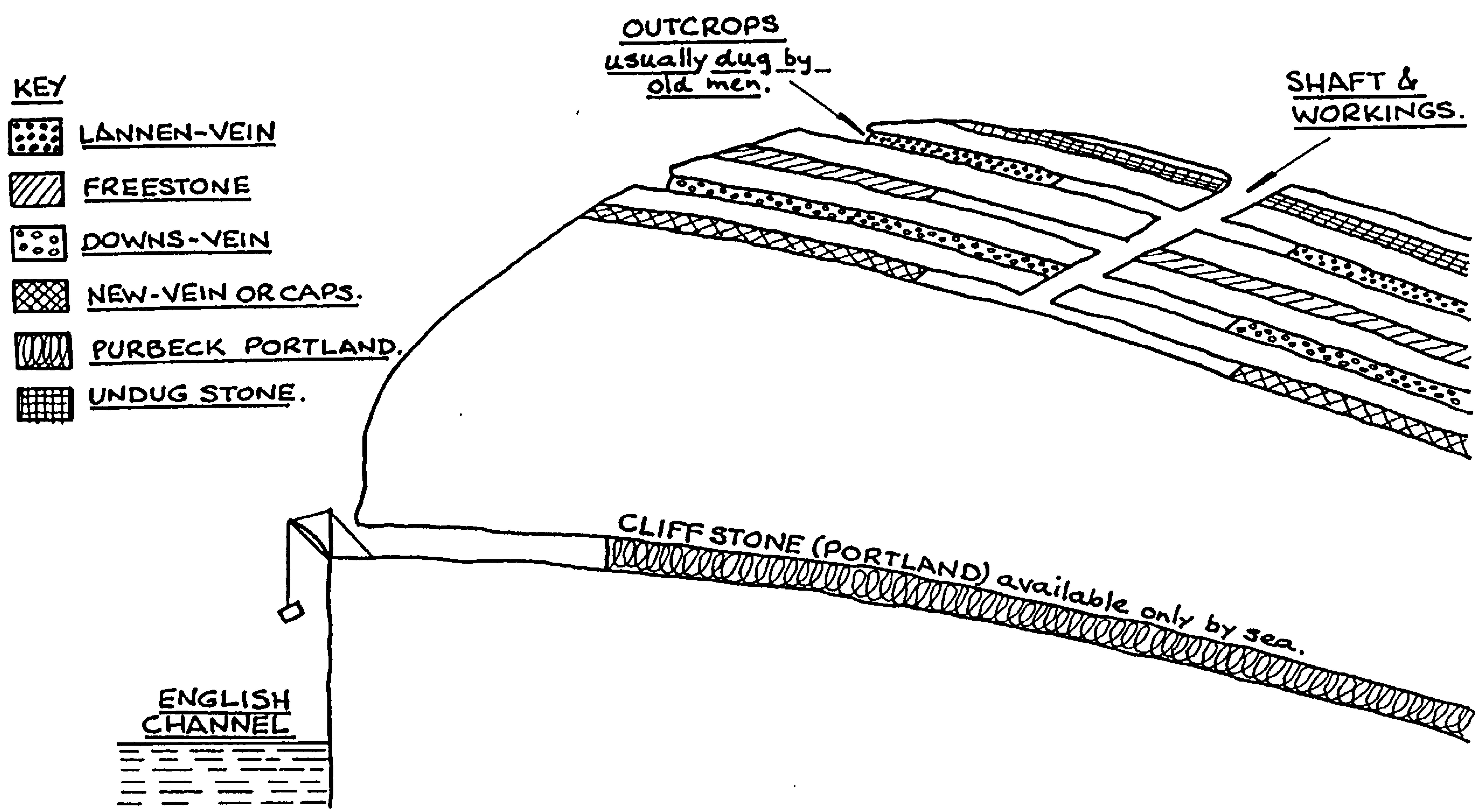


FIG. F3.2

CROSS SECTION OF PURBECK SHOWING POSITIONS OF THE BEDS OF STONE IN UNDERGROUND QUARRIES.

FROM PURBECK SHOP BY ERIC BENFIELD.

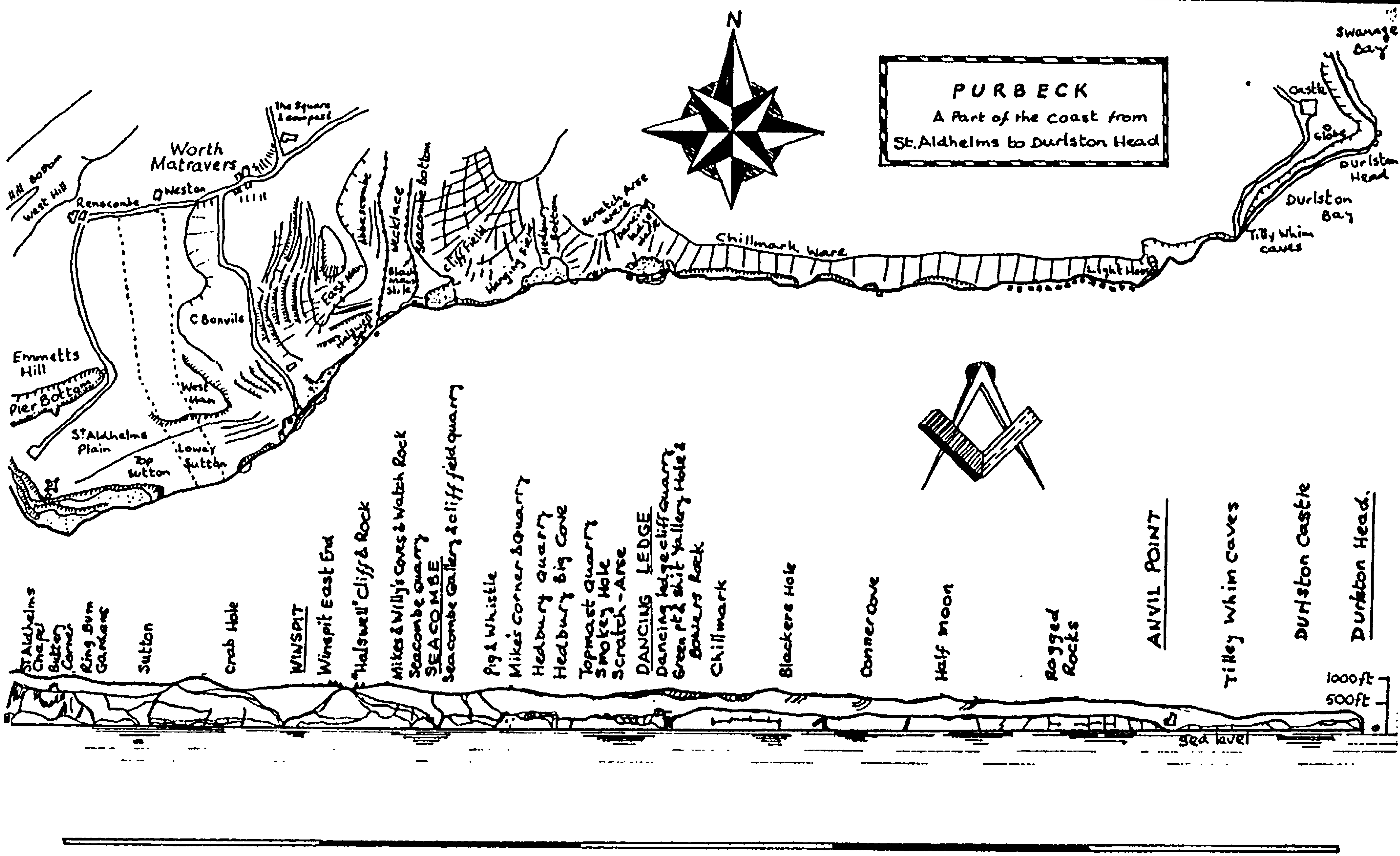
and people came in barges and took away what they wanted (Hardy, 1908). Cliff quarrying for Purbeck/Portland stone began around 1719 A.D. at Winspit, this being the date on the quarry lease.

From St. Aldhelms head to Durlston Head, a distance of 5 miles, there are quarries strung out along the cliffs and these are given names which are shown in Fig 4.2.

At St. Aldhelms Head however the Portland stone forms the top of the vertical cliff which stands on a sloping face of the weaker Kimmeridge clay, with the result that the stone cliffs are constantly slipping. Fallen Purbeck stones form screes as they overlie the sloping clay and adjacent to St. Aldhelms Head is Chapmans Pool which has been eroded by the sea from the soft unstable cliffs of Kimmeridge clay (Chaplin, 1985). Portland stone quarried in Purbeck is known as Purbeck/Portland to distinguish it from Portland stone quarried on the Isle of Portland and Purbeck/Portland stone was quarried along the sea cliffs from St. Aldhelms Head to Durlston Head wherever a boat could be moored against the vertical cliffs.

The Dorset Coast Path passes the sea cliff Quarries which lie within the designated Dorset Area of Outstanding Beauty, along with all the other Purbeck quarries, and the coast path is within the Dorset Heritage Coast (Dorset County Council, 1992). These planning designations govern today's developments but of course they did not apply when the cliff quarrying began, the major concern then being to quarry stone to make a living rather than preserve the coastline! Stone was first quarried from the cliffs by undermining the cliffs and bringing the stone down, but this method ended with the introduction of gunpowder, and the cliffs were then blasted down, thousands of tons at a time (Hardy,1908).

A hammer, gad and bars were usually used to release rock from a face, but if these hand tools failed fire setting was used. A fierce brushwood fire would be set against the face and the heat generated was used to loosen the individual elements by thermal expansion. This was aided by contraction when water was thrown on to the heated face. Brushwood firing had been used in Purbeck to fire pottery by the Romans and although there are few trees on the heathland there is a plentiful supply of gorse which would have enabled this method to have been used. Fire setting was used in some European locations until the late 19th Century but this



SCALE IN MILES.

FIG. F4.2

LOCATION OF CLIFF QUARRIES.

Based on a drawing by Tom Aderson with W. J. Bower.

Cambridge. 1962.

method was gradually replaced by explosives.

Blasting powder was first used in the Slovakian ore mountains in 1627 in the Oberbiederstollen mine by Casper Weinde, a miner from Tyrol. German miners introduced gunpowder for underground blasting at the Ecton copper mine in England and it was in general use in Cornish mines by 1689 (Gregory, 1980). Piling gunpowder against the face and lighting it was the first method used to blast down rock but later it was realised that this method was both wasteful and ineffective. It was necessary to place the explosive within the rock mass behind the face to burst the rock outwards. To achieve this it was necessary to drill holes into the face in strategic positions to accommodate the explosive which was then sealed into the hole by clay stemming material. Until the late 19th century holes were drilled in hard rock by successive blows on a chisel pointed steel drill with a heavy hammer and between blows the drill was rotated to keep the hole circular. Using this method holes were drilled up to 3" diameter x 4ft long. In 1871 Ingersoll-Rand developed the compressed air powered piston drill.

Hooson (1749) explains how gunpowder was used to blast rock in Derbyshire as follows, this presumably giving a possible picture of how this material might have been used in Purbeck:-

"We make a cartridge of brown paper (something longer than the hole we have bored) and put into the bottom of it 3, 4 or 5 inches of gunpowder, according as we think the strength of the rock will require, and put the plug into the cartridge close on top of the powder, it being first primed, and tie all that together with a thread and then put it into the hole with about half an inch of the cartridge sticking out of the hole that you may better apply a match to it". Hooson then explains the dangers associated with this method and how miners have been killed, maimed, blinded and burnt when using this method because the charge exploded before the miner could run far enough away from the explosion. Hooson then advocates the use of the new method as follows:-

"although it is possible to pour gunpowder into the bored hole and ram it down, it is still preferable to use a cartridge. Once the powder, or cartridge is in the hole, leaving a space at the top, a plug of clay is pressed into the hole with a small diameter stick held in the centre of the hole with the bottom touching the charge. The stick is then removed and a little gunpowder is then placed in this small central hole and rammed down with a wire onto the charge below, leaving most of the hole clear.

A fuse is then made from wheat straw, by slitting it on one side all along its length and filling it with gunpowder. The fuse is then placed into the small hole in the clay plug, so it touches the charge below, leaving some straw fuse standing above the top of the hole to which we apply a candle match, making sure that the fuse is long enough to enable the miner to run to safety. If this be done no other danger is to be seen in the way of blasting".

Hooson then explains the precautions that must be taken when blasting a rock near a spring of water, but apart from coating the cartridge with wax, the basic method remains unchanged.

Straw fuses burned gradually towards the charge, but the length of straw limited the length of time the fuse burnt and the hit and miss methods by which they were made created problems which remained until Bickford invented the safety fuse in 1831. The main period that the sea cliff quarries operated was from 1673 to 1815, and during this period hammer, gad and bars along with brushwood firing were available. Blasting by gunpowder probably arrived around 1750 and holes were made in the rock by hand tools for the charges, the pneumatic drill did not come into use until 1871. As the safety fuse did not arrive until 1831, blasting was almost certainly carried out by the method described by Hooson (1749).

Stone from the cliff quarries was transported by sea, indeed the Purbeck stone trade remained largely maritime until 1914. (Samuel, 1977). Owing to the problems encountered in getting a ship near enough to the cliff face to take on stone, particularly if the sea was not calm, stone was first loaded on to flat bottom barges which were then rowed and sailed out to sea going vessels anchored in deep water. To obtain a sheltered anchorage the sea going vessels were usually located in Swanage bay, which being fairly shallow limited vessels to 300 tons, but during the time that cliff quarries operated the usual vessel was a ketch that carried 40 tons, the tare weight of the vessel being 30 tons.

Fig 5.2 shows how stone was loaded at a typical cliff quarry (1) and how loading could be carried out at a sheltered anchorage where the barge cleared the sea bed at low tide (in this case stone was lowered into the anchored barge which was rowed off when full). Durlston Bay would seem to be the only place where these conditions applied because the other cliff location front directly onto the sea. In the majority of cases stone was thrown down from the cliffs to form a loading platform (2): at full tide the barge sailed over the platform and anchored (3) as the tide receded the flat bottom barge was left sitting on the loading platform (4). Stone was then loaded into the barge from the quarry edge by a whim and this was completed before the tide turned. At the next high tide the laden barge was rowed off (5) to Swanage where the stone was loaded onto sea going vessels. As the cliff face was quarried further inland, away from the loading station, intermediate trucking was introduced

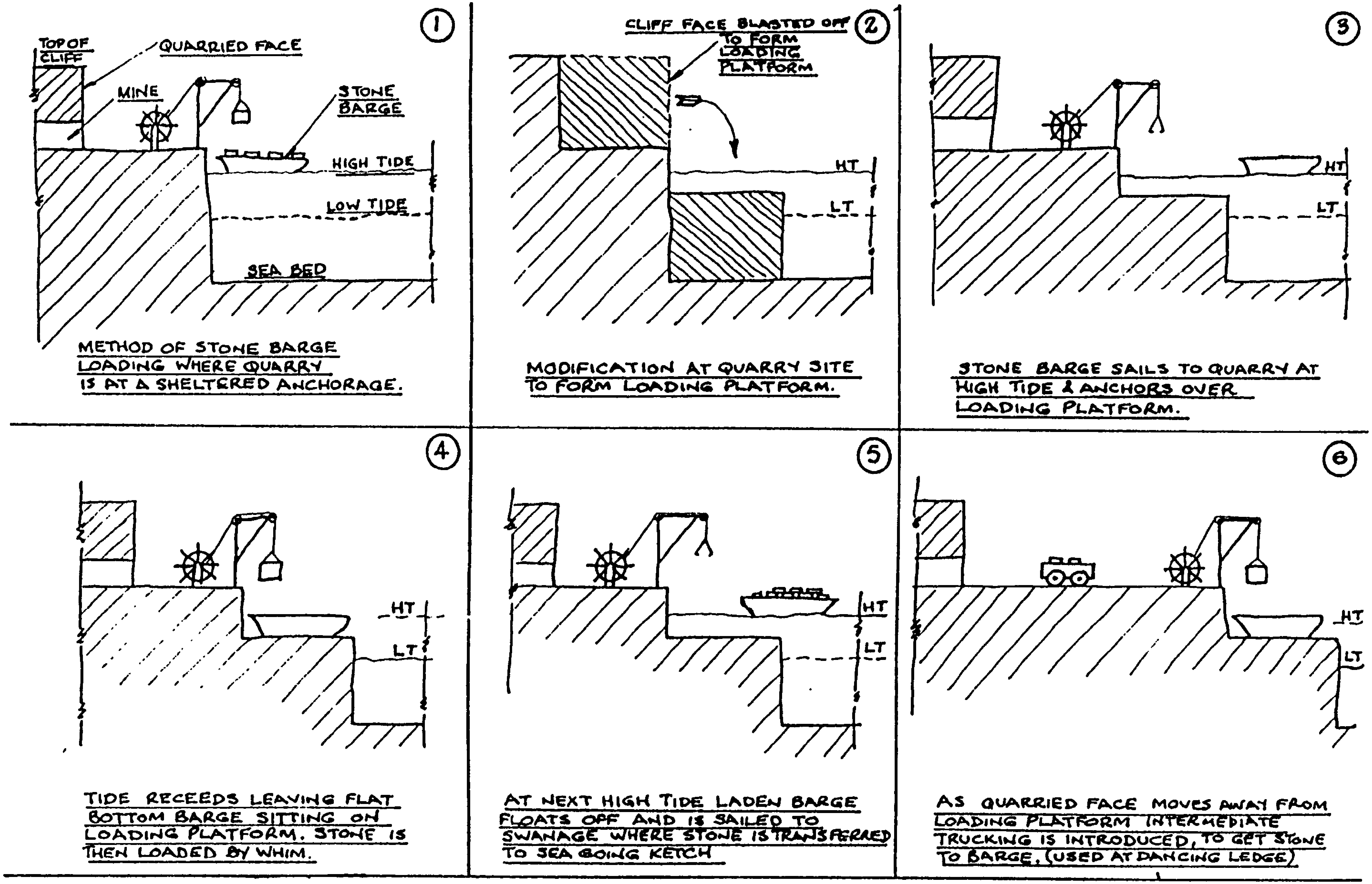


FIG. F5.2

SECTIONAL VIEWS SHOWING STONE BARGE LOADING AT TYPICAL SEA CLIFF QUARRIES.

(6). When the stone had been extracted it was dressed at the quarry, only finished components being shipped, the quarry waste being tipped either adjacent to the quarry or into the sea.

At Durlston Bay vast quantities of stone were shipped from the cliffs for fortification enlargements at Portsmouth, and Mason (1984) states that at Durlston Bay barges were not used, the blocks of stone being moved down an inclined ramp direct into the sea going vessel, and this method is shown in Fig 6.2. Hardy (1908) states that the stone at Durlston Bay was shipped in a different way: a strong ladder was used with one end on the beach and the other on the boat, with a man on each side of the ladder breast high in the water rolling the stones. This was very trying to the men and 'a man caught his death at this work'. It would appear from this evidence that stone was directly loaded into sea going vessels at Durlston Bay first by the ladder method and this was replaced by a ramp to keep the men out of the water. The stones loaded were longer than the width of a ladder, not so heavy that two men breast high in water could not turn them over and not so wide that they were outside an arms length when they stood vertical on the ladder whilst being rolled towards the boat: kerbstones and gutters appear to fit this specification.

Fig 7.2 shows the Portland stone cliffs at three Purbeck locations with the names of the stone seams, the two most popular being Pond Freestone and Under Freestone. Similar conditions exist along the cliffs except at St Aldhelms Head, where the freestone seams are found at the top of the cliff instead of half way down. Initially the whole cliff face was quarried, selecting useable stone and scrapping the rest but finally the underfreestone was mined by cutting galleries into the previously quarried cliff face which had now provided a working floor and a boat landing platform. To form the galleries the underpicking cap that lay immediately below a sound gallery ceiling was blasted away. This enabled the Under Freestone to be removed from below a good ceiling using hand tools. Some cliff quarries were still operating when pneumatic tools were introduced into Purbeck around 1925 (Benfield, 1990), at which time rock drilling to accommodate the blasting charges ceased to be done by hand. When the underpicking cap and freestone had been removed the sea cliff gallery was around 10ft (3m) high and the gallery some 25ft (7.5m) wide extended around 230 ft (70m) into the hillside. Pillars of stone were left to support the roof, with supplementary pillars being built by the quarrier from stone blocks. Blocks of up to 50 tons of good freestone could be taken from the cliffs and cut into manageable sizes. (Legg, 1989). Since transport was by sea the quarries could only operate in the summer when the weather was calm enough to allow the flat bottom barge to be rowed and sailed to Swanage. Finished stone components

FIG. F6.2

RAMP LOADING OF STONE BOATS

DURLSTON HEAD QUARRIES.

MASON (1984)

ARKELL 1935.

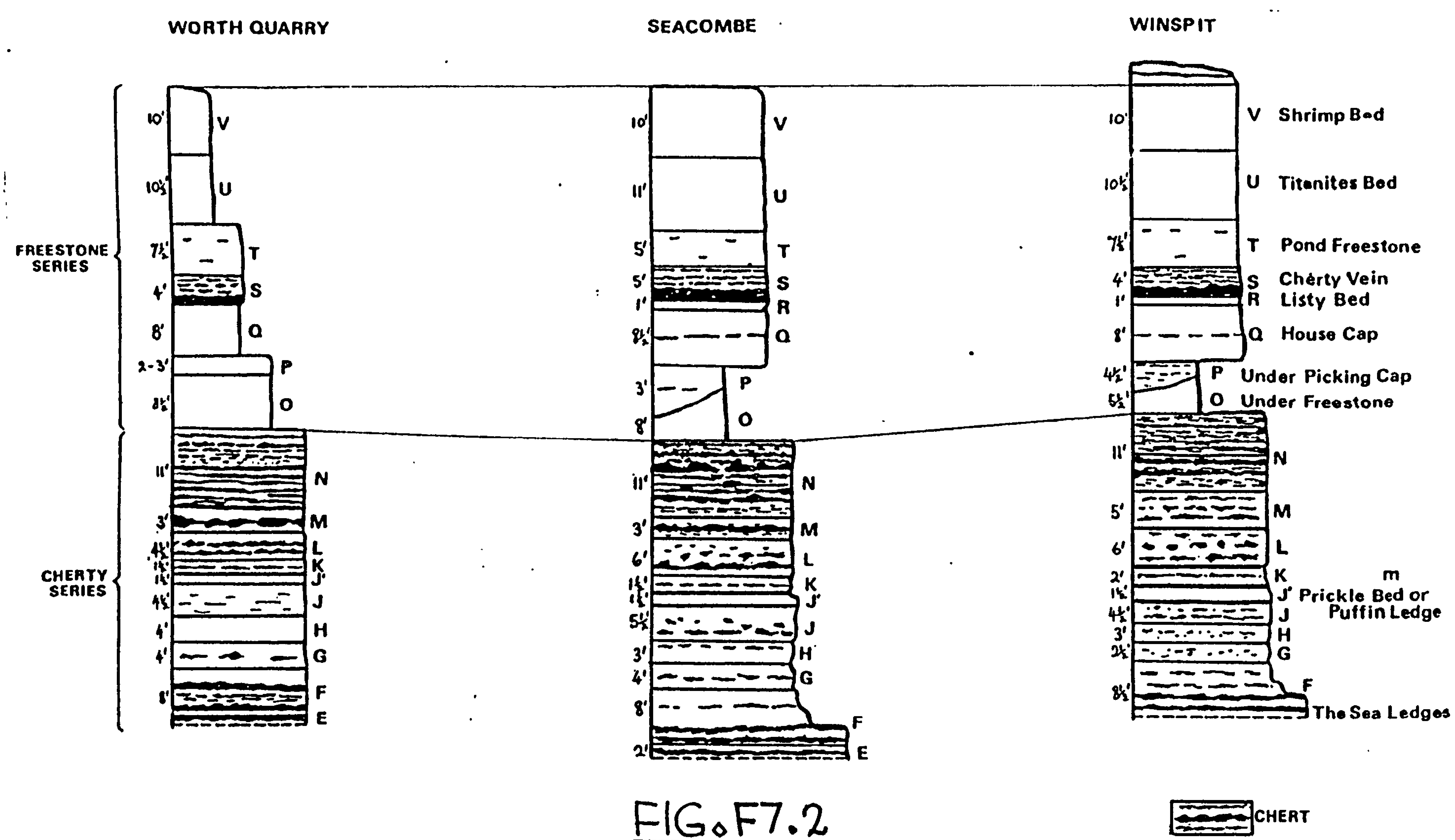


FIG. F7.2

PROFILES OF PORTLAND STONE

IN PURBECK.

had to be loaded into the waiting barge and this was achieved by using a 'whim'. The method used during the peak years of cliff quarrying is shown in a lithograph of about 1870 by T. M Hardy depicting the whim and jibet at Hedbury quarry, reproduced in Fig 8.2. Timber for the jibet and the whim came from the shipwrecks that foundered on the cliffs below the quarries and it seems fairly certain that some of the whims were the actual ships wheel salvaged from the wreck. A guy chain can be seen at the top of the jibet anchored back to the cliff face to prevent the jibet falling over the edge. Fig 9.2 is a sketch of a scale model of a whim and jibet built by a Purbeck quarrier Brian R Bugler.

A whim is basically a wooden roller with a bearing at each end, each bearing being attached to a vertical post which has a chain running from the top to an anchor point on the floor. Fixed to one end of the wooden roller is a ship's steering wheel which turns the roller clockwise or anticlockwise, there being no brake or ratchet fitted to the roller. The jibet consists of a vertical post with a roller at the top and a steel rope guide in the form of an inverted "U". A footstep bearing is fitted at the bottom of the vertical post which is mounted on a raised wooden platform allowing it to turn through 360 degrees. On the front of the vertical post is an angled wooden arm that carries a pulley in a shrouded mounting at the end. A rope, long enough to reach from the rock ledge to the boat below, is passed round the pulley at the end of the arm, over the pulley at the top of the jibet, given a few turns round the wooden drum and the surplus coiled in front of the whim.

Stone was loaded by swinging the jibet over the loading floor and attaching a block of stone by a sling to the rope, smaller components being placed in a skip or net. The load was raised off the floor by turning the wheel anticlockwise and holding onto the rope being payed off the wooden roller. One man turned the wheel whilst another controlled the tension on the free end of the rope. Extra turns can be made on the rope to ensure that the load can be lifted and its descent into the boat fully controlled. When the right conditions had been established the load was lifted and swung over the edge of the cliff. Lowering was controlled by turning the wheel clockwise whilst the rope was payed out under tension. When the stone had been loaded into the boat and the lifting gear unhitched, the wheel could be turned anticlockwise to bring the sling back for another load. As can be seen, in this case, the whim was primarily a lowering device that worked as a horizontal ships capstan and these were probably obtained from shipwrecks and modified to serve the quarry. Working the stone at the quarry prior to shipment ensured that freight charges were not paid for scrap which would be the case if it was dressed at the receiving station.

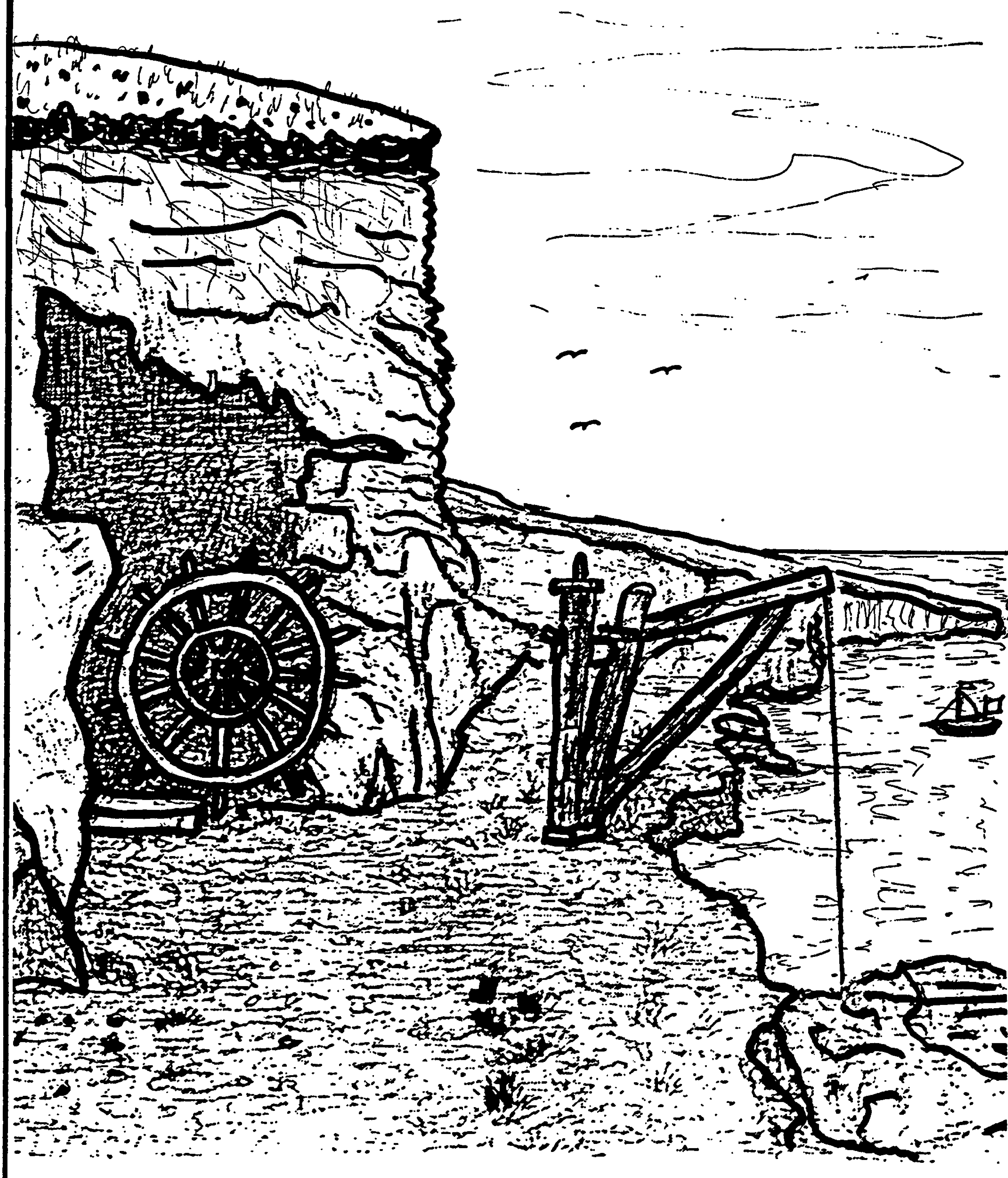


FIG. F8.2

WHIM AND JIBET AT HEDBURY CLIFF QUARRY.

WITH ACKNOWLEDGEMENTS TO T.M. HARDY.

FIG. F9.2

WHIM AND JIBET. DEVICES LIKE THIS WERE USED ALL ALONG THE PURBECK CLIFF QUARRIES TO LOWER STONE INTO THE BOATS.

SKETCH OF A SCALE MODEL BUILT BY BRIAN R BUGLER.

SCALE 2'-0" TO 1"

It is not possible to give details of every sea cliff quarry within the confines of this thesis, but a representative selection of individual quarries are described as encountered when travelling east along the coastal path from St. Aldhelms Head:

Winspit Quarries

Winspit is located at the seaward end of a cliff top valley a mile distant from the village of Worth Matravers. This is an ideal place for a sea quarry, where the sea has cut across a valley opening. The flanks of the valley could be quarried by cutting into the hillside and then turning the corner to quarry the cliffs midway down instead of having to quarry down from a high cliff edge. This method can best be seen from the sea and Plate 11.2 shows Winspit Quarry from this position, looking direct into the valley. It can clearly be seen how the flanks of the valley have been quarried and then turned to quarry the cliffs midway down, this provides the stone working and loading floor and the entrances to galleries where freestone was mined can be seen at this level. There is a track, with quarries on each side, that leads to Worth Matravers, which in later years enabled stone to be transported inland when sea transport ceased. Winspit quarries operated from the late 17th Century until the late 1950's. Peak production was reached between 1840 and 1890, when many of the other cliff quarries had closed down, and between the two World Wars thousands of tons of rubble stone was removed by open cast means for the construction of roads and airport runways, the stone being carted inland up the track to Worth Matravers.

It was not only the freestone beds which were used, the fine grained white 'Shrimp Stone' was burnt for lime, the harder grey Blue Stone (or 'Oyster Bed') proved very durable and was used for gate posts. The coarse House Cap was not very workable but was of use for breakwaters and other rough constructions. Many of the rough stones would be used as sacrificial stones in sea defence work. Underfree stone from the quarry was used in the Isle of Wight, Southampton, Portsmouth, Brighton and numerous other destinations in the South of England.

A general view of the quarry is shown in Plate 12.2 which shows how the hillside in the valley has been quarried before turning the corner onto the cliff face. The central track leads to Worth Matravers and there is another quarry face on the other side of the valley just beyond the foreground. As the galleries were driven into the rock to quarry the stone the quarry ceiling was supported on stone legs or pillars and a typical gallery opening is shown in Plate 13.2. Winspit's gallery openings are generally 4 m (13ft) high and 6m (20ft) wide and adjacent openings can be separated by a narrow 1.25 m (4ft) stone pillar although in general they are much larger and

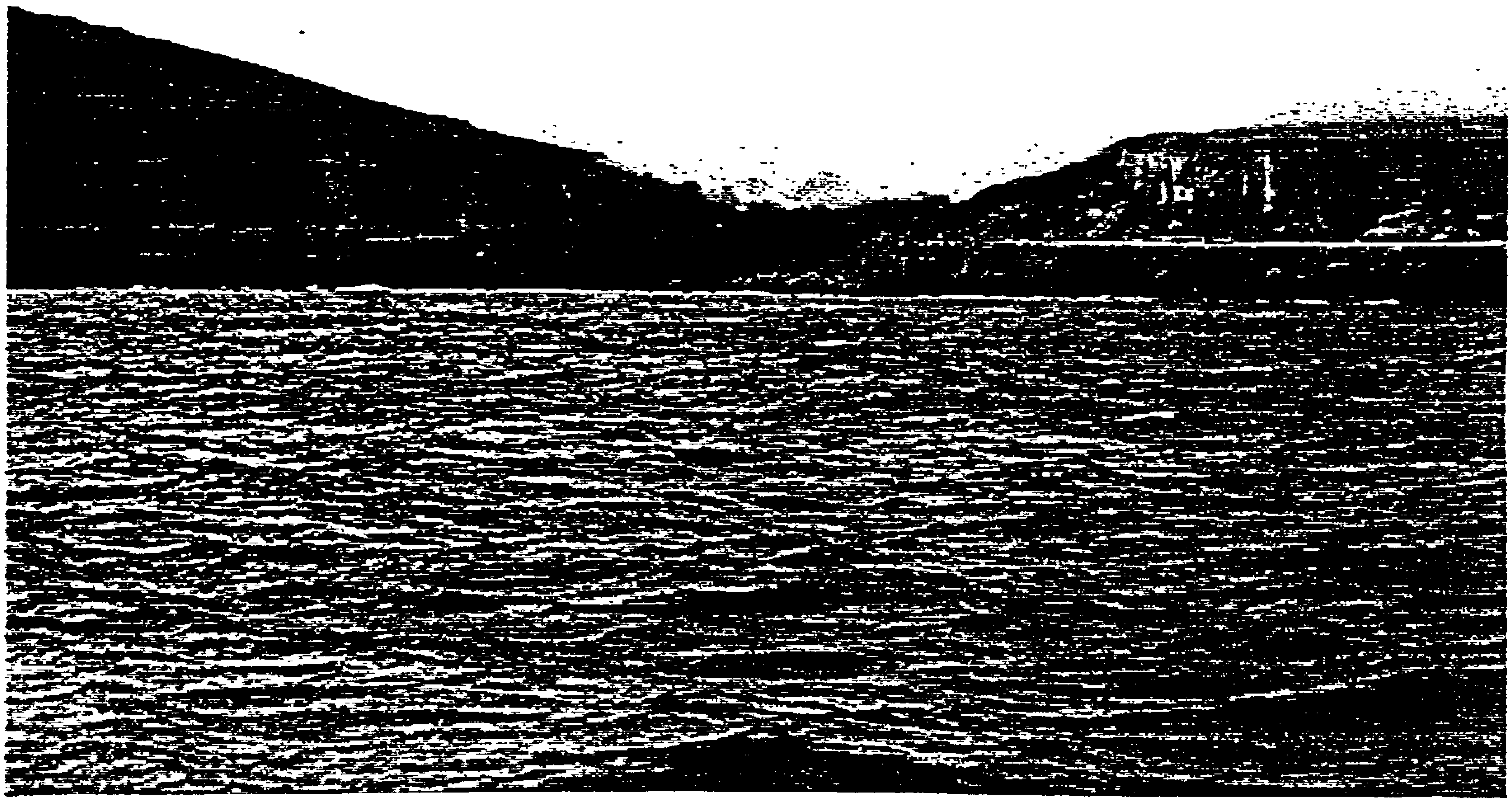


Plate 11.2 Winspit Quarry from the sea

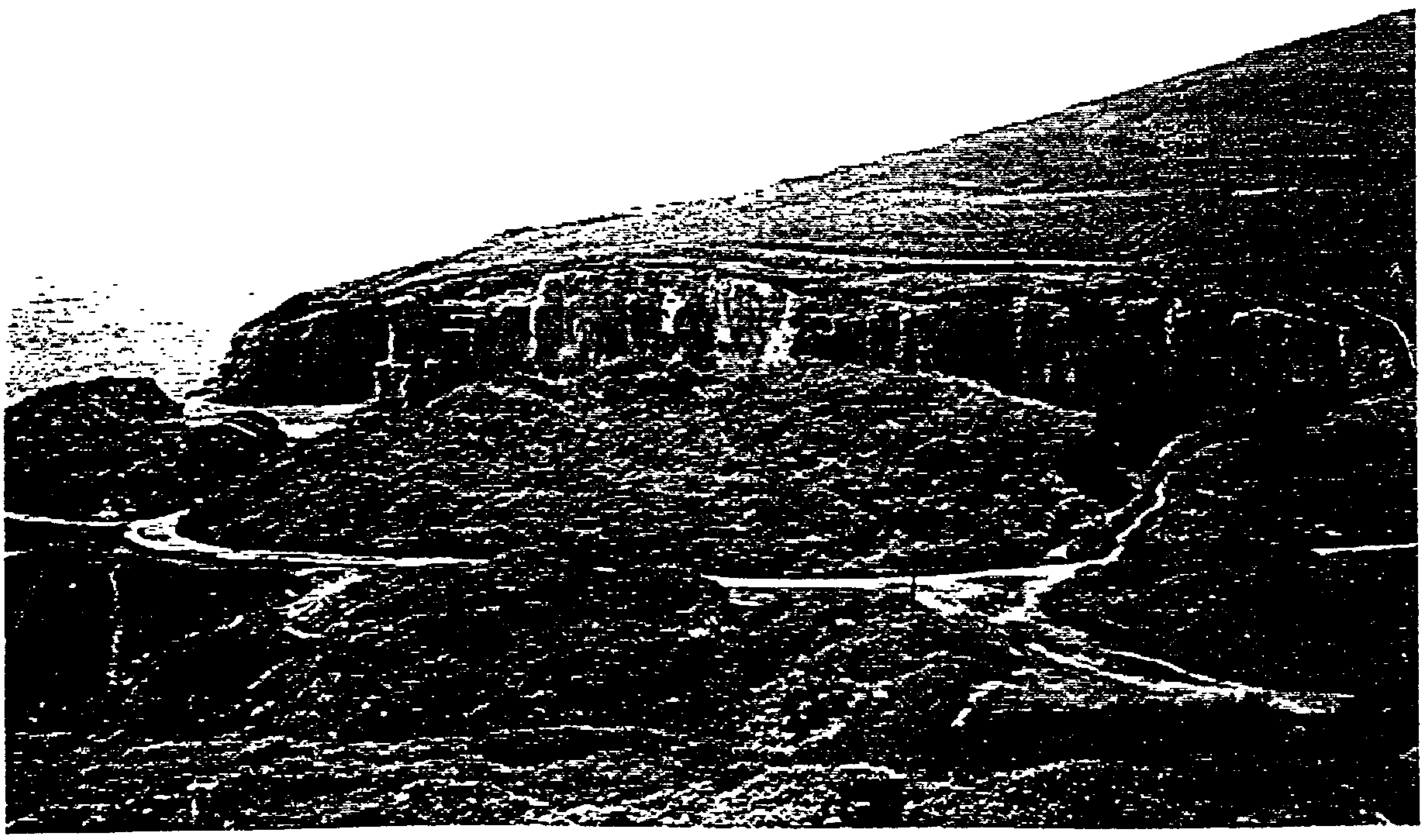


Plate 12.2 Winspit Quarry

spaced approximately 10 m (33ft) apart. One of the disused galleries is now occupied by a colony of bats and a grille has been erected to afford them protection, the entrance is shown in Plate 14.2. On the quarry faces can be seen blast marks caused by shot firing and the action of the sea is clearly visible on the wave cut rock platform below.

Halswell Cliff Quarries

The cliff face to the east of Winspit has been quarried and access is gained from Winspit itself along a ledge quarried from the cliff face but eventually the ledge tapers towards the rock face and prevents further passage. Plate 15.2 shows the Halswell cliff quarries, which are galleries driven into the cliff from the fairly narrow ledge on which can be seen the mounting points for jibets and whims. It can be seen that there have been rock falls over the years and the working environment here is entirely different from that found at a more 'roomy' quarry. Halswell rock takes its name from the East Indiaman 'Halswell' that foundered below the cliff in 1786 - although some survivors were rescued by quarrymen who lowered ropes down from the cliffs 168 of those on board were, unfortunately, drowned.

Seacombe Quarries

These quarries operated from the late 17th century to the early 20th. Trade from the quarries revived following the first World War and in the 1920's the Dorset Quarry Company Ltd adopted open cast methods there, the stone being transported inland. In the 1930's the quarries closed down and, unlike Winspit, did not revive with the outbreak of the Second World War.

Seacombe is located at the seaward end of a cliff top valley. The flanks were quarried by cutting into the hillside and then turning to quarry the cliffs. Plate 16.2 shows the quarry from the sea: it can be seen how the flanks of the valley have been quarried and then turned onto the cliffs. Gallery entrances can be seen leading off the stone working and loading floor midway up the cliffs and a track leads from the quarry to Worth Matravers. Stone extracted from Seacombe was generally of better quality than Winspit stone and larger blocks were quarried, the most notable being a 3.5 ton trough for the North Woolwich Galvanising Works. Plate 17.2 is a general view of the quarry and Plate 18.2 shows the entrances to some of the galleries.

Mason (1984) surveyed the galleries and reported that the ceiling was supported on

Plate 13.2 Winspit Cliff Gallery

Plate 14.2 Winspit Disused Quarries

Plate 15.2 Halswell Cliff Quarries

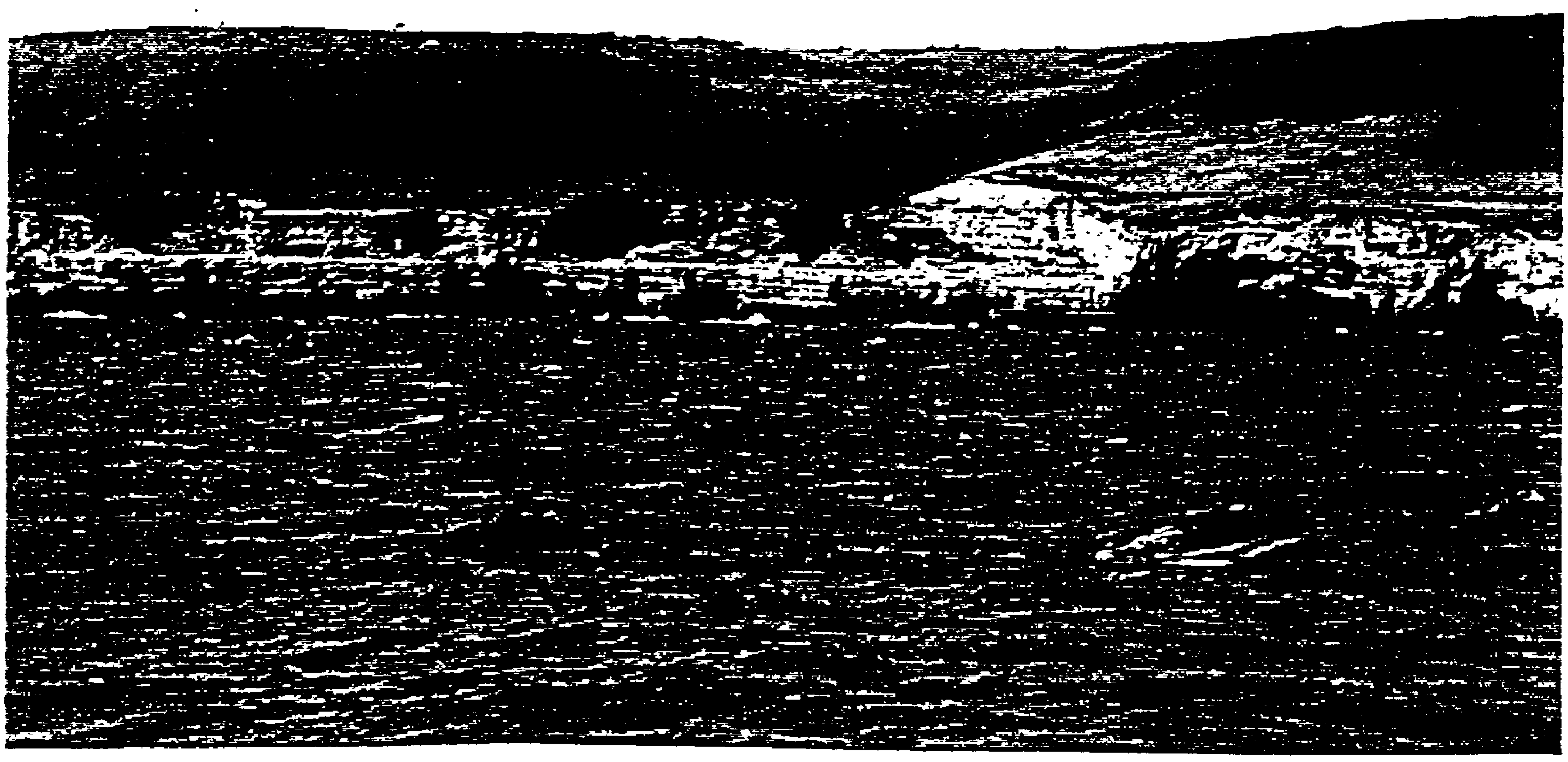


Plate 16.2 Seacombe Quarry from the sea

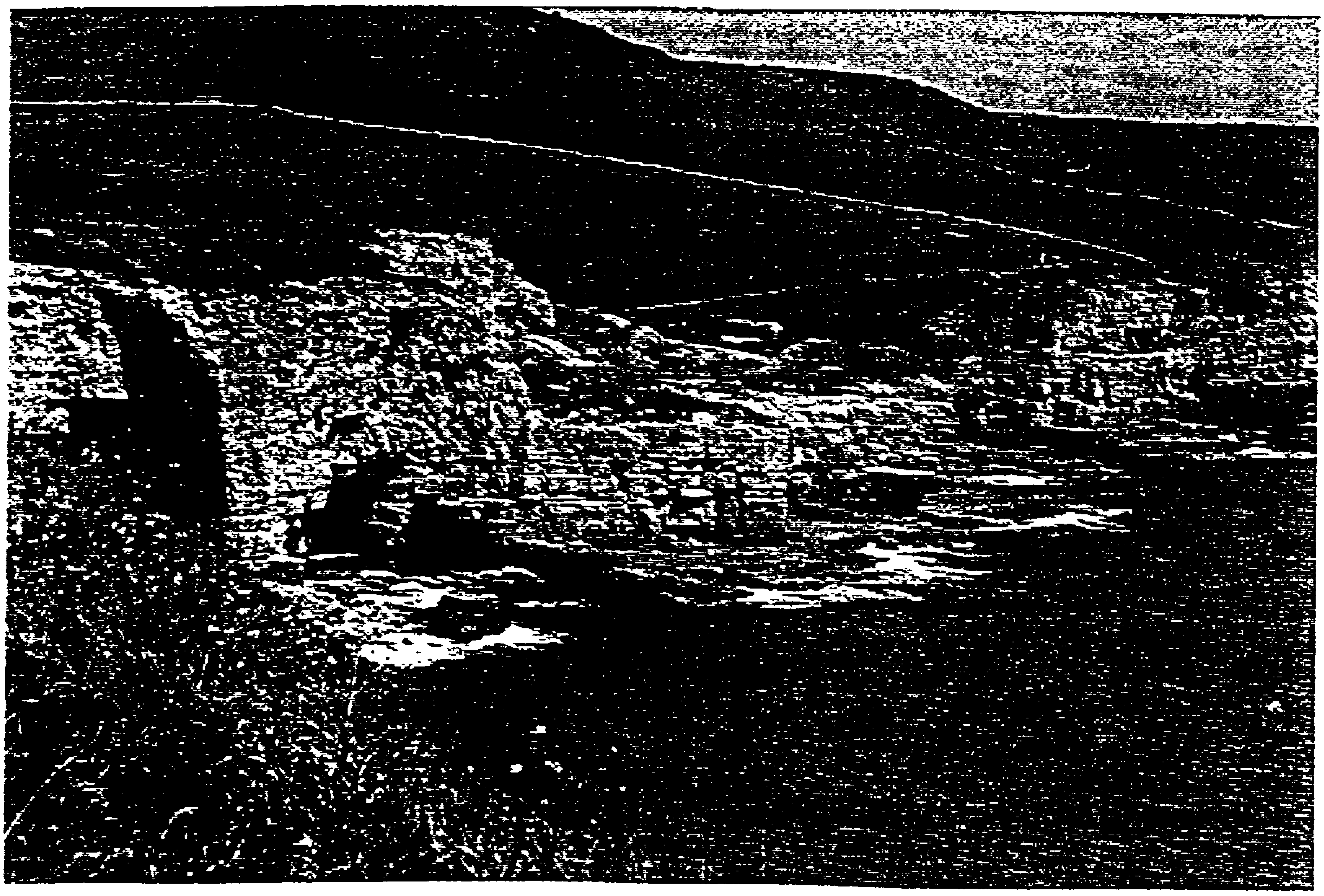


Plate 17.2 Seacombe Quarry

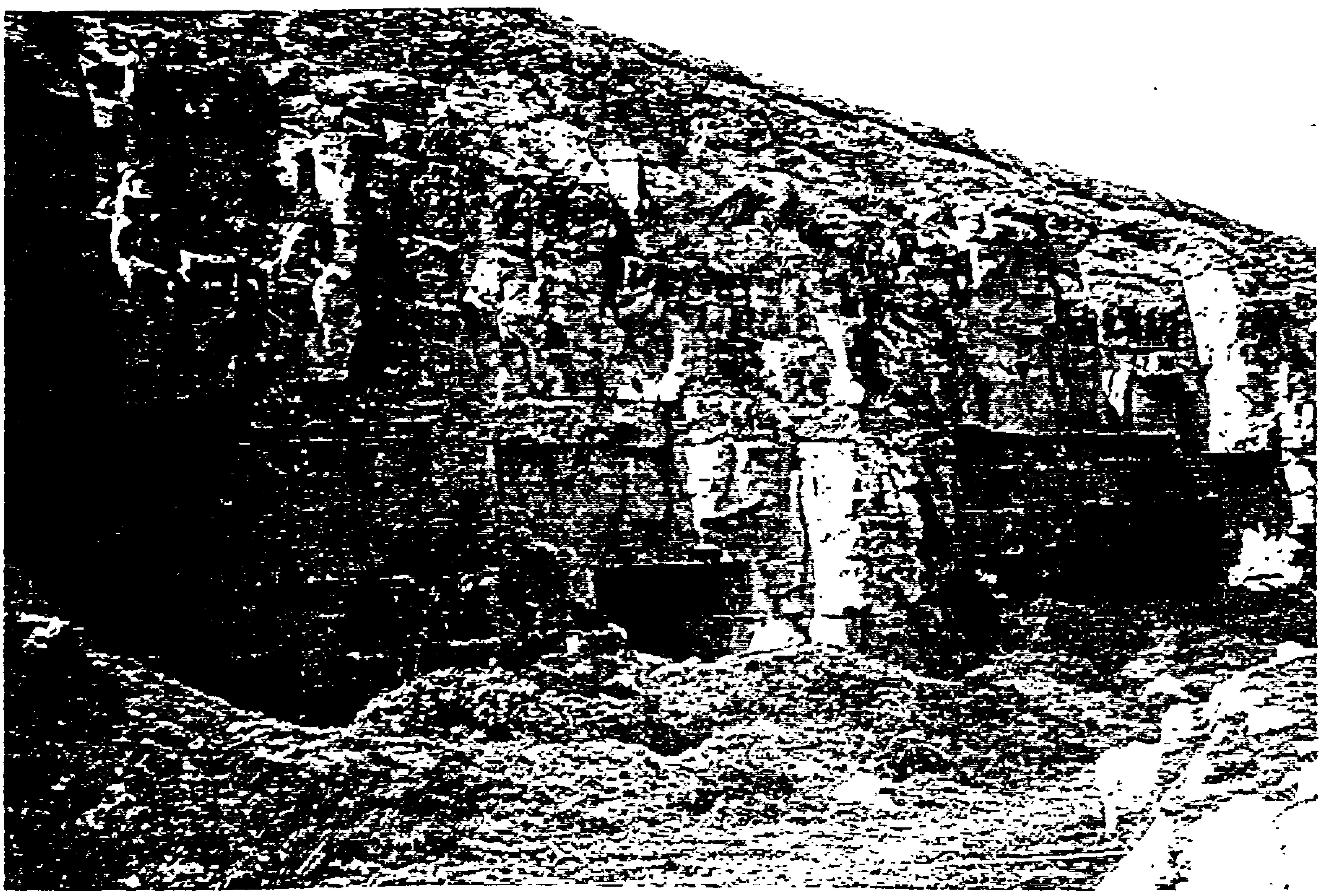


Plate 18.2 Seacombe Quarry Galleries

stone pillars and built up stone columns: many looked precarious and their safety was by no means certain, and this is still the case. The survey drawing is shown in Fig 10.2, and it can be seen that the support pillars are irregularly spaced and inspection shows that some of the pillars are exhibiting signs of distress.

Headbury Quarry

This quarry shown in Plate 19.2 is cut back into the cliff, so that the cliff path is diverted inland to avoid it. It derives its name from its founder Thomas Eidbury but during the latter 19th century it was worked by the Lander family, the senior member being known as 'Chinchen Landers'. It has all the characteristics of the large cliff quarries, open cast, galleries and a loading bay. This particular quarry boasts a cannon, placed there at the time of the Napoleonic invasion scare of 1801, and this can be seen in the left foreground (Saville, 1986).

Top Mast Quarry

Not all the quarries along the cliff are large in size and one of the smaller ones is Top Mast shown in Plate 20.2, with the characteristic working and loading floor quarried mid way up the cliff.

Dancing Ledge Quarry

Said to derive its name from the fact that the sea ledges in front of the quarry were large enough to accommodate dancers. All transport was by sea and a general view of the quarry, looking West is shown in Plate 21.2 and it can be seen that open cast quarrying and galleries cut into the cliffs were both used. A face produced by open cast quarrying is shown in Plate 22.2 and this also is the entrance to a gallery which has been partially covered by quarry waste. The cliff path runs behind the fence posts on top of the quarry face.

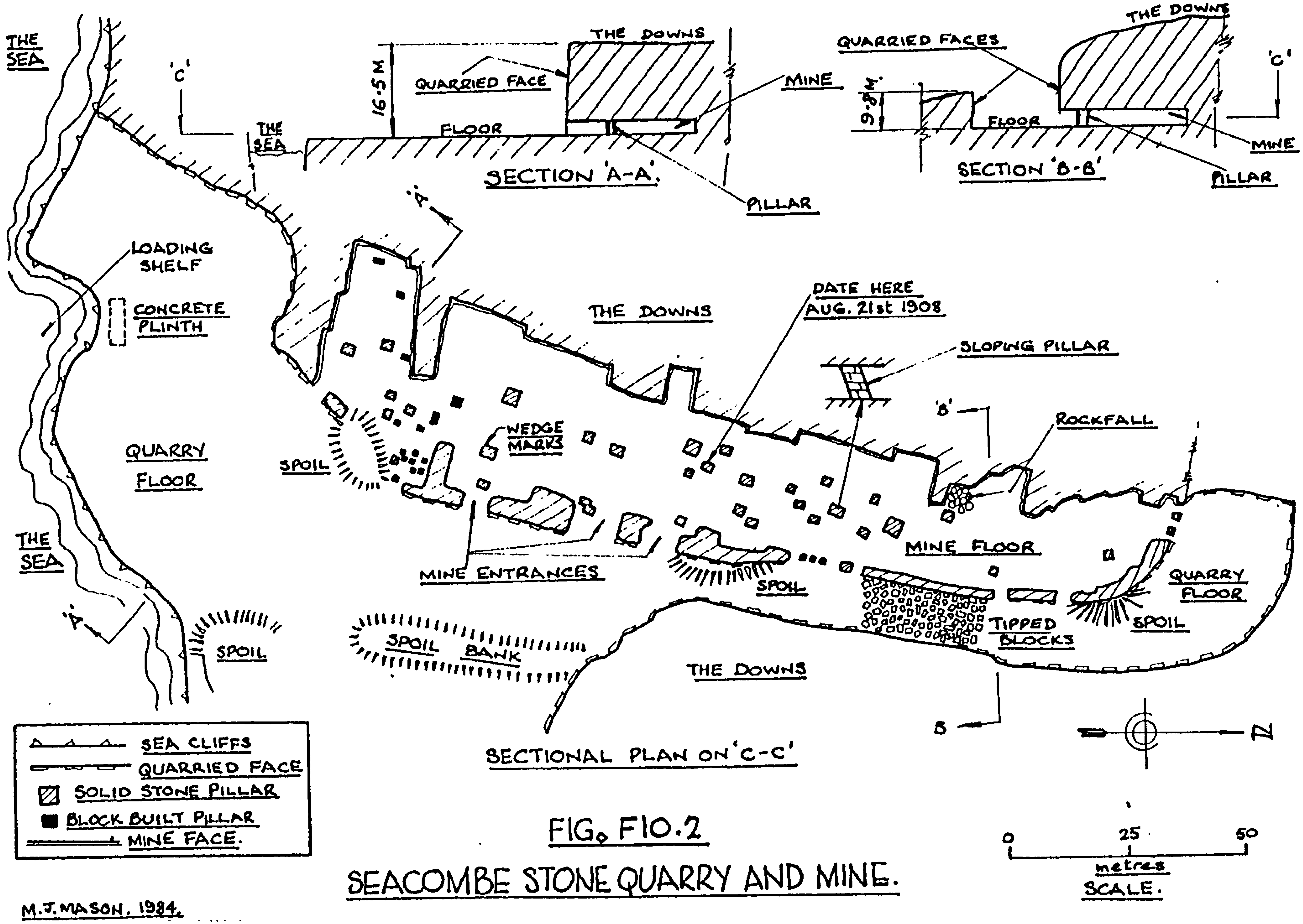


FIG. F10.2

SEACOMBE STONE QUARRY AND MINE.

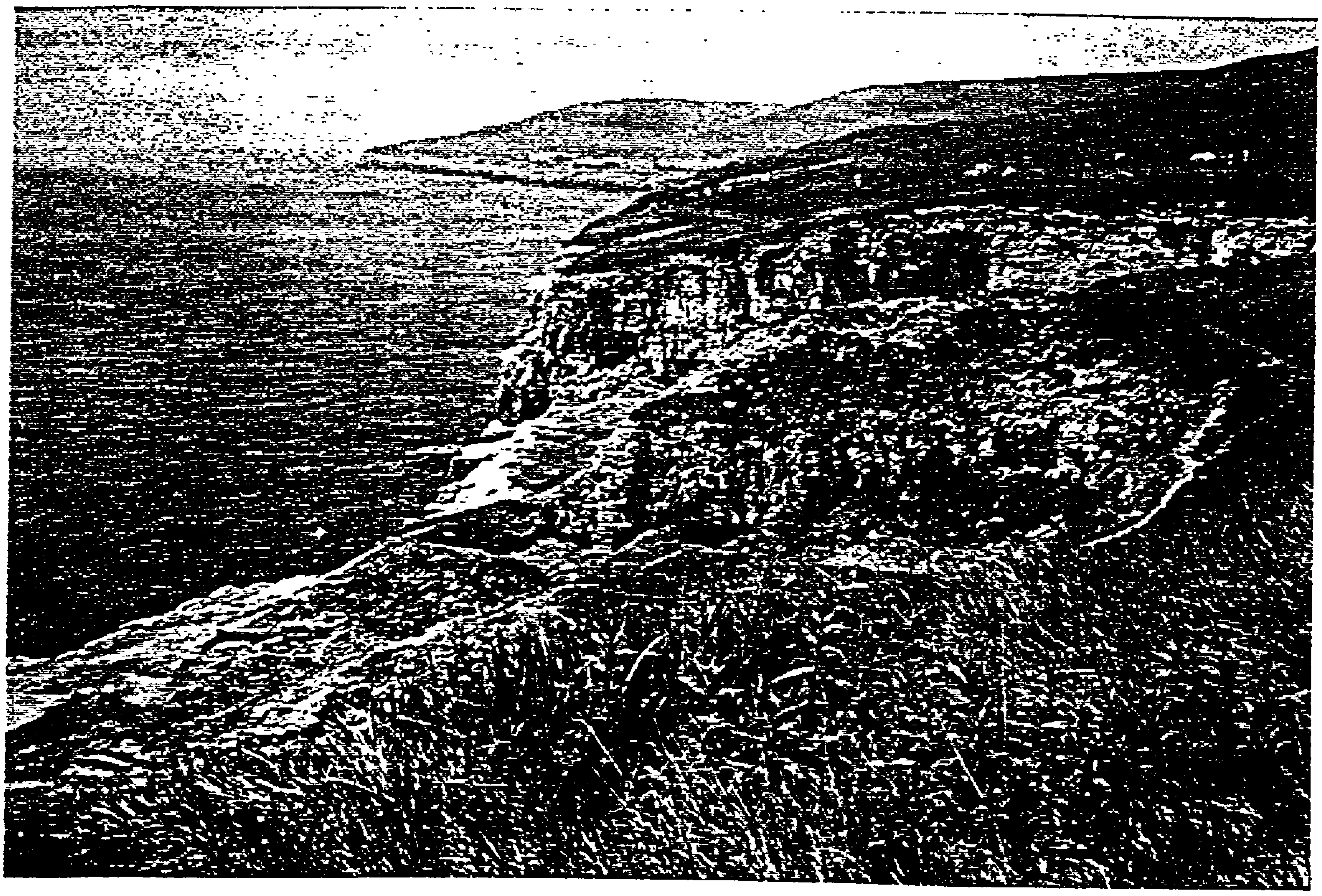


Plate 19.2 Headbury Quarry

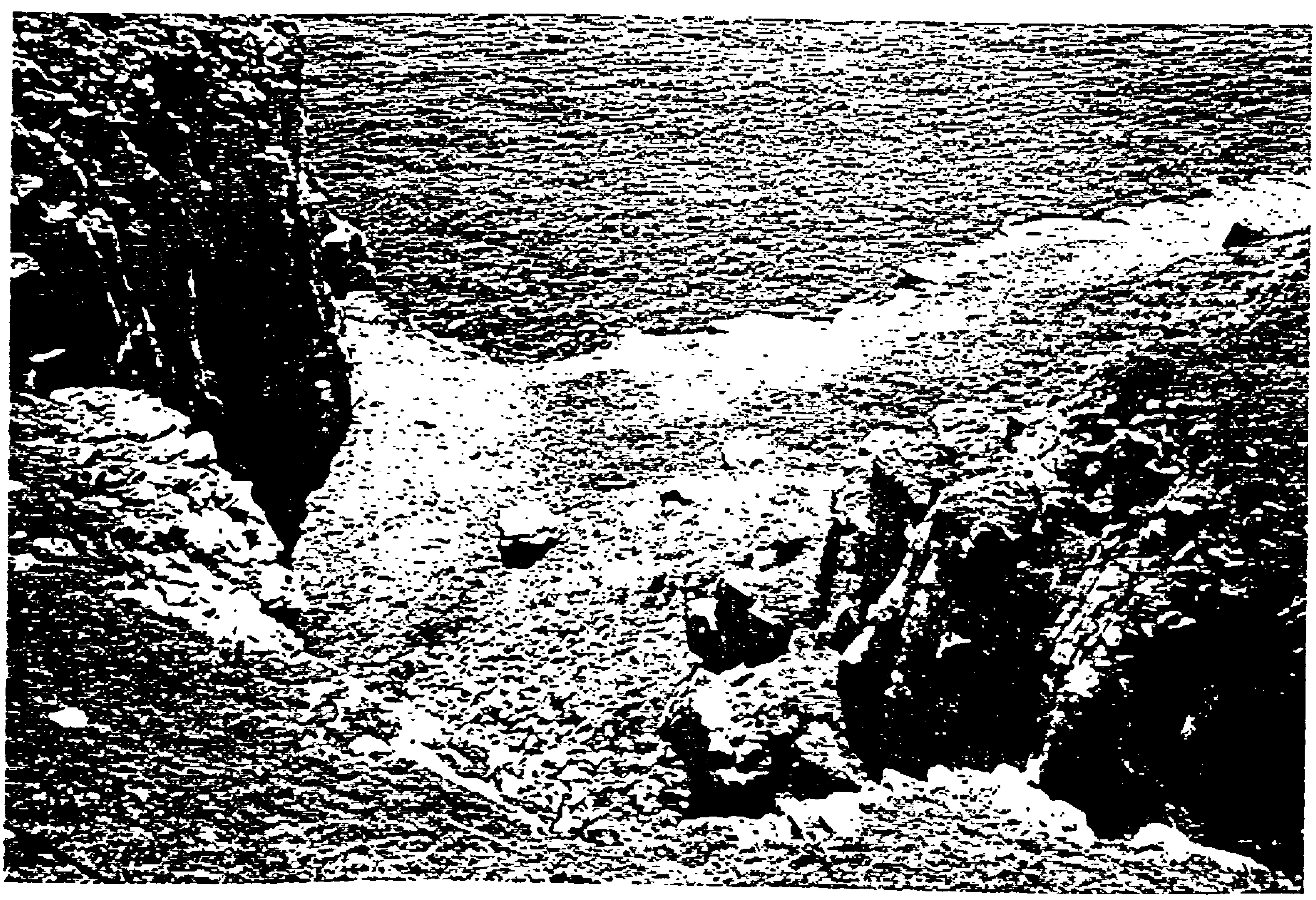


Plate 20.2 Top Mast Quarry

Plate 21.2 Dancing Ledge Quarry

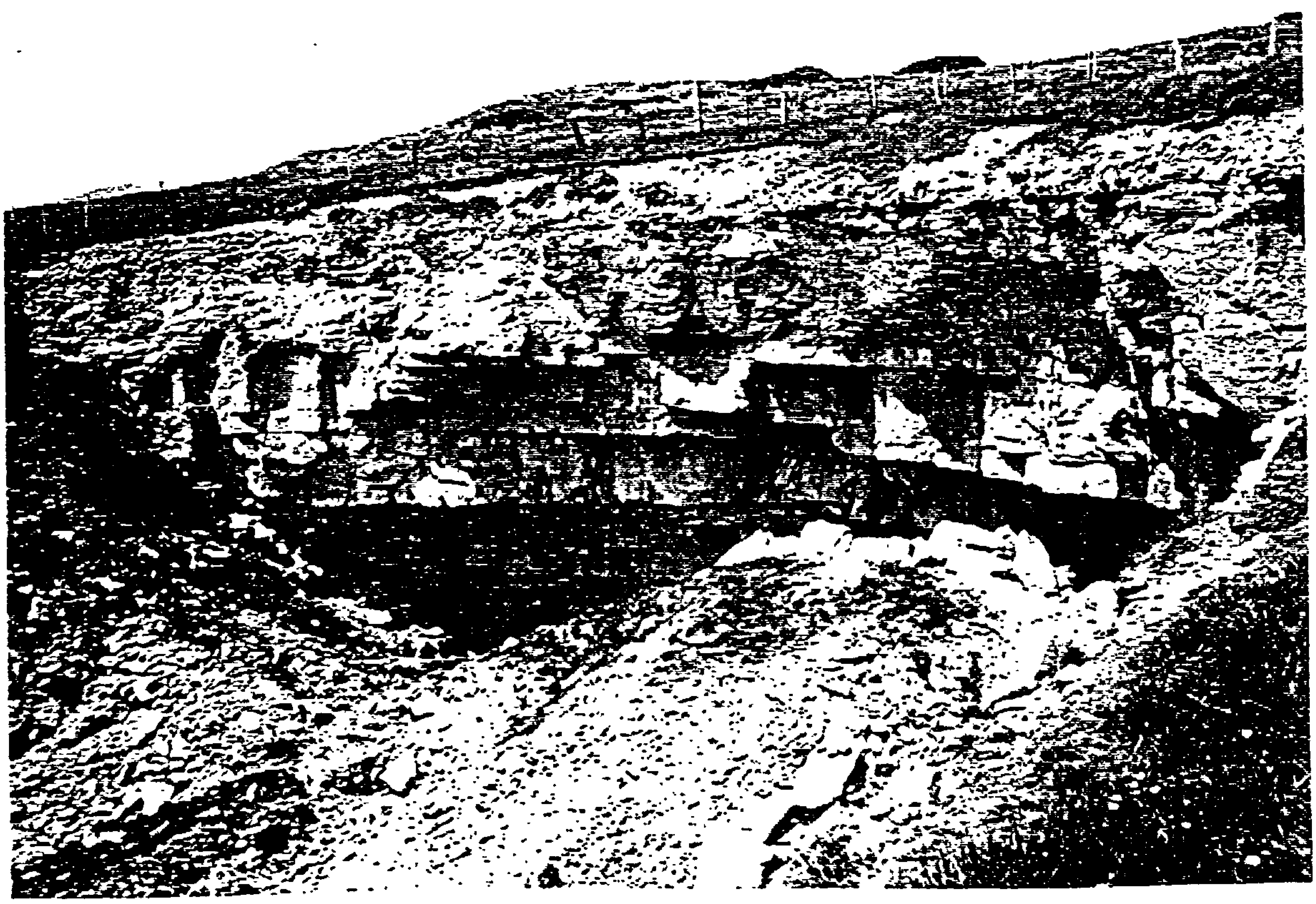


Plate 22.2 Dancing Ledge Quarry Gallery

On the sea ledge a 'horn-cart' was used to transport the stone to the sea to be loaded onto the waiting barges, this was a two wheeled cart without sides, the back of which rested on the ground for loading. In front were two long shafts which curved outwards, which gave the cart its name, the object of the curved shafts was to ensure that the team of men who pulled it did not tread on one anothers' heels. (Saville , 1986). The ruts made by the cart wheels are shown in Plate 23.2 and quarrying began here at the same time as Seacombe and Headbury.

Tilly Whim Quarry

The quarry's name is an amalgam of two names, in that before 1721 Tilly Mead was the name of a meadow in the town, formerly part of the Manor of Eightholds, on which the larger part of Tilly Whim is located and a whim is a device for raising and lowering loads, i.e. a horse whim. As whims were used to lower stone into the barges and the quarry was located in Tilly Mead, this would appear to be how the quarry got its name (Robinson, 1882). A lease was granted by Mr W . L. T. P Taunton, lord of the manor of Eightholds, in 1806 to Messrs. Gillingham, Marsh, Randle & Marsh, Stone Merchants, for 16 years to quarry stone at Tilly Whim Quarries (DCRO, D/MOW/T9). Robinson (1882) refers to a letter that Taunton wrote on 13 April 1812 describing Tilly Whim, from which the following is an extract:-

"There is so much room in this quarry for any assignable number of men to work and so great a facility, in summer, of shipping the goods, letting them down at once by a crane into the vessel, that men of industry and enterprise ought to command almost the whole market for the species of articles which this quarry produces, and to supply it from this spot only" .... "The sort of goods which this quarry yields are of what is called the Purbeck Portland, a sort of freestone, much like the Portland only harder, and much used for building in bridges, harbours, fortification walls, troughs, columns, rollers, staddle stones, etc".

The total shipment of stone for the five years ending with Ladyday 1810 was:-

37 sets of bigs and caps	318.5 feet of rollers
14 sets of rink stones	2305 tons of backing
83 pairs staddle stones	97 tons of block
340.5 pecks of sinks and troughs	133 tons of pitchers

for which the royalties payable to Taunton amounted to £20 - 7 - 2d, which makes his letter appear similar to a sales pitch for someone to buy stone and increase his royalties. In the two years ending Ladyday 1812 only 110 tons of pitchers were shipped and the quarries closed down.

No stone ever went inland from Tilly Whim because there was no road and the footpath was very steep. The lease issued by Taunton was dated 1806 but the appraisal of goods at death of Alexander Molmoth, Marbler, in 1703 credits him with stone at Tilly Whim quarry to the value of £43 - 10 - 0d (DCRO, MIC/R/307/48). Shipments of stone from Swanage commenced in 1700 and all stone left Tilly Whim by sea, so Molmoth was probably the first to quarry Tilly Whim and transport stone from the cliffs there. Plate 24.2 shows Tilly Whim quarry from the sea showing the working and loading floor partway up the cliffs with the open cast and gallery quarries off this floor. Behind the quarries can be seen the steep ascent inland which prevented stone being transported that way and necessitating sea transport. Falls of stone from the quarried cliff face are evident and this danger brought about the closure of the quarries to visitors in the 1970's, having remained opened since quarrying ceased in 1812. Plate 25.2 shows the entrance to two of the galleries and this shows the working floor and the rock falls in side elevation, looking east.

Durlston Head Quarries

East of Tilly Whim is Durlston Head which marks the eastern end of the cliff quarries and Plate 26.2 shows Durlston head from the sea. On the headland can be seen Durlston Castle, a Victorian folly built by George Burt which is now a restaurant within Durlston Country Park and owned by Dorset County Council.

Plate 27.2 shows the cliffs at Durlston Head and some of the galleries can be seen. The cliffs and caves here were said to be a favourite place for smuggling, a popular cargo being brandy from France (Robinson, 1882). When the cliff quarries were operating along the 5 mile stretch between St. Aldhelms Head and Durlston Head the stone was transported from the quarries to Swanage, for loading onto sea going vessels, by stone boats. These stone boats were strongly built flat bottomed craft which were pointed at the stem and stern and carried from six to nine tons. These cumbersome boats were usually anchored at their mooring during fine weather, but when the dreaded easter or nor'-easter blew, the boats had to be beached and hauled up on the boat haul at Swanage, where the pier now stands. Each stone boat was manned by two strong men, who used the long, heavy sweeping oars, assisted by a small lug sail when the wind was favourable to drive the ponderous craft along (Hardy, 1908).

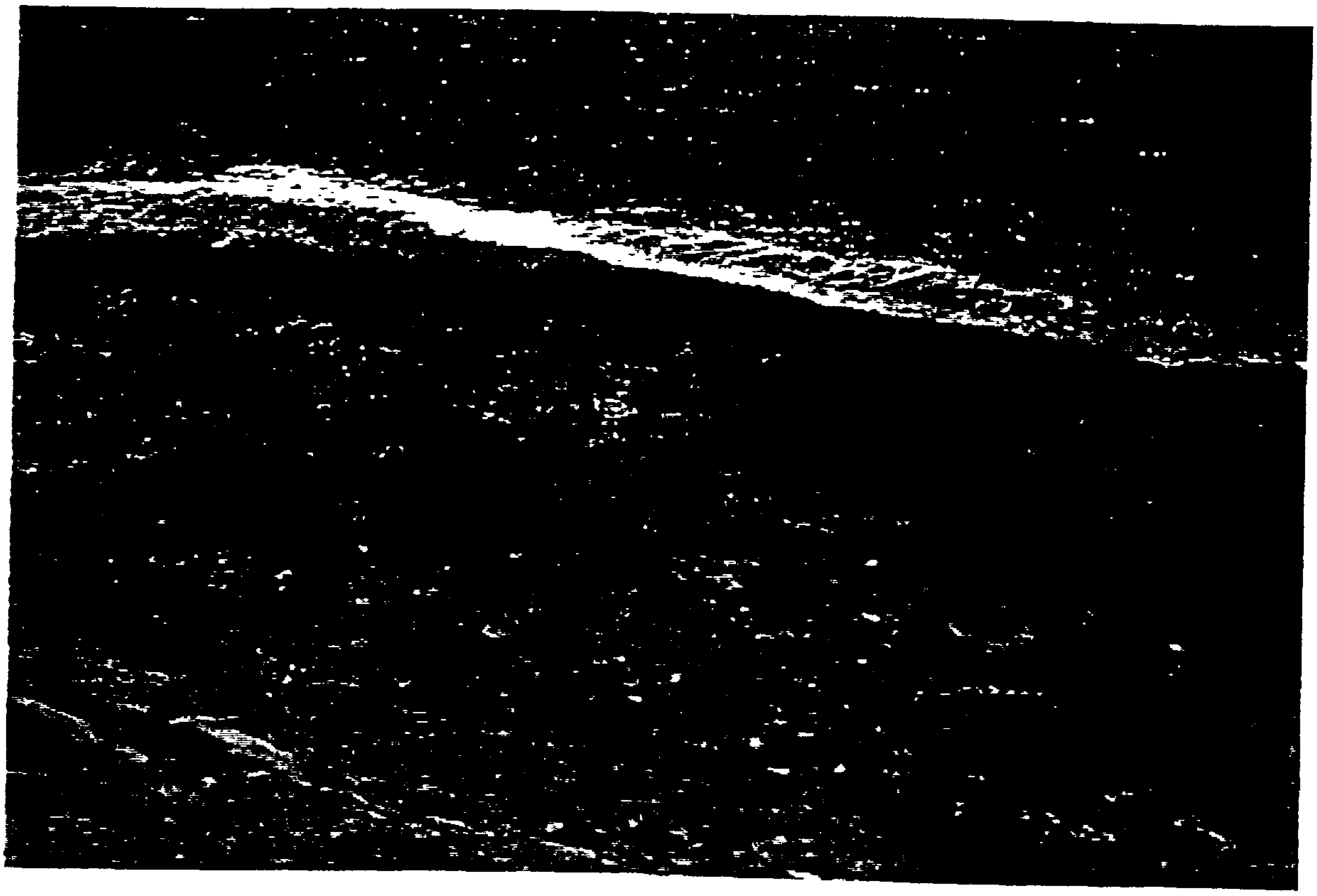


Plate 23.2 Cart wheel ruts at Dancing Ledge Quarry

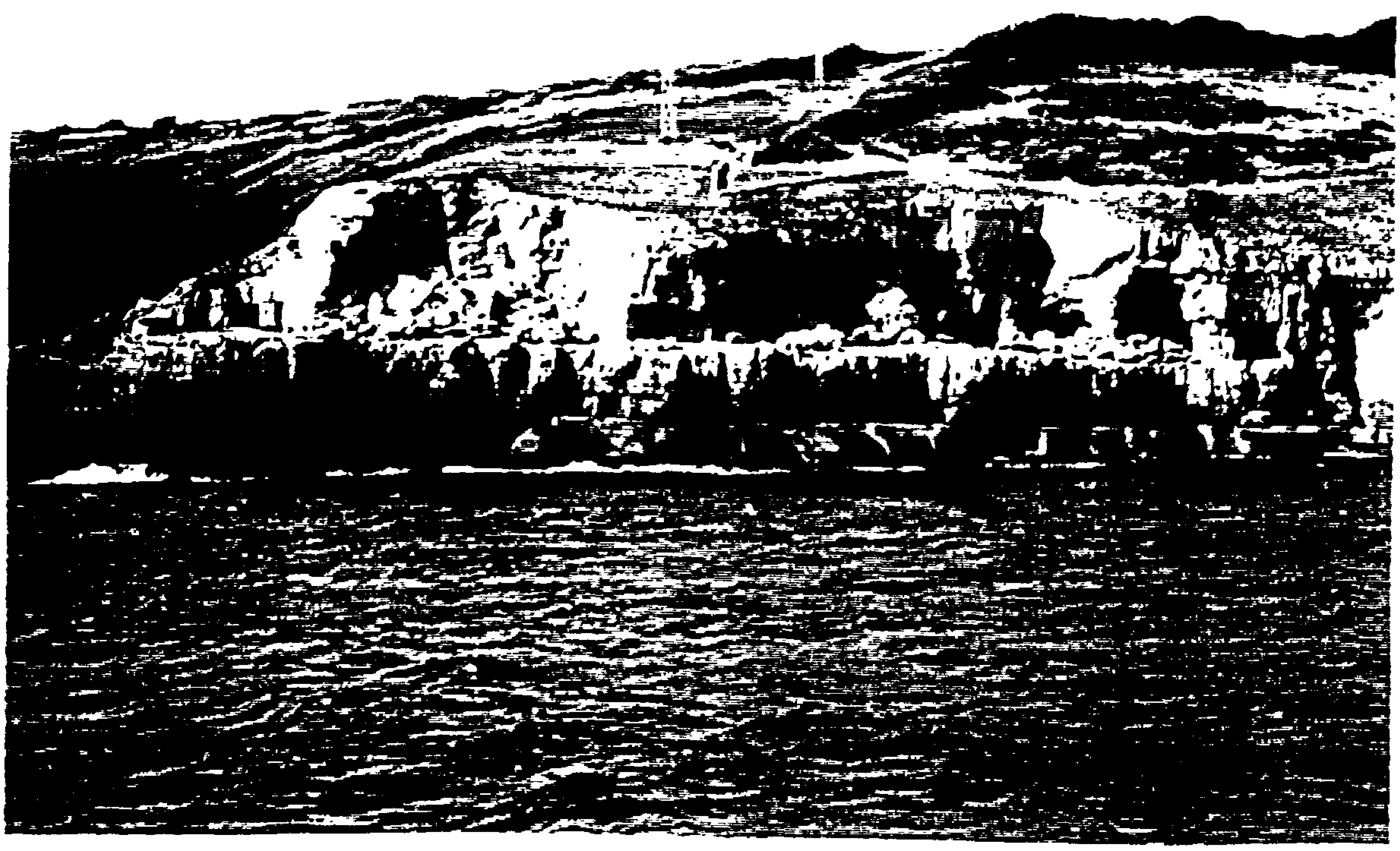


Plate 24.2 Tilly Whim Quarry from the sea

Plate 25.2 Tilly Whim Quarry

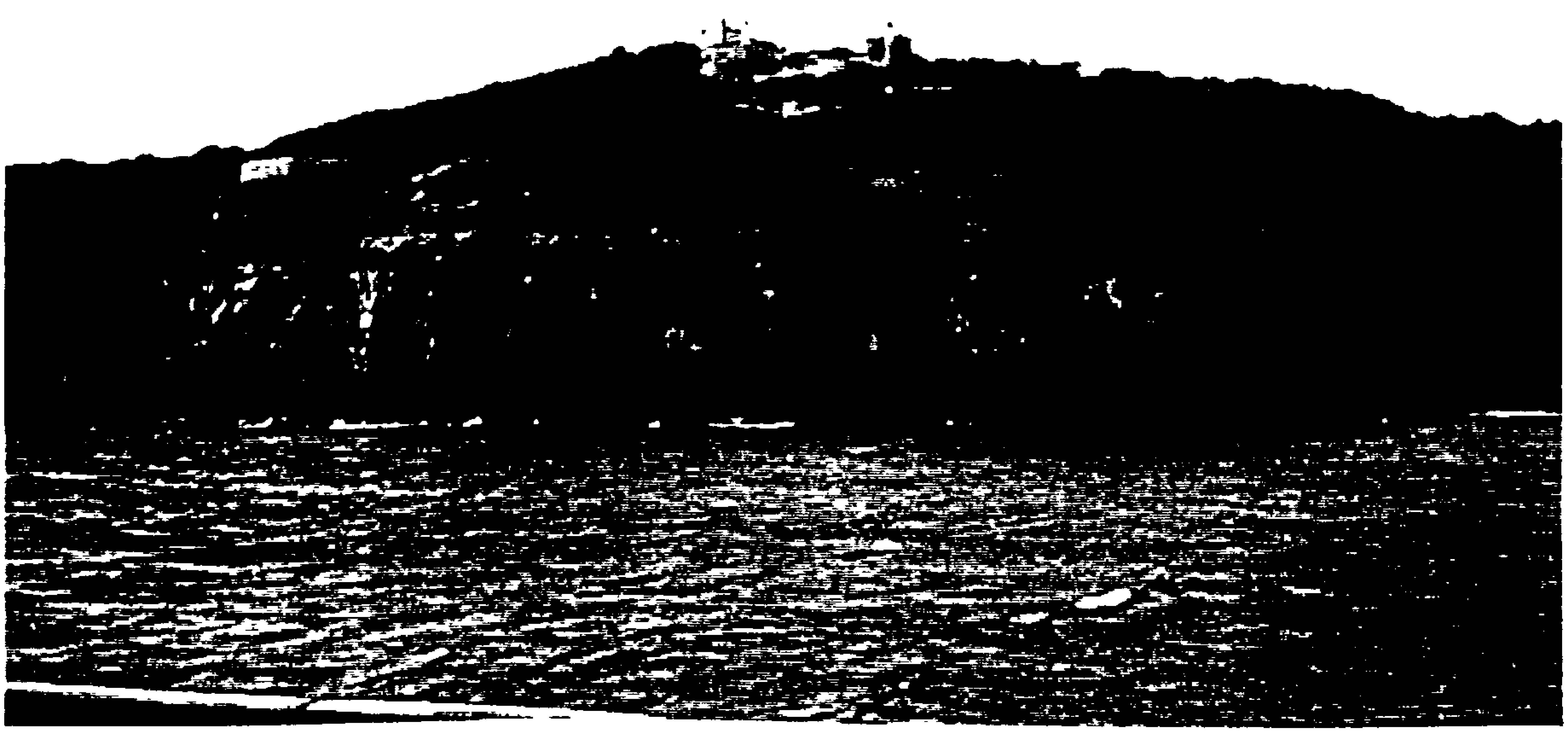


Plate 26.2 Durlston Head from the sea

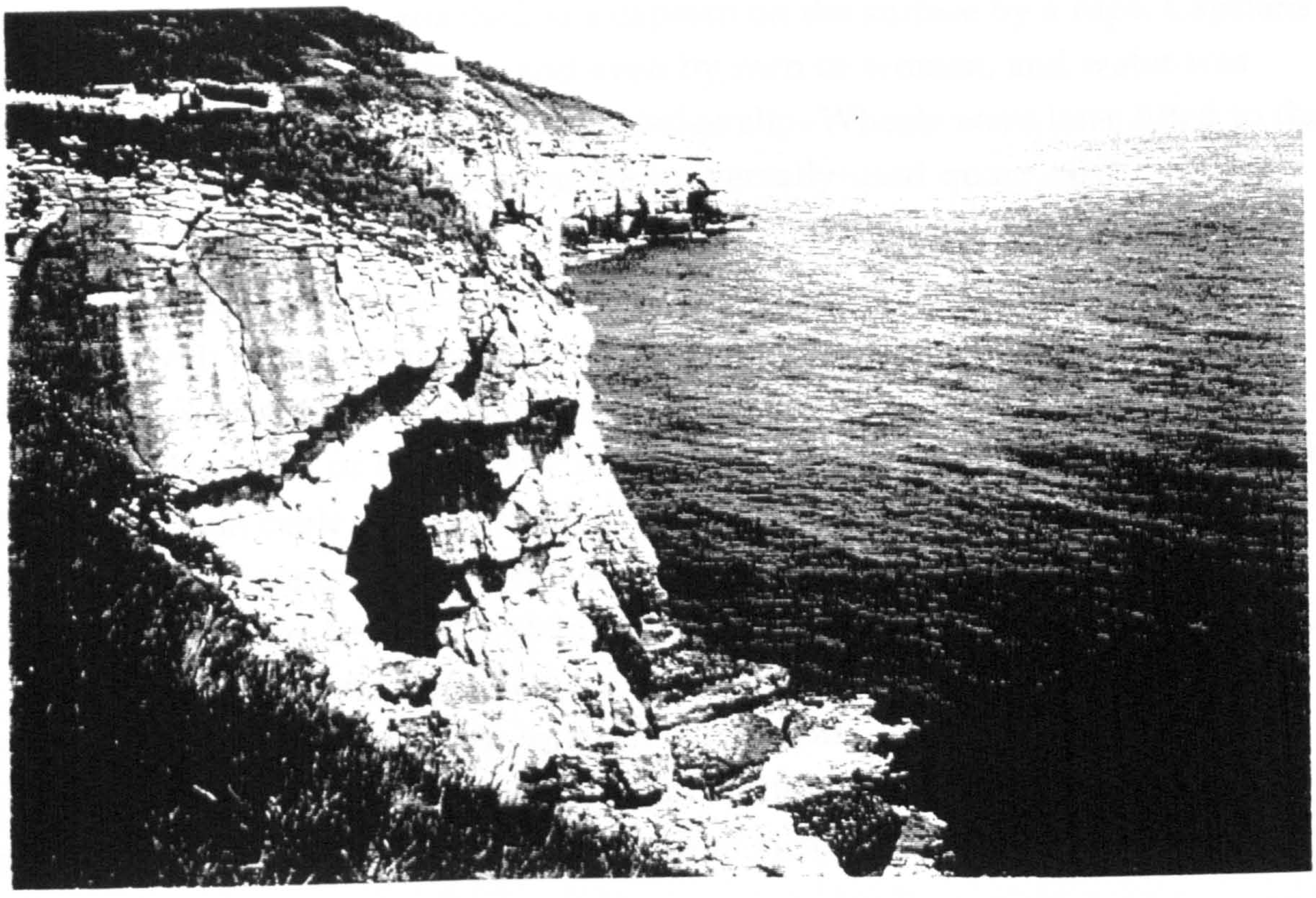


Plate 27.2 Durlston Head Quarries

(b) Mining

The Purbeck marble industry seems to have reached its peak by 1450 and then gradually declined until it petered out around 1700. Records show that Purbeck paving stones were being shipped into London in 1580 and they, like the marble, came from open cast quarries. As the demand for paving and other stone increased stone mines, or quarrs, were opened around 1650. This method of mining left the overburden in place and allowed the deep lying stone to be quarried economically . The early mines had shafts sunk at a shallow angle, with a maximum depth in Swanage of 120 ft: they were called slides because at first the stone was pulled to the surface on a wooden sledge attached to a capstan on the surface by a rope. Capstans were turned by horses or donkeys, and even by men or women, and water was poured on the slide to make the wooden sledge slip. Wheels were later fitted to the sledges and further development gave the universally used quarr cart.

There was constant trouble with the rope slipping in wet weather, and rapidly wearing out with rough useage, thus eventually rope was replaced by chain cable, which being far stronger than rope, and used in association with a wheeled quarr cart, allowed the shafts or slides to be made much steeper, which required less work to construct. Chain cable was reputedly first made by William Coombs, a Swanage blacksmith, to overcome the problems associated with rope and the captain of the stone vessel 'Swanage' seeing the obvious advantages ordered one for his boat. His first port of call was Portsmouth and the chain cable attracted the attention of the dockyard officers who later began to make chain cables for ships, nevertheless the first chain cable was made by a Swanage blacksmith, who unfortunately had no patent protection on his invention to make him rich! (Hardy, 1908).

From the shaft (or slide) lanes were driven out along the chosen seam for perhaps a hundred feet or more, stone legs being built up to support the ceiling where the stone had been removed. When the stone had been hauled up the slide it was dressed by the quarrier into the required shape and stacked awaiting collection by the stone merchant.

Commercial and Social Organisation

Robinson (1882) recorded that there were four stone merchants engaged in the trade at Swanage. From the quarries stone was taken to Swanage and stacked on the shore at the bankers until it was sold to a customer by the merchant and shipped out. The merchants owned the stone at the bankers and also dealt with the outside world.

From small beginnings many of these merchants became rich, but the quarryman, each employing only three or four hands, mostly members of his own family, did not have the necessary capital to break out of the merchants stranglehold on the trade (Hutchins, 1861 - 74). The merchants purchased their stone from many small quarries and consequently had to mix the products from different quarries to supply a large order: this gave an inconsistent product as far as quality was concerned and was the principal reason for both customer complaints and the mixed reputation of the quality of Swanage stone.

Although the quarriers relied on the merchants for their wages they were not paid a low wage but compared favourably with urban artesans. They did however waste much of their skilled time by acting as labourers in hauling stone. Before the repeal of the 'truck' system they were, however, always deep in debt to the merchant and without the benefit of coin of the Realm goods and services were paid for either in stone or by barter.

A view on the Purbeck quarrier in the 19th century is given by Legg (1989) who quotes from the report of the Inspector of Mines for the West Country, Dr C le Neve Foster, who carried out a postal survey of the Swanage and Langton quarrylands in 1878:

"The Purbeck stone is a new feature of my statistics. In spite of a great many difficulties, I believe I have at last attained a fairly correct statement of the total amount raised from the mines. There are nearly 100 stone mines in the Swanage district worked by one, two or three men underground, who are in many cases the owners as well as the occupiers. Their work is often most irregular; if the men can find work as masons they abandon their quarries, for a time, and do not return to them until other work is slack. As the quarrymen of Purbeck have never been troubled with Government forms till this year I had considerable difficulty in getting returns from them. Endless mistakes were made, requiring investigation by correspondence and I may safely say that the 92 stone mines near Swanage, employing only 264 persons, gave me more trouble than all the other mines of my district put together. No doubt I shall have much less inconvenience in future years as the men will soon get into the way of filling up the return correctly". The following figures represent the number of tons raised during the past year (1877):

Purbeck stone and marble, dressed; 11, 816 tons 10 cwt
Purbeck stone, undressed; 1, 411 tons 10 cwt

The difficulties that Dr Foster experienced in 1877 were still causing problems in the quarrying industry in 1912. Samuel (1977) recorded that for most of the 19th century quarrymen may be said to be statistically invisible, as regards the majority of most of them. The census records 60,000 of them in Great Britain in 1891, yet within four years of the passing of the Quarries Act in 1894 no fewer than 134,478 persons were registered as being in quarrying employment, a figure which on the evidence of the mines inspectors themselves, must have represented only about a half of the total number of those following some kind of quarry based occupation (the Act was confined to pits of over 20ft in depth), one possible reason for the failure to number them is that quarrymen were often something else besides. As a divisional inspector of mines put it in 1912; ' You may have a perfectly good quarryman working 3 weeks or a month in a quarry, and another time he is a farm labourer or working on some other work altogether. Thus it is difficult to provide any exact estimate of the size of the Purbeck stone industry labourforce.

The long history of stone extraction had however seen the development of regulatory organisation at the local level. For example when disputes arose on quarrying they were usually able to be settled locally, but if this was not possible the Warden of the Purbeck Marblers was informed and his steward brought the members together for a meeting, often held at Greasehead, halfway between Langton and Swanage. For a time there was a rift between the two townships and rival companies were set up and even after the schism was healed a Swanage clerk and a Langton clerk recorded their own versions of the proceedings. Arguments over underground workings were hot and hard to adjudicate and when a vote was finally taken it was customary for the 'Ayes' to step over the capstan chain.

Masons were dependent on their punches, chisels etc used in the quarrying and dressing of stone and these required regular sharpening. Tools could be ruined by a moments overheating , the temper on steel had to be straw coloured, so that a chisel kept its edge, yet was not brittle. This work was done by the blacksmith and this accounts for the relatively high number of blacksmiths to be found in the district. As the blacksmiths closed down owing to lack of work, tools began to be sharpened by the quarryman and small forges appeared in the quarr huts. The forge, together with tools, spack, roller and donkey were all locked away in the quarry huts when the quarryman went home because they were his major assets. With the advent of tungsten steel and chisel claws with replacement blades resharpening tools became less of a problem.

As they grew older quarrymen required an easier physical job and many of them finished off the last years of their working life working the Lannen, or Laning Vein. It was close to the surface and although the lanes had a low ceiling which gave cramped conditions it required less strenuous effort to build up the stone supporting legs. For all age groups this was a dangerous profession, and accidents were fairly common. Even as early as 1268 a verdict of misadventure was recorded on Walter le Vel and Hugh le Mochel who were crushed in Peter de Clavile's stone quarry where they were digging with a pick valued at 6d. There are recent stories of crushed heads and amputated limbs as a result of founders to inspire respect for the rock in young apprentices and the old mens knowledge of it. (Hyland, 1978).

Quarrying and mining also influenced directly the settlement pattern, and the village of Langton Matravers owed its expansion to the stone trade and its 18th and 19th century cottages, often built of stone waste, marked the period when the stone industry moved back from Swanage, where there was a serious danger of overmining. In 1761 the road to Swanage was made a turnpike and the dirt roads in the area gradually fell into disuse. Adjoining Langton is the hamlet of Acton, which lies close to the Priestway, the track that runs through the heart of the stone land from Worth to Swanage which was used to cart stone to the bankers. It is a bare place on the limestone plateau and although its earliest building is of the 16th century, most of its houses, like those of Langton, belong to the 19th century and were built to house the quarrymens' families. Even in the nineteenth century conditions were fairly primitive, and old shafts were used as wells for domestic water and there is evidence that effluent from the communal closets or cess pits filtered back through the limestone layers into the old workings (Hyland, 1978).

Purbeck Mining Methods

Stone mining in Purbeck began around 1650 to meet the demand for stone, which was shipped primarily to London, and the importance of this trade is marked by two agreements entered into by the Purbeck Marblers. The first of these pertains to a right of way at Ower, which had been the main Purbeck port for centuries (timber for Corfe Castle was landed there in 1090), but in 1695 the Marblers thought it important enough to enter into an agreement to secure the right of way to Ower, even though there had been free passage there for at least 600 years. The second agreement in 1697 concerned the setting up of a Joint Stock Company to secure for the numerous quarriers, who had no capital and were operating on a small scale, a fixed payment for their stone, and afford them protection from unscrupulous merchants. It is possible to determine the size of the quarrying operation at this time because the second agreement was signed by 142 freemen and with an average workforce of 3 per undertaking, and there were approximately 50 mines and quarries operating.

Working methods remained little changed throughout the working of the stone from the 1600s, and Payne (1953) states that until 1946 all cutting was done by hand often using tools that had been in the family for generations. Shortly after this date the stone mines were closed down on safety grounds by the Inspector of Mines although some were given special dispensation to continue until the early 1950's. Thus stone mining in Purbeck was a manual operation for 300 years and though methods may have changed with experience they were never power assisted.

Reflecting the considerable interest in the availability of the stone from a practical viewpoint, Hutchins (1861-74) described every bed of stone and earth to be found in the Swanage mining area, down to a depth of 120'. Four seams were mined and these were:-

1. The Lannen Seam, 35 feet deep
2. The Freestone Seam, 67 feet deep
3. The Downsvein Seam, 77 feet deep
4. The New Vein Seam, 100 feet deep.

In order to reach these seams shafts were sunk into the ground and galleries were driven off this shaft into the respective seams. The reason for developing mining is relatively straightforward, in that it enables the required stone to be extracted whilst leaving the overburden in place, the layers of merchantable stone being relatively thin in relation to the immense weight of useless over-burden above them. Even the shallowest mine at Swanage, if worked opencast, would require an overburden of 7 tons of clay and rubbish to be removed to win 1 ton of useful stone. Where the merchantable beds lie deep the disadvantage of an open quarry, or ridding, when compared to a mine are even more apparent.

From the four veins of stone being mined underground, stone was hauled to the surface, up the shaft, on a small quarr cart connected by a chain to a horse operated capstan at the surface. Fig 11.2 lists the beds of stone and earth down to 100ft, the four seams that were worked, the sloping shaft (or slide) that gave access to the seams and the quarr cart that was used to transport the stone to the surface. When any of the three seams above the New Vein seam, which was at the bottom of the shaft, were being worked, timber was placed across at the required level to give

NOTES

THE NAMES, THICKNESS AND DESCRIPTIONS OF THE PURBECK STONE BEDS SHOWN WERE OBTAINED FROM HUTCHINS HISTORY AND ANTIQUITIES OF THE COUNTY OF DORSET, VOL I, APPENDIX H, PAGE 685.
THE STONES MOST COMMONLY QUARRIED WERE TAKEN FROM THE FOUR SEAMS SHOWN.
THE STONE SEAMS SHOWN ARE TYPICAL OF THE ONES FOUND IN THE SWANAGE DISTRICT OF DORSET.

FIG. F11.2

TYPES OF STONE QUARRIED FROM THE PURBECK BEDS BY UNDERGROUND MINING IN THE SWANAGE DISTRICT.

access to that particular seam.

As the mines at Swanage were deeper than those at Langton, the capstans there were larger to take the longer chain and were also turned by a horse. At Langton the capstans were smaller and donkey operated, thus it was possible to determine the depth of a mine by the size of the capstan at the surface. Due to faulting the Freestone seam and Downs Vein seam, which lay 67 feet and 77 feet respectively below the surface at Swanage, came to within 30 feet of the surface at Langton, and to be able to mine stone from two popular seams so near the surface gave Langton a great advantage over Swanage, but this was offset by Langton's stone being farther away from the port which increased the cost of transport. Thus at Swanage four seams were worked down to a depth of 100ft whilst at Langton only two seams were worked down to a depth of 30ft.

In order to reach the veins of stone that he required the quarrier had to sink a shaft into the ground, the earlier shafts being at a shallow angle when the stone was pulled up on a sledge connected to a rope. When the sledge was replaced by a four wheeled quarr cart and the rope by a chain the angle of the shafts began to get steeper, reaching a maximum of around 70 degrees. A steep shaft, being the shortest way down, does not require as much effort to construct as a shallow shaft and it does not required as much supporting to make it safe. The sides of the shaft do not tend to cave in but where the shaft cuts through seams of dirt, clay or loose material arches have to be constructed to prevent the ceiling falling down. At the entrance to the shaft a retaining wall is constructed to prevent the surface earth falling into the shaft. Plate 28.2 shows the entrance to Belle Vue Quarr, or stone mine the retaining wall can be seen and this rests on the first ceiling support arch. Beyond this first arch can be seen others which support the ceiling where required as the shaft descends.

Steps were constructed at the side of the shaft to allow the quarrier to enter and the quarr cart was pulled up a smooth slide in the centre of the shaft. Plate 29.2 shows the slide at Belle Vue Quarr looking upwards from the bottom of the shaft, the stone steps are on the left and on the slide can be seen two tracks worn in the stone over the years by the wheels of the quarr cart and between these tracks can be seen a groove worn in the stone by the hauling chain that pulled the cart to the top of the slide.

When the shaft reached down to the vein of stone to be extracted, a horizontal lane was driven off the shaft into the required vein. The beds in the selected vein

Plate 28.2

Entrance to Belle Vue

Stone Mine

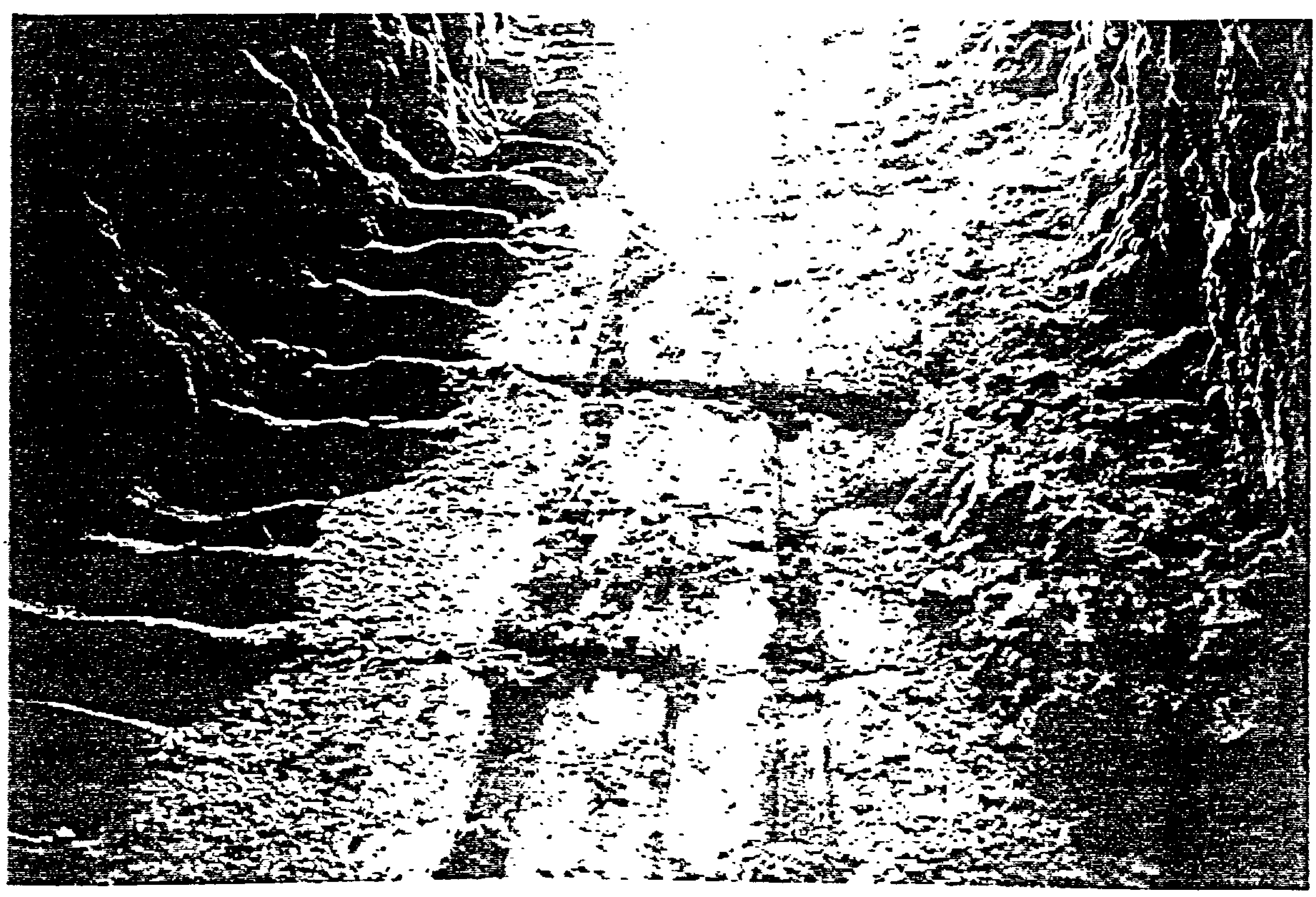


Plate 29.2 Slide at Belle Vue Stone Mine

comprise stone and earth, or picking dirt and in order to obtain the required bed of stone the bed of picking dirt must first be removed. In an ideal situation the depth of the vein to be removed would not be much higher than a man, there would be a good bed of stone to form a sound ceiling, with a good stone floor for the quarr cart to run on and there should be a fairly deep bed of soft earth that can be easily picked out. But nature has decreed otherwise, the veins are between 4′ 6″ and 10′ high and the dirt beds are not always directly below a sound ceiling. The method of quarrying stone underground is the same in as much that as stone is progressively removed the ceiling must always be adequately supported to prevent its collapse.

In the case where the picking dirt was just below the ceiling the stone is quarried as shown in Fig 12.2, first the picking dirt was removed from above the top corner stone then the stones are removed in the order 1 to 5; this operation was repeated 6 to 10, then again 11 to 15 and finally 16 to 20, the quarried stone being taken up the shaft. There was now a clear area at the bottom of the shaft leading into the lane being cleared and work proceeds until the lane is deep into the vein being quarried. As the lane was not very wide the ceiling is safely supported on the beds of untouched stone on each side of the lane. As the quarrying continues, using this method, the working face moves away from the shaft in the direction shown, and as time goes on stone will be taken in every direction from the base of the shaft which leaves a large void where the stone has been removed, the ceiling being supported on stone legs erected by the quarrier.

As the working face moves into the beds of stone the width of the lane or working area increases, and so does the area of unsupported ceiling and legs of stone must be erected as the work proceeds. If the ceiling is poor more legs must be erected and this reduces the width of the lane and also the size of the stone that may be removed on the quarr truck. Between the stone legs low walls are erected to keep the lanes clear of rubbish, all the unwanted picking dirt and small stones are thrown over the walls to allow free passage for the quarr cart and give the quarrier a clear working space. This method of working is shown in Fig 13.2, but in practice the legs will not be positioned in such a regular pattern, they will be located where required by the condition of the ceiling.

When the quarrier had loaded the quarr cart with stone he had to get it to the bottom of the shaft so it could be pulled up by the capstan. The carts were strongly made of elm and strengthened by iron plates,having four small wheels, closely spaced, to make it easy to swing round corners when moving. They were 4′ long x 2′6" wide x 1′ high to allow passage through the narrow lanes which govern the size

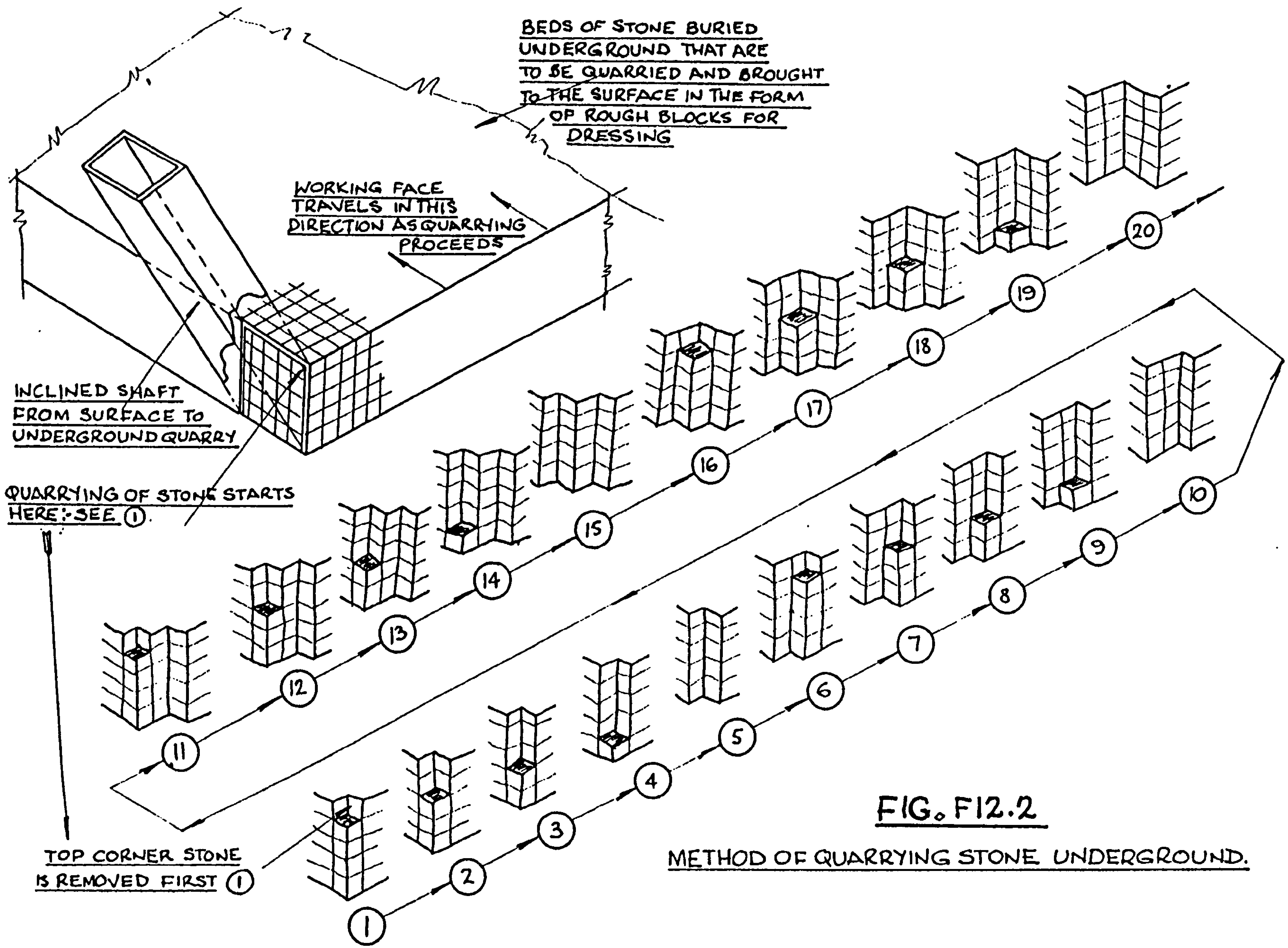


FIG. F12.2

METHOD OF QUARRYING STONE UNDERGROUND.

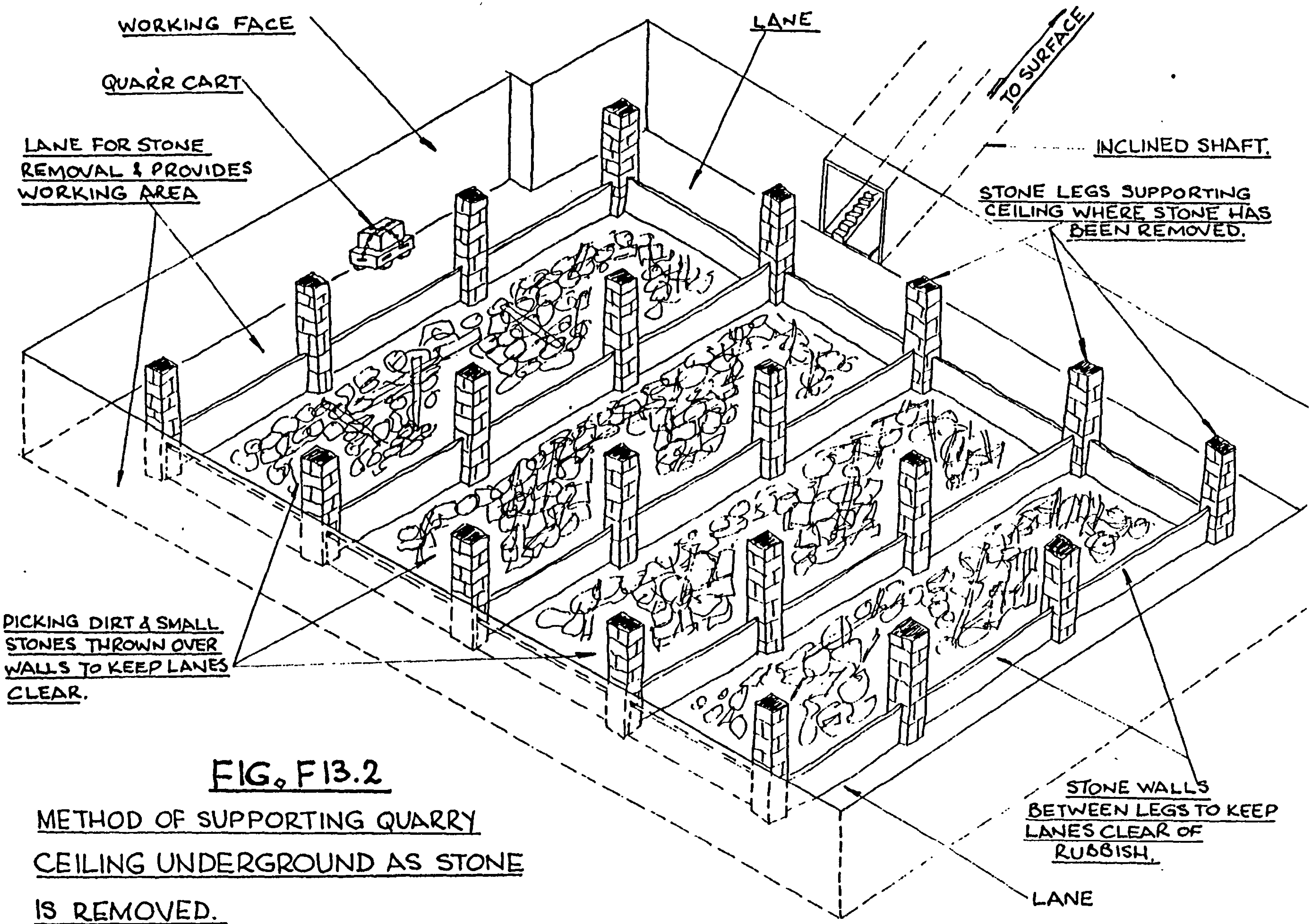


FIG. F13.2

METHOD OF SUPPORTING QUARRY CEILING UNDERGROUND AS STONE IS REMOVED.

of stone that can be removed. Some lanes are 6′ wide, but where the ceiling is poor they are only 3′ wide, which makes stone removal a tricky operation. To haul the cart to the shaft the quarrier had to run backwards in front of the loaded cart, bracing his hands against the load, and a chain, secured to both sides of the cart, which passed round his hips. The chain had to be be tight enough to allow him to slew the front of the cart around corners but not so slack that it would fall from his hips if the load chain slackened. If the cart stuck in a rut it was necessary to brace against the sides to get it moving again and as the balance of the load is changed as it went uphill and downhill it may have been necessary to adjust the load 4 or 5 times before the shaft was reached. Before the quarr cart and its load was pulled up the shaft it had to be slung again to make it safe (Benfield, 1990). Plate 30.2 shows a lane in Belle Vue Quarr: the unmined stone can be seen on the extreme right and left with the underpicking dirt just below the ceiling still intact. In the centre are the stone legs that support the ceiling as the stone is extracted to provide a lane, or working area in front of the unmined stone, or standing pièce.

Corben (1880) recorded that the clay had to be removed from above the stone before it could be moved, sometimes 6 or 7 feet each way, and this stone ran all under the country. "If it had been built by man we should call it a solid piece of masonry but there was this difference: there were four courses from 10″ to 1′ 3″ in thickness and instead of the stones bearing over on each other, they were built like putting 4 bricks one on the other, then put piles of 4 bricks tight packed together for miles, so that you could take away one pile of bricks without moving the other; only the stones were rough and differing in size, the rough joints being filled up with soft clay instead of mortar or cement. So we had a pick axe with a 4′ long handle to pick out the clay between the top stone and the ceiling. The clay was very hard and we struck it several times before we could get any out, the pick glancing off it so often, and being so awkward to strike with your head squeezed up against the ceiling working sideways with the pickaxe. When a quarryman looks at a face of unmined stone it is similar to looking at a stone wall, he can obtain the height and width of each stone but until he has removed one stone, he does not know the depth of the stone, i.e. how far it is to the back joint". Benfield (1990) states that a quarryman with the necessary experience can strike the stone with a hammer and get a very good idea of its size by listening to the sound. He does however refute the claim than an experienced quarryman can tell the size of a stone to the very inch by this method and also cautions that even when a side and end can be seen there may be a flaw in the hidden sides!

Benfield (1990) records that the first underpicking that he did was waist high when

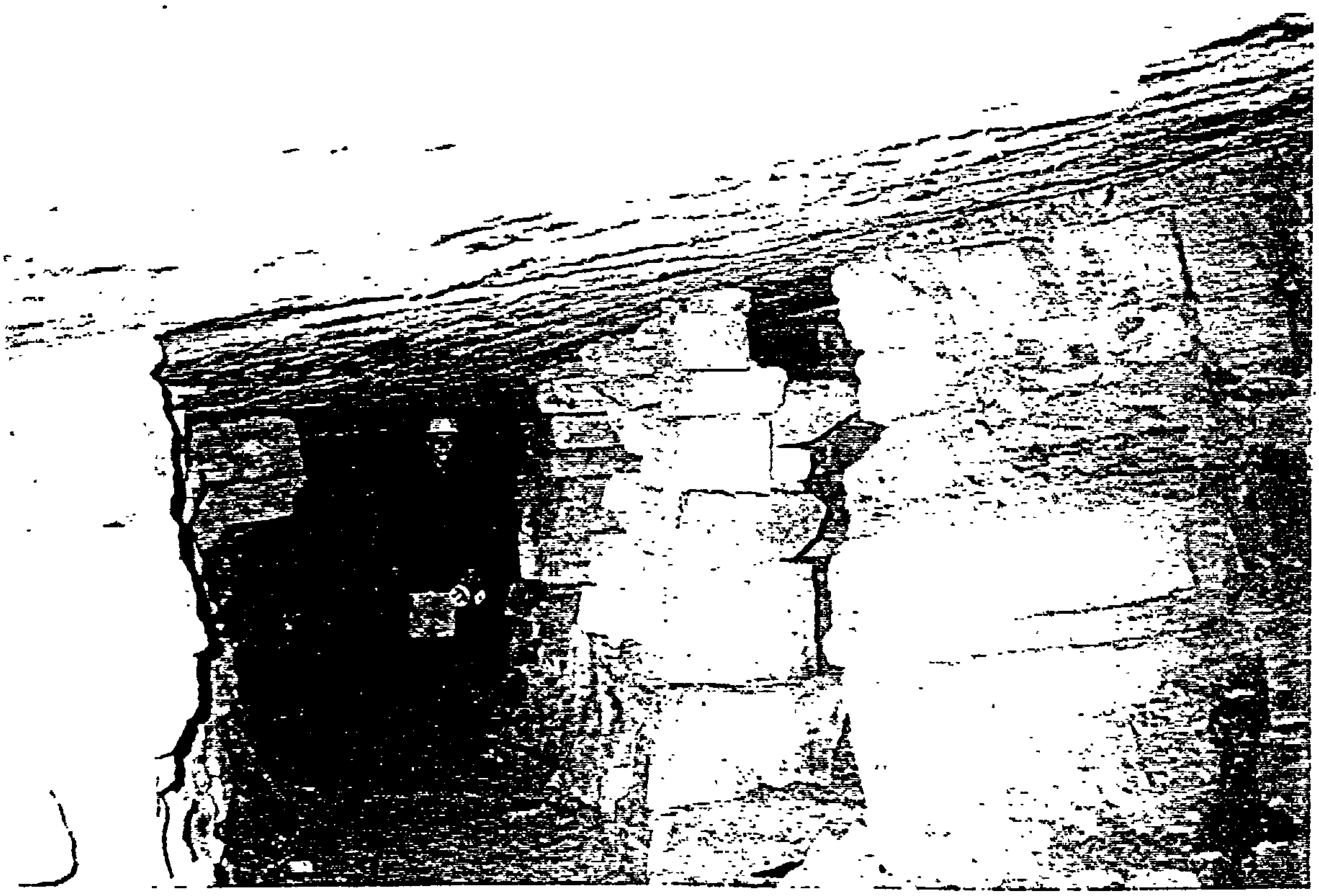


Plate 30.2 Lane in Belle Vue Stone Mine

working in a 6′ high vein. It was a convenient position for using a hammer but the dirt was only 2″ thick which meant that it had to be removed completely before the top stone would come down, one handful left behind was enough to stop it coming down easily. Sometimes it was held by one little bit at the back corner which had to be removed before it would fall. The miner had to use a long paddle to ensure he was clear should the stone fall suddenly and he had to jump out of the way. Care always had to be taken with the operation and this particularly applied to the miner working alone because if he was trapped or hurt he may not be missed for several hours. Benfield also stated that a small patch of stone 2′ square presents no difficulty, you may drive in your paddle, which is a bar of steel with one end flattened, by hammering, but you also have to lever out each cut you make taking care to remove the whole of the underpicking dirt irrespective of thickness, leaving some behind will give trouble later. When clearing out underpicking dirt, certain signs and feel of the dirt will tell you when the back joint is reached. It is however more difficult to clear to a depth of 6′ because with your cheek pressed against the ceiling it is difficult to see into the void created by the removal of the underpicking dirt to check that the stone is clear. There is risk to the miner when removing underpicking dirt from below a stone because the block may drop suddenly, there is also danger when he moves a stone sideways out of the working face for loading on the quarr cart and also dragging the cart to the foot of the shaft. There is also the constant danger of a ceiling fall particularly if the ceiling is faulted. Hutchins (1861-74) records an accident that happened in 1813 at a stone mine in Swanage, Samuel Phippard and James Sumner were killed when part of the mine ceiling fell on them.

Benfield (1990) in addition notes that the best ceiling is the one with the tightest joints, and it is no use expecting to keep up a ceiling that has wide joints filled with clay. In a tight jointed ceiling the closely packed stones will grind together as the ceiling attempts to fall, but even in the best ceilings a stone will be found with a wide joint around it. Although it may be possible to allow the surrounding stones to drop so that the top edges come together to form an inverted arch, it is easier and safer to take down the suspect stone.

If the mine was just higher than the quarrier, had a good ceiling with the picking dirt immediately below it, and a stone floor, the stones were removed from the top to the bottom. The first operation was to clear the underpicking dirt, using a paddle, and allow it to pile up on the stone floor. When the underpicking dirt was cleared from above the stone was split into the required thickness using wedges (or gads) along the natural splitting plane. Next the sides of the stone were cleared and the stone levered forward, but to prevent the stone from pivotting on the stone below it allowing the top back edge of the stone to jam against the ceiling, the front of the stone being withdrawn was supported underneath by a stick. When the stone had been levered out far enough the quarrier knocked the stick out and the stone would fall edge on onto the pile of picking dirt below. He had to judge that the stone was far enough out before he knocked the stick out or it would jam at the back against the ceiling. If the stone jammed or skidded when levered out it was a dangerous situation for the quarrier who had to free the stone and ensure that he could jump clear should the stone fall unexpectedly.

The quarr cart was brought alongside the stone for loading and if the stone was large the cart was placed on its side off its wheels and the stone chained to it. When the stone was secured the cart was pushed over onto its wheels, taking the stone with it ready for transporting to the bottom of the shaft. This process was repeated down to floor level but as stones were removed from the stack the jamming problem reduced, because there was more space between the top of the stone and the ceiling.

As work proceeded along the face, in addition to the front face of the stone one side becomes exposed and this made it easier to remove the stone because the quarrier could get behind the back joint from the side to lever out the stone. In some veins of stone the underpicking dirt did not lie immediately below the ceiling but lower down the stack of stones and in this case the quarrier had to prop up the stones above the underpicking dirt using sticks jammed against the floor. This ensured that as the underpicking dirt was removed the stack of stones did not fall to the floor.

If the underpicking dirt was at floor level it was removed after the stones above have been propped by sticks. Next the first stone above the underpicking dirt was unpropped and levered down onto the floor, the other stones above remaining propped. The stone was then levered out from below the stack unless it was too large to move and then it was split using wedges into a manageable size. When the space below had been cleared the next stone was unpropped and levered down but when enough space had been cleared below the stack the quarr cart was brought into use. Before the stone was levered down the cart was placed underneath it and to protect the cart from damage when the stone drops, scrap stone was used to form small pillars around the cart which are slightly higher than the top of the cart. When the stone fell it dropped onto the scrap stone pillars which took the shock and thus protect the cart. The stone was then levered up to allow scrap stone to be removed from the top of the pillars so that the stone sat on the cart when the pillars were cleared, thus allowing the stone and cart to be removed from beneath the stack.

This process was repeated until the stack of stones was removed from floor to ceiling. If the underpicking dirt was above floor level the stones above the dirt were propped up by sticks jammed against the floor, the underpicking dirt then being removed by paddles. When the dirt had been removed the stone(s) below the dirt were removed by levering them out, but if they were too heavy they could be split into a manageable size using wedges.

Once the lower stones were removed the upper stones in the stack were removed by unpropping them one at a time and levering them down onto scrap stone pillars followed by transfer to the quarr cart for removal as before. When stone was moved from the bottom of the stack the pivotting and jamming problem encountered when stone was removed from the very top of the stack was eliminated because the stone was moved sideways whilst being supported by either the floor or the quarr cart. The greatest danger to the quarrier was stone falling unexpectedly from the stack therefore he had to ensure that he was never in a situation that would put him at risk from falling stone.

When stone was removed from the top of a stack, levered forward and dropped onto the floor care had to be taken to ensure that it did not jam between the unmined stone and the ceiling support leg making it difficult to move and this can be achieved by placing a few stones on the floor which enables the block to be raised to enable the cart to be slid underneath without jamming. Care also had to be taken, when walking backwards whilst pulling the stone on the cart to the bottom of the slide, not to crash the cart into a ceiling support leg or it could get knocked out of line allowing the ceiling to drop. As the working face moved forward legs were built by the quarrier to support the ceiling where required and if a fault was found on the ceiling the leg would be placed to bridge across the fault line. To build up the stone support legs the quarrier leant back a bit and 'rolled' the stone up his body to the required height and then placing it in position. (Personal interview with Mr H. F. Bonfield, Blacklands Quarry, 1992)

Sometimes wooden wedges were used to close up the small gap at the top of a stone leg and if the workings had to be left for a while then the ceiling had to be supported over the working area and unmined face to prevent the ceiling moving down and closing the gaps created by the quarrier to win the stone.

A quarryman aimed to leave stone with its underpicking dirt undisturbed when the workings were closed down for a time because the ceiling has a considerable weight of unwanted stone above it and therefore a constant tendency to come down.

The legs were not regularly spaced but located where required to support the ceiling neither is the floor of the mine level, because the beds of stone dip and twist like the surface of the land in hill country. To maintain ceiling height and follow the vein of stone being mined the floor dipped and rose to suit.

When the ceiling of a stone mine is supported on legs instead of the beds of stone that have been removed, the ceiling is no longer uniformly supported and because the area of the supporting legs is much less than the area of stone removed the load taken on every square foot of the legs is much greater. When the ceiling began to fall a block in a leg would sometimes shatter and Corben (1880) stated that when he was at work he heard these legs go off like great guns and when he examined them the stones were split from top to bottom through every stone indicating the immense weight there was upon them. Plate 31.2 shows a stone leg roof support at Belle Vue Quarr and some of the stones are showing signs of high loading.

Problems are caused on the surface when legs collapse completely allowing the ceiling to fall. In about 1895 the Western house of Alexandra Terrace, Swanage collapsed into a lane from Cowlease, but generally the legs are still holding up even though parts of residential Swanage have encroached above the old workings (Legg, 1989). Problems associated with the collapse of stone legs occur in the other stone mining areas and a BBC radio report (15. 5. 1992) announced that at Bath there are problems with the stone mines because water ingress has eroded the supporting pillars of Portland stone and as some of the mines are only 12′ below the ground, collapse of the pillars will cause a high degree of subsidence on the surface. When the mines are deep the amount of subsidence on the surface is much reduced when legs collapse.

Water ingress into mines is a natural occurrence, water seeps through the overburden into the workings and storm water runs down the shaft. Any water that does not drain away naturally from the mine during dry weather has to be bailed or pumped out from the lower workings. Although it was usual to obtain Purbeck marble by open cast quarrying to a depth of 20′, the limit for pick and shovel quarrying, there is one instance at Woodhyde where marble was removed by mining. In this case there were two beds of marble, with the inferior bed on top and this was used for a ceiling whilst the good marble was mined from below it. Stone legs were used to hold up the ceiling of inferior marble and the unstable overburden above it and the stone legs have been forced into the soft floor of the mine by the

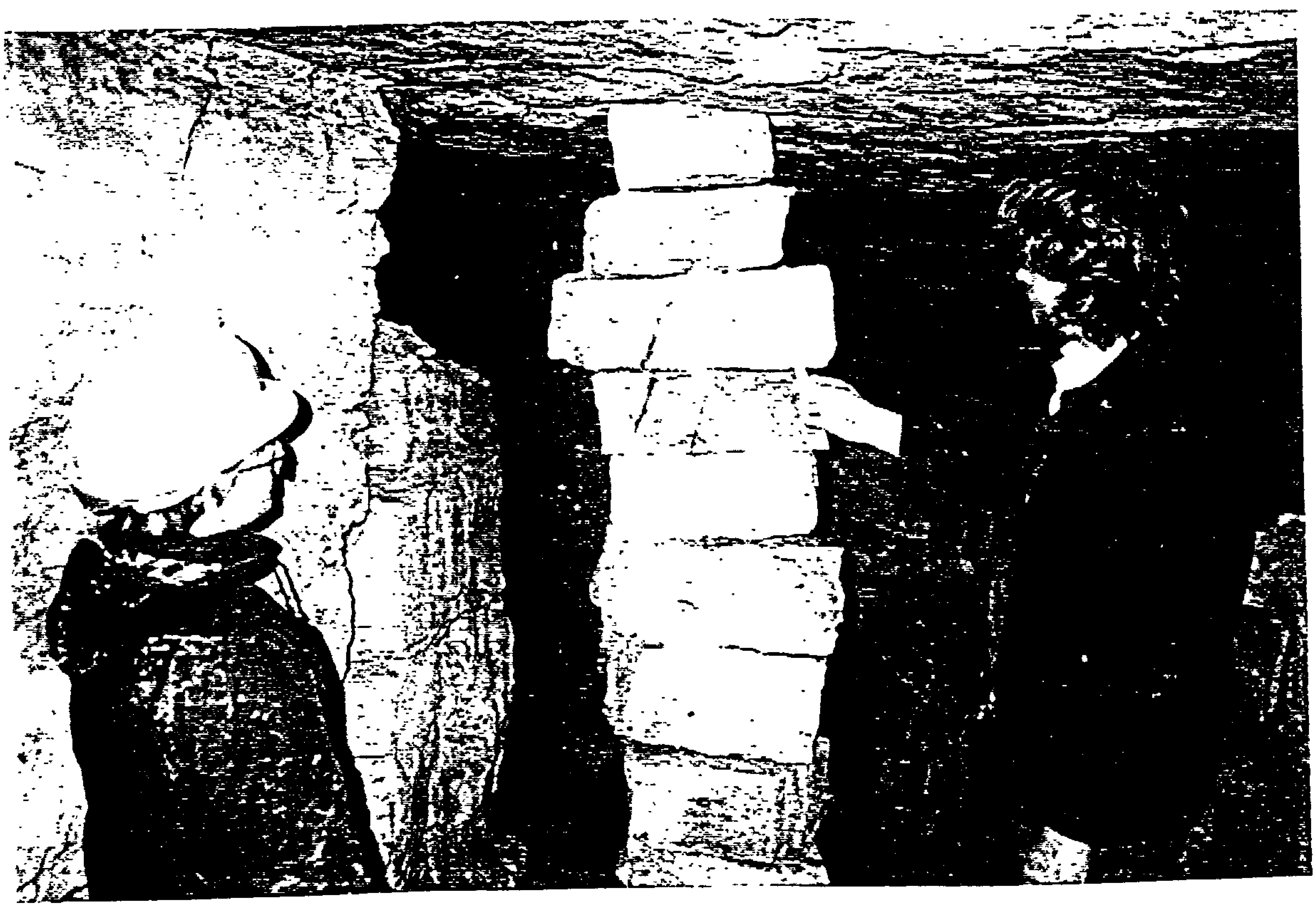


Plate 31.2 Stone Leg Roof Support

weight of the overburden. Thus one of the major concerns of a quarrier was to keep the ceiling up because if it fell either from a collapsing leg or a founder it was impossible to jack it up again. A collapsed ceiling could sometimes be by-passed, if it occurred in a working lane, but a serious ceiling fall could lead to the workings being abandoned, which was a serious loss to a quarrier.

Of the four veins of stone mined in Purbeck the shallowest are the Lannen Vein and the Downs Vein, and Benfield (1990) stated that the height of these two mines could be as low as 3′. Downs Vein was popular, the underpicking dirt was soft and easy to remove, there were no heavy blocks to lift and it cleaves into the popular 3″ thick stone. It has, however, a poor ceiling which requires many supports resulting in lanes only 3′ wide which meant only small stone could be brought out on a small quarr cart. Owing to the low ceiling the quarriers moved about on their haunches, with knees under their chins and their knuckles on the floor. To protect their shoulders from chafing as they constantly rubbed against the ceiling and also to keep them dry, some men wore a sheepskin protector. The ceiling of the Lannen Vein was sound and thus did not require as many stone support legs as a Downs Vein mine, it also had the benefit of a stone floor and not earth as in a Downs Vein mine. Stone beds taken from the Lannen Vein were easy to handle and because the ceiling was low it was easier to build up the stone support legs.

Although the quarriers had to kneel to dig the stone by the light of a candle in both the Downs and Lannen Vein, the latter was the quarriers favourite, for the reasons stated, and quarriers would leave this vein unworked until the last years of their working life. Corben (1880) explains that when stone legs are crushed by the weight of overburden that they are supporting, the ceiling moves down. In the mine that Corben was working in, some parts of the ceiling had moved down between 1 and 2 feet further reducing the working height.

The other two seams worked in Purbeck were the Freestone and New Vein and these gave the best working headroom for the quarryman. To reach the New Vein seams the quarryman had to cut through the 12 foot thick cinder bed and the ceiling of the New Vein mine was the fifth bed of stone below the cinder bed. Below this ceiling was the underpicking earth followed by eight further beds of stone which were mined when the underpicking earth was removed. In later years sometimes the five layers of stone below the cinder bed, that had been left in position, were removed and this entailed increasing the height of the stone legs to the underside of the cinder bed which became the new ceiling. Reworking a mine in this manner was hard work because the floor was covered in the rubbish discarded in the previous mining operations.

Benfield (1990) comments that although the stone mines occasionally produced blocks more than 2' thick, the usual yield was much thinner stone, 6" being the maximum thickness called for. As saws were not used to thickness the stone, the quarrier had to split the stone into acceptable thicknesses, using his knowledge of where the stone will split. Blocks of dimension stone were obtained from the cliff quarries or inland quarries working the marine beds where the blocks were larger.

Sedimentary beds of stone are separated into blocks by natural joints caused by the beds drying out and fault lines running across the joints. In Purbeck the joints run NW to SE and the lanes in the mine follow these faces, the fault lines cross the joints from SW to NE which produced blocks which are only rough cubes. When stone is mined it is the general rule to keep the corner of the stone towards you at the point where the joint and fault lines meet. Some quarrymen say that they can cut across a nor-easter but must always cut with a nor-wester: they mean that when they have dug a block they may see a list or place across it and remembering how the block lay underground, they know whether the list ran nor west or nor east and cut accordingly remembering that a norwester will fall off when the block is cut into smaller pieces. When the face being worked has travelled a long way from the first shaft sunk it is usual to sink another, this reduces the distance that the stone has to be pushed underground and also improves ventilation by allowing a through draught.

The new shaft is sunk and connected to the old workings so that the rubbish initially produced in the new workings can be wheeled and tipped into the old workings but when sufficient space has been created in the new workings the rubbish is placed behind retaining walls constructed from scrap stone as before.

At Swanage the stone has been mined at 4 levels and Figure 14.2 is a survey of the Cowlease Quarries showing how the Freestone and Downsvein seams have been worked. There are 9 shafts in the area with angles of descent between 40 degrees and 60 degrees and 4 filled shafts reported to lead to one of the largest quarries in the area. Five founders are shown along with 3 break throughs from one quarry into another and break throughs were only made with the agreement of the individual quarriers to prevent stone being illegally removed.

A more detailed survey of the lower quarry is shown in Fig 15.2 and this shows the void remaining when 10,300 tons of stone have been removed and explains that the


KEY
LANES IN THE FREESTONE SEAM APPROX 50 FT BELOW SURFACE
COMMON IN THE FREESTONE SEAM (BACKFILLING)
LANES IN THE DOWNS VEIN SEAM APPROX 75 FT BELOW SURFACE
COMMON IN THE DOWNS VEIN SEAM (BACKFILLING)
CART TRACK NOW FOOTPATHS
SHAFTS WHICH COULD NOT BE OPENED UP FOR SURVEY.
HEIGHT / WIDTH FREESTONE SEAM
HEIGHT / WIDTH DOWNS VEIN SEAM
X GLASS TUBES SET UP TO FIND OUT IF THERE IS ANY SETTLEMENT.
SHAFT WITH SLIDES DESCENDING AT A RATE BETWEEN 60 & 40 DEGREES
BREAK THROUGHS INTO OTHER QUARRIES.
P PHOTOGRAPH FOLLOWED BY ITS NUMBER e.g. P3.
A PARTLY OPENED UNTIL FOUND THAT IT COULD BE REACHED FROM 'B'
B DUG AN OPENING AND SURVEYED A & B.
C DUG AN OPENING AND SURVEYED FREESTONE & DOWNS VEIN SEAMS.
D AN OLD SHAFT DISCOVERED FROM UNDERGROUND. NO VISIBLE SIGN OF IT ABOVE GROUND.
E NO NEED TO DIG OUT BROKE THROUGH FROM G
F DUG AN OPENING. REMOVED ONE CAR AND SQUEEZED PAST ANOTHER CAR TO CARRY OUT SURVEY
G DUG AN OPENING BROKE INTO D, E & I AND SURVEYED ALL THREE.
H DUG AN OPENING ONLY TO FIND IT HAD FOUNDERED IN BOTH THE FREESTONE AND DOWNS VEIN SEAMS
I QUARRY SURVEYED FROM 'G' SHAFT HAS FILLED WITH SOIL AND SCARS RATHER THAN USUAL RUBBISH.
J UNABLE TO DIG OUT BY HAND REPORTED TO BE ONE OF LARGEST QUARRIES.
K
L
M
CARAVAN SITE
LANE FOUNDERED SOME YEARS AGO LOSING A HORSE IN THE HOLE
THIS AREA NOT YET ABLE TO BE SURVEYED
FOUNDER
TO THE HIGH STREET
TO PURBECK ROAD
N
SCALE IN FEET
SURVEY OF COWLEASE QUARRIES
RE TOWNSEND FARM
SWANAGE
DORSET

FIG. F14.2

FIG. F15.2

BURTS FREESTONE QUARRY LOCATED UNDER HOBURNE PARK AND MARINER DRIVE, SWANAGE.

ceiling of the mine above the void is now supported on stone legs. To enable the void to be put in proportion a tennis court has been drawn to the same scale and it must be remembered that this is only one quarry of the 100 that operated at Swanage and some quarries also operated at 4 levels off a common shaft.

At the surface of a stone mine there are usually three stone buildings, two are for the quarrier to work in whilst they work the stone and the other to lock up the equipment and donkey. Quarriers shelters are open fronted buildings with three sides constructed with windowless dry stone walls, the roofs are covered with irregular stone flags resting on beams made from the trunks of trees or spars from a shipwreck. The open side of one shelter faces North and the other South so that the quarrier can work in a shelter protected from the weather and inside each shelter stands a banker, which is a block of stone about 3' high on which the stone being worked upon rests whilst the mason used his dressing tools of mallet and chisel. A smaller building is constructed in a similar manner but is fitted with a lockable door to form the quarry store for the tools and donkey when required. A circular wall encircles the site to prevent animals from entering and falling down the shaft and in the wall a gated entrance was provided.

When the shaft was dug some of the spoil removed was used to form a bank of earth with a retaining wall of rough stones next to the road, raised high enough to have its flat top surface level with the top of the stone cart used to take dressed stone away from the quarry. At the top of the shaft or slide stands the capstan which is a vertical wooden winding drum sometimes made from an elm tree trunk or a short length of ships mast from a shipwreck. At the bottom of the drum a stout iron pin was driven in and revolved in a hole cut in a flat stone on which the capstan drum rested This pin was greased occasionally to reduce friction and ensure a long working life. On each side of the drum was placed a crabstone and into the top of each crabstone a slot was cut to carry a collar or beam which supported the top of the drum. To keep the crabstones vertical against the pull of the load butress stones were notched into the crabstones and this arrangement is shown in Fig 16.2.

The wooden drum, or post, continued above the collar and a hole was bored through the post to take the spack, an elm pole approximately 15' long. This pole was horizontal about 4' from the ground at the end of which the horse or donkey is harnessed to turn the capstan. Some capstans were fitted with a circular ratchet and a pawl to prevent the capstan running backwards. An iron chain was wound round the capstan and to the free end of the chain is attached the quarr cart.

LANGTONS STONE QUARRIES BY R.J.SAVILLE.

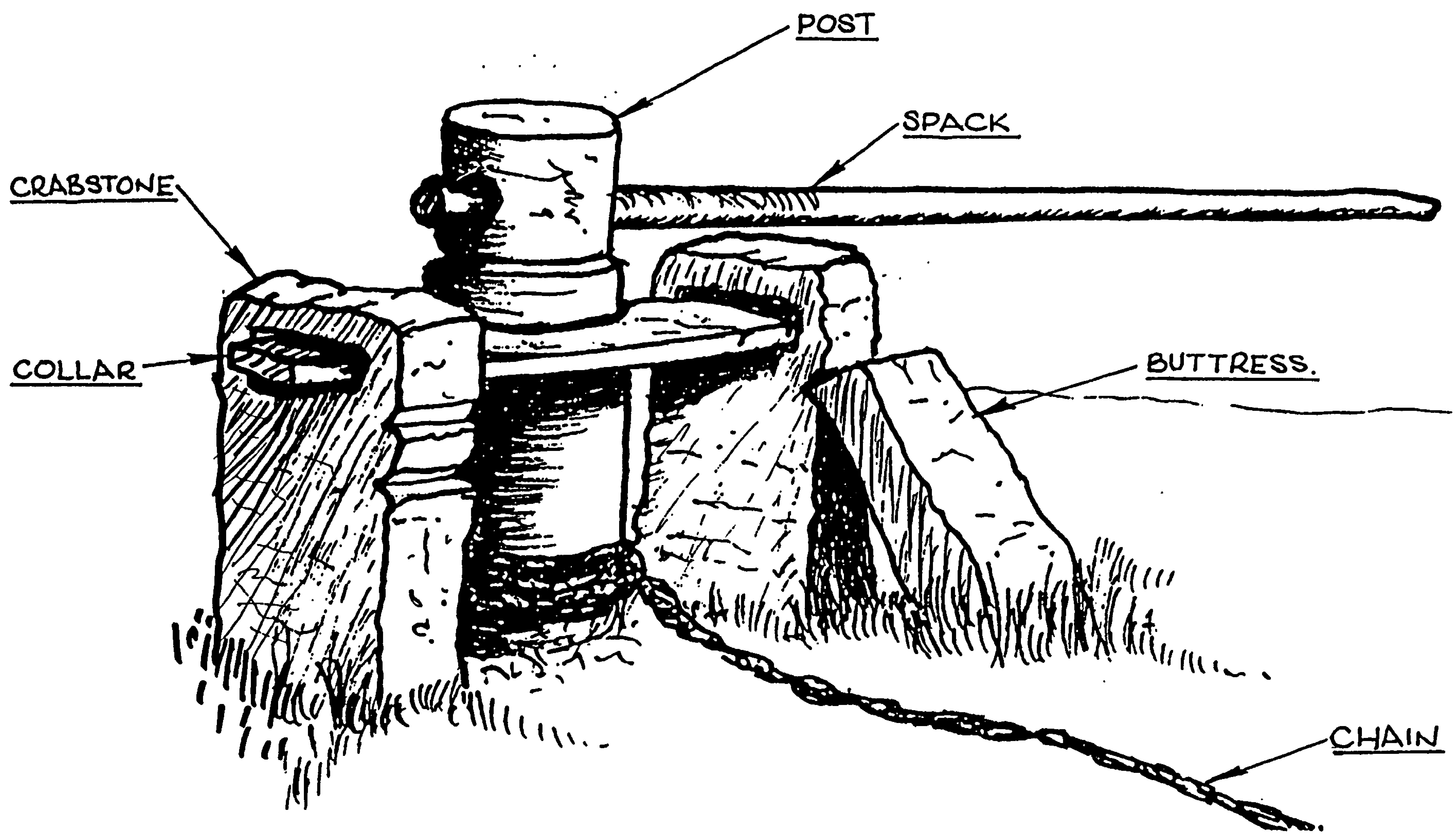


FIG. FIG.2
A WINCH OR CAPSTAN

A fully operational capstan is shown on Plate 32.2 , but the actual remains of capstans at quarry sites are fast disappearing and Plate 33.2 shows the remains of the capstan at Castle View Quarr. At the top of the shaft a groove is cut on each side of a pocket to take a roller which supports the chain that is attached to the quarr cart on which the stone is loaded to be pulled to the surface. To ensure that the chain traverses up the drum when it rotates the drum is inclined from 5 degrees to 7 degrees off vertical and a bar was placed at the top of the drum which the chain touched when one layer of chain had been wound on the drum. When the chain rattled on the bar the quarryman was alerted to the fact that the chain was now traversing down the drum and winding double thickness, the length of chain being limited to two drums full. Additional rollers were sometimes used in the workings to help a quarr cart round a corner but the donkey could not pull the load if the chain was too long.

The size of the capstan was determined by the length of the shaft and the length of the spack was determined by the load to be raised and how the spack was to be turned, horse, donkey or manpower. At Langton, where the capstans were small to serve the shallow workings, a donkey was harnessed to the spack and a ton was raised 6 foot every revolution that the donkey made.

Capstan braking mechanisms were not considered reliable and most capstans were unbraked. If the chain cable between the capstan and the quarr cart broke, the cart would run backwards down the shaft. If the chain connecting the donkey to the spack broke the descending load on the cart put the whole capstan, including the 15′ long spack, into reverse and accidents have occurred when donkey boys were hit by the rotating spack. Capstans were dangerous and had to be used with great care. Fig F 17.2 shows the essential components for hauling stone from a mine and at the end of the day the quarr cart was left at the bottom of the shaft, the spack, roller and donkey were locked away thereby immobilising the quarr. Also in the store were the small forge for maintaining the tools used by the quarrier.

Towards the end of the 19th century some quarrs had iron rails added to the slide to keep the quarr cart central on the paved slide and eliminate the need to lever the cart central on the slide when it went off course. When the donkey had pulled the stone up the slide it was released from the spack and harnessed to the cart to pull it to the working area. Fig F 18.2 is an illustration of the mouth of a stone mine. The donkey operated capstan is pulling a load of stone up the shaft accompanied by the quarrier, another quarrier dresses stone in one of the two shelters, the store can be seen on the right, piles of dressed stone await collection and the enclosing wall can

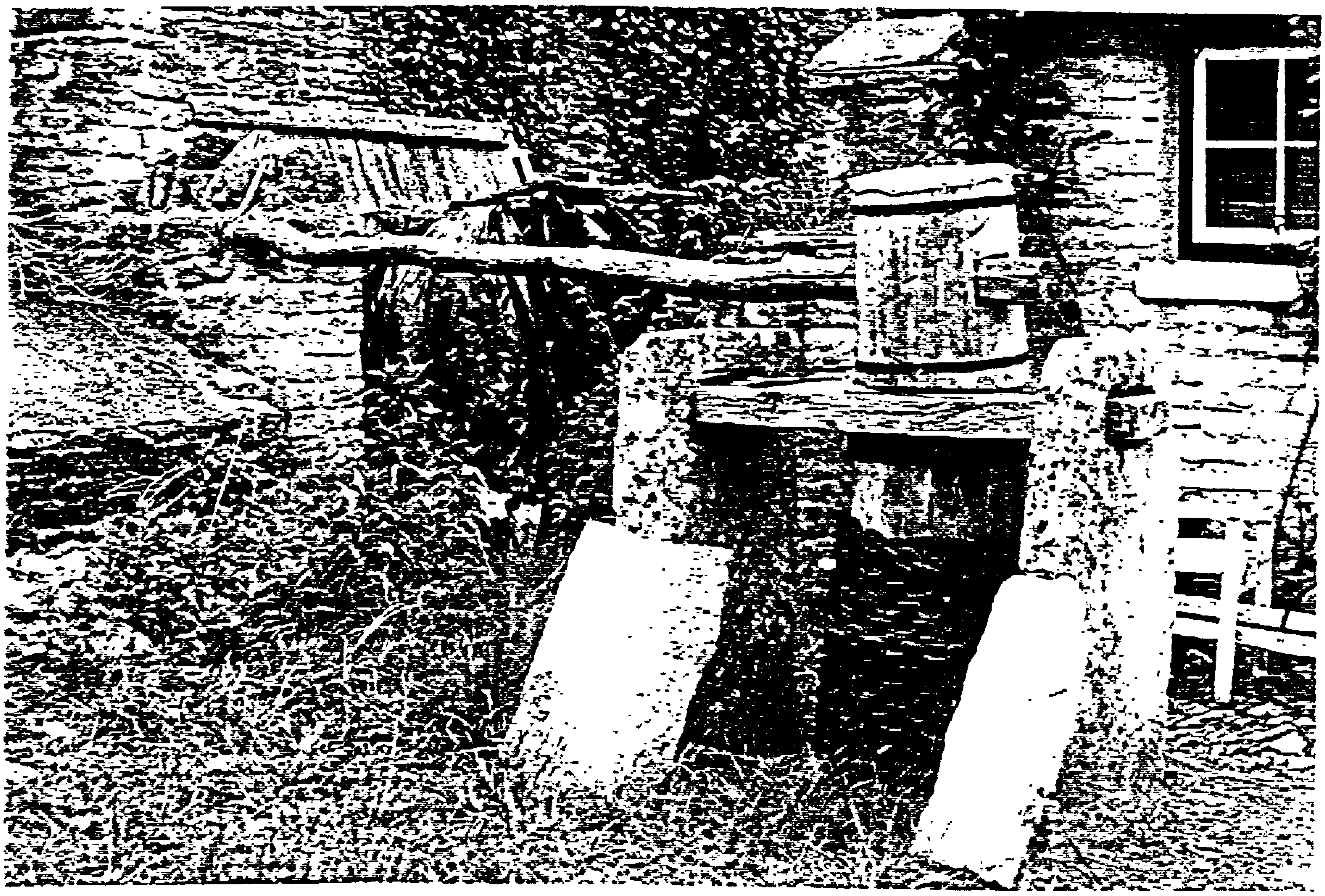


Plate 32.2 Stone Mine Capstan

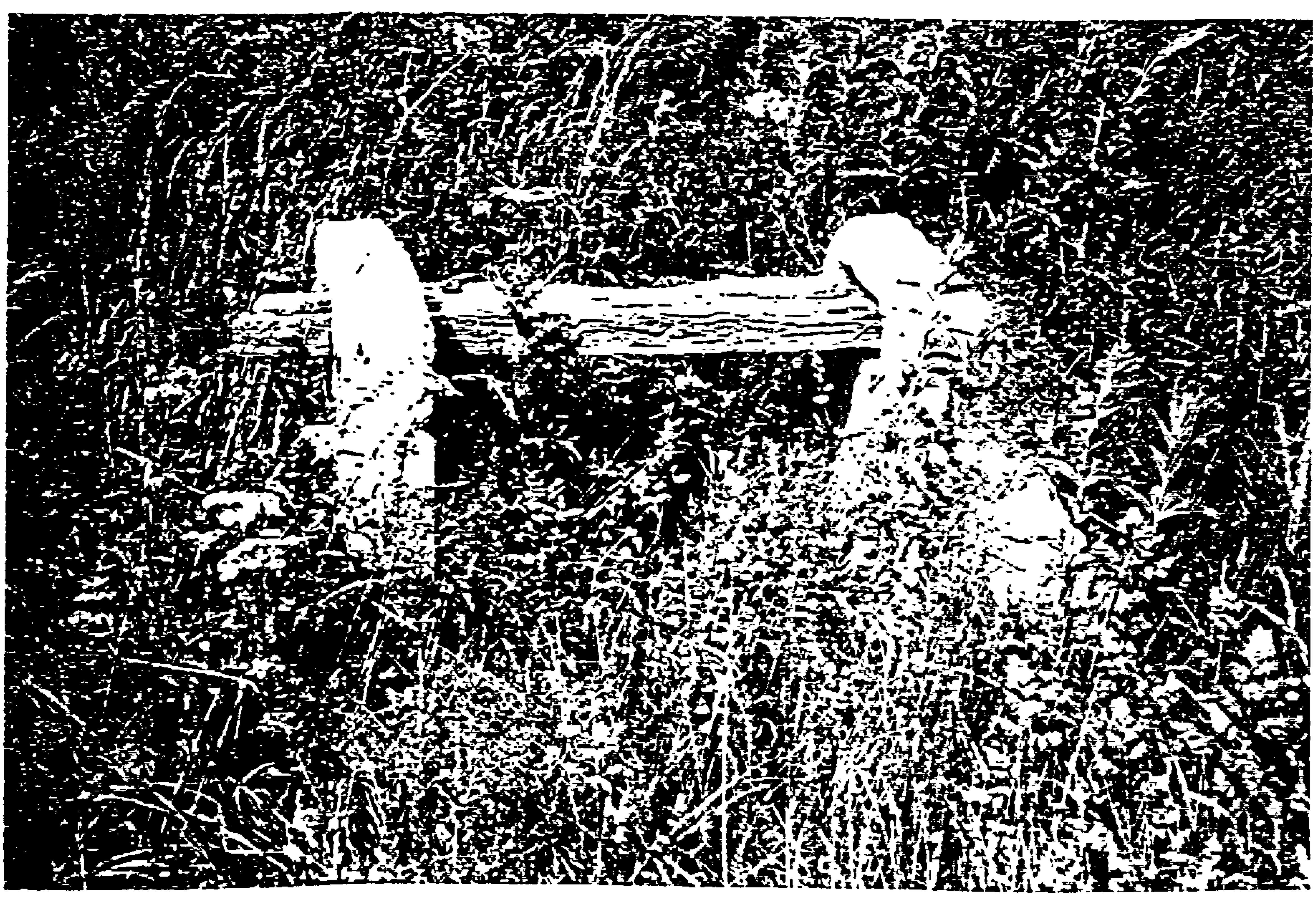


Plate 33.2 Remains of Capstan

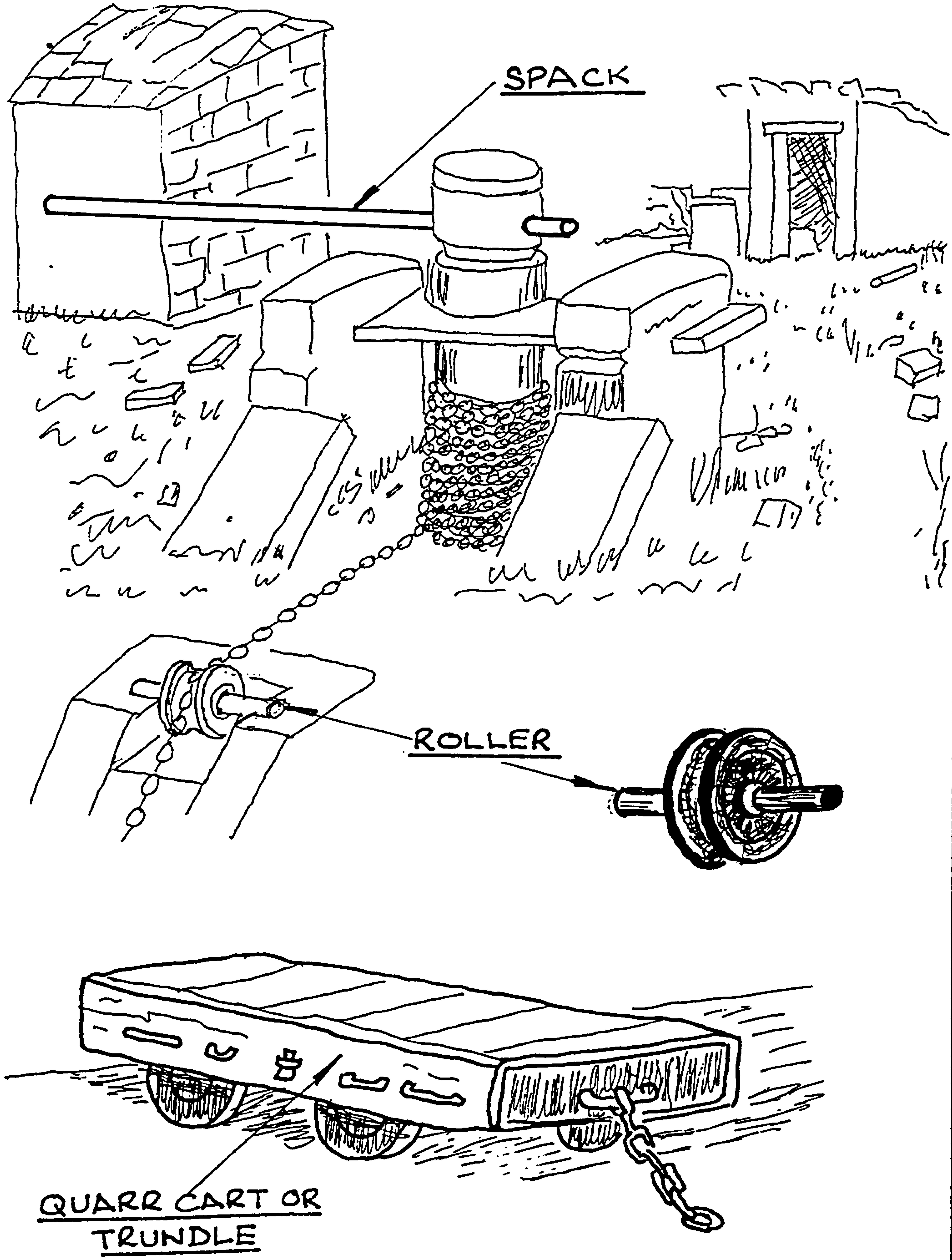


FIG. F17.2

THE 3 ESSENTIAL COMPONENTS FOR HAULING STONE FROM THE MINE.

FIG. F18.2

THE MOUTH OF A STONE MINE.

ETCHED BY ALFRED DAWSON.1882.

be seen in the foreground.

Mining remains above ground are disappearing but two examples are shown, Plate 34.2 shows Belle Vue Quarr, Herston with capstan crabstones in the foreground.

Corbin (1880) explains what the working life of an apprentice quarryman was like when he was serving his time (1826-1837), starting as a 10 year old boy until he was 21 years old. He rose about 2 a.m. and walked to work in the dark for nearly a mile over rough ground with open mine shafts. When he arrived at the quarry he lowered himself hand under hand down the capstan chain to the bottom of the shaft and then walked 100ft into the mine. As there were no matches his next task was to light a candle using flint, steel and tinder, the spark caused by flint on steel lit the tinder, which was a form of charcoal produced by igniting cloth and then smothering out the fire. He explains that he was once pushing on the chain to keep it central on the roller when stone was being hauled up from below, when the chain broke and he slid 70ft down the shaft and luckily for him he landed feet first although the cart was 'beat all to pieces'. During rainy weather the water was 3' deep at the bottom of the slide, thus he was up to his knees in water whilst fixing the cart to the chain at the bottom of the shaft and getting rained on when walking the donkey round the capstan. A hard life indeed for a young lad.

Working the Stone

Most of the cleaving was done underground before the stone was hauled to the surface, some stones being cleaved in situ before removal from their natural beds and others whilst standing on edge on the mine floor. It is wisest to cleave a stone into two equal halves because the split tends to run to the lighter side. Wedge pits have to be put in the stone and where the stone is on or near the floor this was done whilst the head was hanging down beneath the knees. The wedge pit was cut with a hammer and punch deep enough to accommodate half the length of the wedge ensuring that the wedge touches the sides and not the bottom of the wedge pit. If the wedge touches the bottom of the wedge pit whilst being struck by a hammer it would fly out creating a hazard for the quarryman.

Plate 34.2 Belle Vue Quarr

Knowing the size of stone he required and possessing the experience to split the stone into the required size enabled the quarryman to produce what he needed with the minimum of effort. It was more difficult to cut the stone across the bedding planes because there are no natural clifts to lead the way for the split to be achieved. If a stone was halved by wedges the wedges were put in upright but if the block was to be split into two uneven pieces the wedges had to be inclined towards the heavier side and only experience determined the angle of inclination (Benfield, 1990).

Pneumatic drills eventually replaced manual effort in cutting wedge pits and Fig 19.2 shows hand and pneumatic plug drilling and how a stone was split using plug and feathers or wedges. Also shown are stone dressing operations using a hammer and chisel and how blade splitting of stone is achieved using a hydraulically operated guillotine. Hand cutting of a stone ashlar is shown and the method used is to chisel the minimum off the stone to get all the corners level within the 'picture frame' chiselled around the stone, next the stone within the picture frame is punched off and finished with a chisel. From the finished flat face the rest of the stone is squared from that.

A selection of stonemasons tools which are used for quarrying and dressing the stone are shown in Fig 20.2. Hand splitting and dressing is still used today and Plate 35.2 shows stone splitting and Plate 36.2 shows walling stone being dressed to provide square and clean faced blocks. Plate 37.2 shows how blocks are split using a hydraulically operated guillotine which is a quicker method than using wedges on small blocks.

Stone is also worked by machinery and a quarry workshop is shown in Plate 38.2. Stone is sawn into thickness using diamond faced saws and a gang saw is shown in Plate 39.2, a single blade circular saw is shown in Plate 40.2 with a larger version in Plate 41.2. For a smooth finish stone is ground and polished and this operation is shown in Plate 42.2. High quality hand carving is still carried out and two examples of this craft are shown in Plate 43.2. When the quantity to be produced justifies their purchase, form tools are used, the cutter being made to produce the profile required on the stone and Plate 44.2 shows stone components produced by this method.

FIG. F19.2

WORKING THE STONE

A. SHADMON

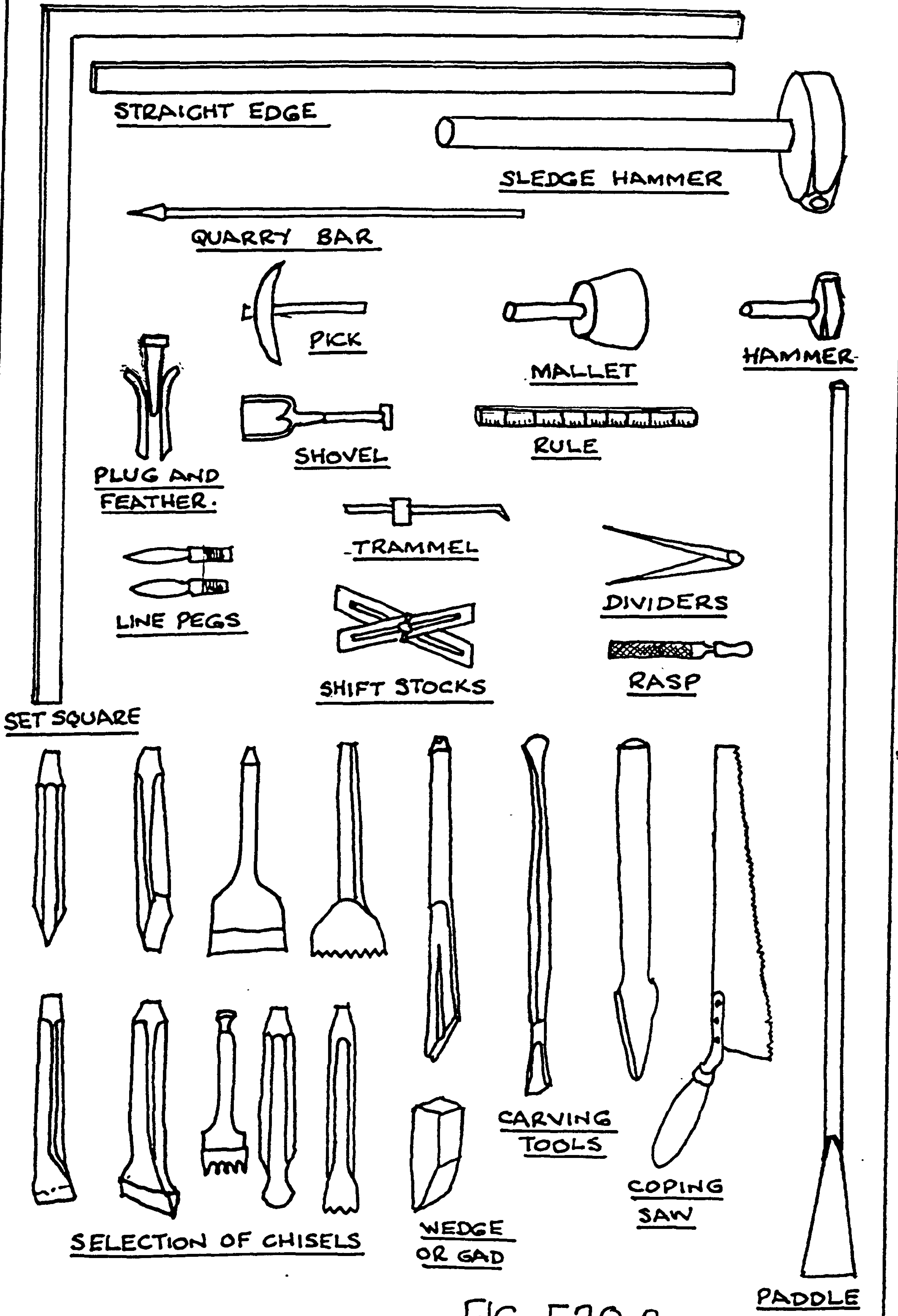


FIG. F20.2

STONEMASONS TOOLS

A.SHADMON
A.CLIFTON-TAYLOR

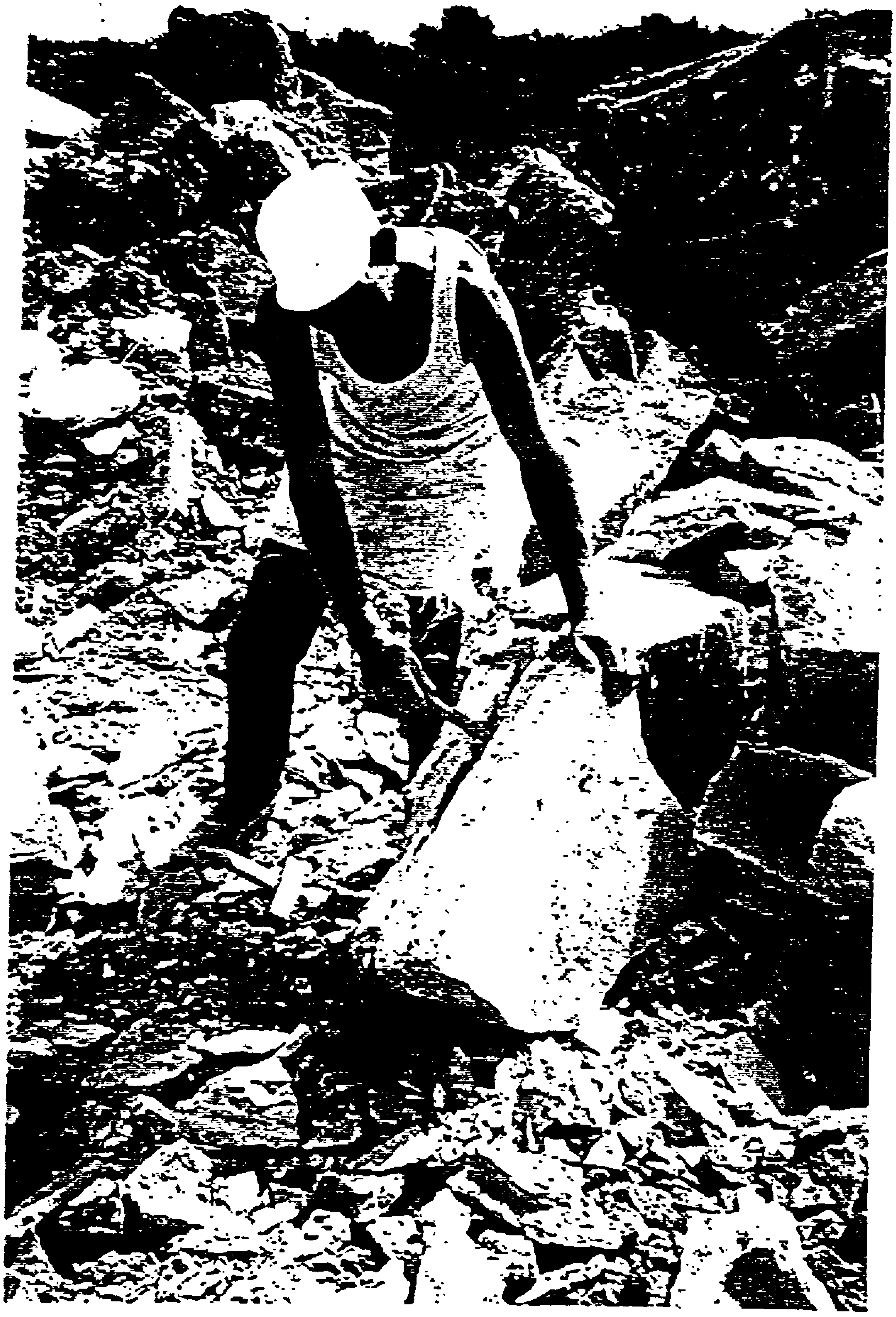


Plate 35.2

Stone Splitting

Plate 36.2 Dressing Walling Stone

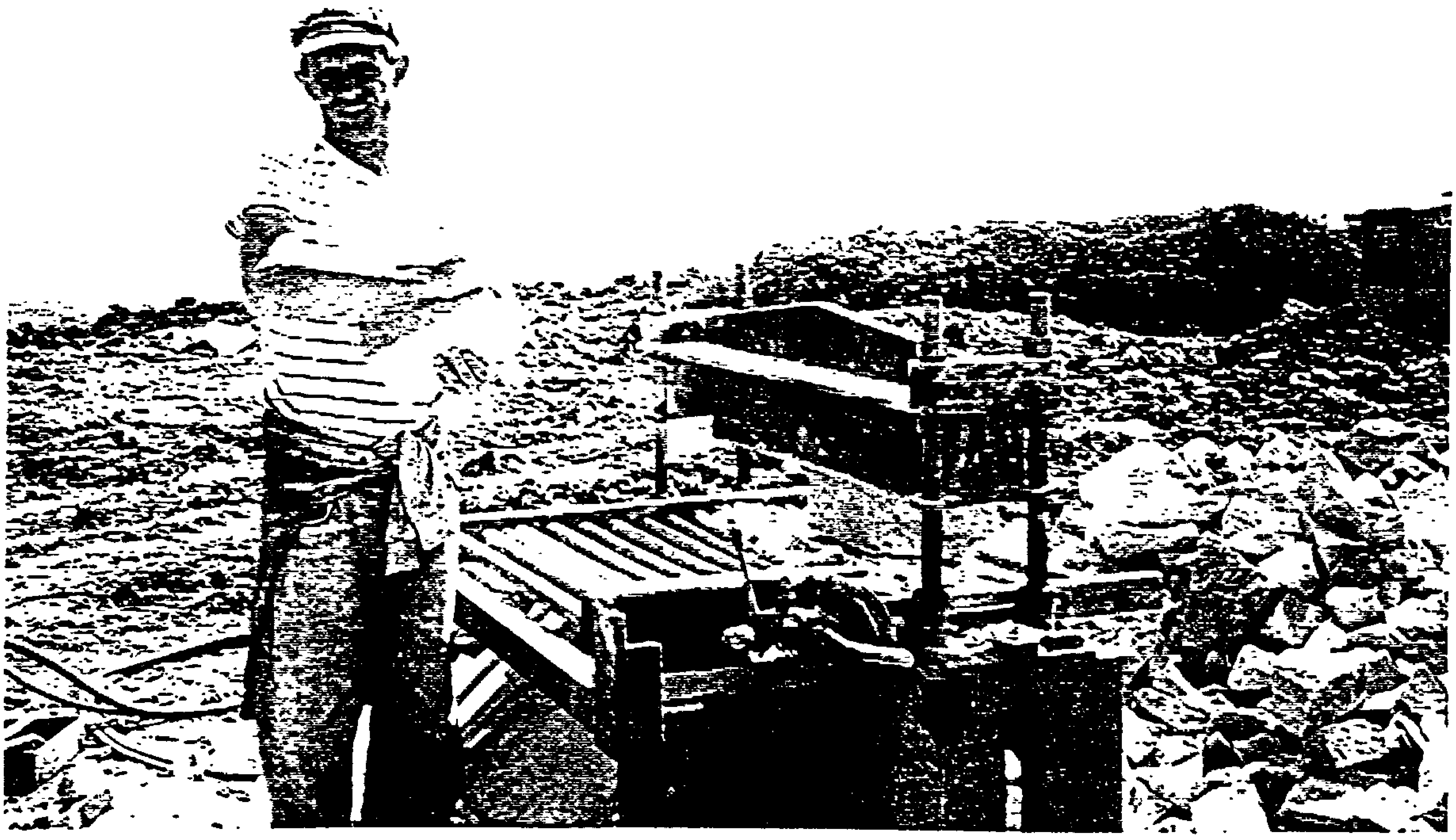


Plate 37.2 Stone Guillotine

Plate 38.2 Stone Quarry Workshop

Plate 39.2 Gang.Sawing of Stone

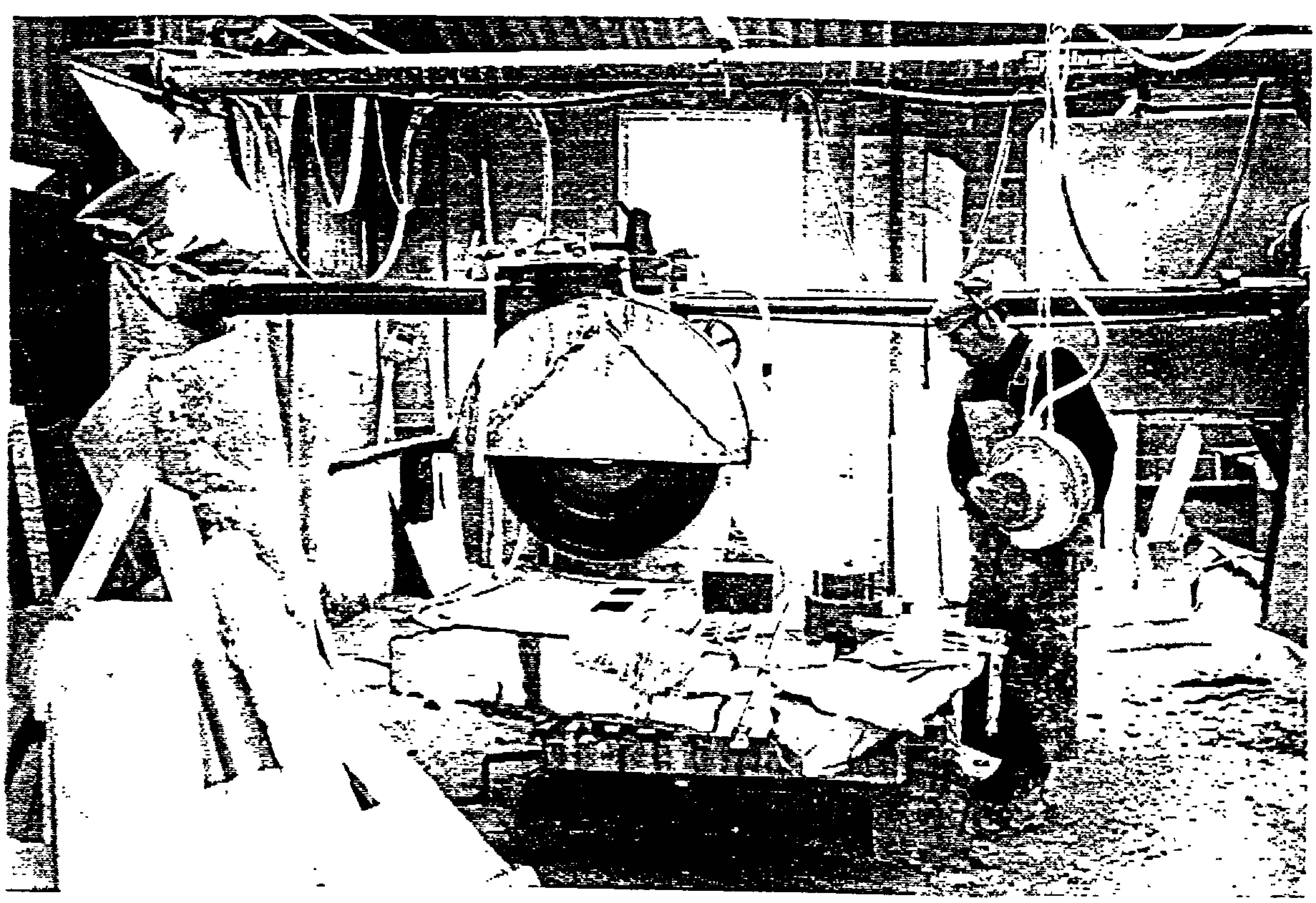


Plate 40.2 Circular Stone Saw

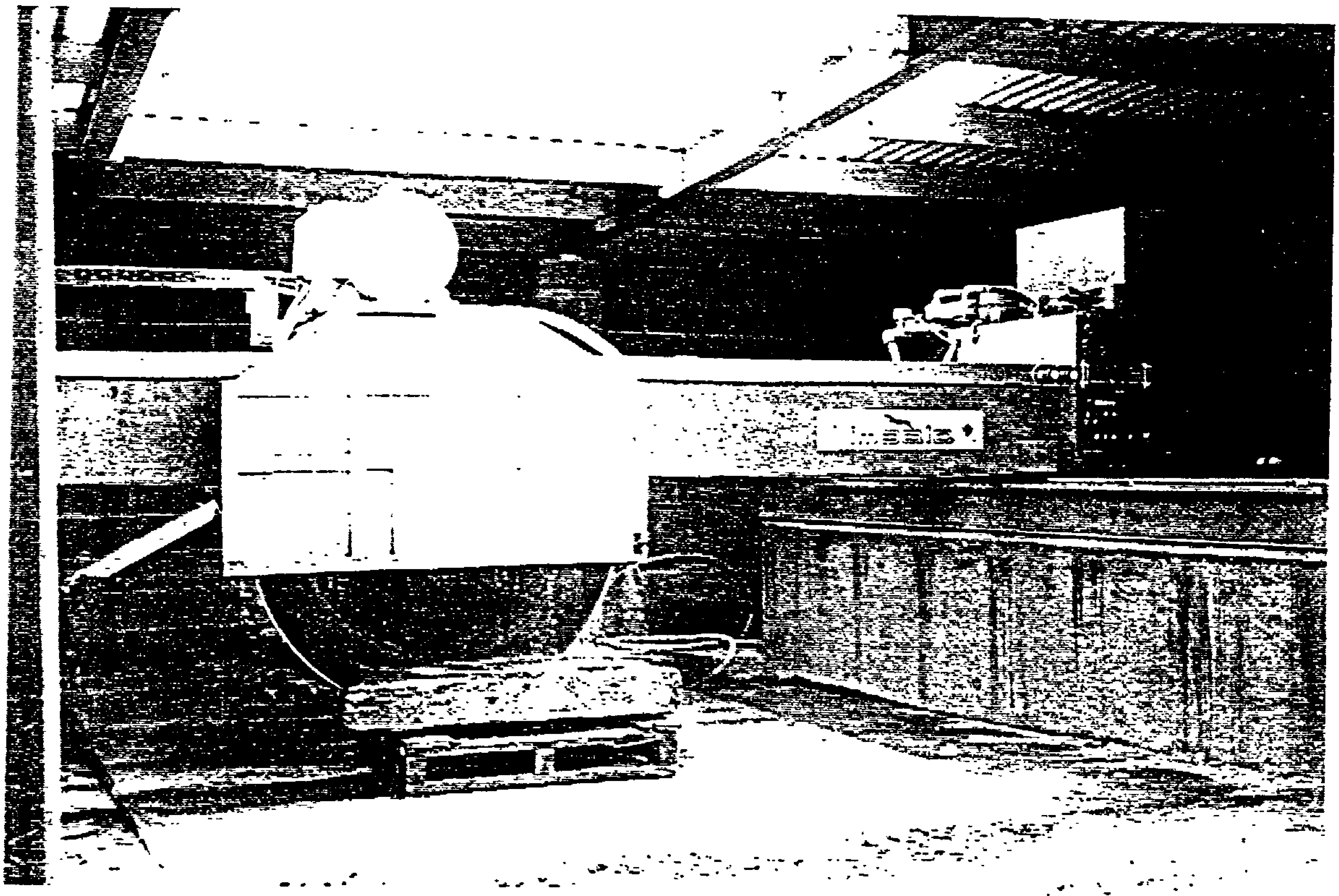


Plate 41.2 Large Circular Stone Saw

Plate 42.2 Stone Grinding

Plate 43.2 Stone Carving

Plate 44.2 Finished Stone Components

Transport

From the 12th to the 14th century there was a large demand for Purbeck marble for church and cathedral decoration. It was dug from open pits along the marble seam that runs across Purbeck from Peveril Point to Worbarrow Bay. From the pits it was taken along the marble 'trails' to Corfe Castle for carving and the finished carvings were then taken across the heathland to Ower Quay for shipment. Keen (1978) (DNHAS Vol. 100) reported on excavations carried out at Ower in 1978, and states that it was a production centre for pottery, salt, lathe turned shale bracelets, shale roofing tiles and limestone. Although the site dates back to before the 1st century AD it was abandoned in the 4th century AD when the Roman market for pottery collapsed.

Ower was given by King Athelstan (895-941) to Milton Abbey and the Saxons produced salt from sea water using salt pans, water in marshy places on the edge of the sea is high in salt content and boiling in pans hastened evaporation. Under the Norman Kings, Ower was called Ora and is so recorded in the Domesday Book, the name Ower however was derived from the Old English name Ofer which meant shore (Boyce, undated) (SDNQ, Vol XIX).

During the reign of Henry III (1216-72) and Edward I (1273-1307) there was such a volume of traffic passing through Ower that in 1286 it was decreed that a township be established near the port. It was called New Town (Newton) and was built with its own church and the right to hold a market twice a week and a town fair on five days of the year. This development was not a long term success however, and Newton was only short lived: a survey dated 1586, just 300 years after the charter was issued, found that only one house remained.

One possible reason for its demise was that the shallow anchorage in this part of the bay was beginning to silt up and as boat hulls were now changing from flat bottom to deeper sharp sloping types that gave greater speed, but required a deeper anchorage, sea going trade moved to Poole. Ower remained operational without an adjacent township until 1700 when trade moved to Swanage, which had the advantage of being on the sea coast and was not prone to silting. (Short, 1967).

The demand for Purbeck marble gradually decreased and when Corfe Castle was destroyed by Cromwell's forces in 1646 marble carving ended. However as the demand for marble decreased that for Purbeck stone increased, for it was required for the mushrooming towns and cities, particularly as street paving with Swanage becoming the main stone port from 1700, using the Priests Way.

The old trackways for the stone are shown in Fig 21.2, and an old marble trail that ran from a marble quarry at Blashenwell to Corfe Castle is shown in Plate 45.2. Priests Way runs as a corridor through the stone country in the form of a cart track, with a wall, fence or hedge on each side from Worth Matravers along the southern edge of Acton and Langton Matravers and then through Herston to Swanage (Hyland, 1978). Plate 46.2 shows it at Acton crossing the stone country on the way to Swanage.

As noted above, sea cliff quarrying commenced in 1673 when Winspit opened, and later other quarries followed along the cliffs towards Swanage. The only way that stone could be transported from the cliff quarries was by sea, because it was not possible to take it inland, only Winspit and Seacombe eventually had inland access. Stone from the cliff quarries was lowered down the cliffs into stone boats that carried 6 to 9 tons, they were then rowed away from the cliffs, each boat having a crew of 2 men. The boats were rowed out to sea going vessels anchored off the cliffs where the stone was transferred. They also carried stone by sea to Swanage for transfer to vessels anchored in the bay, each stone boat being fitted with a small lug sail for use in a favourable wind.

During fine weather these cumbersome boats were usually anchored at their moorings in Swanage bay until required, but when a strong east or north east wind blew they had to be hauled up onto the beach using capstans rollers and chains. The stone boats remained beached during the winter months when bad weather prevented stone transport taking place, the boat haul was situated adjacent to the Marine Villas shown in Fig 22.2. Loading stone boats at the cliff quarries was a particularly hazardous operation in a choppy sea they were in danger of either being dashed into the cliffs and damaged or swamped when they were fully laden and at Winspit alone 1400 tons of stone a month were transported using this method (Payne, 1953).

From the inland quarries stone was transported to Swanage beach in 4 wheel carts which carried up to 4 tons, pulled by 2 or 3 horses. A large part of the journey was downhill and the carts were fitted with a wooden brake shoe that acted on the back wheel and in the case of heavily laden carts the back wheels could be locked by means of a chain. Accidents occurred on this trip and in October 1881 the Dorset Chronicle reported that a Mr Pitcher was coming down the hill from the quarries

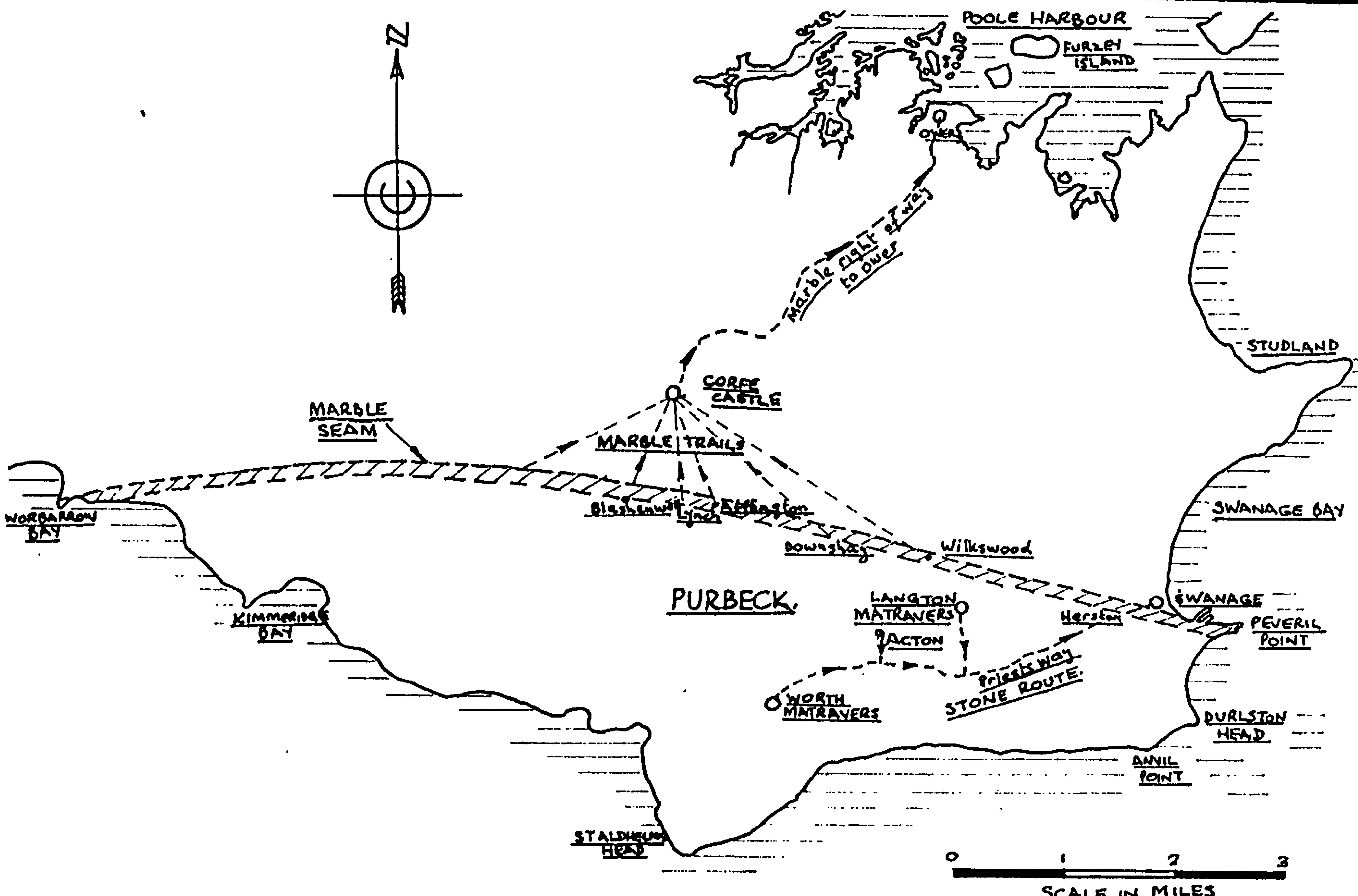


FIG. F21.2

CART TRACKS FROM QUARRIES TO PORTS.

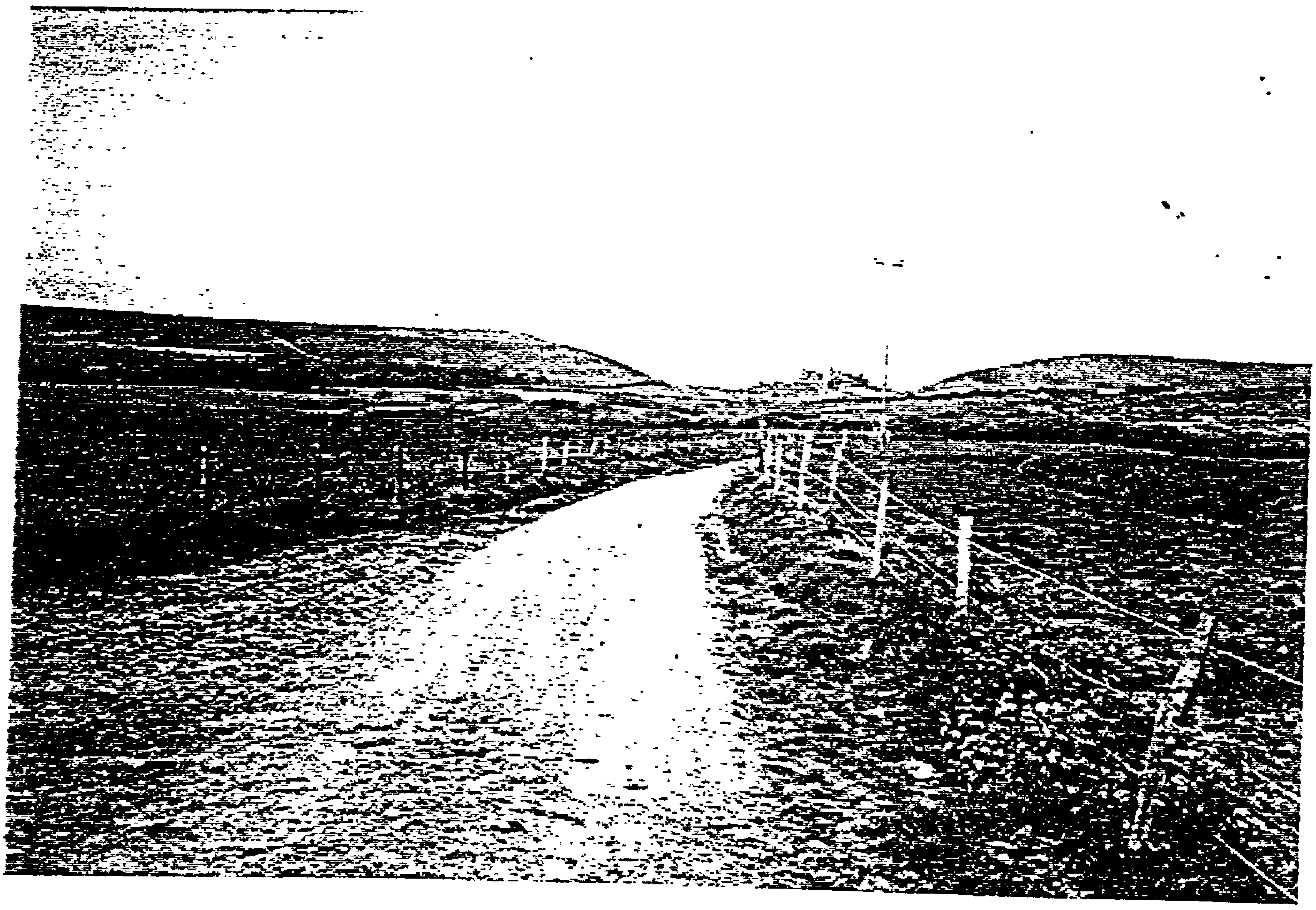


Plate 45.2 Old Marble Trail

Plate 46.2 Priests way at Acton

FIG. F22.2

PLAN OF LAND AT SWANAGE
SHOWING PROPOSED NEW GROIN.

DORSET C.C. RECORDS OFFICE
REF. D.218

with a cart loaded with 4 tons of stone pulled by 3 horses when the tackle used for tying up the rear wheels broke and the cart ran over his legs and broke them. The shafts of the wagon struck a wall which stopped it thus preventing further injury to personnel and saving the lives of the horses. Mr Pitcher after great suffering sadly died two weeks later when lockjaw set in.

Stone was hauled across cart tracks from the quarries and then along High Street down to the beach. At the peak of the stone trade around 60 cartloads of stone per day came into the town from the quarries, the empty carts returning for more stone.

Ruts were made in the road, up to 12" deep, by the cart wheels as they passed through the narrow streets. During fine hot weather the carts crushed the roads to powder and when the wind rose the dust would be almost suffocating, whilst in the rain the mud on the road would be inches deep making them almost impassable on foot. When the stone arrived at Swanage it was placed on the bankers to await shipment and these unsightly piles of stone, some 10' high, extended for a hundred yards northward along the curve of the bay from the Victoria Hotel, being on the seaward side of the principal terrace they excluded the sea view from pedestrians and ground floor residents. The piles of stone were intersected by waggon roads to facilitate loading and unloading onto carts. Stone arrived from the quarries either as dressed stone or unworked blocks which were dressed into exactly shaped blocks at the bankers and around 200 masons were employed on this work. There are four great bankers owned by Messrs Randall, White, Burt and Stevens and in their yards and sheds more than 10,000 tons of stone lie awaiting shipment (Payne, 1953).

In order to get the dressed stone onto the waiting vessels, riding at anchor in the bay, it was first loaded into special carts which had two large wheels to give a high loading platform and these were pulled by a single horse. These stone carts were then driven into the sea, until the horse was up to the top of its legs in the sea and then the load was transferred to the stone boats. Some of the stone blocks weighed from 5 to 10 cwt and they were manhandled from cart into stone boat by loaders, some steadying the boat and others loading the stone. It was not just a case of rough handling the stones, care had to be taken to ensure that corners were not knocked off or otherwise damaged. There were usually between 15 and 18 vessels anchored 100 yards or more off shore and the stone boats with their cargoes were rowed out to them whilst the empty carts returned to the bankers for more stone. Stone was loaded from the stone boat into the vessel by block and tackle attached to an arm mounted on the mast of the vessel and when the cargo of 6 to 9 tons had been loaded the stone boat was rowed back to the stone cart. Fig 23.2 shows this

FIG. F23.2

METHOD OF LOADING STONE AT SWANAGE.

c 1887.

SKETCH BY T.M. HARDY.

method of loading stone at Swanage.

As the truck system was still in being the loaders were paid in cash and beer and payment in non-essentials contributed to the poverty that was evident in Swanage (Payne, 1953).

Vessels ranged in size from 50 tons to 300 tons, which was the maximum for Swanage Bay, they were mainly sailing ships although steam ships had arrived on the scene before the boat trade ended around 1900.

There was no doubt that the stone merchants controlled the trade, they had possession of the seashore for the bankers, they owned the stone boats, horses and stone carts, arranged sea transport and loading and more importantly fixed the buying and selling price for stone, the difference ensured that many mechants became rich men.

Loading stone was labour intensive as each block of stone had to be handled 5 times to get it from the quarry on board the vessel ready for shipment.

Swanage was disadvantaged as a watering place by its narrow streets, the stone carts with their attendant problems and the disfiguring bankers. Robinson (1882) looked forward to the bankers being replaced by gardens and a promenade and that Swanage's staple trade of "shipping and chipping stone" would soon have a railway to transport the stone thereby setting the bankers free. Thus when the Dorchester-Southampton railway was completed in May 1847, passing through Wareham some 10 miles away, proposals began to be mooted to construct a branch line to link Swanage and district to the national network at Wareham. At the end of October 1847 a meeting of 40 people was held in Swanage to consider a proposal for a Swanage branch railway and this was followed by another meeting on the 19th October when it was reported that the survey was nearly completed by Captain Moorson. In December there was talk of a tramway through the stone fields connecting to a pier but these schemes came to nothing, and strong opposition was registered by Wareham and local landowners.

Dorset County Chronicle (16.9.1858) noted that a meeting was held (9.9.1858) to consider the construction of a tramroad and pier, J H Calcraft, MP, presiding. It was reported that the main cost of transporting stone by sea from Purbeck was the primitive manner in which it was brought down from the quarries. Constructing a tram road or incline plane in conjunction with a pile pier carried into deep water would save 2 shillings per ton on transport costs and enable orders to be won which are now being lost on cost. Captain Moorson, Chief Engineer, stated that the stone reserves would last at least 500 years but because of the high cost of Swanage stone, stone from Cornwall, which was brought to the coast on tramways was being supplied cheaper to Southampton, even though it came from 150 miles further afield (Robinson, 1890).

On the Southampton-Dorchester railway, Purbeck stone was only considered for use near Wareham, brick being substituted in other areas because it was cheaper, but if the cost of stone was reduced it would sell because people preferred it. Coal was now coming into Swanage using the existing transport system in reverse and savings could be made here as well. Moorson stated that if sufficient funds could not be raised locally he could obtain the difference from an interested party in London. The pier would have to run out 630 ft to give 13 ft of water and the cost would be about £6,500. To serve the pier the associated tramway would run to the first quarry where a banker would be situated as it was intended to store stone along the line to get rid of the Swanage bankers. To connect Worth and Langton quarries to the pier, the tramway will be 3 miles long at a gradient of 1 in 50. At present 100 tons of stone a day were transported and the tram road was designed to handle 300 tons a day, or 600 tons on twin tracks, and this would reduce the transport cost to 10d per ton from 4/- per ton.

The only ones to lose out would be the farmers who had concessions from the land owners to cart stone from the quarries, but the elimination of the stone carts passing along town roads would reduce road maintenance by 1s 8d in the £1.

For constructing the tramway and providing an initial supply of wagons with machinery to handle them would be about £8,100 making a total cost with the pier of £14,600 and this would give a net income of £1,000 per annum. Passengers and goods coming into Swanage and using the pier would increase revenue. Captain Moorson then called for £4,000 to be raised locally stating that he had surety for £12,000 elsewhere. (Popplewell, 1975).

Following further meetings Royal assent was obtained on 8 August 1859 and construction commenced September 1859. John Mowlem was appointed chairman of Directors and their aim was to connect the pier and tram road to the local quarries. In November the first vessel moored up to the part completed pier to unload 50 tons of rails and in December all the wooden piles were driven for the whole of its 820 ft length, all other material being on site. In February 1860 the pier was completed, but objections from landowners in the town prevented the tramway going to the quarries and only a short section was built to the bankers. Although it eliminated beach loading, without a tramway to the quarries, stone carts still rumbled through the town to the bankers and Fig 24.2 shows the tramway running from the bankers to the pier. The pier was equipped with small cranes to load the stone from the rail wagons onto the vessels, the pier continued in use until the 1920's ending its days as a coal wharf for coal boats supplying Swanage. A weighbridge was situated near the toll house at the entrance to the pier the charges being stone ld per ton, coal 2d per ton, hay and straw 6d.

In 1863 a further attempt was made to construct a branch line to Wareham but although an Act of Parliament was obtained this attempt also failed. George Mowlem died in 1868 but his nephew and partner George Burt applied himself to bringing the railway to Swanage. Whilst waiting for the branch line to be built he bought a steamboat, the 'Heather Bell', to run between Bournemouth and Swanage, rail passengers changing at Bournemouth for the steamer to Swanage. The steamer docked at the pier, bringing in passenger revenue and it ran from 1871 to 1877. (Popplewell, 1989).

A report in the Dorset Chronicle (4.10.1877) noted that a meeting had been held to promote Swanage railway to carry passengers, stone, marble, potters clay, cement and lime. Further meetings were held in October 1877 to raise a petition containing 500 signatures supporting the line and the Western Gazette (19.10.1877) reported that on the 12th October 1877, Mr Smith, the engineer reported on the proposal. Smith stated that 40,000 tons of clay and 46,500 tons of stone were exported each year, and that this would produce £15,048 per annum and of this Swanage railway would receive £5,000 for travel over the track. 150 quarriers signed in favour of the line and the cost was estimated to be £84,000 for the 10 miles. At the end of the meeting the chairman invited applications for shares at £10 each, the chairman took 100 and announced that land would be purchased by issuing shares in lieu of cash. The line was re-surveyed in 1880 and in 1881 an Act of Parliament was obtained for the 2nd time, again opposed by Wareham. In 1881 the London and South Western Railway Act gave additional powers to the belated Swanage railway to link itself to the tramway to the pier, but like the tram road to the quarries it was never built and was a contributing factor in the change of Swanage from a stone port to a holiday town. Following the passing of the Act, capital of £90,000 was raised and work on the line started at Wareham on 5th May 1883 and the line was completed on 5 May 1885. In 1886 the line was purchased by the LSWR to bring holiday

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FIG. F24.2
MAP OF HIGH STREET AREA.
SWANAGE.
1887.

makers to Swanage from further afield.

With the completion of the railway much of the stone trade switched to it and the stone bankers moved from the seafront to the railway yard. The shipments of stone from Swanage ceased around 1896. In 1896, even though the railway had arrived, a second pier was build to accommodate paddle steamers bringing passengers from along the coastal ports to Swanage. Many complaints had been received from passengers about the condition of the first pier, and with the advent of the second pier the first pier was only used for commercial purposes, coal and timber were landed and it was used as a coaling station and overnight mooring for paddle steamers. The trucks on the tramway were always horsedrawn and this continued in limited use until the 1930's.

Goods traffic was carried by rail until 1965 when the station goods yard closed down and when the whole branch line closed down on the 3 January 1972 this did not affect the stone trade as all stone was leaving Purbeck by motor lorry long before it closed.

Road Transport

The first turnpike of 1768 was little improvement over the mediaeval road pattern as it went from Stoborough to Creech Grange and then linked with older roads to climb the ridge and enter Corfe from the West. It did not extend to Swanage, this came a little later when a new road was constructed across the heath to Corfe, then through Kingston and Langton to Swanage bringing the port into contact with inland Dorset for the first time. The course of the present A351 between Corfe and Herston did not become a through road until 1862. It would have been used for short journeys from the quarries because sending goods in stages across country was expensive and sea transport was used. The arrival of the railway in 1885 had far more immediate and decisive effects and whilst stone was being conveyed by rail, roads gradually improved so that stone gradually switched to road transport before the railways closed down.

In the 1920's there were many motor lorries for sale, they were re-purchased from the Government after the 1914-18 war, and they were bought to carry stone and this began to affect Swanage railway's traffic only 30 years after it opened. (Hardy, 1970).

Chapter 3:

PURBECK MARBLE

When Purbeck marble is polished and oiled it presents a pleasing appearance similar to a dark marble, this property explaining why it became so popular as a decorative stone during the boom in Cathedral building in Medieval times. This boom created a demand, beginning in the 12th century, for the black and white marble which was the norm for the interior decoration of Italian Cathedrals and churches at the time. The prohibitive expense of importing Italian marble fostered direct substitution of white limestone for white marble, while polished Purbeck marble, darkened with oil, was substituted for black marble. With these acceptable substitutes available the real Cathedral building boom began.

Prior to this the only use made of Purbeck marble was by Roman and Late Iron Age artisans. Purbeck marble was certainly dug by the Romans from the surface of the ground where the marble seams outcropped, and Roman/Late Iron Age mineral working sites have been discovered in Purbeck, these being shown in Fig 1.3. Roughed out mortars and fragments of sawn veneers have been excavated and these indicate that Purbeck marble was being worked at Norden from the 2nd to the late 3rd or 4th century. Purbeck marble mouldings were also found at the builders yard at the Roman proto-palace at Fishbourne along with a wide variety of marbles and other hard stones and other marbles were being imported from Europe. (Parsons, 1990).

Parsons suggests that Roman masons probably imported stones for carving with which they were already familiar on the continent, and such was also the case following the Norman conquest when stonemasons imported Caen stone until they found a suitable stone locally and gained the necessary experience of carving it. Another explanation for the variety of marbles and hard stones at Fishbourne could well have been the dictates of fashion coupled with a desire of the residents to have familiar objects in their new dwelling, to remind them of their homeland.

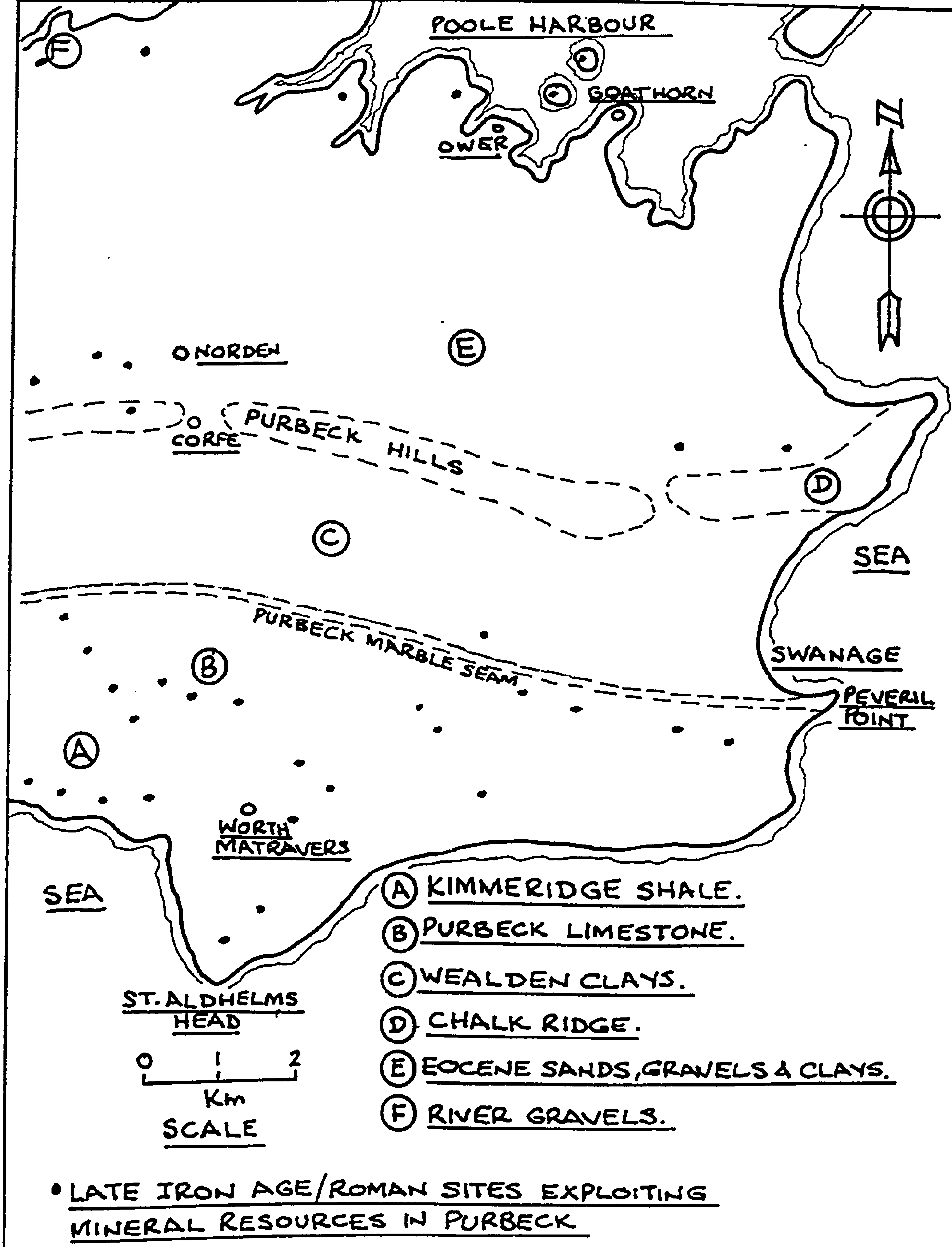


FIG. F1.3

ROMAN MINERAL WORKINGS.
IN THE ISLE OF PURBECK.

STONE QUARRYING & BUILDING IN ENGLAND. – DAVID PARSONS

Beavis (1971) concludes that marble quarrying took place in Purbeck during the Romano-British period but the masons only produced sawn slabs and mortaria at workshops adjacent to the quarries. Most of the marble was delivered to the site in the 'as dug', or partially formed condition to be finished there. This point is re-inforced by the evidence found at the Fishbourne villa, at which Beavis suggests that in addition to decorative stone work for the villa, mortars and pestles were also produced. He also lists many find sites for Purbeck marble architectural objects, ie floor tiles, columns, paving stones, etc, and names the find sites of inscribed Roman slabs, used as a tribute to some important person in the form of a tombstone. Inscribed Roman tablets also record important military, civil and other events. The locations and numbers of these inscribed Roman slabs are shown in Fig 2.3.

Dunning (1948) shows the find site locations of 39 Roman Purbeck marble mortars in England along with a further 2 find sites on the continent and these are shown in Fig 3.3. A typical Roman mortar in Dorchester Museum, is shown in Plate 1.3. This Roman distribution pattern for Purbeck marble artefacts was to be repeated later in Medieval times.

Although there is no evidence of a single ornament or object of Purbeck marble from the pre-Roman period, Dunning (1948) states that there were two Roman sites on the marble seam at Wilkswood and Gallows Gore in addition to the Roman workshop at Norden referred to by Beavis (1971). These sites were producing Purbeck marble artefacts during the first hundred years of the Roman period and there is evidence to prove that the industry was flourishing and productive. After about AD150 the industry declined rapidly, the production of building materials and large slabs seeming to have ceased and not a single mortar is known after AD150. There is, in fact, a complete lack of Purbeck marble artefacts from the middle of the 2nd century up to the early 4th century. The industry had thus become defunct in the middle of the Roman period following the 100 years during which it flourished under their patronage. This is further illustrated by the fact that during the 1st and 2nd centuries 80% of the Purbeck marble discovered was at sites between 50 and 200 miles from Purbeck. By the second half of the 4th century Purbeck marble, as well as Purbeck burr mortars are only found within a 40 mile radius of Purbeck. From a flourishing industry under the Romans it had dwindled down to a few families producing mortars and using the barter system for payment (Dunning, 1948).

SOME ASPECTS OF THE USE OF PURBECK MARBLE IN ROMAN BRITAIN BY JOHN BEAVIS

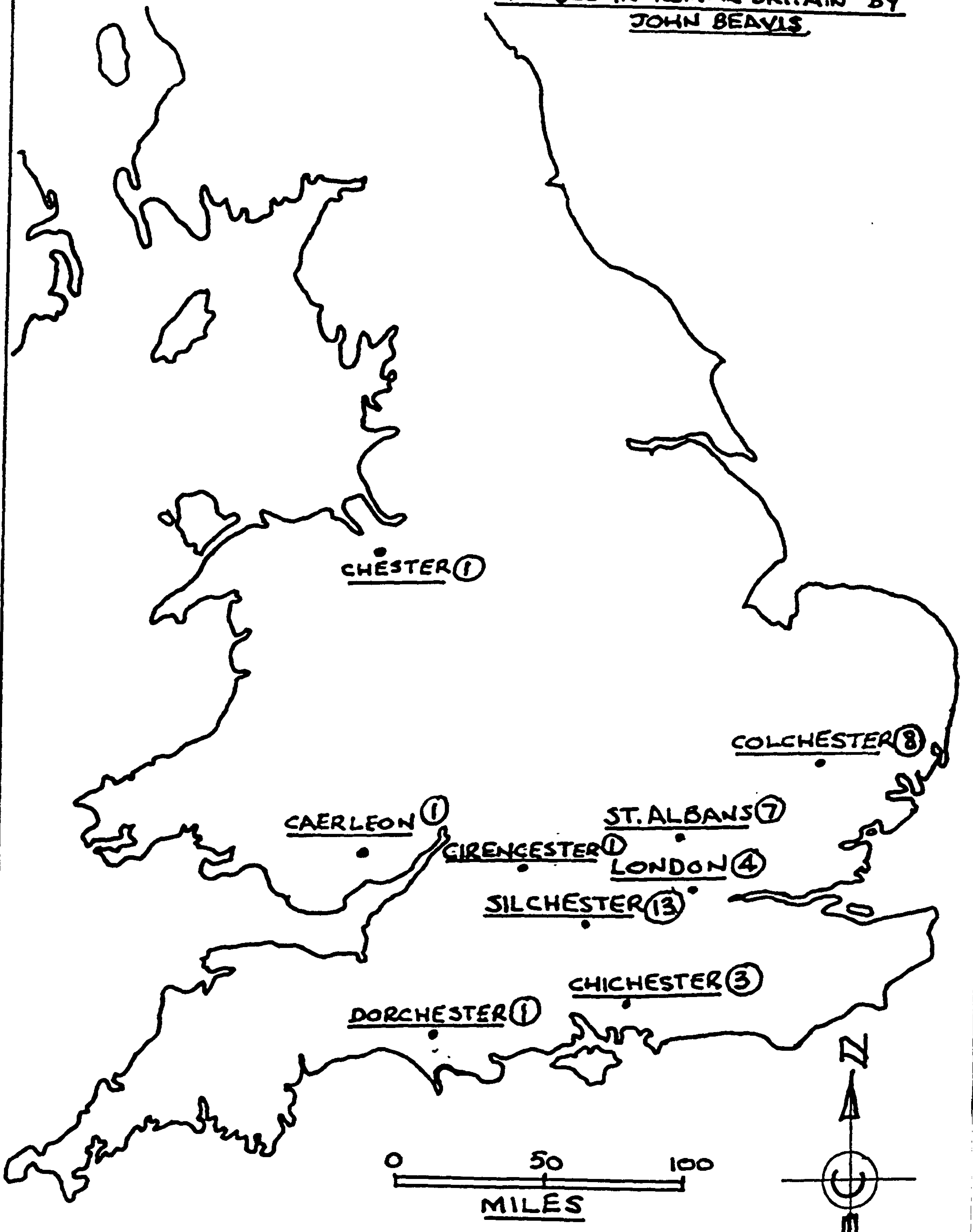


FIG. F2.3

LOCATION & NOS. OF INSCRIBED ROMAN TOMBSTONES & MILITARY, CIVIL & OTHER INSCRIPTIONS ALL ON PURBECK MARBLE.

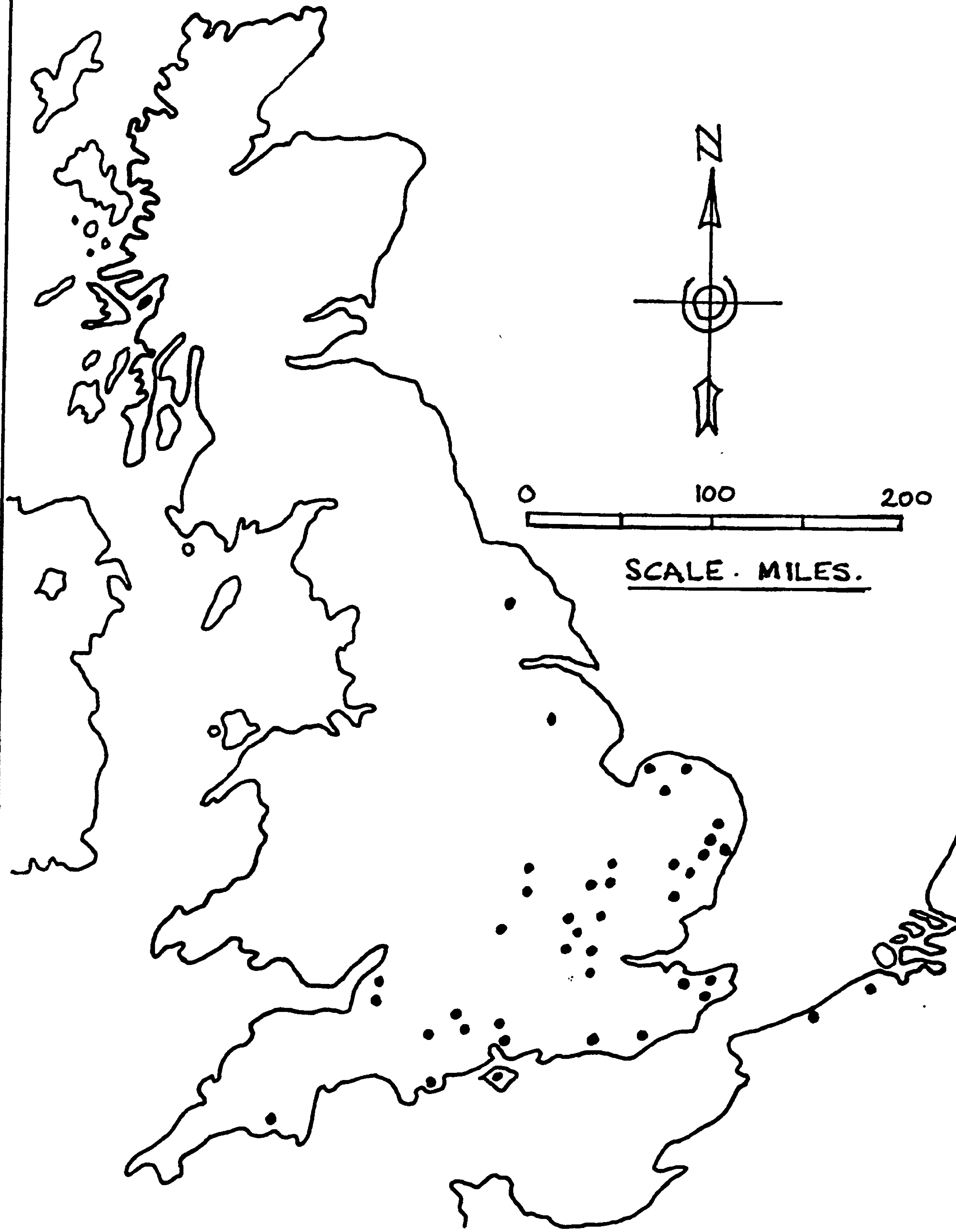


FIG. F3.3

DISTRIBUTION OF PURBECK MARBLE MORTARS.

STONE MORTARS BY G.C. DUNNING. (1966)

Another contributory factor for the decline of the Purbeck marble industry was the nature of the rock itself. It weathers rather badly and when exposed for any length of time, the high polish is lost and discolouration of the surface takes place. As exposure to the elements continues the surface begins to pit and flake and the inscriptions on the tablets are lost. These defects render it unsuitable for long term exposure as part of the exterior fabric of a building, particularly in the British climate, and it was supplanted by mainly the oolitic limestones.

The Medieval Period

Until the Norman invasion in 1066 AD the Purbeck marble industry had lain virtually dormant since the 5th century. During this period stone was probably being used for local purposes. The principal turning point in the fortunes of the industry came with the construction of the great Norman fortification of Corfe Castle, which sits on the hill guarding a strategic gap in the Purbeck hills. The first castle at Corfe predates the Normans, and consisted of a single tower erected during King Alfred's reign in 871 AD as a defence against the marauding Danes and to protect Wareham, in those days a very important Saxon town and port, from a Danish attack from the sea coast. In AD 958, King Edgar extended the castle and Italian workmen arrived to instruct the local artesans in the Italian stone building techniques. Following the Norman invasion a castle was in building at Corfe by 1090 AD and by 1100 AD the keep was standing. The Normans built the castle mainly from burr stone locally quarried at nearby Quarr. Burr is a hard limestone which contains small snail and fish remains and the seam lies immediately below the Purbeck marble seam. It also has the disadvantage of only producing relatively small blocks.

From the time of the Norman conquest Corfe was a Royal castle and in 1199 AD King John made Corfe a Royal residence by building a palace there. He had the West Baily fortified and added three towers (Hardy, 1983). Corfe gained added importance when the state papers were stored there by order of King John who also had important prisoners detained in the dungeons there. The stonework is of high quality and the masons who worked on the castle lived outside the walls, the usual arrangement at a fortification giving rise to the settlement (now the village) of Corfe Castle. The Castle fell to Cromwell's forces in AD 1646 and over a period of months it was partially destroyed by gunpowder, the high quality stonework offering a high degree of resistance to total destruction. Plate 2.3 is taken from a painting of Corfe Castle showing it as it probably was just before its destruction by Cromwell's Army and Plate 3.3 shows Corfe Castle today.

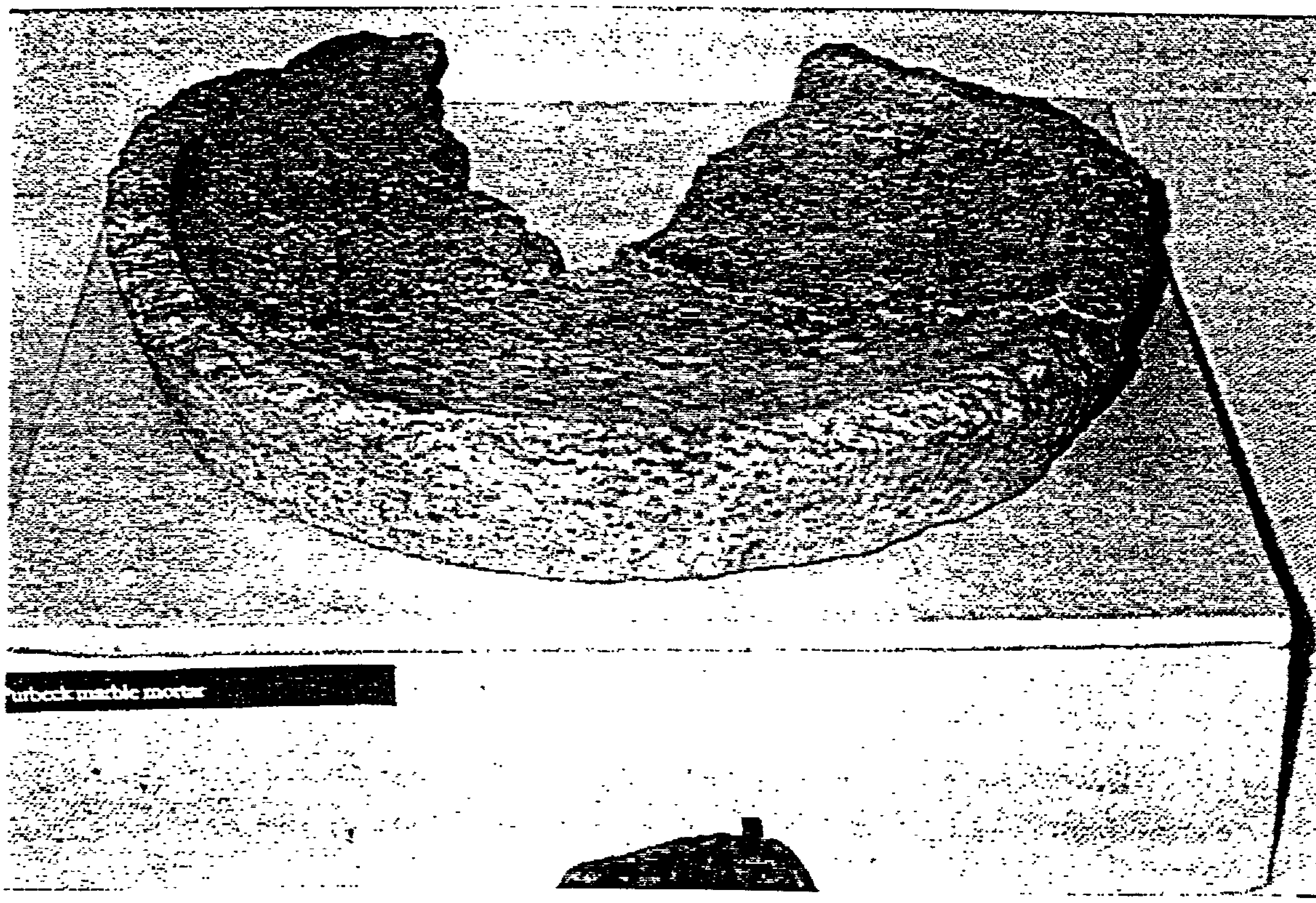


Plate 1.3 Typical Roman Purbeck Marble Mortar

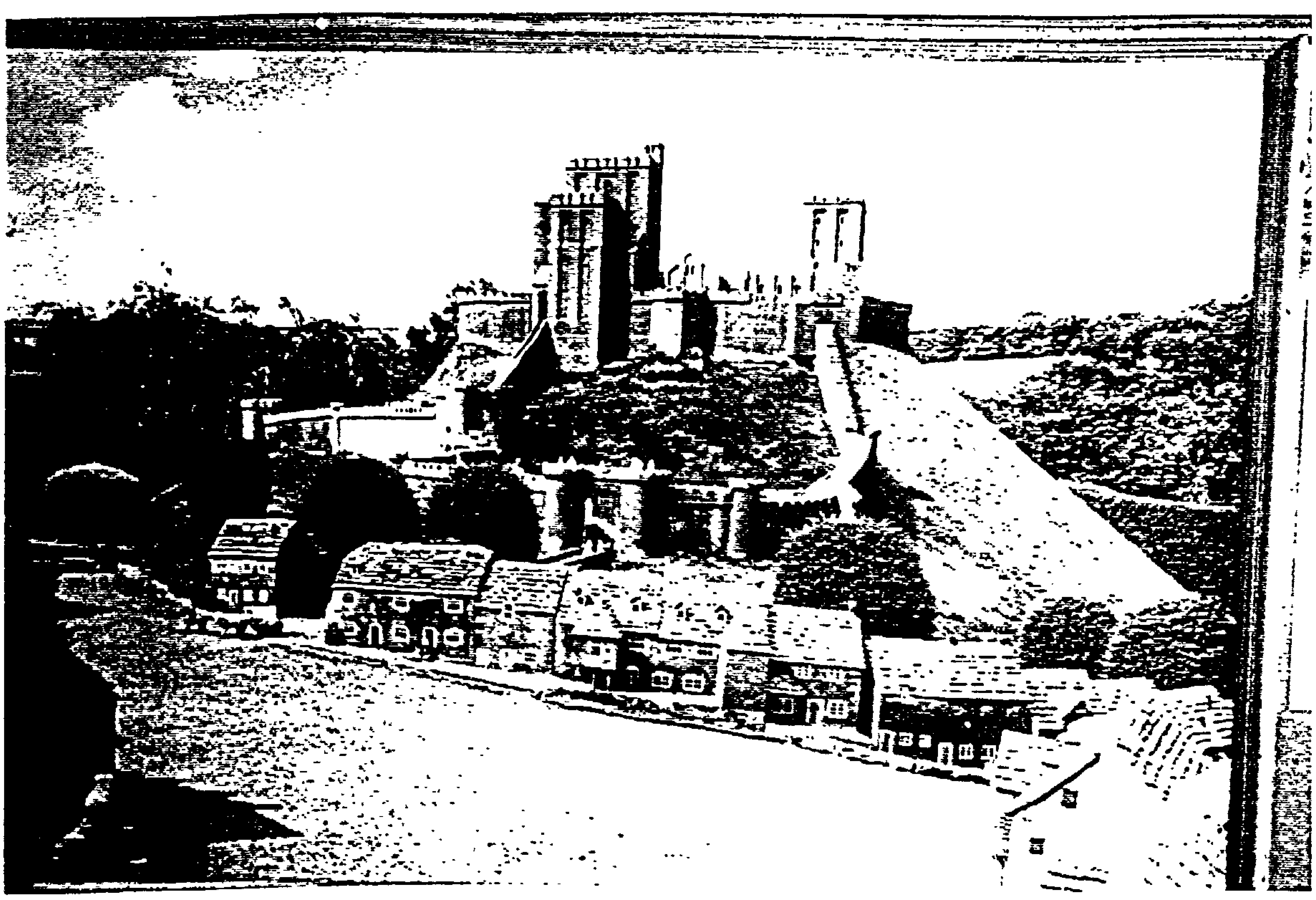


Plate 2.3 Painting of Corfe Castle

During the 12th to the 14th century, when there were masons working on Corfe Castle, there was a boom in cathedral building and the black and white Italian marble theme, referred to earlier in this thesis, created the demand for Purbeck marble. Quarrying the upper-most seam of Purbeck marble, originally dug by the Romans, began again but on a much larger scale to satisfy the demand created by the introduction of Gothic architecture. The taste for internal polychrome decoration of church interiors was finding expression as the Early English period of Architecture developed to supplant the transitional Norman.

Nothing could have been more appropriate for this purpose than the new style of polished detached shafts clustered round the central columns of the Nave or Choir, which, alike with the vaulting shafts above, contrasted so effectively with the white freestone walls of limestone. This idea had in fact already materialised before the close of the 12th Century and Canterbury Cathedral furnishes the earliest example. Although originally thought to have been built on a greenfield site, recent evidence (Daily Telegraph, 6 Feb 1993. p8), suggests that the cathedral was built on the site of St Augustine's Cathedral begun in 597 AD, thus making it one of the oldest sites of worship in the English Church.

Thomas Beckett the Archbishop of Canterbury was murdered in the Cathedral in 1170 and he was canonised by the Pope in 1173 which made Canterbury the popular centre for pilgrims. In 1174 the Cathedral was badly damaged by fire and the monks appointed a Frenchman, William of Sens, as master builder to undertake the rebuilding to match its new found importance as a centre for pilgrimage. Following a fall from scaffolding in the Cathedral William of Sens died in France in 1180 and his work was carried on by William the Englishman. They were responsible for the choir and Trinity Chapel having jointly pioneered at Canterbury one of the earliest examples of the Gothic style of building and introducing Purbeck marble columns for the first time, the work being completed in 1184 (Keates, 1991).

Plate 4.3 shows Trinity Chapel, which was the work of William the Englishmen, and Plate 5.3 shows in the foreground, up to the trancept the choir which was the work of William of Sens. The choir narrows as it approaches Trinity Chapel and this was necessary to keep clear of the foundations of the earlier Cathedral. The polished detached shafts of Purbeck marble can be seen clustered around the central columns of the choir with Purbeck shafts in the vaulting above.

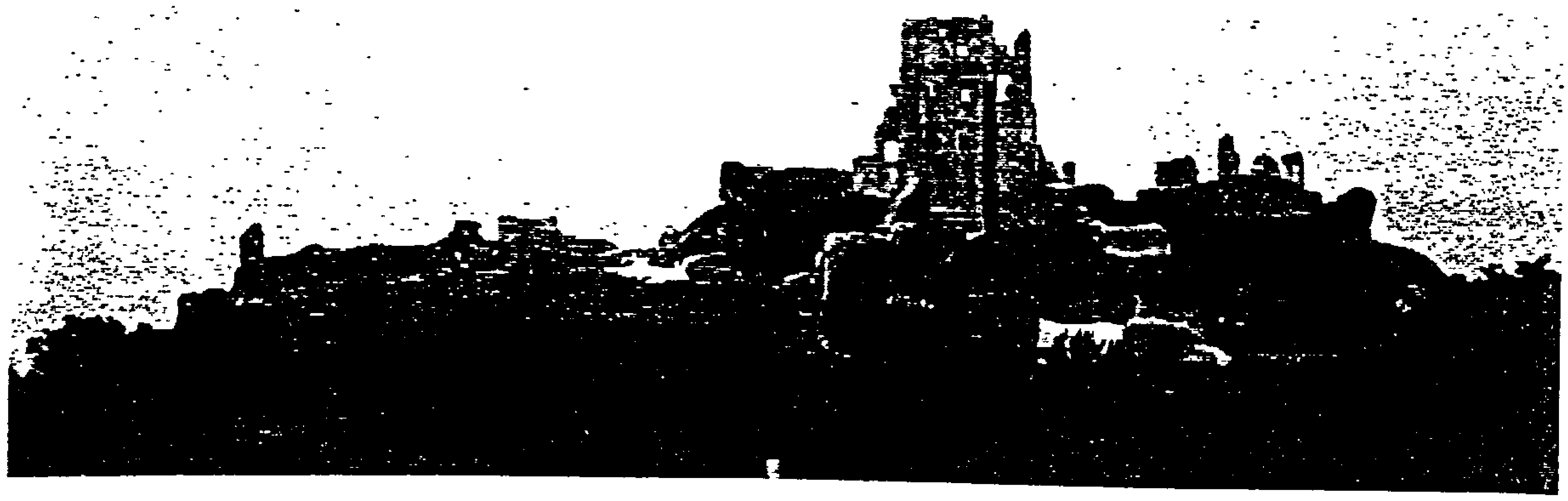


Plate 3.3 Corfe Castle Today

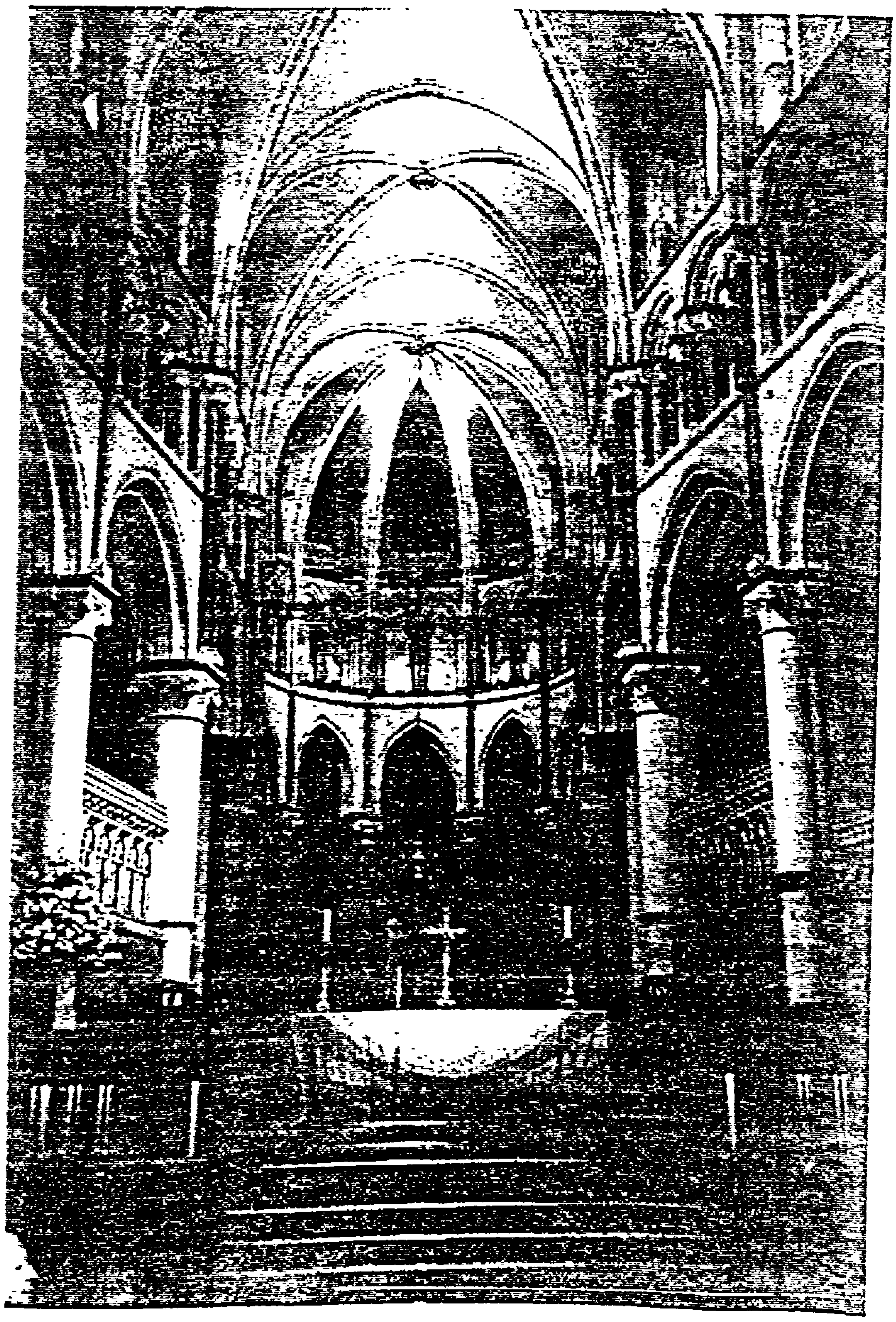


Plate 4.3

Trinity Chapel

Canterbury Cathedral

Plate 5.3 The Choir and Trinity Chapel, Canterbury

In 1185 the round of the Temple Church in London with its wealth of Purbeck marble columns and vaulting shafts was begun by the Knights Templars and the architectural theme was continued when the choir was added in 1240 (Lewer, 1991) and Plate 6.3 shows the Round or Rotunda and Plate 7.3 is a view of the choir looking towards the altar.

At Winchester Cathedral Bishop Godfrey de Lucy's work (1189-1204) incorporated Purbeck marble columns and steps in the choir extensions. Plate 8.3 shows the columns and Plate 9.3 the steps.

Salisbury Cathedral is the outstanding example of the lavish use of Purbeck marble, all of one period (1220-1258) and was the first important building to be wholly carried out in the early English style. It was built on a site 2 miles south of the first Cathedral at Old Sarum. The main body of the Cathedral is of Chilmark stone but the interior contains 12,000 tons of Purbeck marble. Plate 10.3 shows the nave with the main pillars with their clusters of polished Purbeck marble shafts. A view across the nave in Plate 11.3 shows the variations of the marble shafts. Plate 12.3 shows the Purbeck marble shafts in the vaulting and side aisle. An external view of the cloisters is shown in Plate 13.3 and Plate 14.3 shows the condition of some Purbeck marble pillars on the side of the cloisters open to the weather. The quarry from which the Purbeck marble was dug is at Downshay and Plate 15.3 shows the road leading to Downshay Manor which passes through the old marble quarries. It is difficult to link the splendour of Salisbury Cathedral with this pastoral view which leads on to Downshay Manor, the home of Alice de Briwere who gifted the marble to the Cathedral.

Worcester Cathedral, which is much restored, also contains a large amount of Purbeck marble, the Early English work here dating from 1224. The architectural style of slender shafts clustering around a central pillar is instantly recognisable and examples of the fine workmanship are shown in Plate 16.3 and Plate 17.3.

Netley Abbey, a Cistercian monastery, proposed by Peter de Roches the Bishop of Winchester (1204-38), was built in 1239. It was a monastery until the dissolution act

Plate 6.3 Rotunda, Temple Church, London

Plate 7.3 The Choir, Temple Church

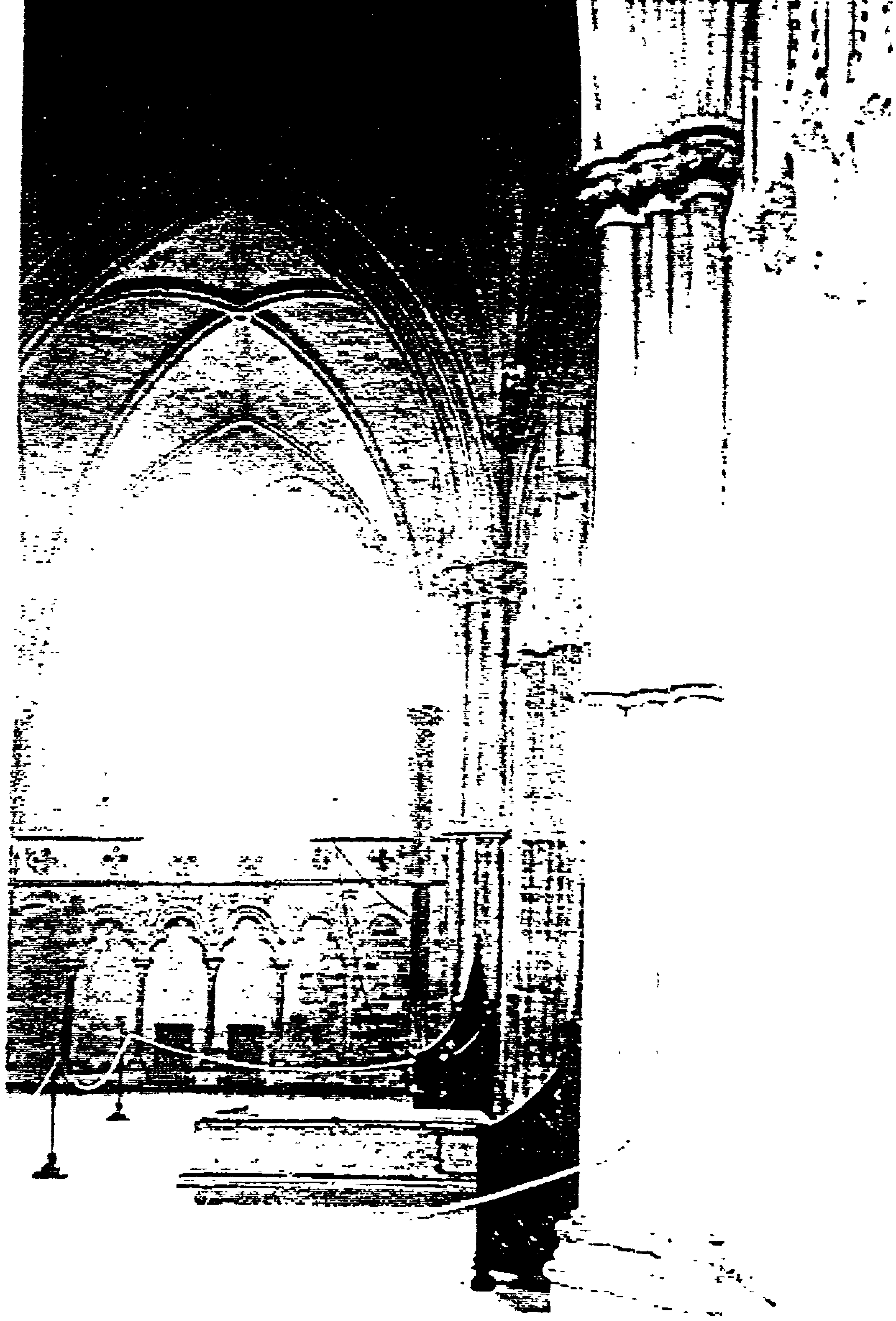


Plate 8.3

Purbeck Marble Columns

Winchester

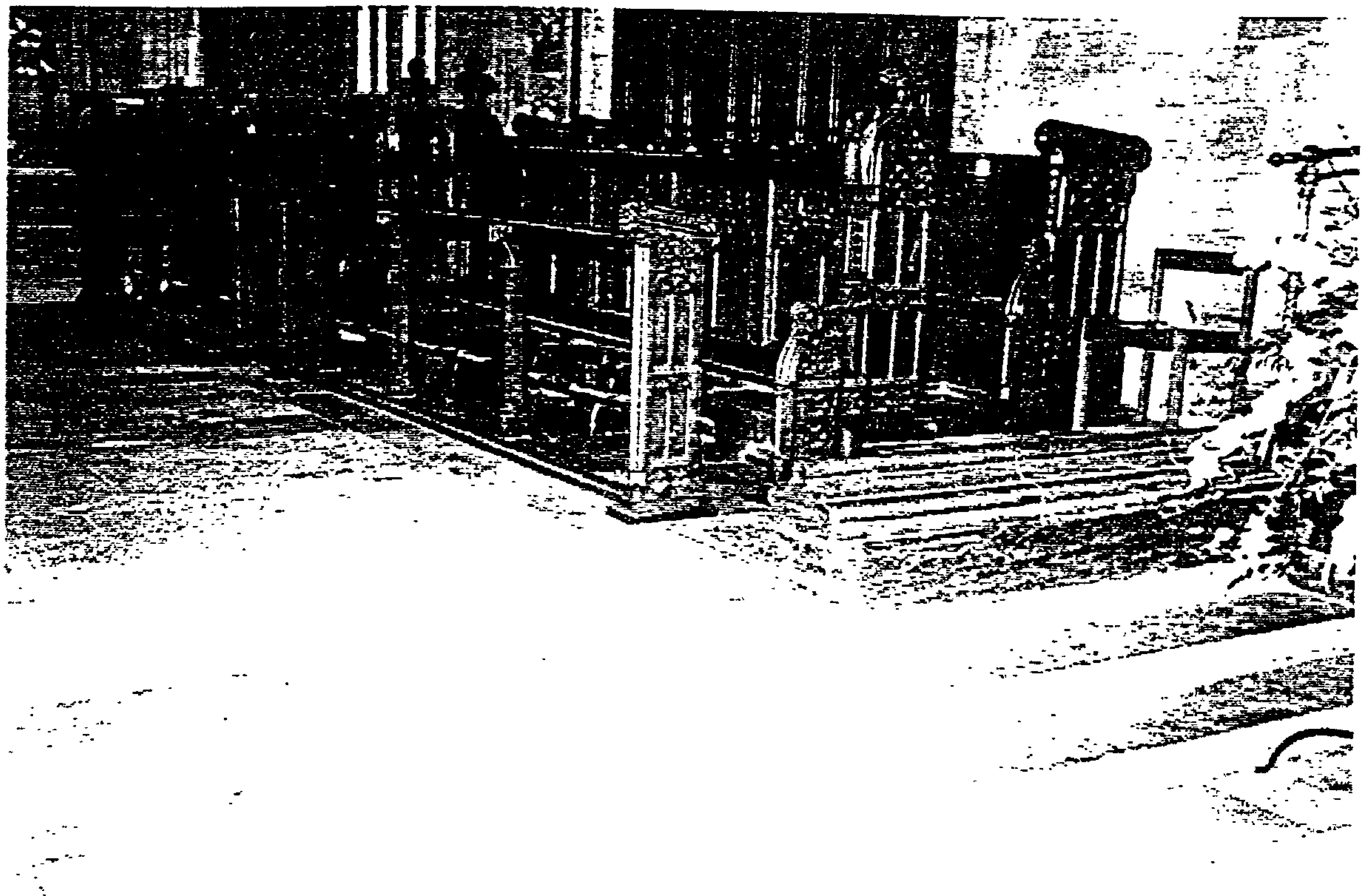


Plate 9.3 Purbeck Marble Steps, Winchester

Plate 10.3 Nave, Salisbury (1)

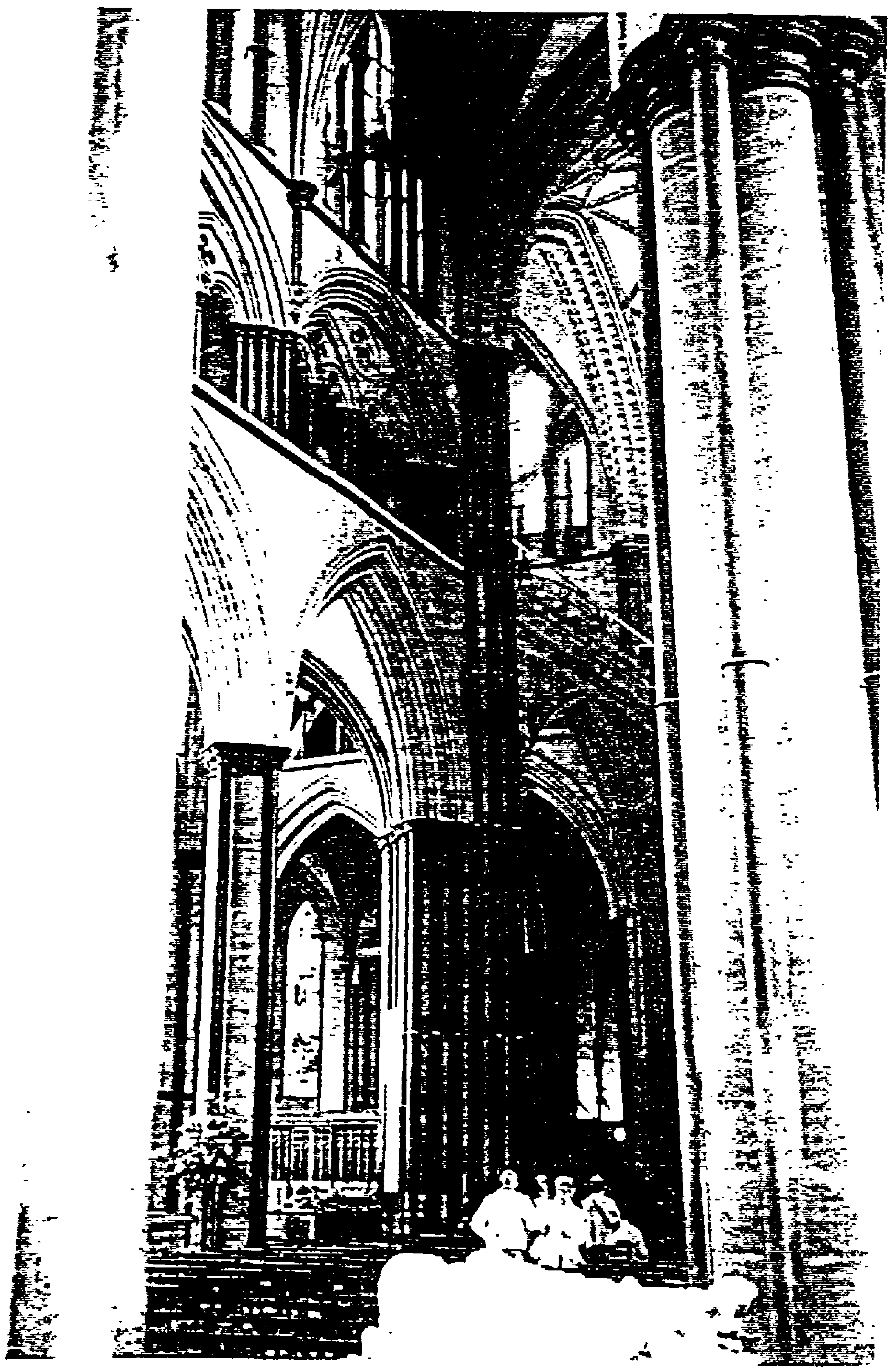


Plate 11.3 Nave, Salisbury (2)

Plate 12.3 Vaulting, Salisbury

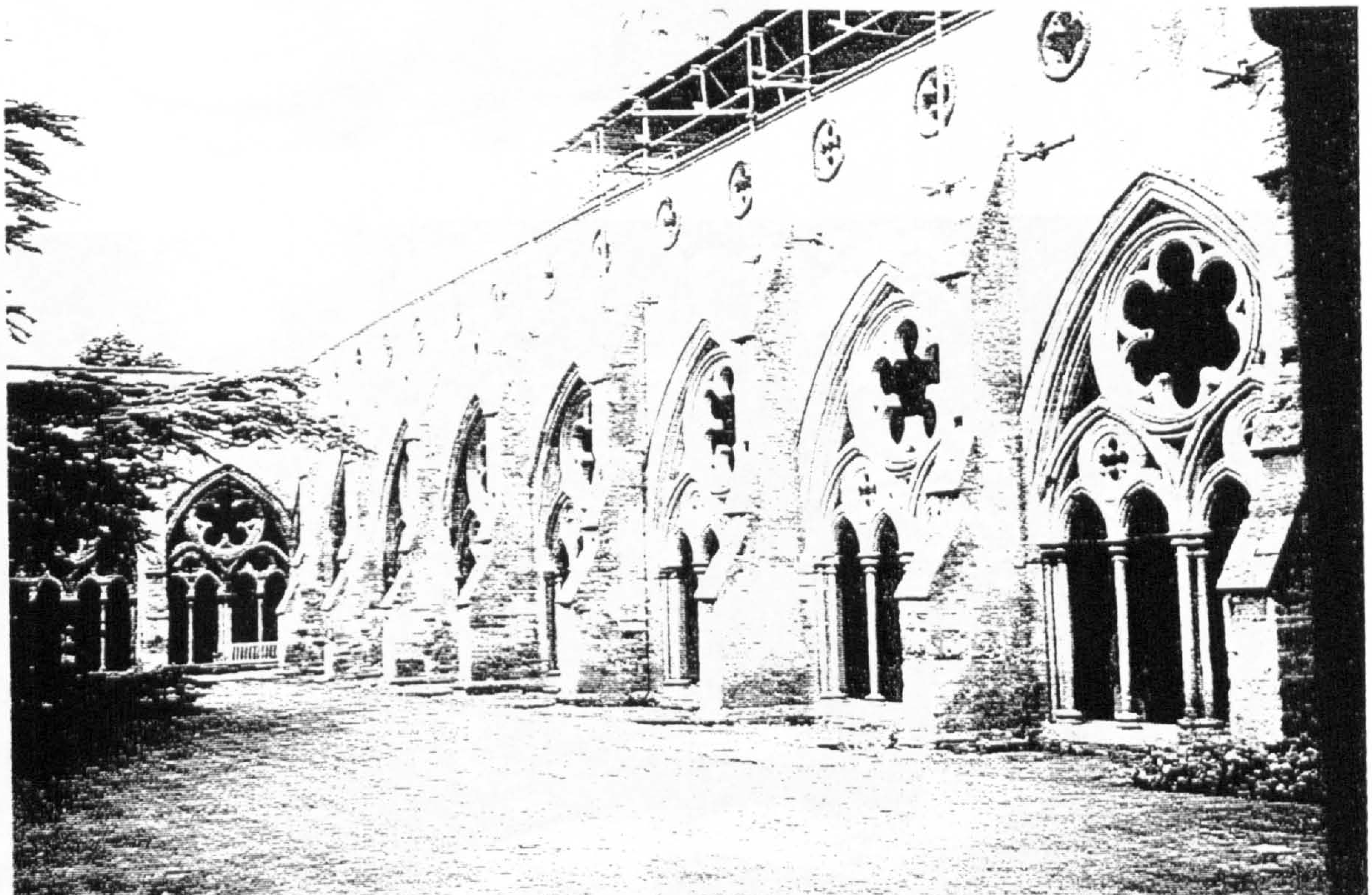


Plate 13.3 Cloisters, Salisbury

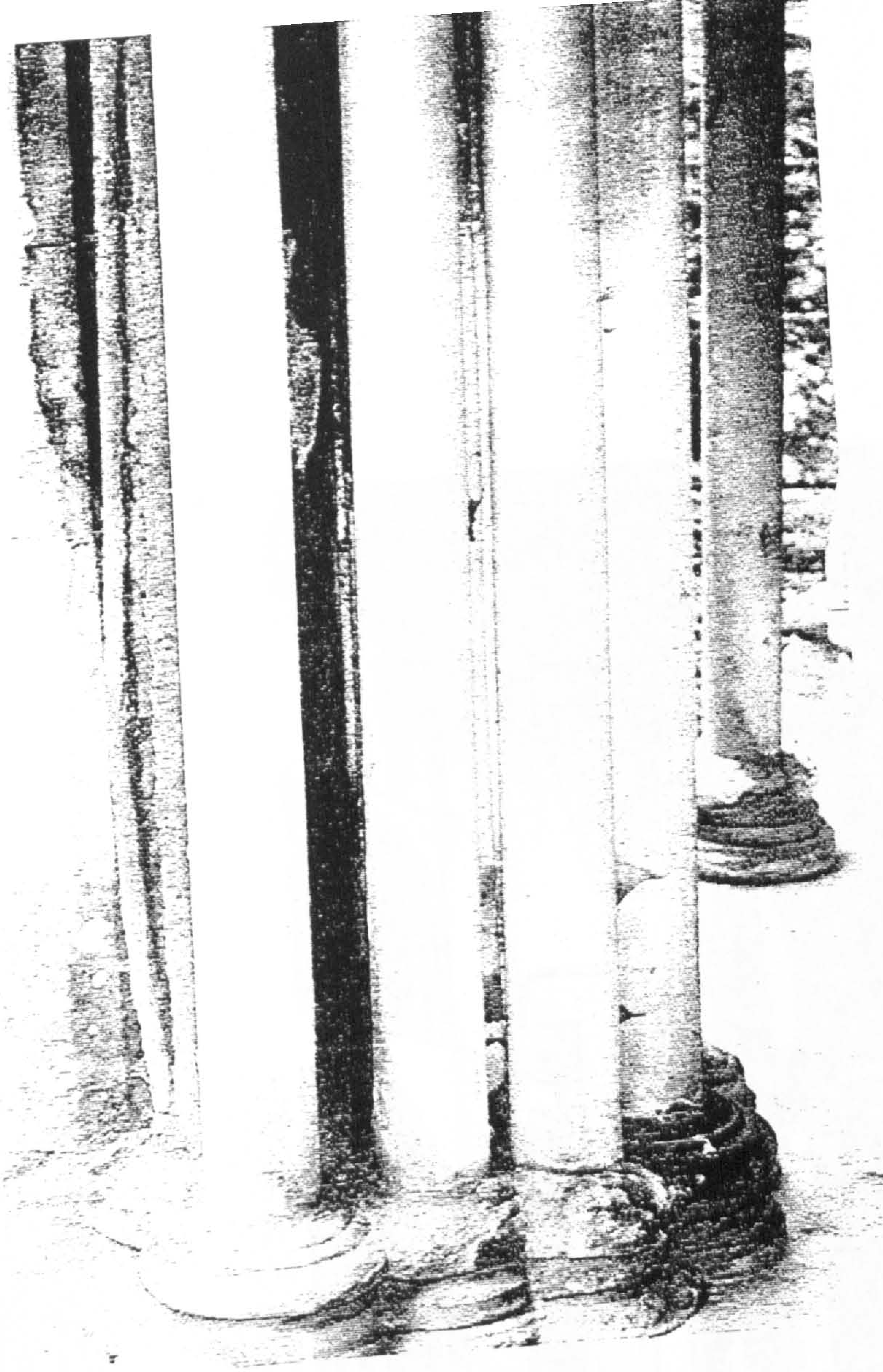


Plate 14.3

Purbeck Marble Weathering

Salisbury

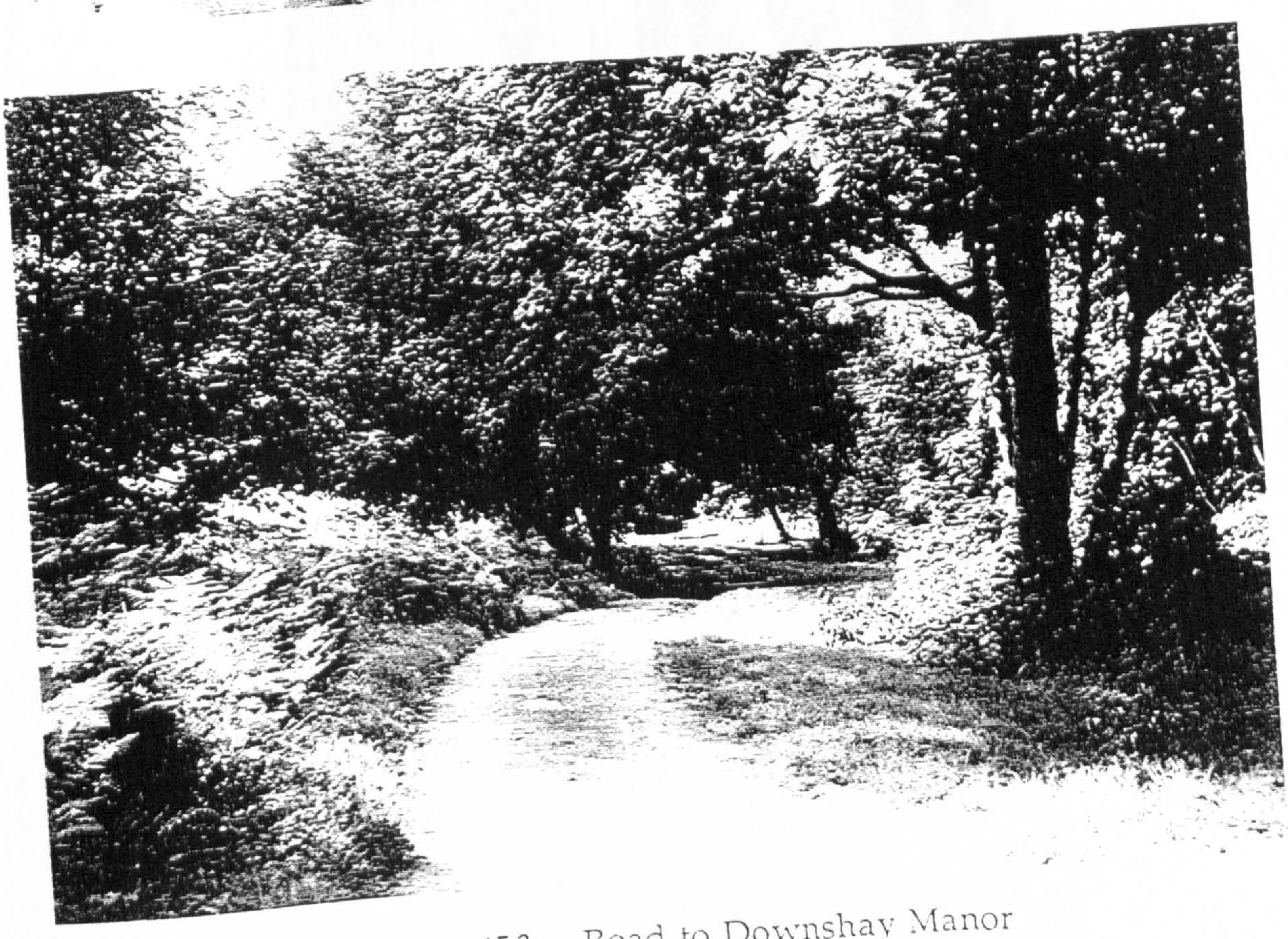


Plate 15.3 Road to Downshay Manor

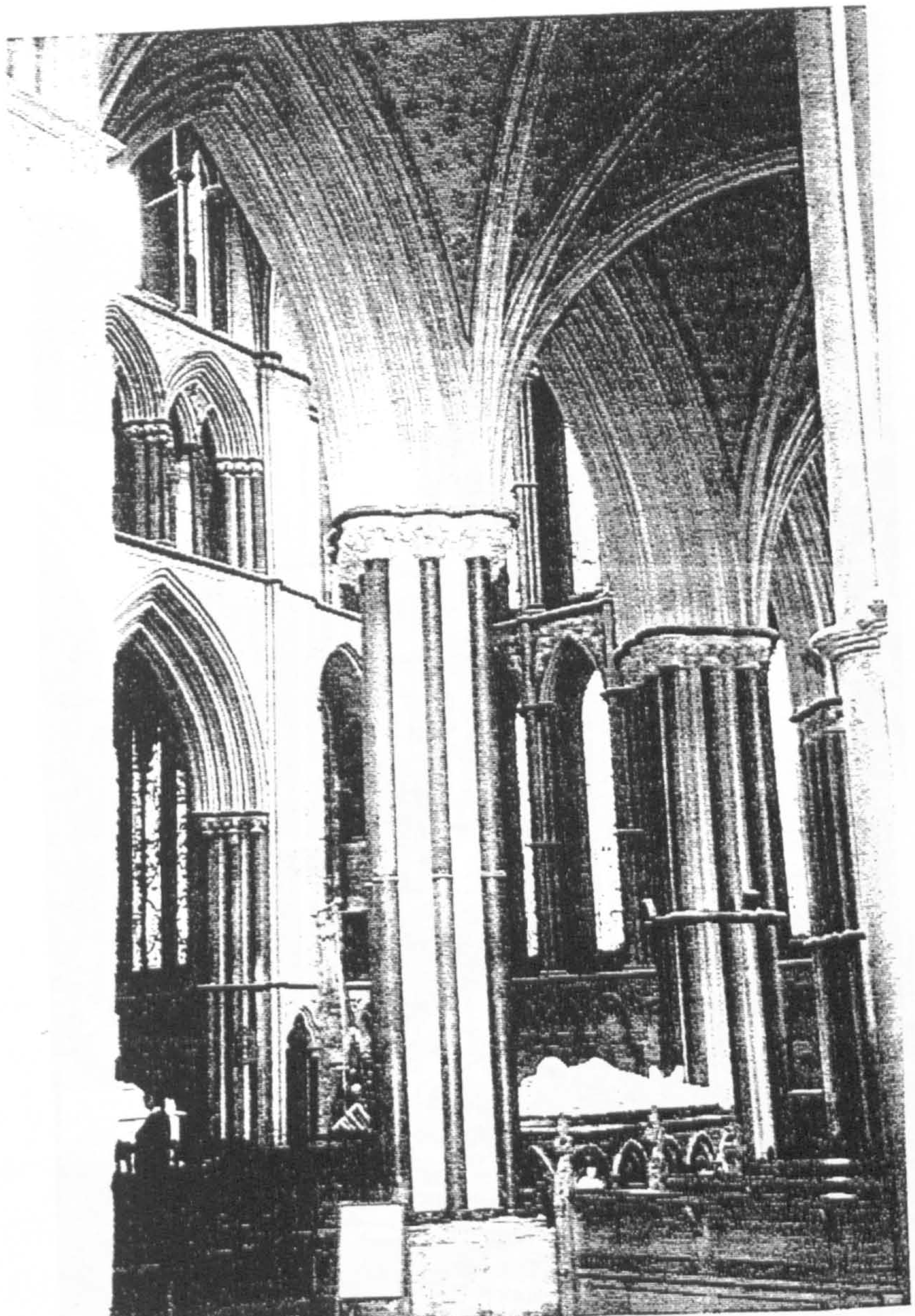


Plate 16.3 Purbeck Marble pillars, Worcester (1)

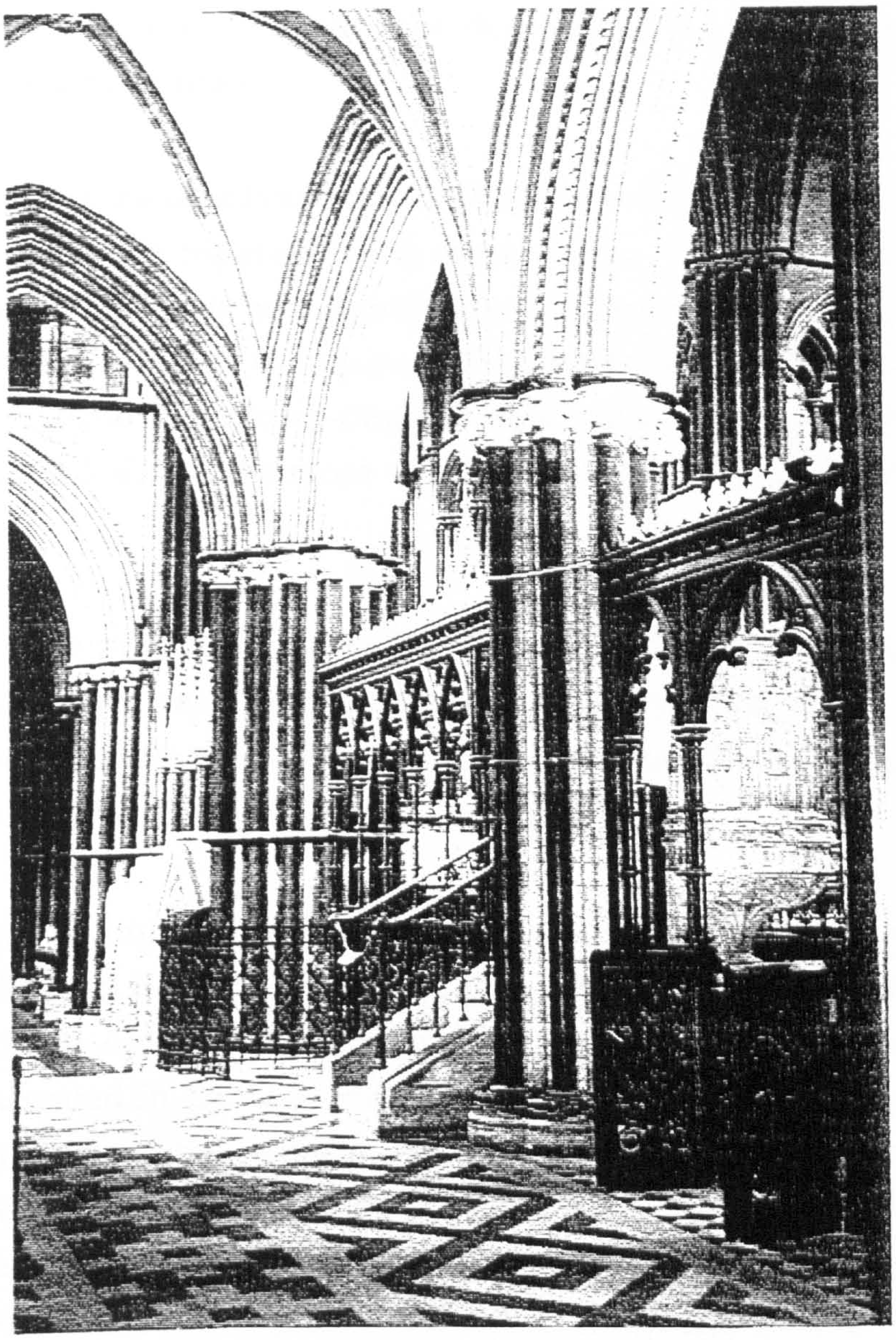


Plate 17.3 Purbeck Marble pillars, Worcester (2)

in 1536 when it became a large dwelling house until 1700, when its new owner, Sir Berkeley Lucy, sold a great part of the fabric as building material. Purbeck marble bases, capitals and cluster shafting was used for some of the archway pillars and a close up of one of the pillars is shown in Plate 18.3 and the bad weathering properties of the Purbeck marble components in relation to the other stone used in construction can clearly be seen. A close up of the capital, Plate 19.3 shows how badly the capital has weathered and the open structure of the Purbeck marble, with its snail shells can be clearly seen.

Netley Abbey illustrates the disadvantages of Purbeck marble when exposed to the weather and gives a direct comparison with other stones. Purbeck marble were incorporated in many cathedrals and churches in Medieval times. It was used in humble parish churches and two examples of Purbeck marble pillars in Purbeck churches are shown. Plate 20.3 shows single marble pillars in Lady St Mary Church, Wareham and Plate 21.3 shows the more usual cluster pillars in St Edwards Church, Corfe Castle.

Distribution maps were produced by Leach (1978) showing the most important sites where Purbeck marble was used in architecture during Medieval times. Fig 4.3 shows where Purbeck marble was used in monastic and secular buildings and Fig 5.3 shows Purbeck marble useage in parish churches.

Westminster Abbey was built in 1065 by Edward the Confessor and every sovereign apart from Edward V and Edward VIII have been crowned here. In 1265 the Norman east end of the Abbey was demolished and rebuilt under the orders of Henry III and consecrated in 1269 but the new Abbey remained incomplete until 1376 when the rebuilding of the nave began. The nave was not completed until 150 years later and Knoop & Jones (1967) examined this delay and point out that in Medieval times there were between 900 and 1000 monastic establishments, collegiate churches and hospitals built, mainly of stone which was a stupendous scale for the day. In addition, 1000's of parish churches were being built along with Royal and other castles, town walls like those at York, Chester and Southampton, municipal buildings and bridges. In the main, building work only continued during the months from April till November each year and closed down for the winter. There was undoubtably a shortage of stonemasons and quarrymen during the whole of this period.

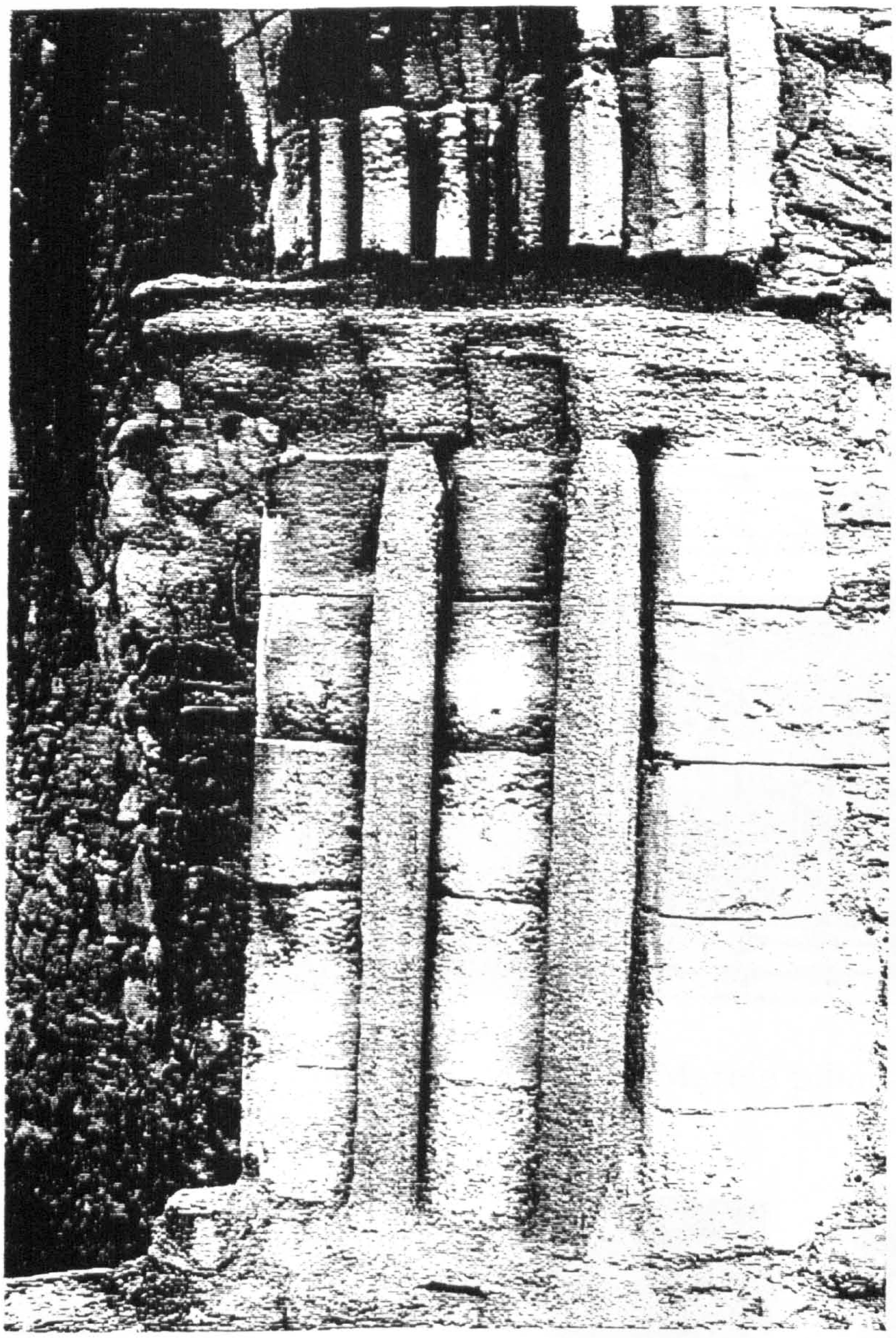


Plate 18.3

Purbeck Marble, Netley

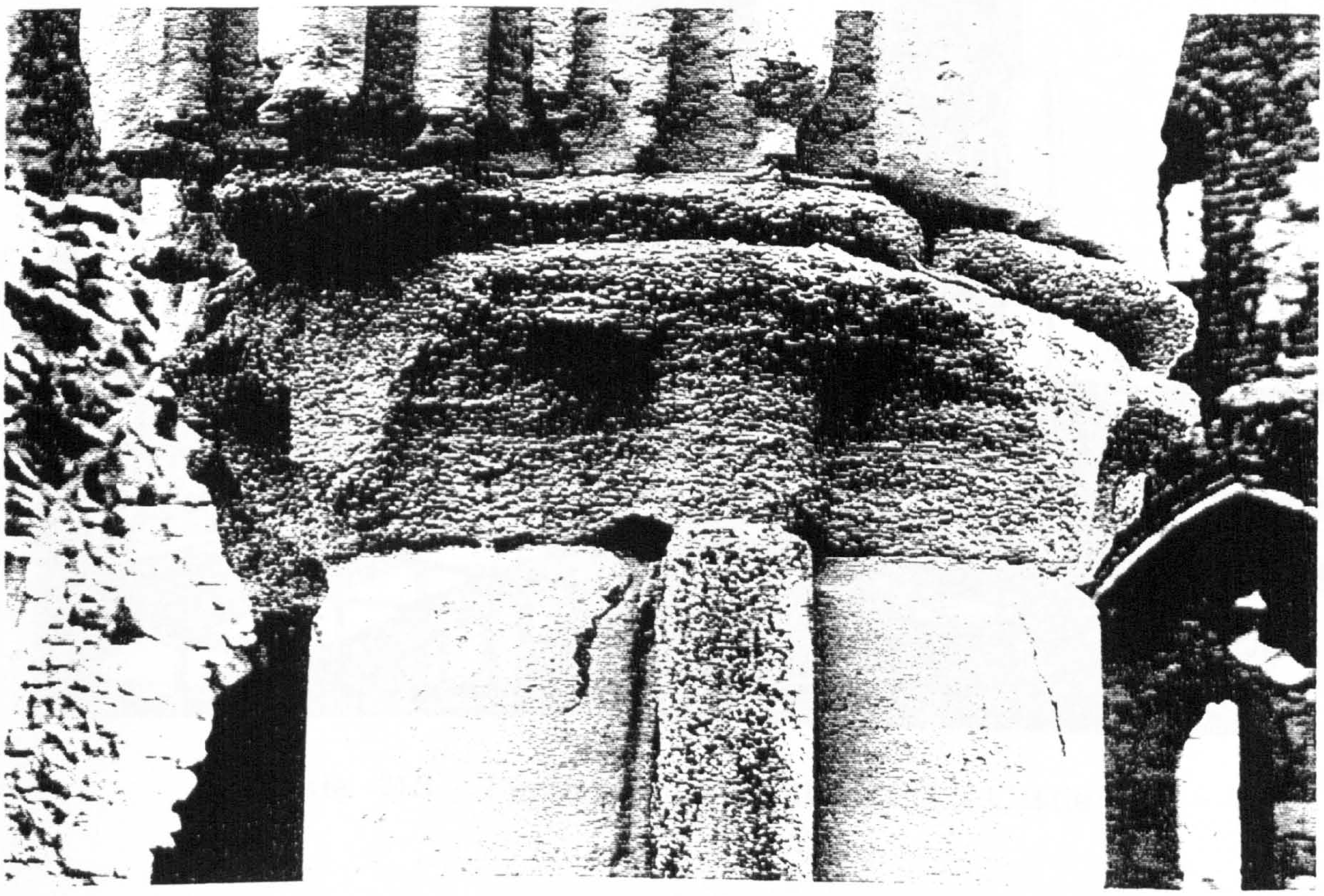


Plate 19.3 Purbeck Marble erosion, Netley

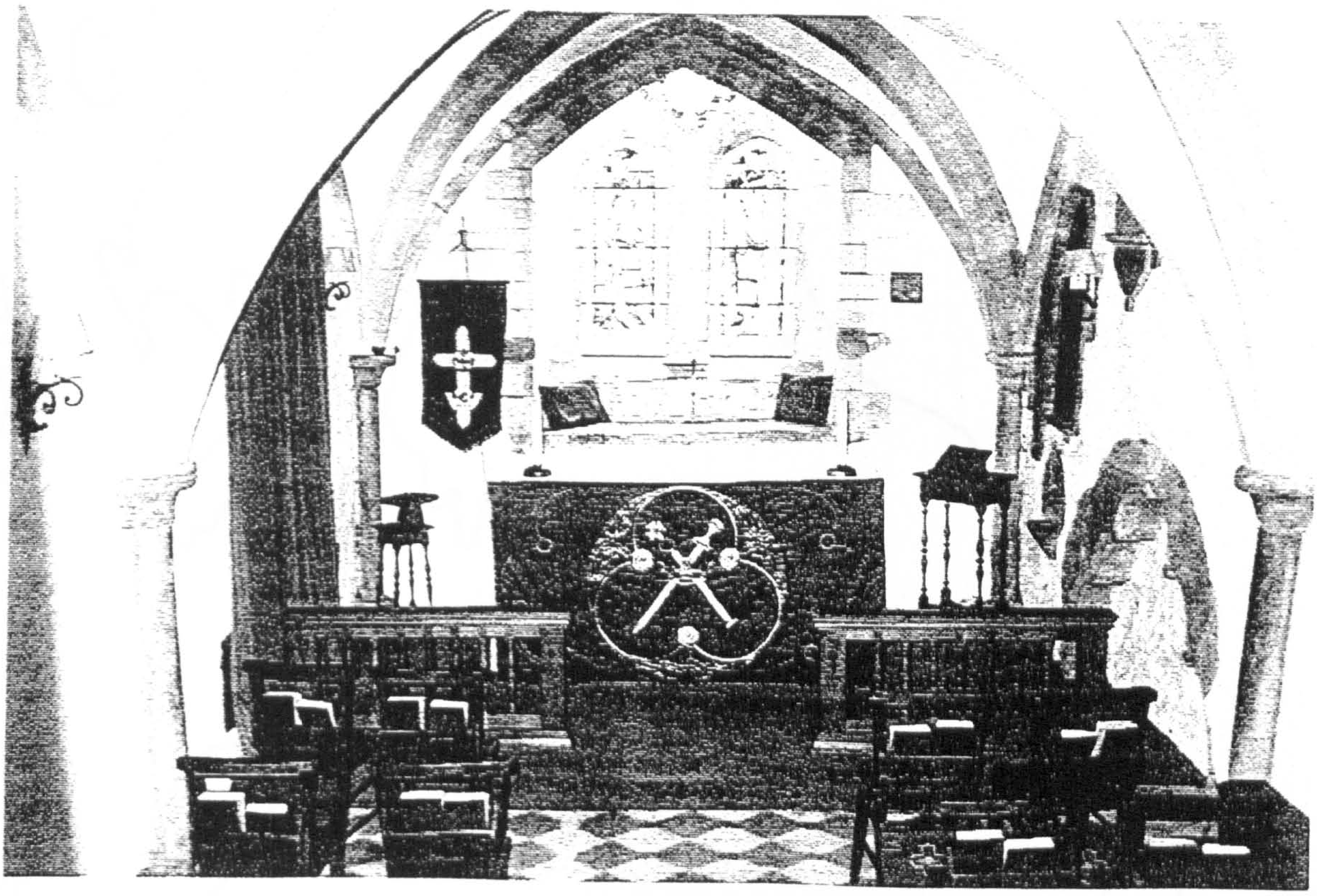


Plate 20.3 Purbeck Marble pillars, Wareham

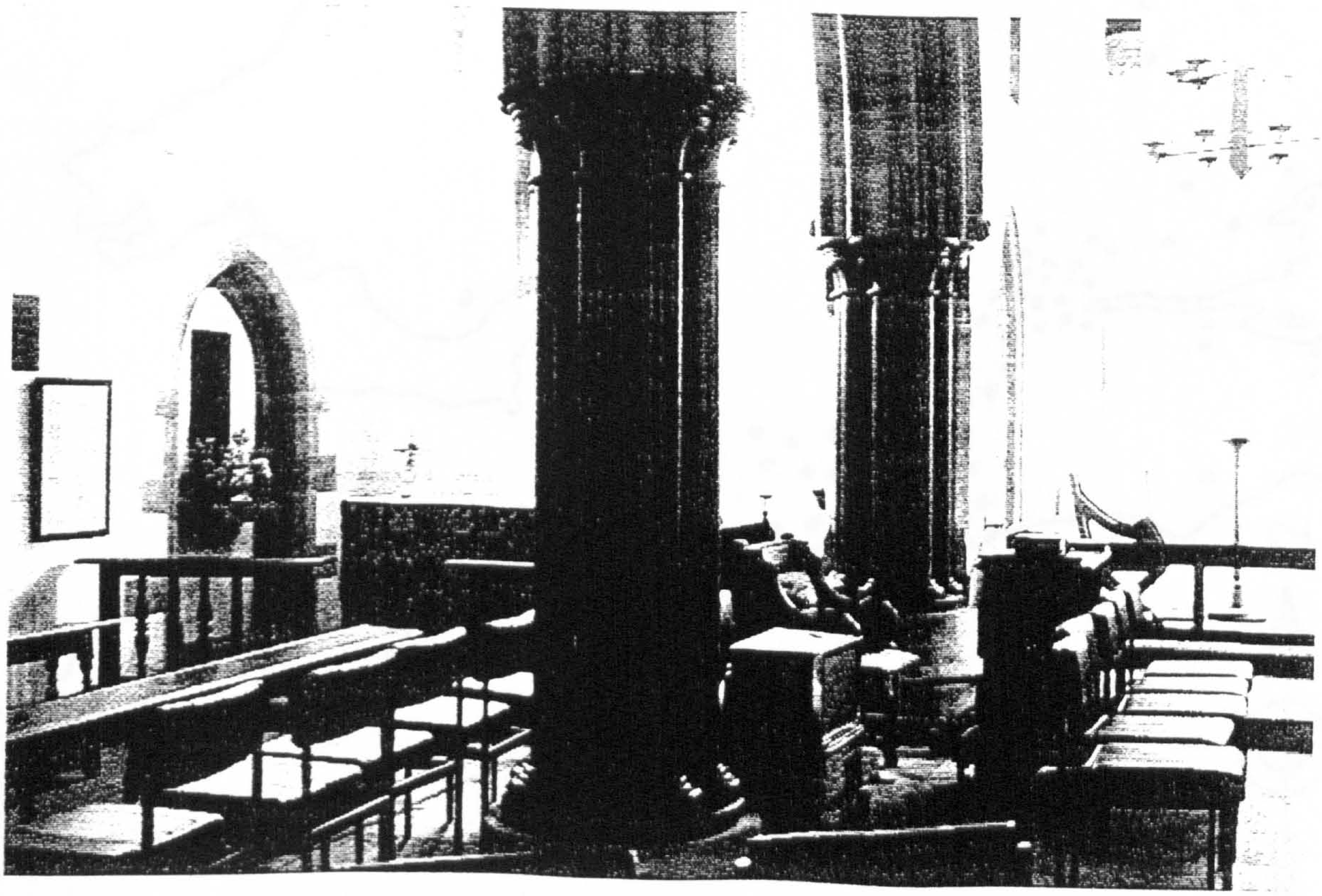


Plate 21.3 Purbeck Marble pillars, Corfe Castle

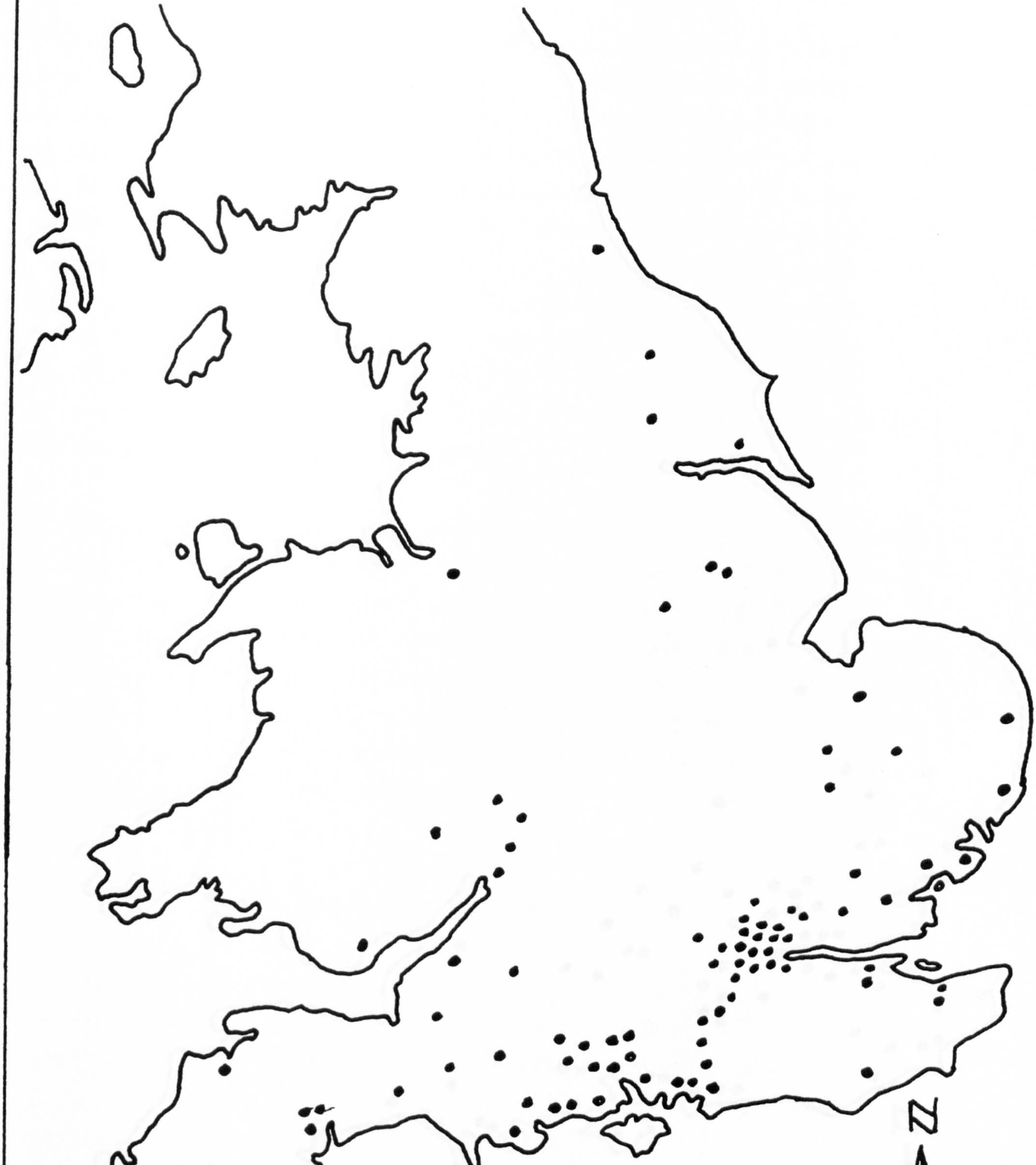


FIG. F4.3

PURBECK MARBLE IN ARCHITECTURE.

(MONASTIC AND SECULAR BUILDINGS)

USE OF PURBECK MARBLE BY ROSEMARY LEACH.

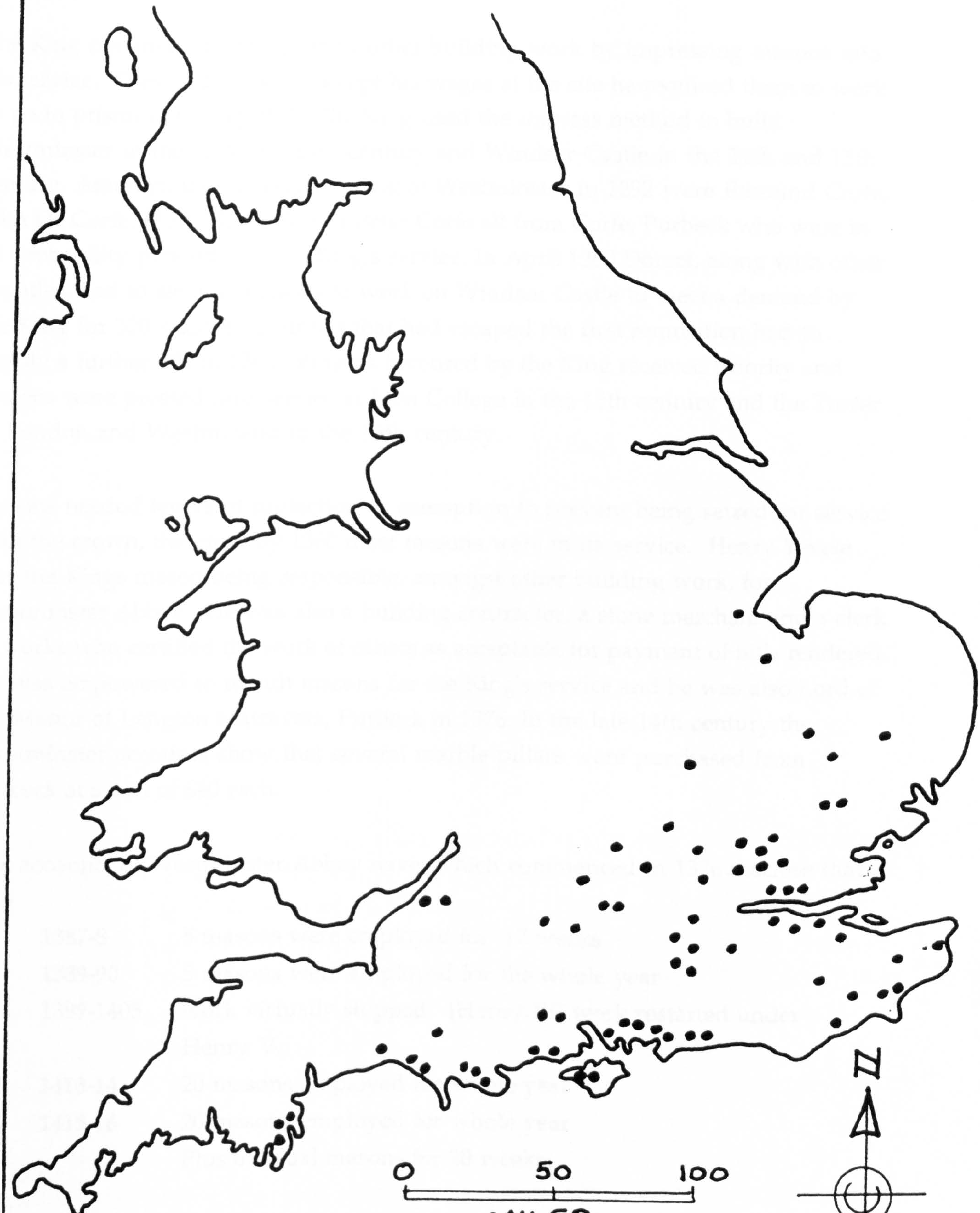


FIG. F5.3

PURBECK MARBLE IN ARCHITECTURE

(PARISH CHURCHES)

USE OF PURBECK MARBLE BY ROSEMARY LEACH.

The King obtained priority over all other building work by impressing masons into his service. They had either to accept his wages at the site he required them to work or go to prison until they did. The King used the impress method to build Westminster in the 13th and 14th century and Windsor Castle in the 14th and 15th century. Amongst the masons working at Westminster in 1292 were Edmund Corfe, John De Corfe, Hugo de Corfe and Peter Corfe all from Corfe, Purbeck who were in all probability pressed into the King's service. In April 1360 Dorset, along with other counties, had to send 40 masons to work on Windsor Castle to meet a demand by the King for 320 masons. Counties that had escaped the first requisition had to supply a further 270 in 1362. Projects favoured by the King received priority and masons were pressed into service at Eton College in the 15th century and the Tower of London and Westminster in the 16th century.

Masons needed letters of protection or exemption to prevent being seized for service with the crown, therefore by 1360 most masons were in its service. Henry Yevele was the Kings mason being responsible, amongst other building work, for Westminster Abbey. He was also a building contractor, a stone merchant and a clerk of works who certified the work of others as acceptable for payment of bills rendered. He was empowered to recruit masons for the King's service and he was also Lord of the Manor of Langton Matravers, Purbeck in 1376. In the late 14th century the Westminster accounts show that several marble pillars were purchased from Purbeck at a cost of £40 each.

The accounts of Westminster Abbey nave, which commenced in 1376 disclose that in :-

1387-8	5 masons were employed for 17 weeks
1389-90	5 masons were employed for the whole year
1399-1403	work virtually stopped. (Henry IV) work restarted under Henry V.
1413-14	20 masons employed for whole year
1415-16	20 masons employed for whole year Plus 6 casual masons for 20 weeks.

There were long periods of inactivity under Henry VI who gave priority to Eton and Kings College, Cambridge. In the records for Westminster in 1292 there is no reference to apprentice masons and this is the case at all other prestige building sites. This shows that only masons who had served their apprenticeship elsewhere were on prestige sites, illustrating the selectiveness of the impress system.

Stone building was an activity of the State and church and accounts were kept which enable numbers of masons employed on site to be obtained. Medieval houses, however, were built mainly of wood or wood and wattle. Stone was used for the better class houses just for the foundations. It was not until the Great Fire of London in 1666 that houses had to be built of brick or stone.

From the 12th century Purbeck marble and Purbeck stone fonts were produced and Leach (1978) produced a location map of Purbeck Fonts and this is shown on Fig 6.3. St Edwards Church, Corfe Castle has a Purbeck marble font and this is shown in Plate 22.3.

Effigies were produced from Purbeck marble at Corfe Castle from the 12th to the 16th century. Before the spectacular boom which took place in the 13th century Purbeck marble had, during the 12th century, become established for church artefacts, particularly fonts. In addition, effigies began to be produced all exhibiting a flatness of carving which denotes the transitional stage between incised slabs and the fully carved effigies of the next century. It is, however, well known that because the vein of Purbeck marble is only thin all effigies carved from it are rather flat. Three well known 12th century effigies are of Bishop Joscylin de Bohum, Salisbury Cathedral shown in Plate 23.3, Abbot Clement, Sherborne of which little remains, Plate 24.3 and an Abbot at Abbotsbury, shown on Plate 25.3.

During the same period tombs began to be produced comprising a stone coffin with a profiled and/or carved coffin lid. Some of the tombs were later enclosed in chantry's, but this ended with the Reformation. At Winchester Cathedral may be found the coffin of Bishop Godfrey de Lucy, Plate 26.3, the tomb of Bishop Henry de Blois, Plate 27.3 and the splendid Retrochoir and Beaufort Chantry, Plate 28.3. Coffin lids were manufactured in large quantities in the Medieval period and became a stock item of production. Plate 29.3 shows a coffin and lid in St Nicholas' churchyard, Worth Matravers, which is a good example of what was mass produced.

In the 13th century incised slabs were still being produced, Plate 30.3 shows the incised slab of an unknown Bishop at Milton Abbey and simple stone coffins similar to that of Prior William de Basynge shown in Plate 31.3.

The carving of effigies was improving and becoming more elaborate and this can be seen in the ecclesiastical effigies of Abbot Lawrence de Bradford, Plate 32.3, and Peter de Roches Plate 33.3.

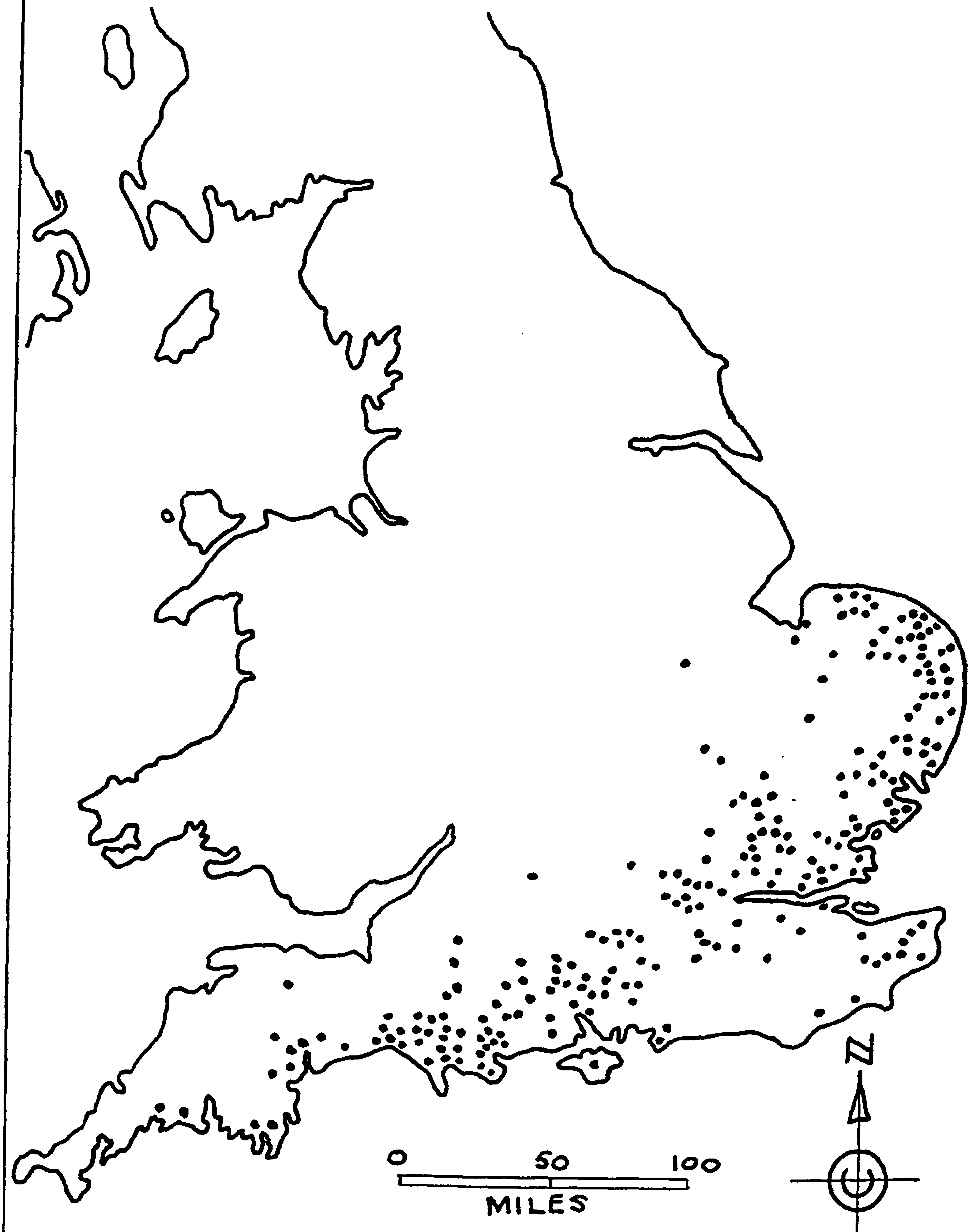


FIG. F6.3

PURBECK MARBLE FONTS.

USE OF PURBECK MARBLE BY ROSEMARY LEACH.

Plate 22.3

Corfe Castle Font

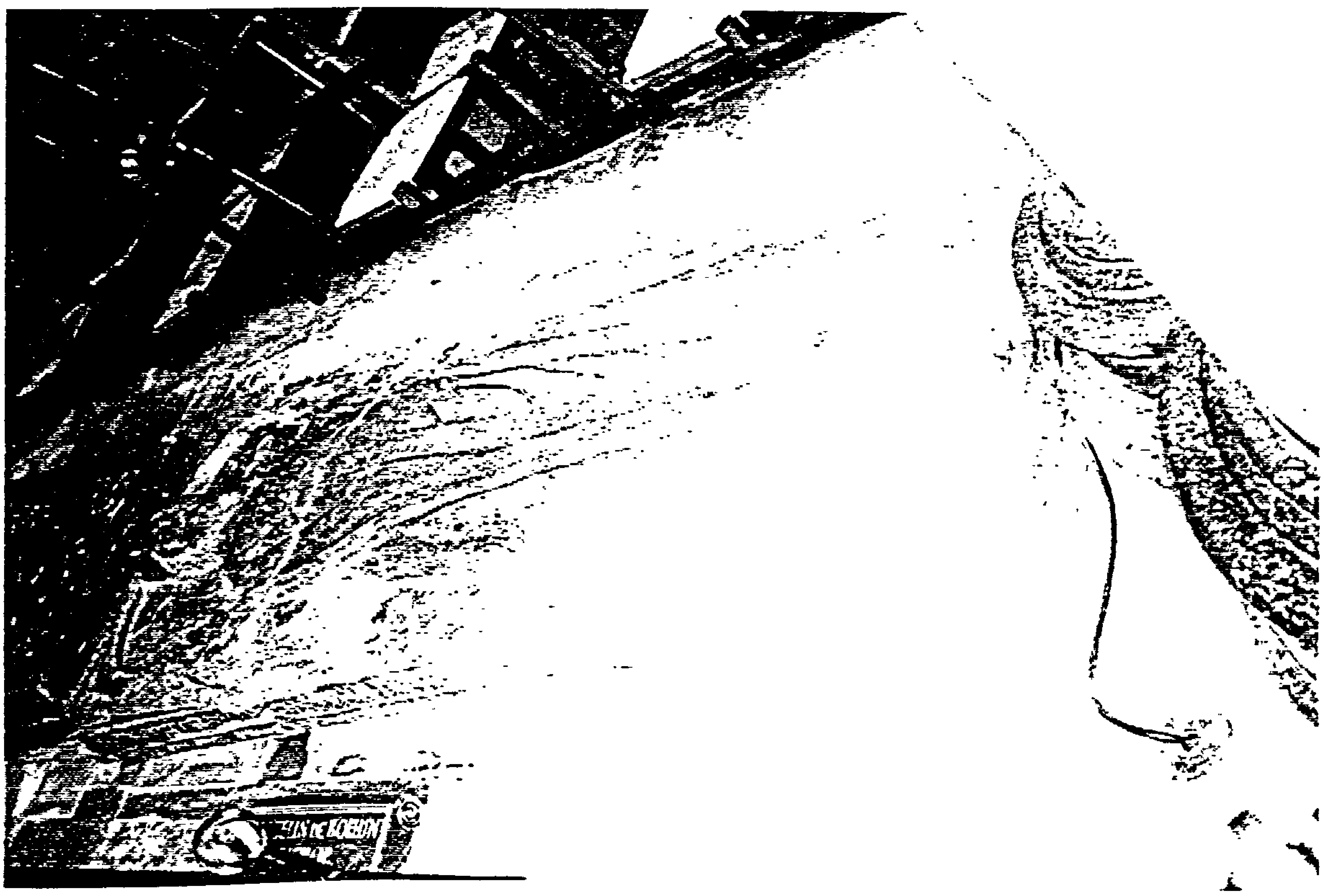


Plate 23.3 Effigy, Salisbury Cathedral

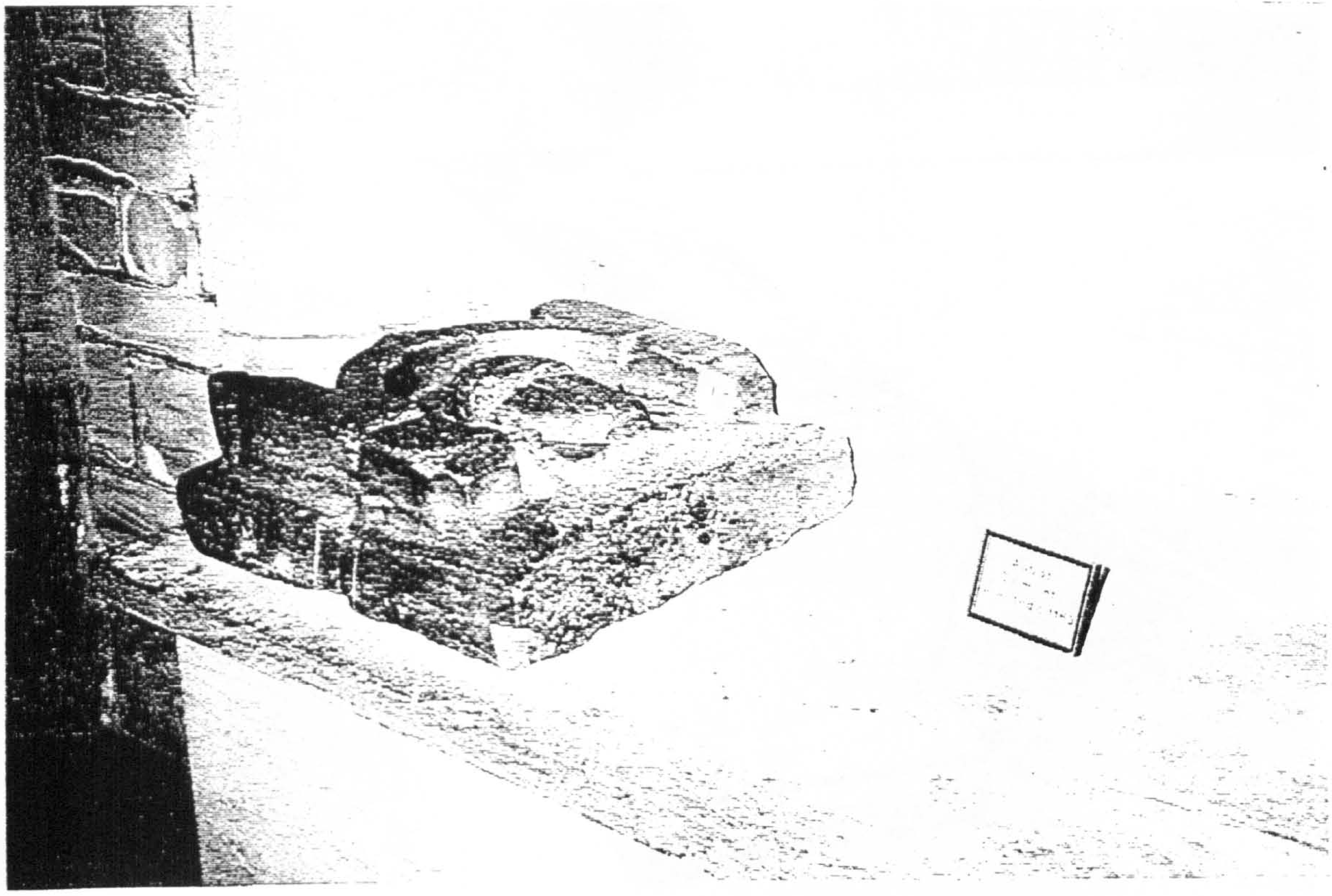


Plate 24.3 Effigy, Sherborne

Plate 25.3

Effigy, Abbotsbury

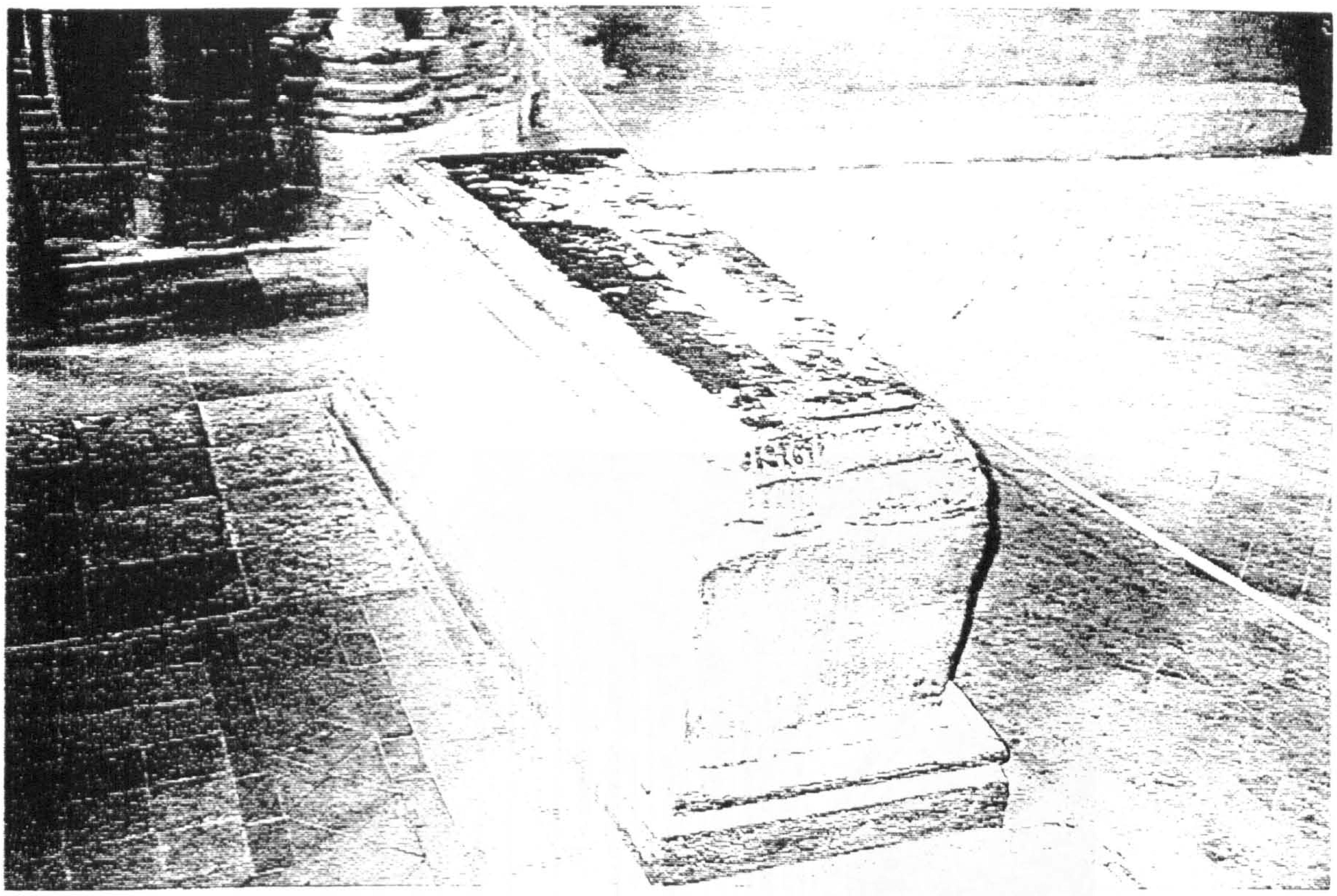


Plate 26.3 Coffin, Winchester

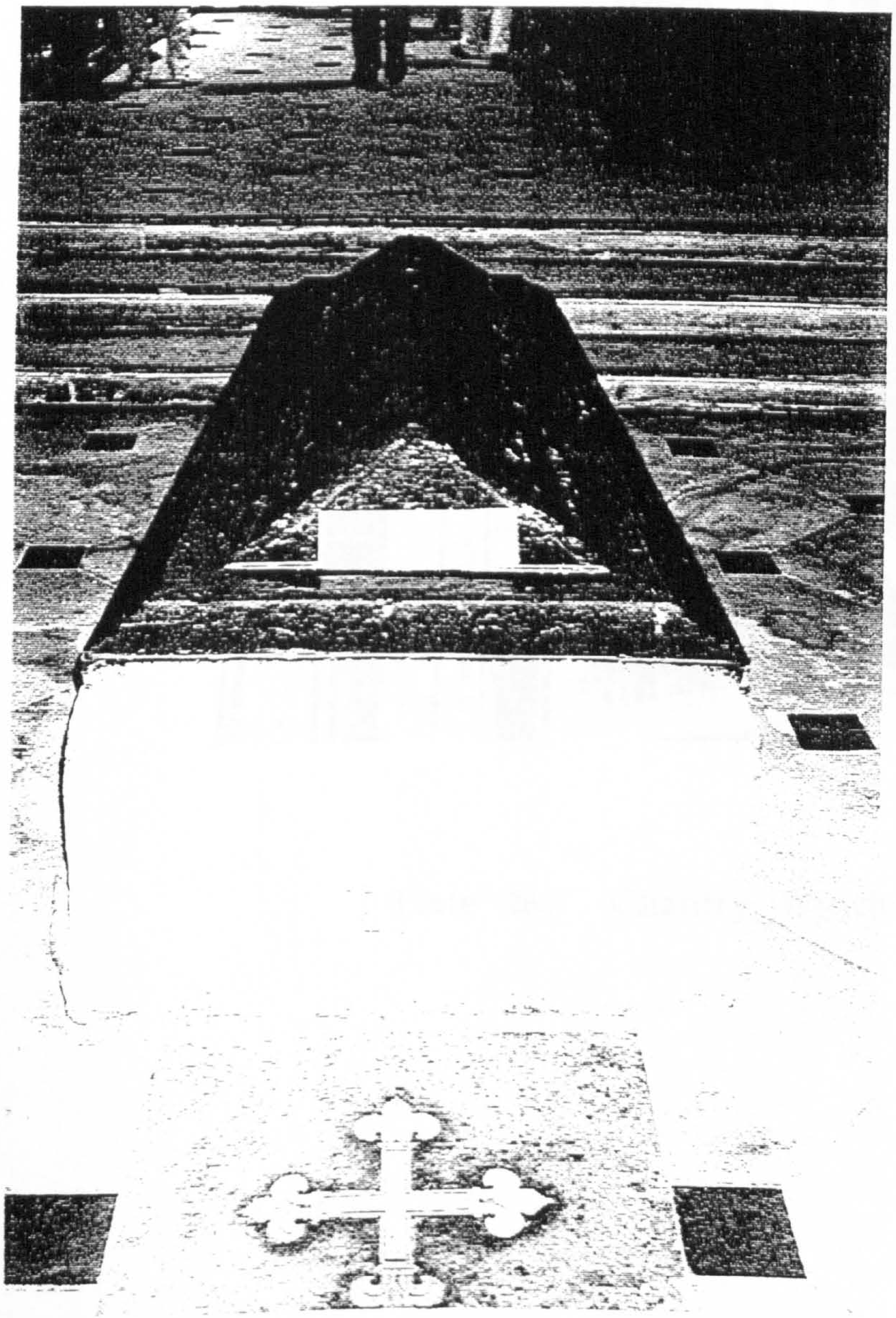


Plate 27.3

Tomb, Winchester

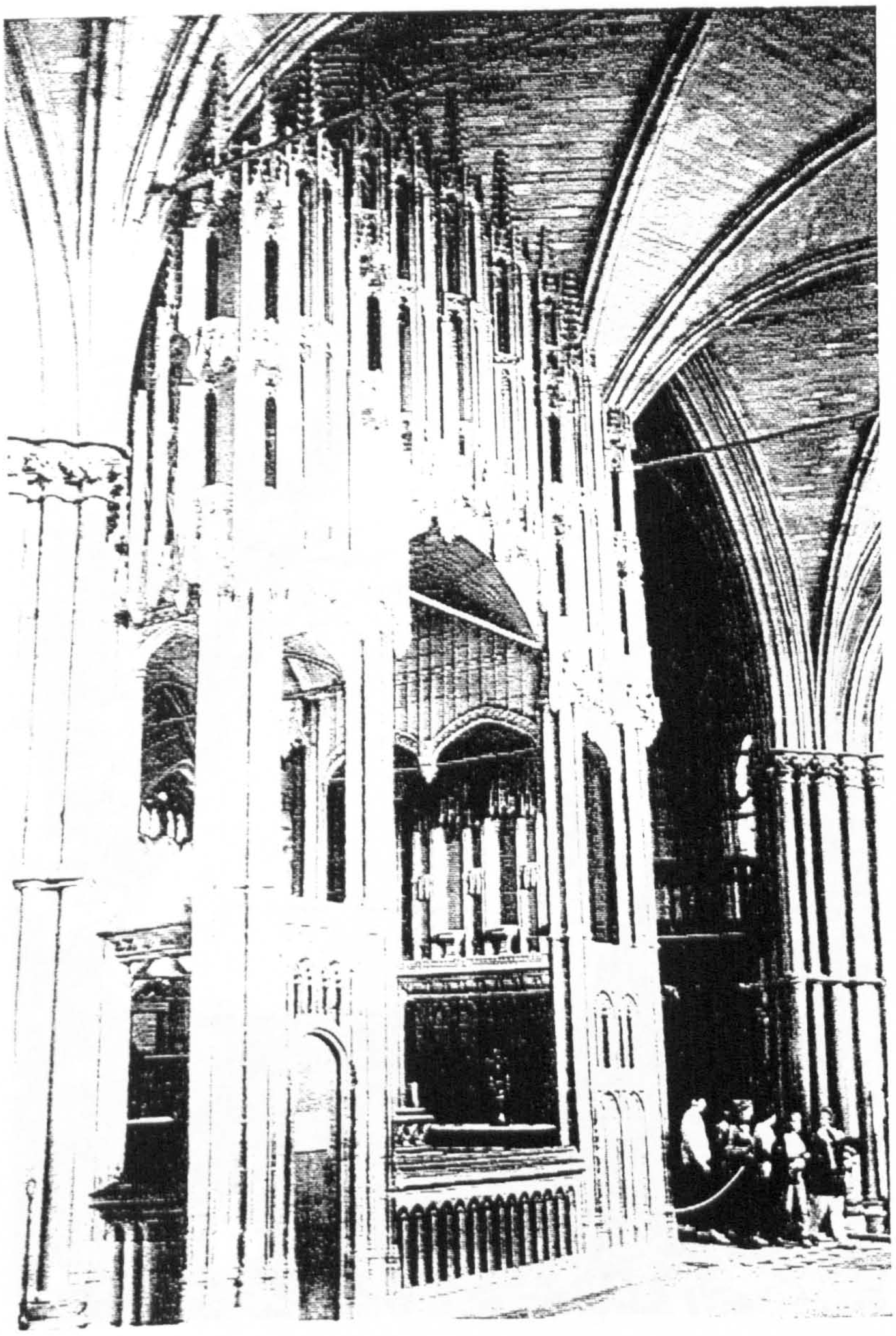


Plate 28.3 Chantry, Winchester

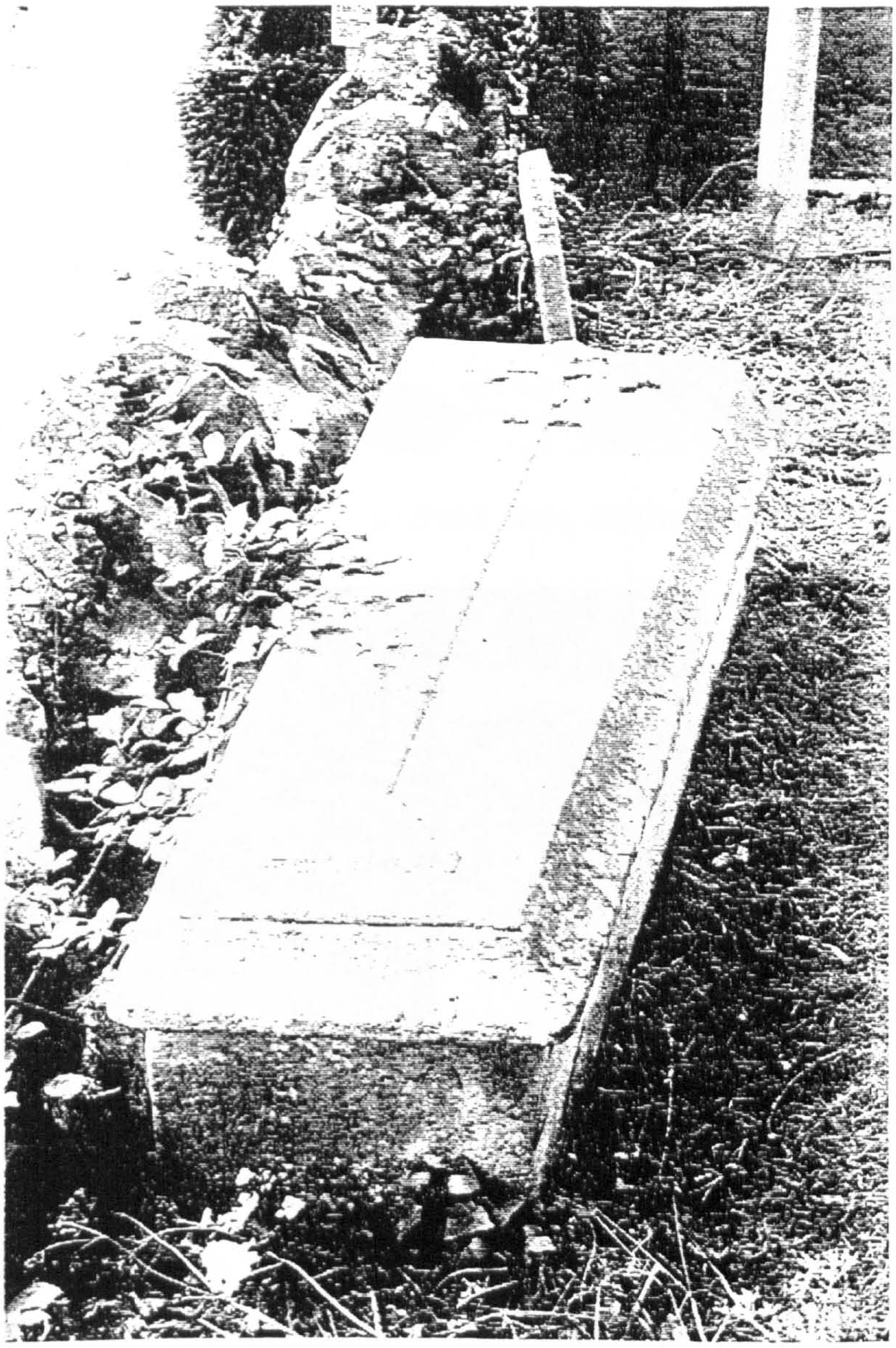


Plate 29.3 Coffin, Worth Matravers

Plate 30.3 Incised slab, Milton Abbey

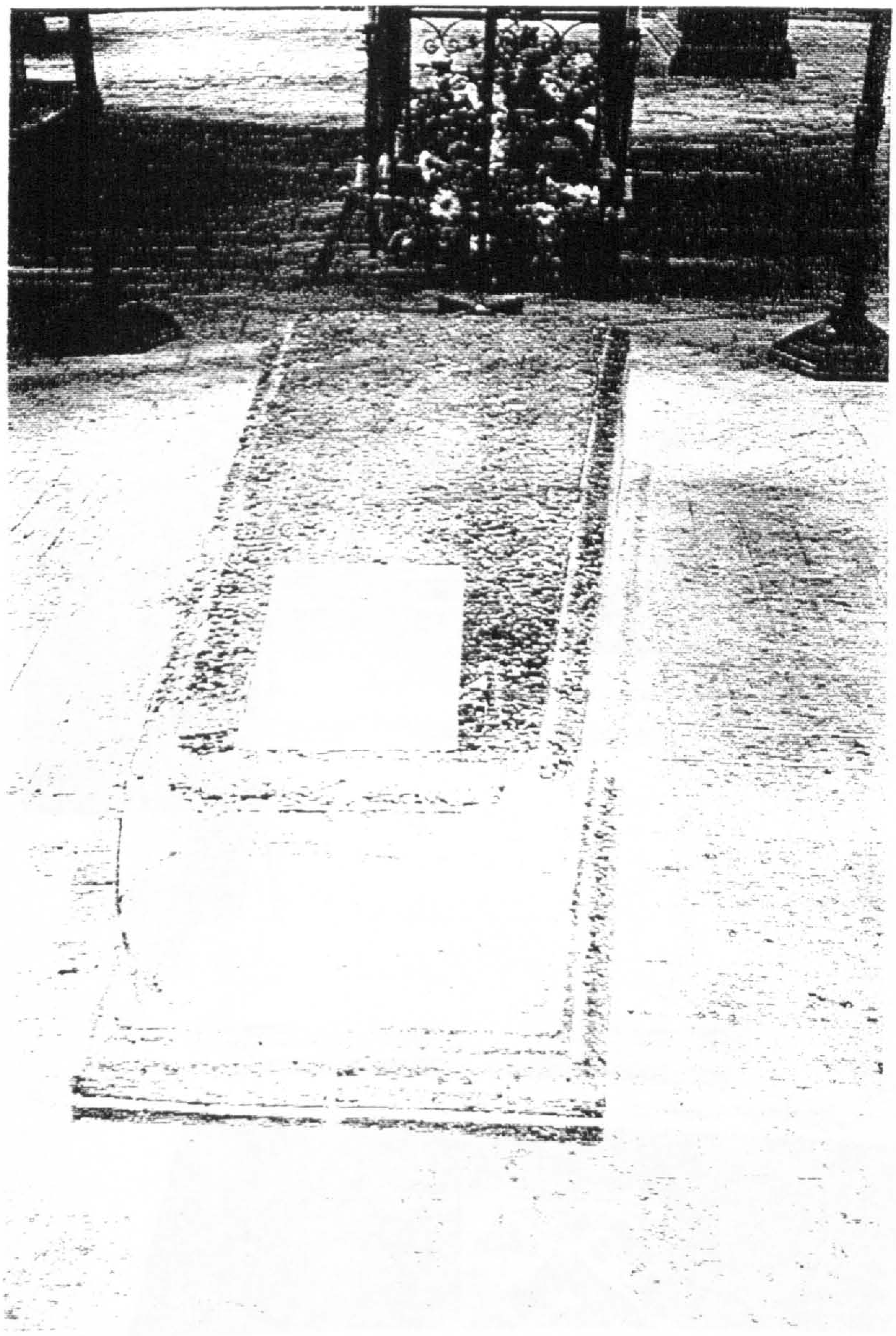


Plate 31.3

Coffin, Winchester

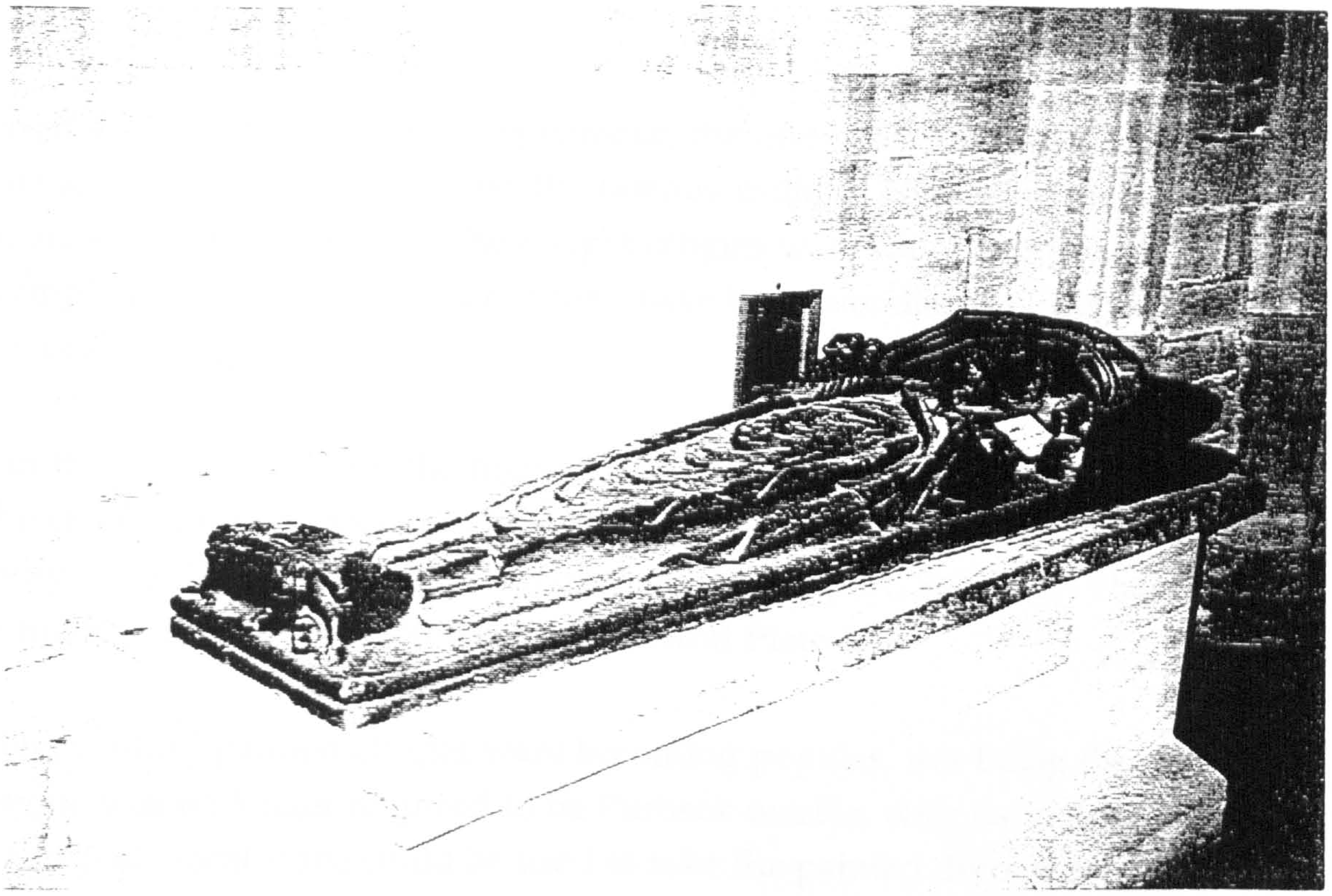


Plate 32.3 Effigy, Sherborne Abbey

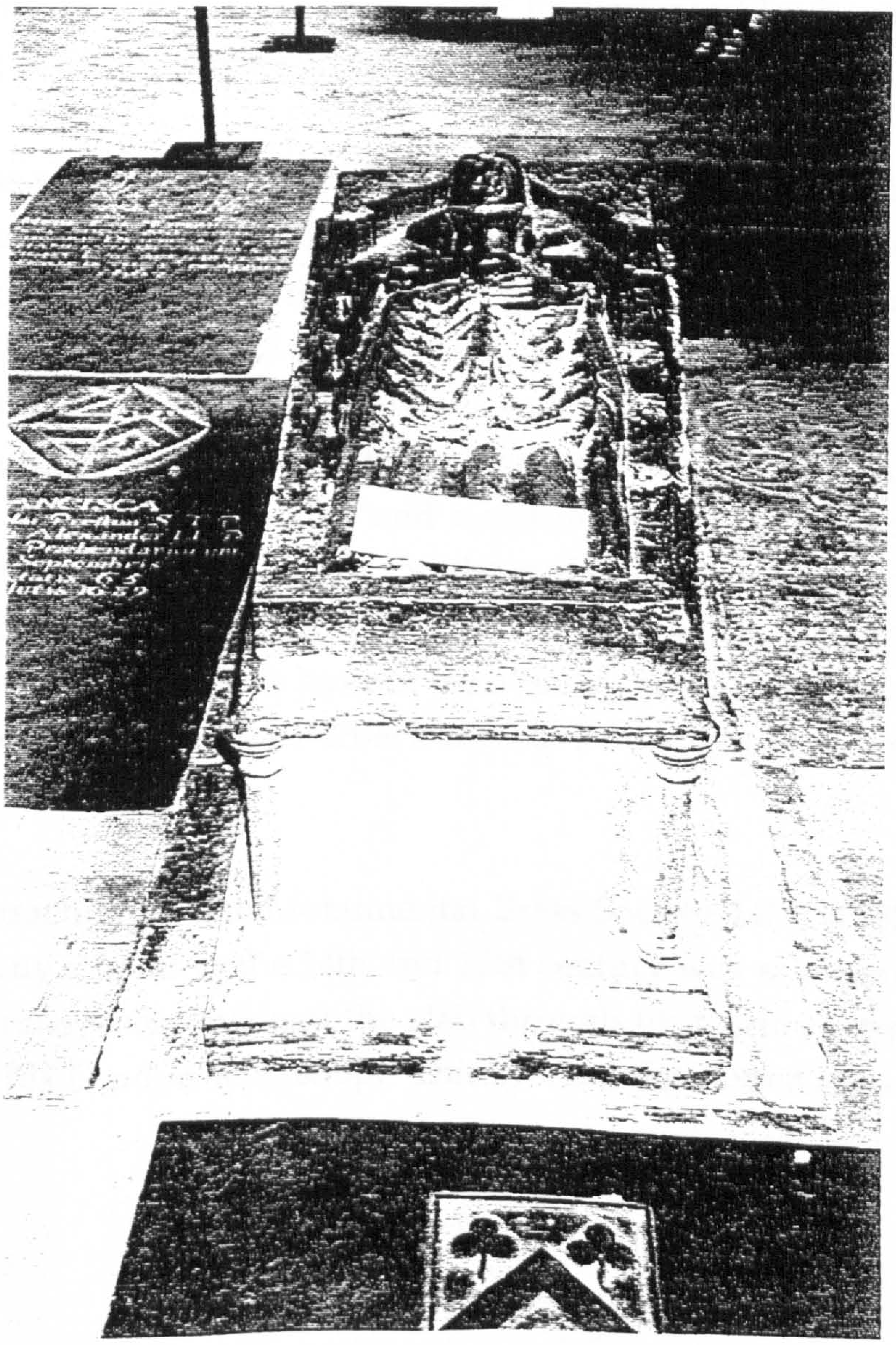


Plate 33.3

Effigy, Winchester

Military effigies began to make an appearance, the one of Sir William d'Estoke at Wareham is shown in Plate 34.3, and the famous military effigies in Temple Church London are shown in Plate35.3. These eight effigies were badly damaged in the blitz when Temple Church was bombed but they have been wonderfully restored by skilled workmanship.

Tombs in the 13th century are the high point of the marble craftsmen's work and three choice examples are shown, the tomb of Archbishop Hubert Walter, Canterbury, Plate 36.3, and tomb of Bishop Giles de Bridport, Salisbury, Plate 37.3 and the tomb of King John in Worcester Cathedral Plate 38.3.

By the 14th century painted effigies were becoming popular, this being the case the carved stone was no longer required to be Purbeck marble, with its unique polished surface and plain local stone could be used to take the painted decoration. Purbeck marble slabs inlaid with brass continued to be produced and 5,000 brasses still remain in England to this day although hundreds more have been ripped from their settings and lost. A brass inlaid Purbeck marble altar slab of Abbot Walter de Sydling at Milton Abbey is shown in Plate 39.3 (Evered, 1991).

After the middle of the 14th Century the trade began to decline but it did not fade out entirely, fonts, plain slabs, slabs for brasses and tomb chests continued in production. A 15th century example is a Tomb chest probably of Thos Hampton Stoke Charity, Plate 40.3 (King, 1990). Even inside the church, protected from the direct attack of the elements Purbeck marble exhibits surface weakness. Plate 41.3 is a close-up of Hamptons Chest Tomb and this shows the effect of wetting/drying cycling. The church is damp and moisture condenses on the surface of the tomb, sunlight from a window plays on the surface and dries it out. When the sun goes in the moisture collects again and when the sun shines, the cycle repeats. The surface of the stone in the shade has not been damaged to the same extent and this illustrates how sensitive Purbeck marble is to slight variations in ambient conditions.

The transactions of the Monumental Brass Society 14(3) (1988) report that the usual way to buy a brass in the 14th and 15th century was as a complete memorial retailed by a marbler, who obtained the slab through his Corfe connections and inlaid it with brass in his London workshop. This system, developed for a mass market, was

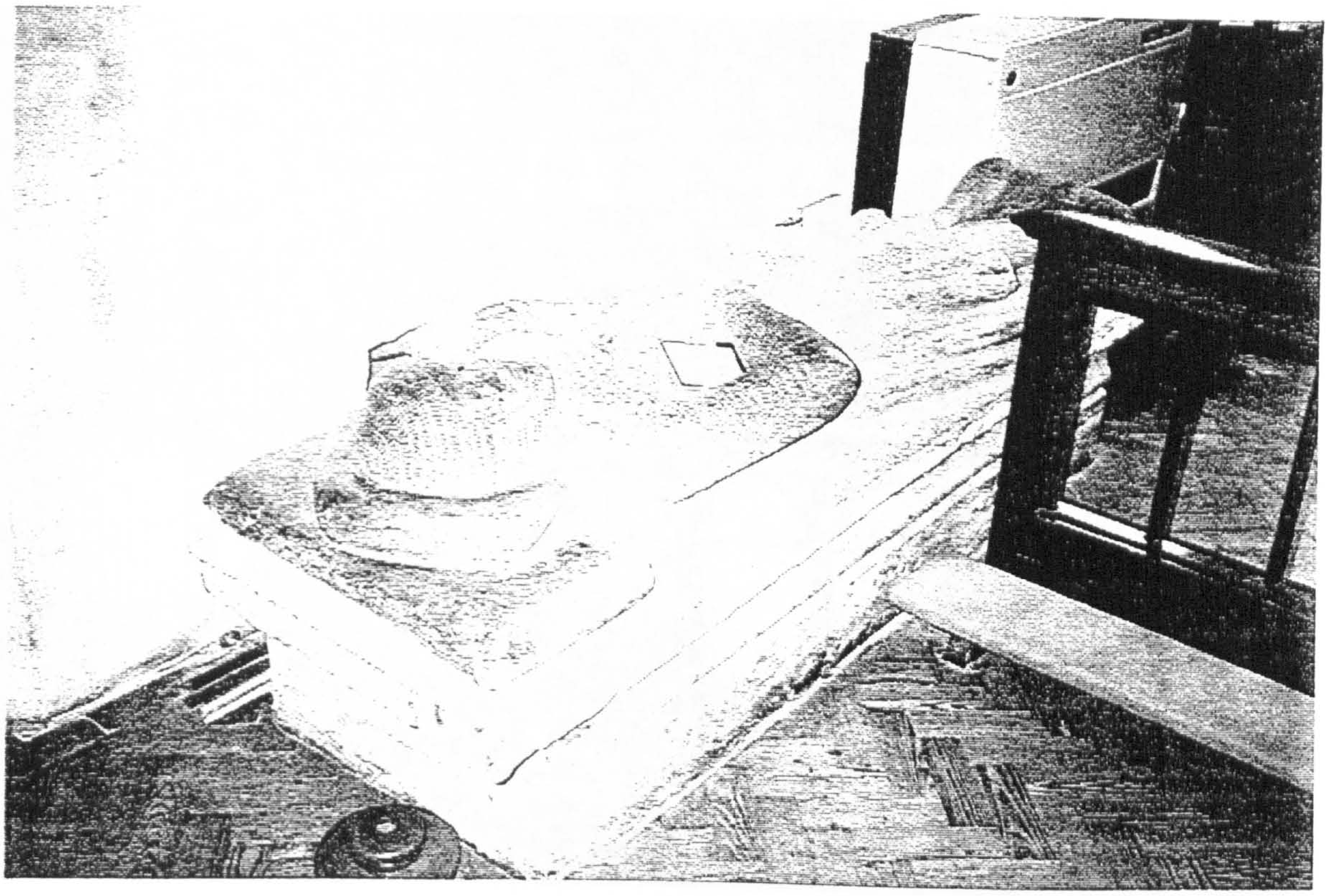


Plate 34.3 Military effigy, Wareham

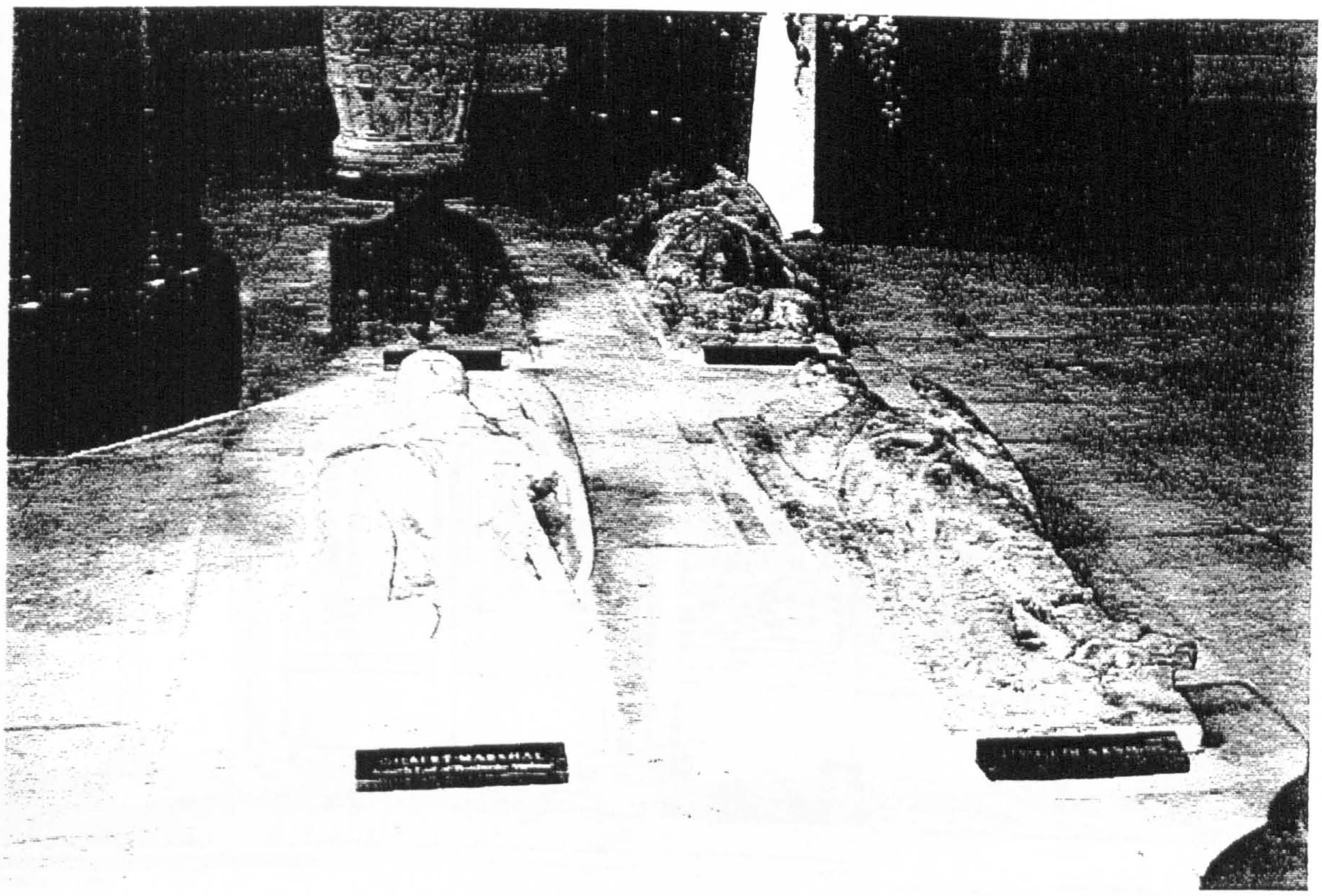


Plate 35.3 Military effigies, Temple Church

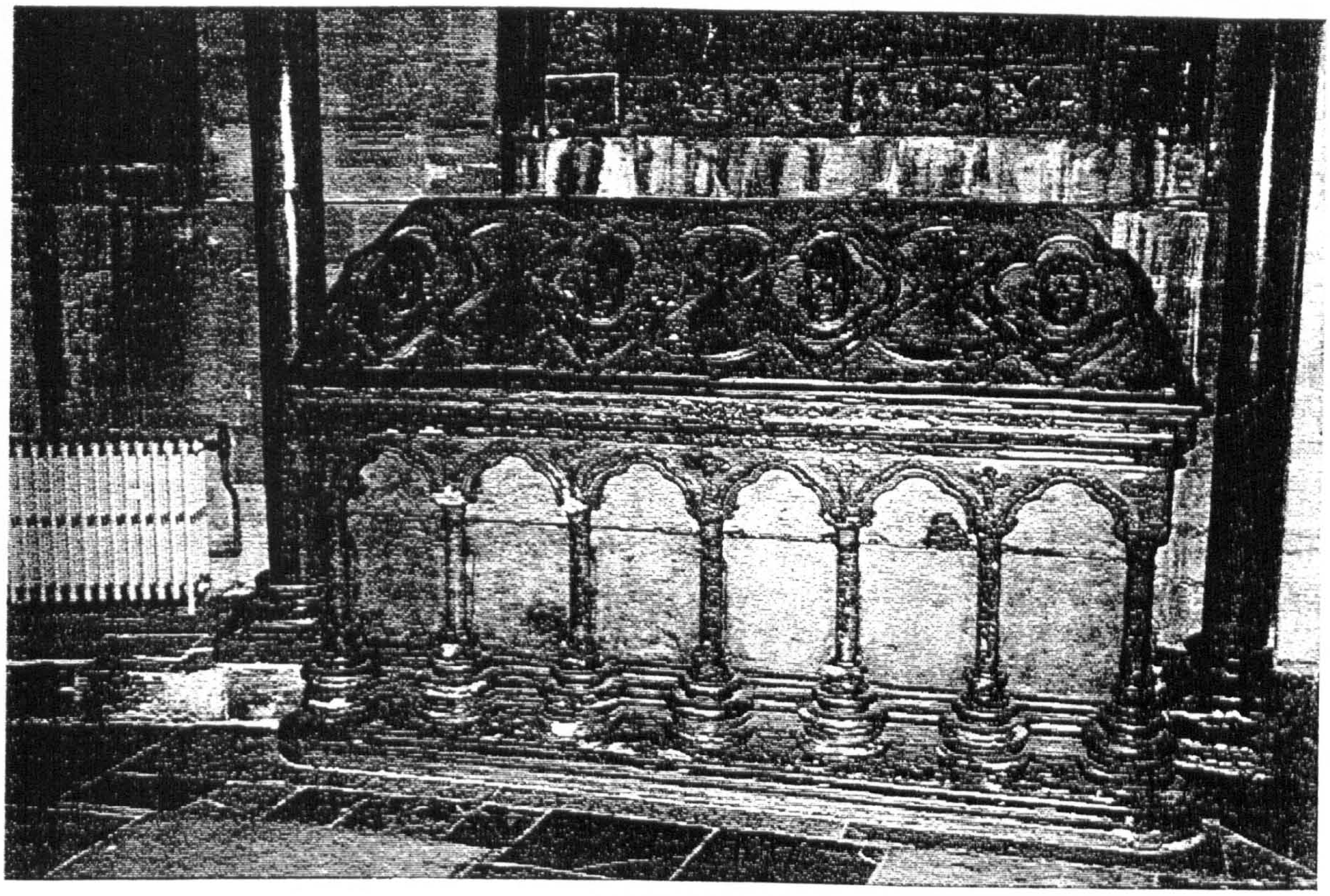


Plate 36.3 Tomb, Canterbury

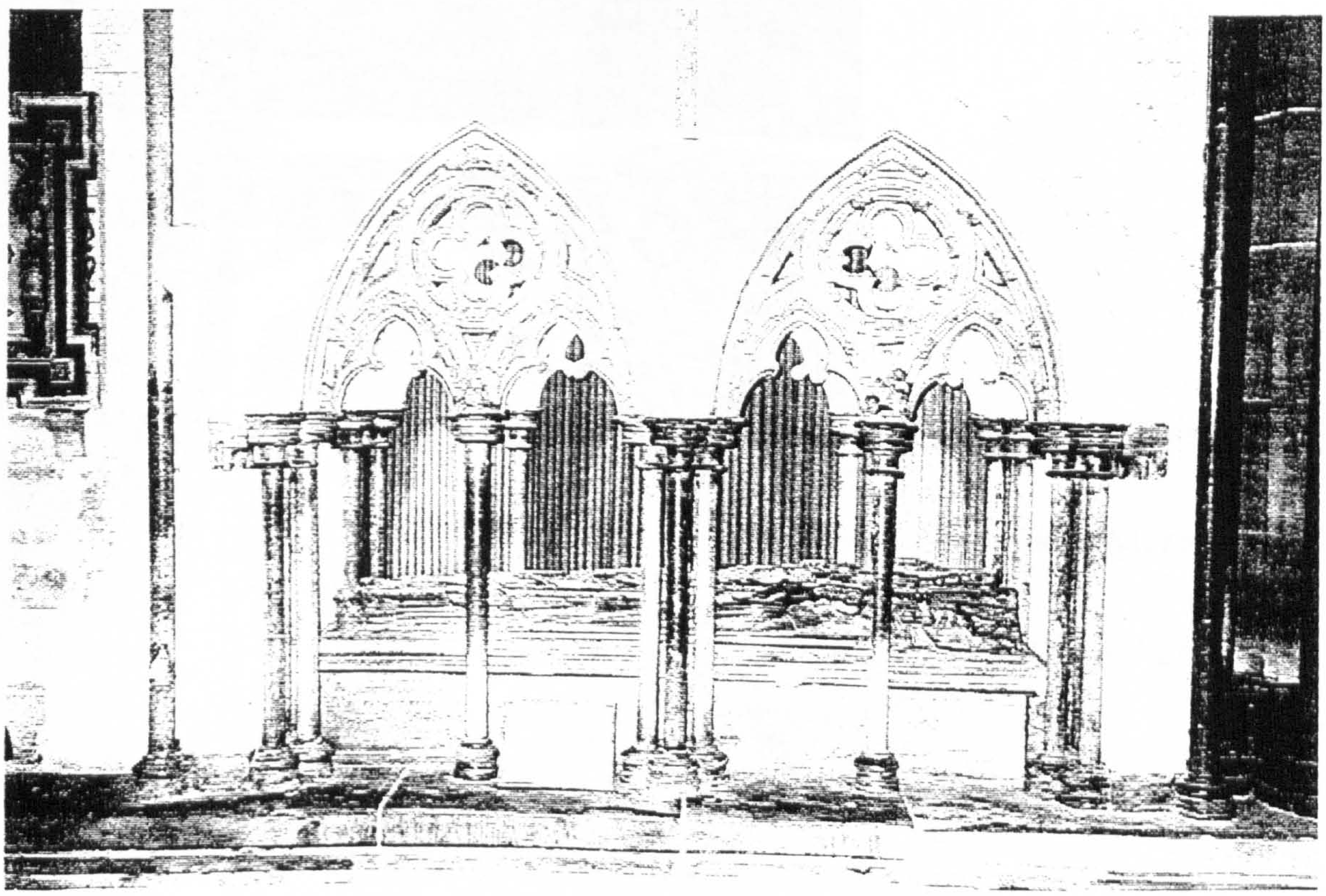


Plate 37.3 Tomb, Salisbury

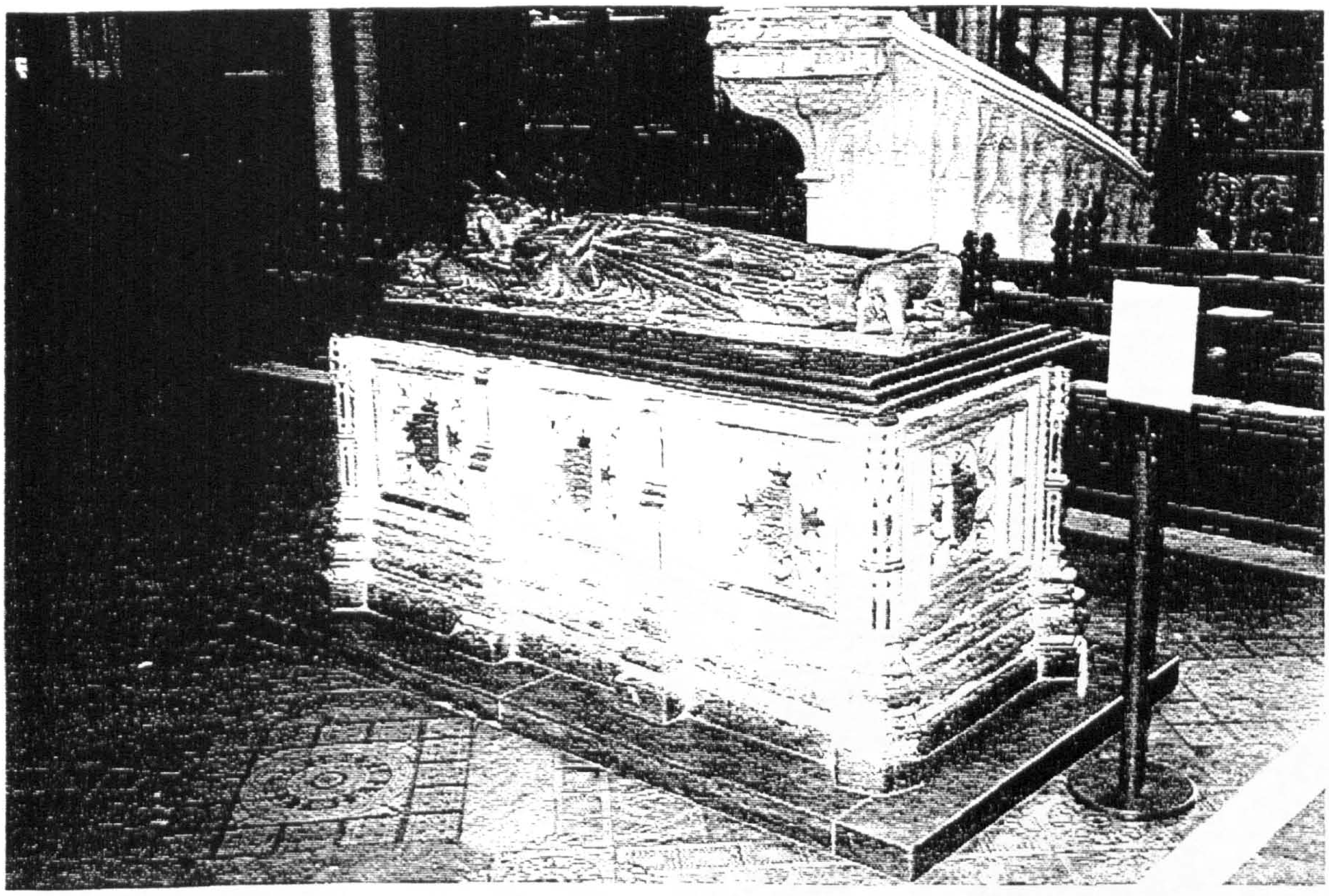


Plate 38.3 Tomb of King John, Worcester

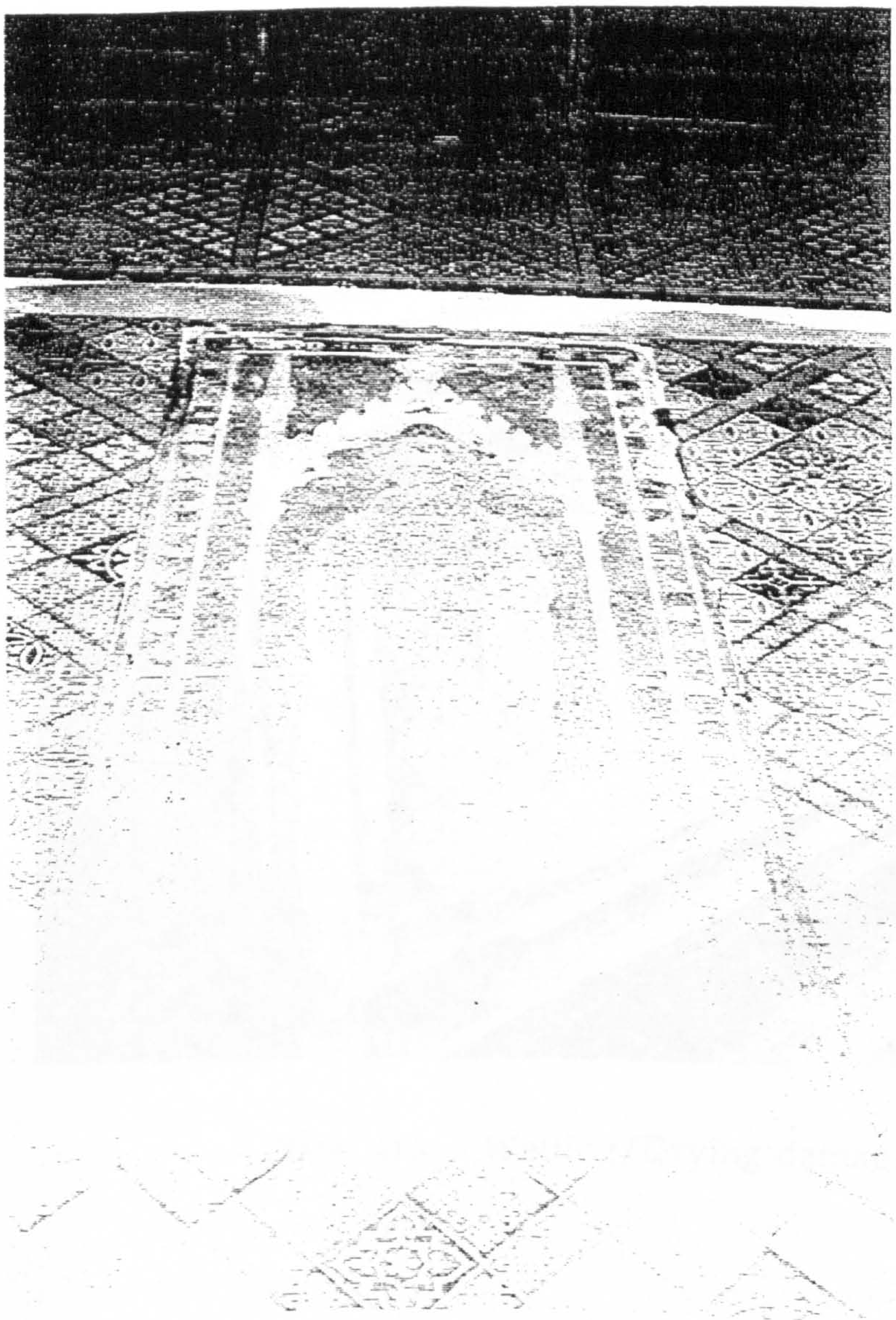


Plate 39.3 Brass inlaid

Purbeck Marble slab

Milton Abbey

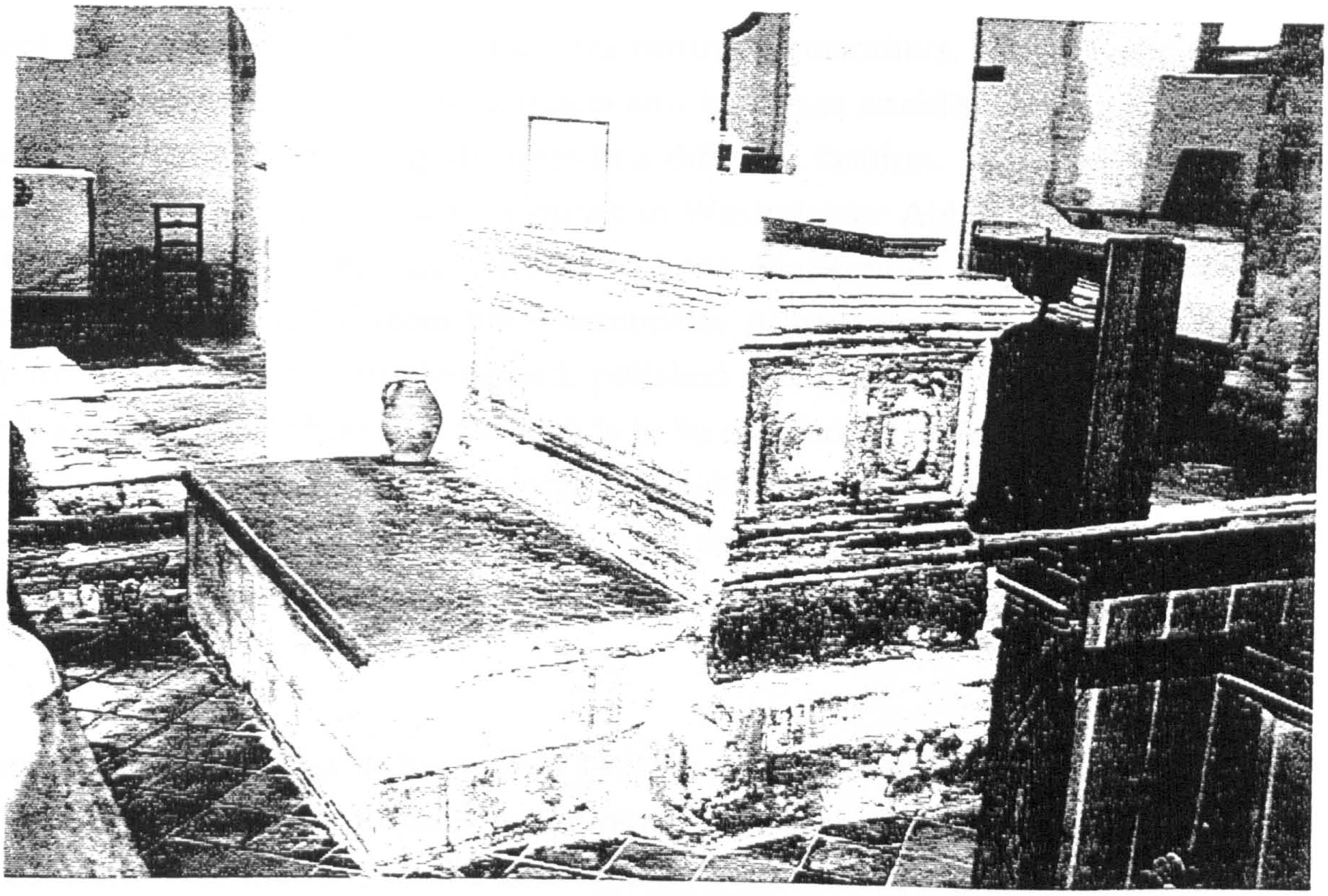


Plate 40.3 Unknown tomb, Stoke Charity

Plate 41.3 Wetting/Drying damage, Stoke Charity

convenient both for the producer and for his ordinary customers. But a patron who wanted something special or whose contacts and influence enabled him to get a good deal might go about buying his brass in a different fashion. A plausible theory is then advanced that John Crendon, a monk in Westminster Abbey, sent a letter to Bishop Walter Skirlaw of Durham, known to have connections with Westminster Abbey, that he has purchased from the Westminster Abbey suppliers at Corfe a 9 ft long slab of Purbeck marble, unblemished, polished and finely squared up at the edges. He advised the Bishop that the slab is to be delivered to Westminster at a cost of 5 marks 40d (£3.10s.) and requests reimbursement. He then enquired if he should send the slab on to Durham as a blank or would the Bishop like him to have his brass image inlaid on the slab with verse or prose written around the edge or in the middle.

The Bishop died in 1406 and in his will of 1404 he asks to be buried in Durham Cathedral between the two columns on the north side of the choir. The brass is now lost but reference was made to it in a 16th century report stating that in the north alley of the choir between two pillars on the south side was buried Walter Skirlawe, Bishop of Durham, under a fair marble stone very sumptuously besett with many brasen Images, having his own Image most artifically portrayed in brass in the midst thereof with this saying engraved on his breast,

> "Credo quod redemptor ineus vivit et in die vovissimo de terra surrecturus sum et in carne mea videbo Deum Salvatorem meum."

It can be reasonably assumed that the slab was made around 1404 to enable the Bishop to see it before he died and it was interesting to note how he made use of contacts to get it at cut price. Three examples of Purbeck marble in the 16th century are given the altar tomb of John Waller Stoke Charity, Plate 42.3 the tomb of Prince Arthur, Worcester Cathedral, Plate 43.3 and the tomb of Bishop Langton having a brass inlay in the top, Winchester Cathedral, Plate 44.3.

Six reasons for the decline of the Purbeck marble industry are given by Dru Drury (1948) they are:

1. Change in architectural style, marking the passing of the Early English period with its clustered polished shafts.

2. It had become apparent that when used vertically, at right angles to their natural horizontal beds, the surfaces of the shafts were prone to

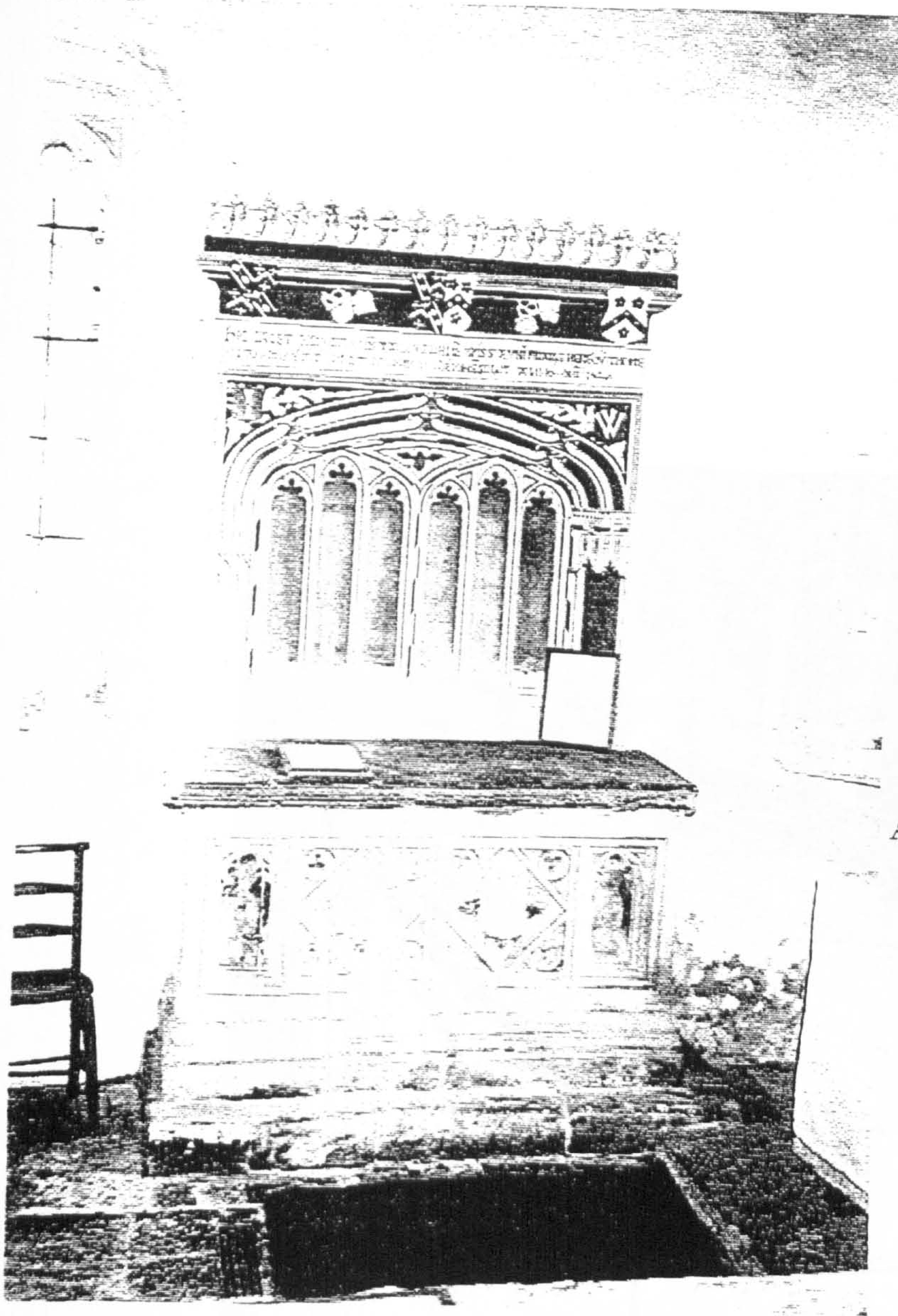


Plate 42.3

Altar Tomb, Stoke Charity

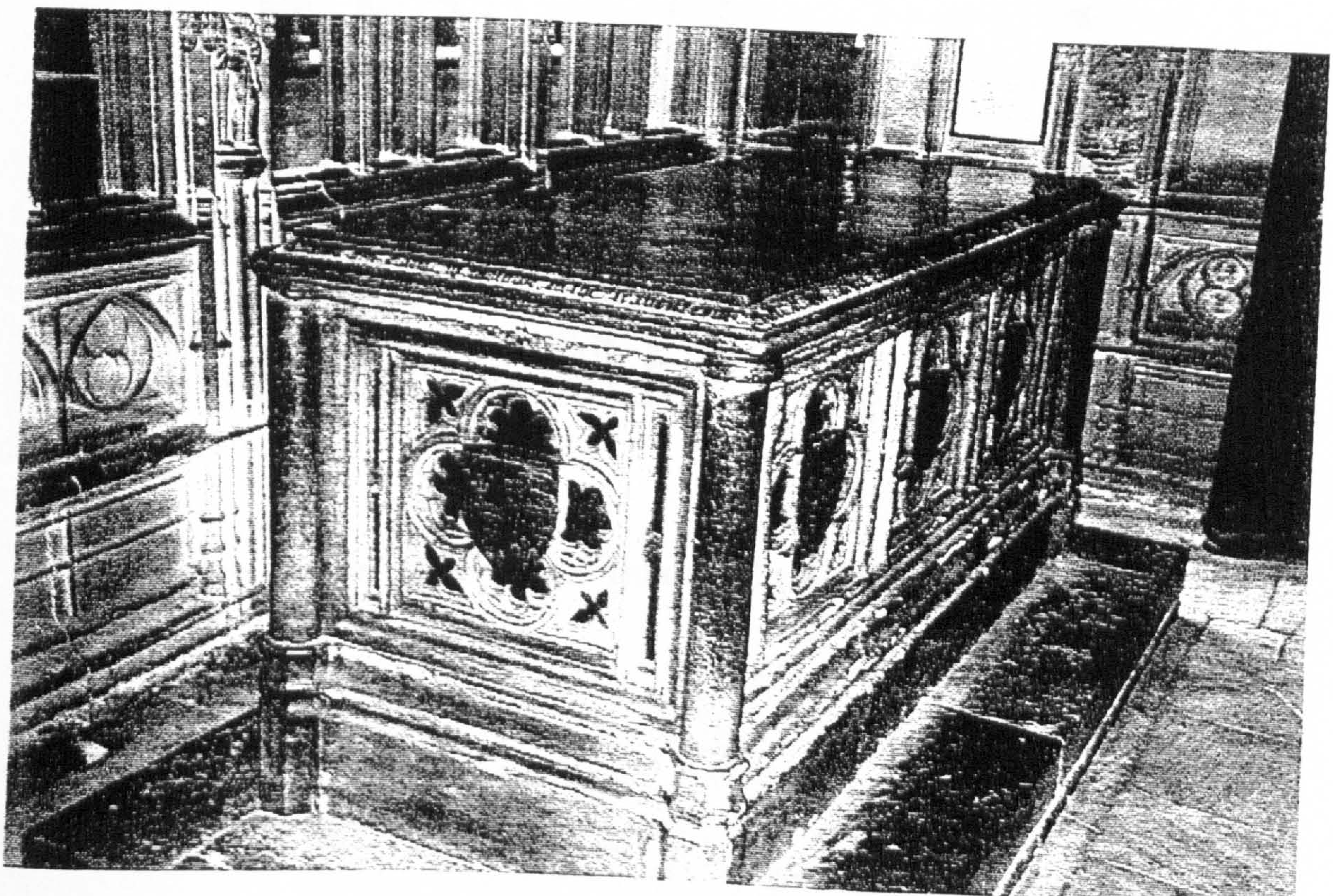


Plate 43.3 Tomb of Prince Arthur, Worcester

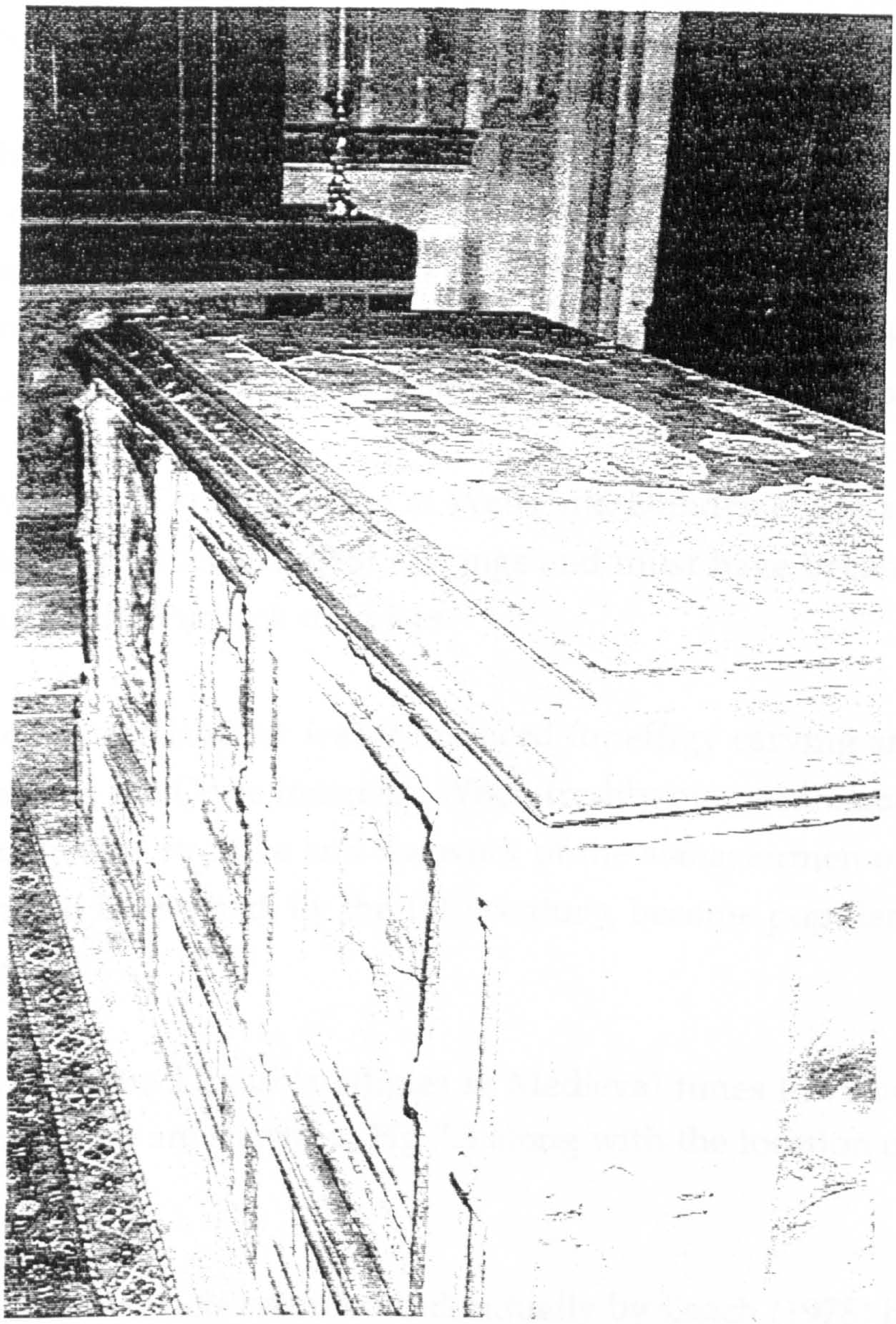


Plate 44.3 Brass Inlaid Tomb, Winchester

flake and scale off. Deterioration was even more rapid when they were exposed to weather variations. As shown in this thesis at Salisbury Cathedral, Netley Abbey and Stoke Charity.

3. Rival centres where marble could be worked were inaugurated nearer the construction site, cutting out the expense of long distance carriage from Purbeck.

4. Although the Purbeck marblers had attained a high degree of skill by the middle of the 14th century, the marble was not easy to work for sculptures and effigies. As the use of painted sculptures increased the softer freestones, which were easier to carve replaced Purbeck marble, because the surface of the stone was now covered with paint.

5. Craftsmen working Doulting stone at Wells and Dundry oolite at Bristol began to produce excellent carvings and must have become serious rivals to the Purbeck marblers.

6. In the 14th century Alabaster was introduced for effigy carving and this really ousted the Corfe imagers. When freshly quarried alabaster is exceptionally easy to carve and the work of the alabastermen of Nottingham and Derby had, by the 15th century, become popular all over the country.

The main location of Purbeck marble effigies in Medieval times have been recorded by Leach (1978) and these are shown in Fig 7.3 along with the location of Purbeck marble tombs, Fig 8.3.

All the Purbeck marble artefacts recorded individually by Leach (1978) have been grouped together and these are shown in Fig 9.3 which repeats the Roman distribution pattern for Purbeck marble mortars and other artefacts. The oolitic limestone seam from the Jurassic period has been recorded by Shore (1957) and by superimposing the limestone seam on the map showing the location of the Purbeck marble artefacts it can be seen that very little marble crossed the limestone seam. The majority of the marble artefacts lie to the south east of the limestone seam which shows that the marble was mainly carried by sea and river and that the limestone ridge proved a natural obstacle to transport, and this is shown in Fig 10.3. It also illustrates that although some of the sites are tracking the limestone seam,

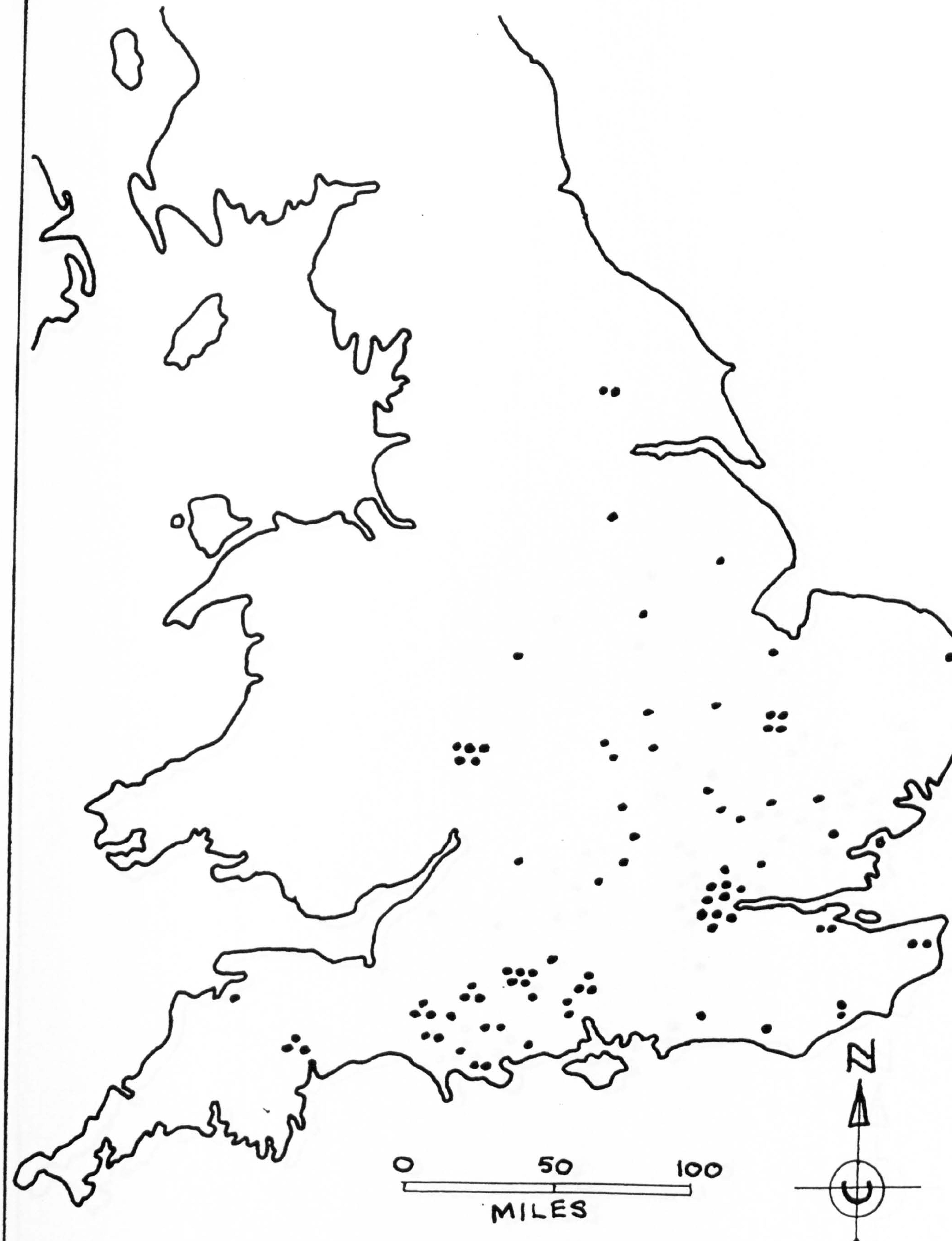


FIG. F7.3

PURBECK MARBLE EFFIGIES.

USE OF PURBECK MARBLE BY ROSEMARY LEACH.

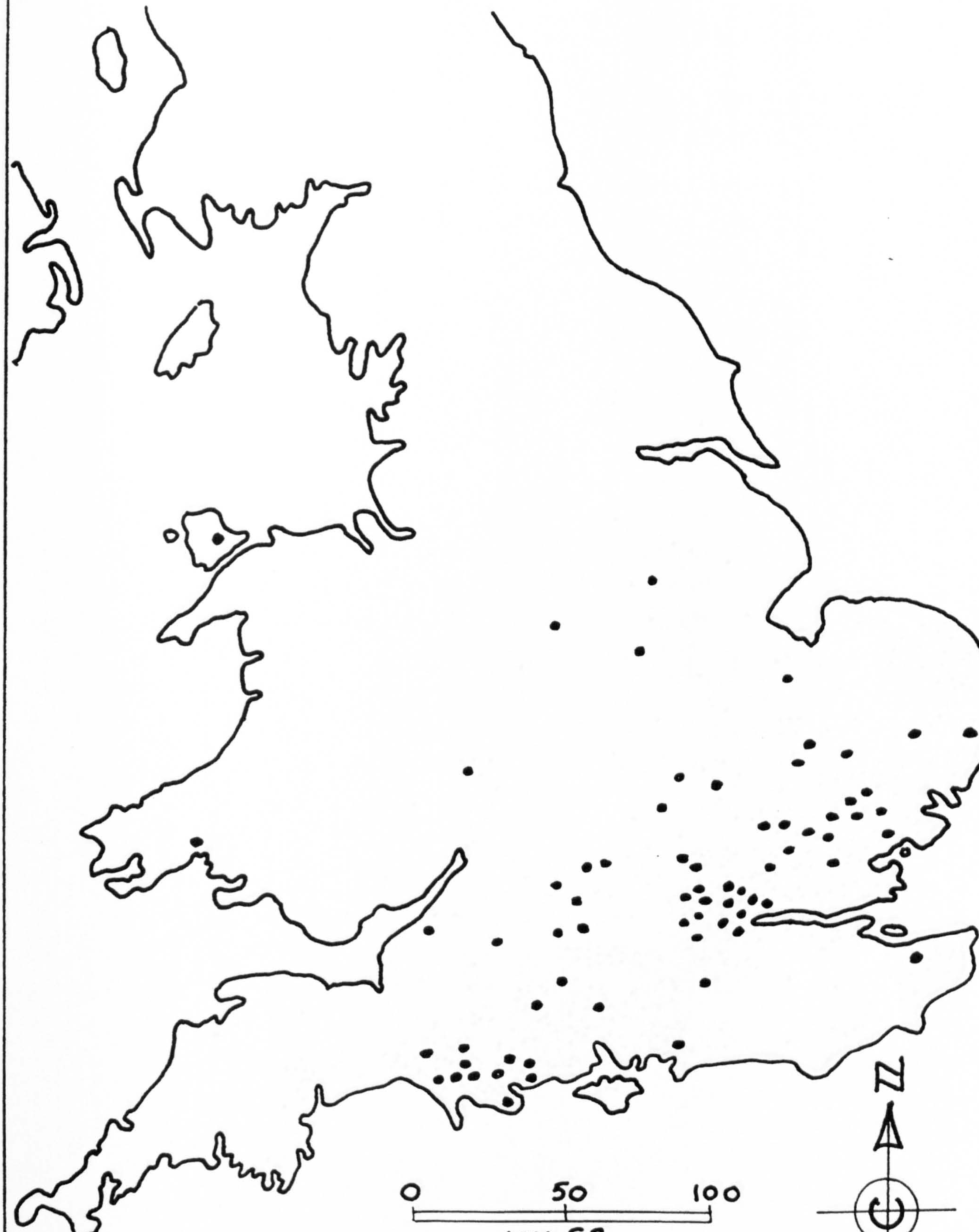


FIG. F8.3

PURBECK MARBLE TOMBS.

USE OF PURBECK MARBLE BY ROSEMARY LEACH.

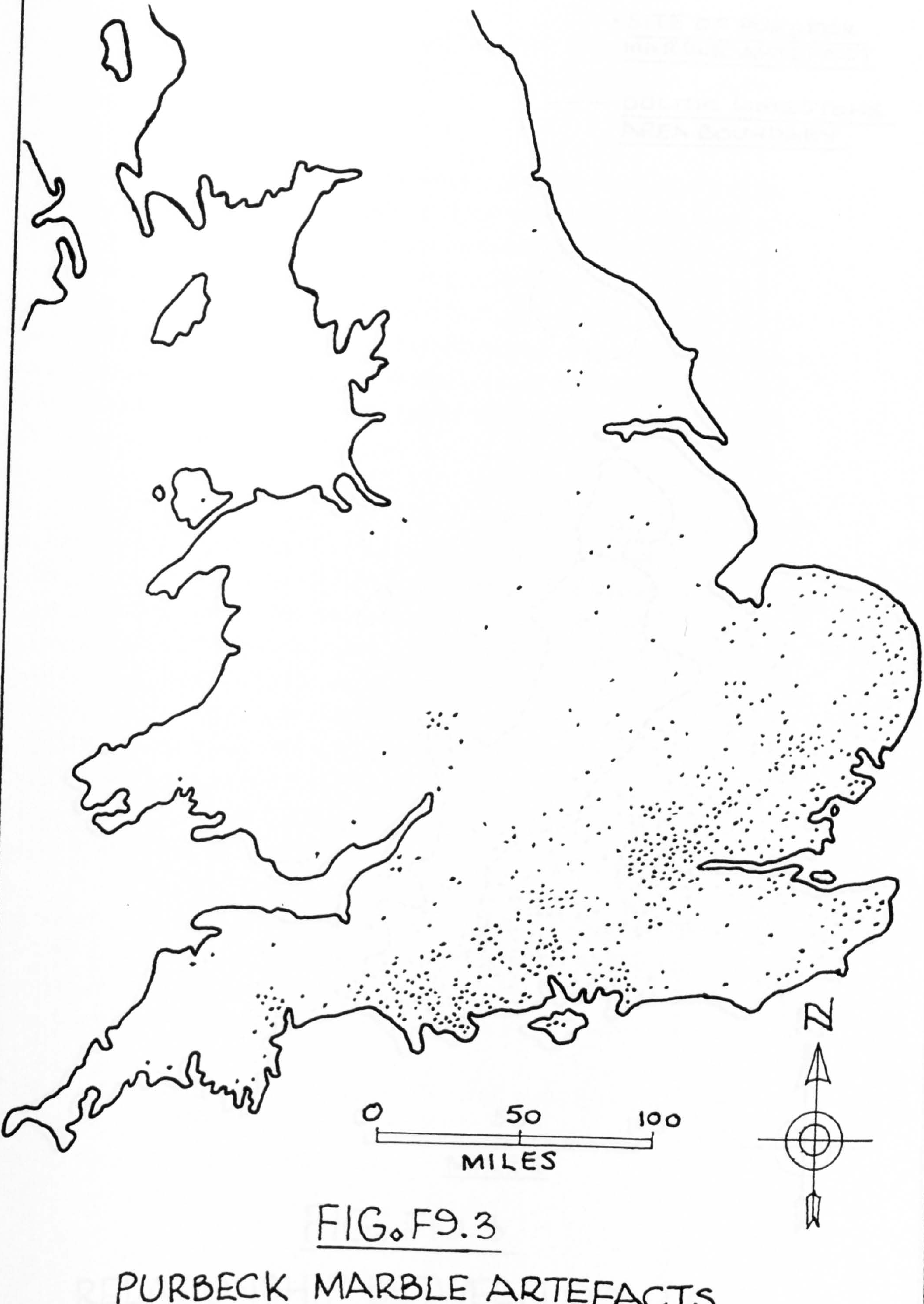


FIG. F9.3

PURBECK MARBLE ARTEFACTS.

ROSEMARY LEACH.

BEAVIS/SHORE/LEACH

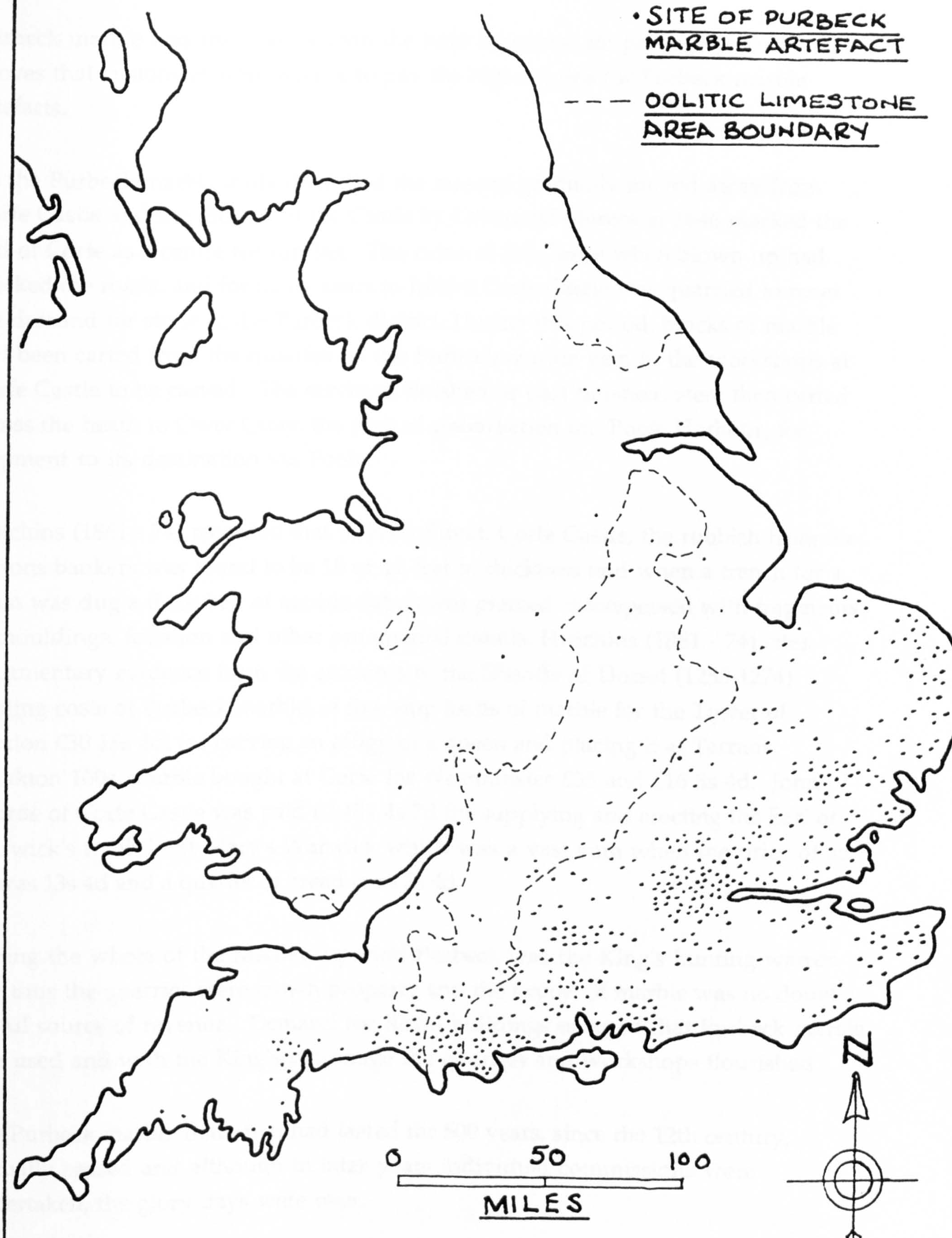


FIG. F10.3

RELATIONSHIP BETWEEN OOLITIC LIMESTONE AREAS AND PURBECK MARBLE ARTEFACTS.

Purbeck marble was used rather than the local limestone for prestige projects, which proves that customers were willing to pay the higher price for Purbeck marble artefacts.

As the Purbeck marble trade dwindled the masons gradually moved away from Corfe Castle and the sacking of the Castle by Cromwell's forces in 1646 marked the end of Corfe as a centre for carving. The ruins of the Castle when blown up had blocked the roads, and for many years to follow Corfe Castle was quarried to meet the demand for stone in the Purbeck district. During this period, blocks of marble had been carted from the quarries on the Purbeck marble vein to the workshops at Corfe Castle to be carved. The carvings, finished or part finished, were then carted across the heath to Ower Quay, the port of embarkation on Poole Harbour, for shipment to its destination via Poole.

Hutchins (1861 - 74) recorded that in West Street, Corfe Castle, the rubbish from the masons bankers was found to be 10 or 12 feet in thickness and when a trench for a drain was dug a thick bed of marble debris was pierced, interspersed with fragments of mouldings, foliation and other ornamental details. Hutchins (1861 - 74) cites documentary evidence from the accounts of the Sheriffs of Dorset (1250-1274) quoting costs of Purbeck marble, ie five ship loads of marble for the Tower of London £30 16s 4d, for carving an effigy of a queen and placing it at Tarrant Monkton 100s, marble bought at Corfe for Westminster £35 and £16 8s 4d. John Bourde of Corfe Castle was paid £2,481 4s 7d for supplying and erecting the Earl of Warwick's tomb in St Mary's Warwick which was a vast sum when the price of an ox was 13s 4d and a quarter of bread corn 3s 4d.

During the whole of the Medieval period Purbeck was the King's hunting warren and thus the quarries were crown property and the export of marble was no doubt a useful source of revenue. Demand for Royal buildings ensured that Purbeck marble was used and with the King's patronage the quarries and workshops flourished.

The Purbeck marble trade that had lasted for 500 years, since the 12th century, virtually ceased and although in later years individual commissions were undertaken, the glory days were over.

Chapter 4

Purbeck Stone

This chapter examines the uses and demands for Purbeck stone and shows how the industry was organised and developed. From 43AD to 1700 AD the major requirement was for Purbeck marble, mainly for cathedral decoration, but this was replaced by a demand for stone to meet the requirements of the expanding towns and cities.

Although the Purbeck marble industry had reached its peak by 1450 and then gradually declined, church restorations and intermittent special commissions maintained the marble trade until 1700.

Demand for burr stone for the extension and maintenance of Corfe Castle ended with Cromwell's occupation in 1646 and marble carving at Corfe, which by then was much reduced in scale, ceased and the remaining masons moved away.

Henry VIII inaugurated a defence system comprising a string of coastal forts, one being built on Brownsea Island in 1547, using Purbeck stone, to protect the entrance to Poole Harbour from seaborne attack, (Legg, 1989).

Quarrying for building stone was thus in evidence, and in 1580 the power of search granted in 1481 to the Wardens of Free Masons Lodges in London, to check the quality of imported stone, was extended to cover a new stone, which was becoming popular in the city, called Purbeck stone or Purbeck paving. (Knoop & Jones, 1967).

In 1620 Inigo Jones began building the Banqueting House in Whitehall from stone quarried at Portland and carried by ship to London. This trade was increased following the Great Fire of London in 1666 when Sir Christopher Wren specified its use for the prestige buildings, including St. Pauls Cathedral, that he had been commissioned to build.

On their journey to London from Portland the ships sailed past the Purbeck cliffs, which were Purbeck/Portland stone, which was surely the incentive for the Purbeck quarrymen to follow Portland's lead. Indeed we find that the Purbeck sea cliff quarry of Winspit opened in 1680 to supply stone by sea.

Portland stone was, however, preferred to Purbeck/Portland owing to the fact that it was easier to carve, was a purer white in colour and could be obtained in large blocks. Nevertheless Purbeck stone had the advantage over Portland stone when it was used for street paving and roof tiling because it could be readily split into the required thickness. It was this factor plus its pleasing appearance that made it so much in demand in the mushrooming towns and cities of the 18th, 19th and 20th centuries. In the 16th and 17th centuries the Crown found it necessary to concern itself with buildings other than its own particularly in London. To house the rapidly expanding population, caused by the influx of country people, new houses were being constructed and existing ones being divided into tenements, which housed a large number of beggars. Dwellings rapidly became unsanitary as both a health hazard and a source of epidemics. Built of wood the buildings of the period, being crammed close together, were a high fire risk. Statutes were issued between 1593 and 1661 placing restrictions on new house building, the sub-division of existing buildings into tenements and specifying stone and brick in place of wood for new construction. Although earlier attempts had been made to reduce the fire risk such as encouraging the use of stone for dividing walls in 1189 and the use of tiles, shingles and lead for roofing in 1212 (Knoop & Jones 1967) the peril remained until after the Great Fire when the regulations specifying that houses should be built of brick or stone were introduced.

Street Paving

Paving and cleaning of streets became a priority along with sewage disposal, a clean water supply and street lighting. Jeffery (1988) refers to John Evelyn's diary 31 July 1666 recording "sat with the commissioners, ordered paving from St. James' northward also the Hay Market about Piquidillo and agreed instructions for cleaning the streets. Some roads had to be paved, the inhabitants paying for this. They also had to sweep the streets in front of their homes up to the channel or middle of the street every Wednesday and Saturday. They were also to maintain the street in front of their houses and also provide candles or lanthorns for illumination during the winter months from dusk till 9 p.m. This improvement in street works continued following the Great Fire and Acts for rebuilding the City of London were issued in 1667 and 1671 (Jeffery, 1988).

As the trade in dressed stone for paving increased a Joint Stock Company, dated 1697 was formed by the Company of Marblers and Stone Cutters in Purbeck, a local craft Guild, to market the stone supplied by individual quarries who were in direct competition for custom and were beginning to undercut each others prices in order to win orders. (Cockburn, 1973).

A paving Act of 1690 refers to the Denter Stone channel or middle of the street, which served as the drainage channel, and central channels continued to be used until early in the 18th century, particularly for narrow streets. However by 1765 the Paving Act was specifying channels on each side of the roadway, with the roadway convex instead of concave which was the case when a central channel was used.

Early street paving was of rammed pebbles or cobbles and whilst they provided a durable surface they were uneven which was a distinct disadvantage for both wheeled and foot traffic. Pebble paving was executed with rounded granite pebbles collected from beaches in Jersey and Guernsey, shipped into London and spread on a bed of gravel before being well rammed to form a durable surface.

Jeffery (1988) records that in 1766 paving costs in London were: - new pebble paving not less than:-

14" deep -labour and materials 3/6d per sq. yard.
15" deep - labour and materials 4/- per sq. yard.
16" to 18" deep labour and materials 4/6d per sq. yard.

The bills of quantity stated:-
1 sq. yard of pebble paving requires:

14" deep	3 cwt pebbles
15" deep	4 cwt pebbles
16" to 18" deep	5 cwt pebbles

27 bushels of gravel to 15. sq yards of pebble paving.
Best middling Guernsey pebbles cost 20/- per ton
Gravel costs 3/6d per bushel

Although pebble paving was common in London, in France and Holland square freestone paving stones were being used to provide a smooth surface and this method began to be adopted in England. Regulations of 1671 mention the paving of footways with broadstone with road crossings of square ragstone (Kent) Broadstone being defined as being raised broad and thin out of the quarries viz not above 2 or 3 inches in thickness and these were available in rectangles of various sizes or as uniform squares. Broadstones of good quality with a polished surface were used for the floors of kitchens, dairies and private houses (flagged floors), whilst common broadstones were used for paving yards and passages as well as being placed before shop doors and stalls, the beginnings of the footpath.

Jeffery (1988) records that around 1730 the prices for Purbeck paving were:

New Purbeck square paving	6" thick @ 5/6d per sq. yard.
Hard Blue Purbeck square paving	6" thick @ 6/- per sq. yard.
New Purbeck square paving	4" thick @ 4/6d per sq. yard.

Labour and gravel for laying 6d per sq. yard.

This shows that far less gravel was required to lay paving than pebbles because the cost of gravel to lay 1 square yard of pebbles would be approx. 6/-, labour and gravel to lay 1 square yard of paving would be approx. 6d. Purbeck pitchens or squared stones were used for footpaths and courtyards the size being 6" to 10" square x 5" thick.

In 1737 London was specifying Purbeck squares and footpaths of narrow streets to be 2ft into the street from the curbs of cellar windows, spurs or steps to the houses. Purbeck squares, pebbles and gravel could be used individually or combined together depending on requirements and costs and Purbeck footpaths were laid between pebbles.

Early footpaths and carriageways were at a common level with open drains either in the centre or on each side of the carriageway. To prevent wheeled vehicles running onto the footpath section substantial wooden posts were erected at the edge of the footpath. Plate 1.4 shows this arrangement in present day Canterbury, although the carriageway is constructed in brick instead of pebbles.

Further examples of Purbeck paving are shown in Plate 2.4 at the Inner Temple, London showing a carriageway with falls to a central channel whilst Plate 3.4 shows footpaths at Hare Court, Inner Temple, laid with channels each side between pebbled area. Following the Act of 1765 footpaths continued to be paved with Purbeck stone not less than 2.5" in thickness but with the addition of stone kerbs. Carriageways were increasingly paved with square granite setts in place of pebbles which were laid to a camber to allow surface water to drain off into the side channels. Stone gutters 11" wide and carved to give a 1" dished top were used increasingly on both sides of the carriageway replacing the channels formed by laying stones to form a recessed profile. Although the carriageway is now coated with tarmacadam in place of granite setts Plate 4.4 shows Grays Inn, London, with its

Plate 1.4 Street Design, Canterbury

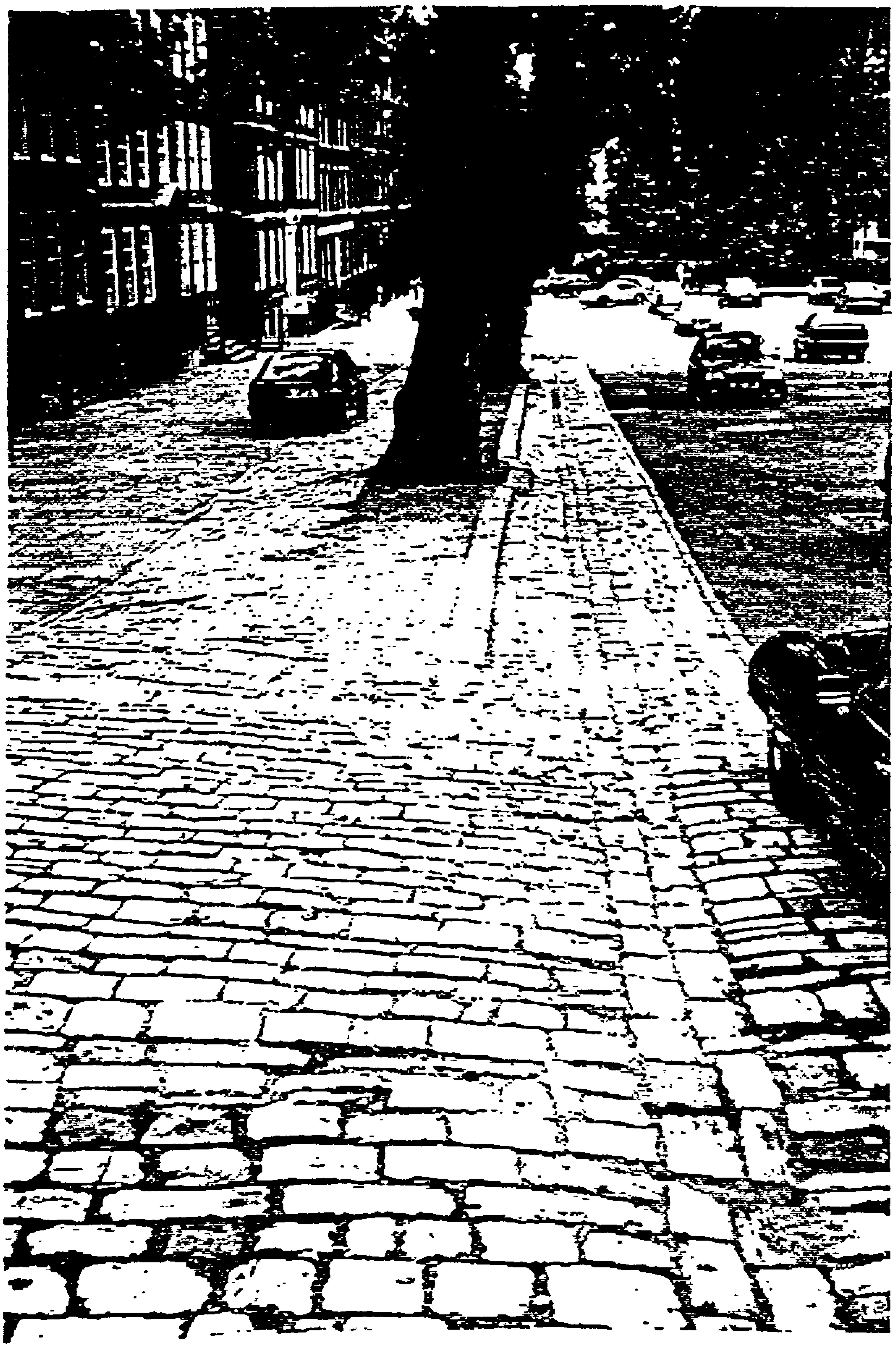


Plate 2.4

Purbeck Stone paving

Inner Temple

Plate 3.4 Paving with gutter, Inner Temple

Plate 4.4 Paving, kerb and guard posts, Grays Inn

Purbeck stone pavements and stone kerbs with posts marking the edge of the pavement. A particularly fine example of regularly coursed Purbeck paving in Field Court, Grays Inn is shown in Plate 5.4.

Granite setts and pebbled carriageways remained in use until the introduction of Macadam's road construction method around 1820 and gradually the pebbles and granite setts were broken up into chippings. Although by the mid 19th century York stone was becoming popular for paving, Purbeck stone continued to be used until the early 20th century. Large quantities of Purbeck squares, gutters and kerbs were shipped out of Swanage for paving and Plate 6.4 shows typical examples. (Tithebarn Museum, Swanage).

Many other components were produced for the expanding towns and cities, ie lintels, cills and stone sinks an example of which is shown in Plate 7.4 (Tithebarn Museum, Swanage).

Southampton Pavement Commissioners issued regulations to effect the paving of the town's streets (Southampton Record Series, Vol 31 1990) and in 1770 an Act of Parliament gave them powers to light the town, pave, repair, widen and cleanse the streets. Stone for the road was imported from Guernsey, ie pebbles and flattners and the corporation also paid for the paving of butchers stalls, the market place and certain pavements with Purbeck 'Pitters', but tenants were made responsible for paving outside their doors.

In 1770 a contract was let to cover the carriageways with good gravel 4" deep every 2 years, if required and by 1775 all the main streets of the city had been paved at a cost of £4,775. Bills were met by levying a rate on the householders, ie between 8d and 4/- in the £ for capital work and 4d in the £ for repairs.

An interesting note appears in the Southampton Harbour Minute Book, 12 September 1805, where Mr Rennie, one of the foremost Civil Engineers of the day, is asked for his opinion as to whether it would be possible to build a breakwater from the Guernsey 'tough stones' which were being brought into Southampton as ships' ballast. Not much chance here of obtaining orders for stone when it was being delivered free of charge.

Plate 5.4 Purbeck Stone paving, Grays Inn

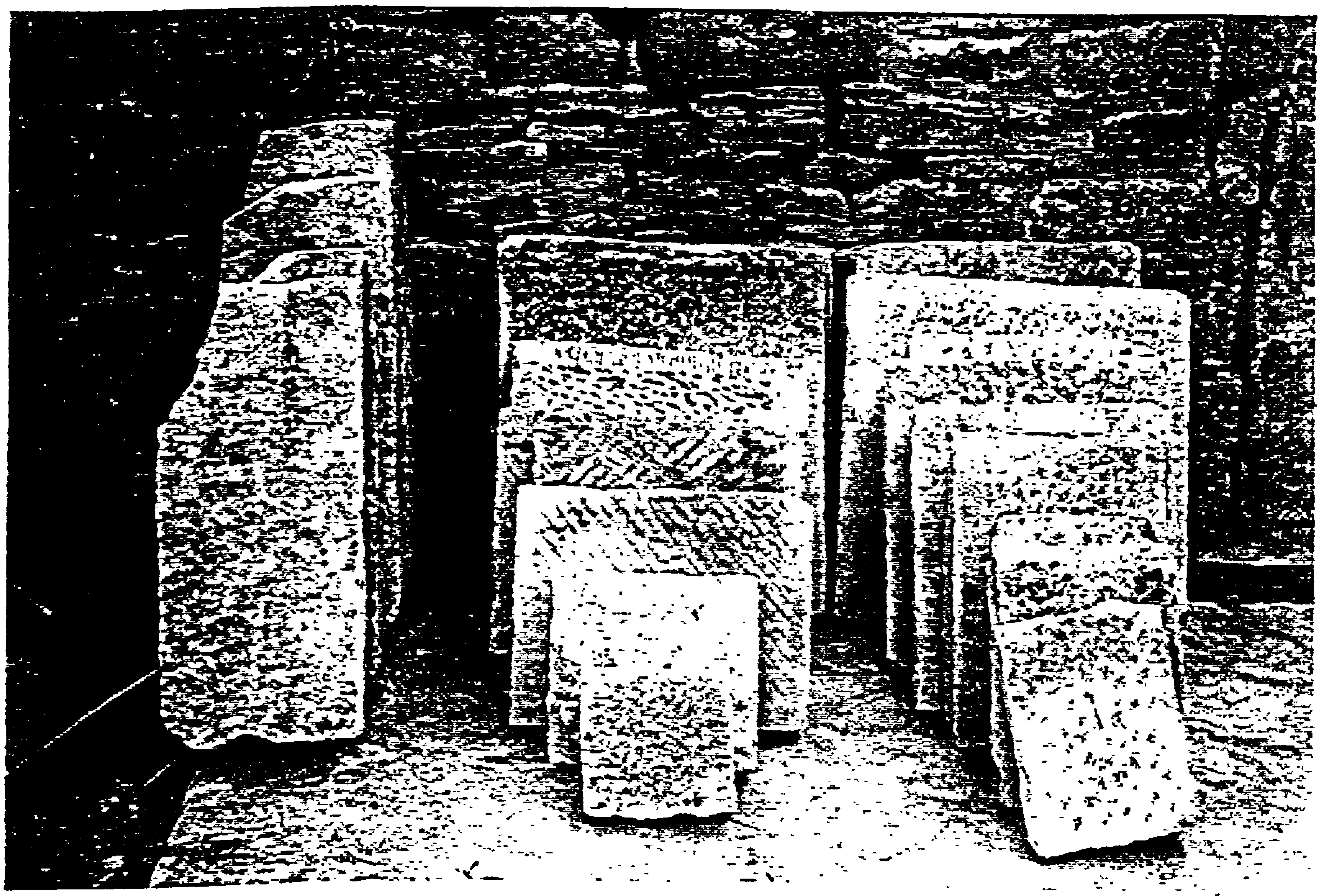


Plate 6.4 Purbeck Paving components

Staddlestones

Another popular use for Purbeck stone was for staddle stones which were sold in pairs, at a cost of, in 1852, 4/- a pair round and 3/- a pair square, complete with caps (Cockburn, 1973). These were placed beneath grain stores to prevent vermin getting in and Plate 8.4 shows a grain store mounted on staddle stones. Fashions change and Plate 9.4 shows what they are used for now, garden ornaments.

Stone Slates

Purbeck stone slates were produced, but it was not possible to cleave the stone as thinly as slate and this created a weight problem as a Purbeck stone slate roof weighs no less than 1.25 tons per 100 sq ft (Clifton-Taylor, 1962). Needless to say, the weight of these stones has produced the characteristic sagging of Purbeck roofs and an example is shown in Plate 10.4 which shows a wavy roof in Corfe Castle.

Because the stones move slightly on the roof they are held in place by being torched underneath with mortar and to prevent leaks they are flushed with mortar on the surface of the roof and this is shown on Plate 11.4. Adding mortar above and below the stone slates increases the weight per sq ft causing more sagging whilst excessive flushing, badly executed, removes the shadow lines under the stone tiles which is aesthetically important. The weight of the Purbeck stone slates probably accounts for the change in roof cladding half way up the roof of the Old House (c1660) at Blandford Forum (Clifton-Taylor, 1962) and this is shown in Plate 12.4.

Other Uses

Purbeck stone was also used for dry stone walling locally and Plate 13.4 shows an example at Acton. Inferior Purbeck limestone was burnt in lime kilns and the Ordnance Survey Map of 1900 shows 9 lime kilns in Purbeck and these are shown in F1.4. Kelly's Trade Directory of 1903 lists 6 lime burners in Dorset and none of these were in Purbeck, so unless they worked on a casual basis, lime burning had ended there. Plate 14.4 shows the existing remains of a lime kiln at South Barn, Langton Matravers.

All the thickness requirements for tiles, kerbs, gutters and paving stones could be met by cleaving Purbeck stone into its natural beds and this property is illustrated in Plate 15.4. The main seams of Purbeck stone were:-

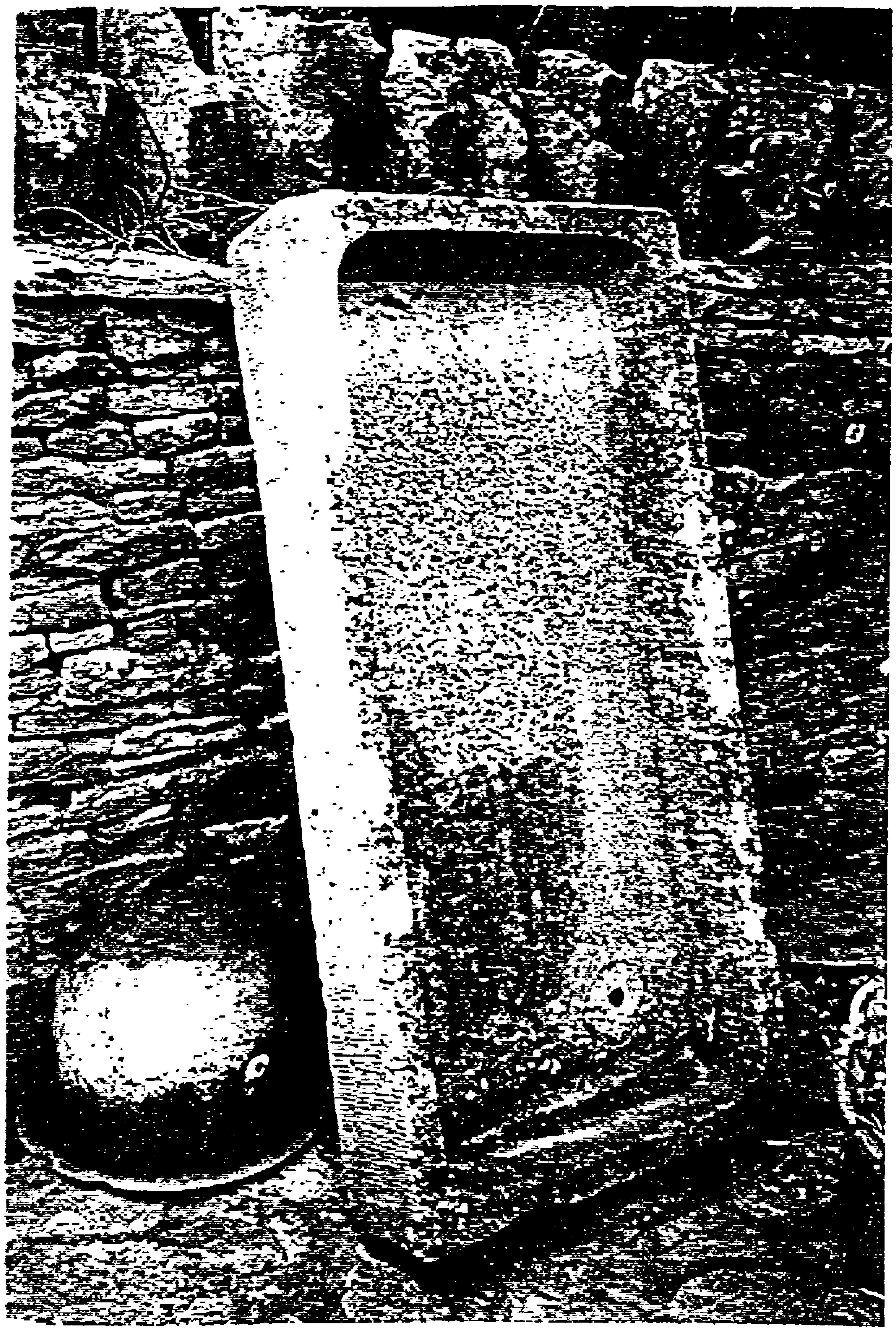


Plate 7.4

Purbeck Stone sink

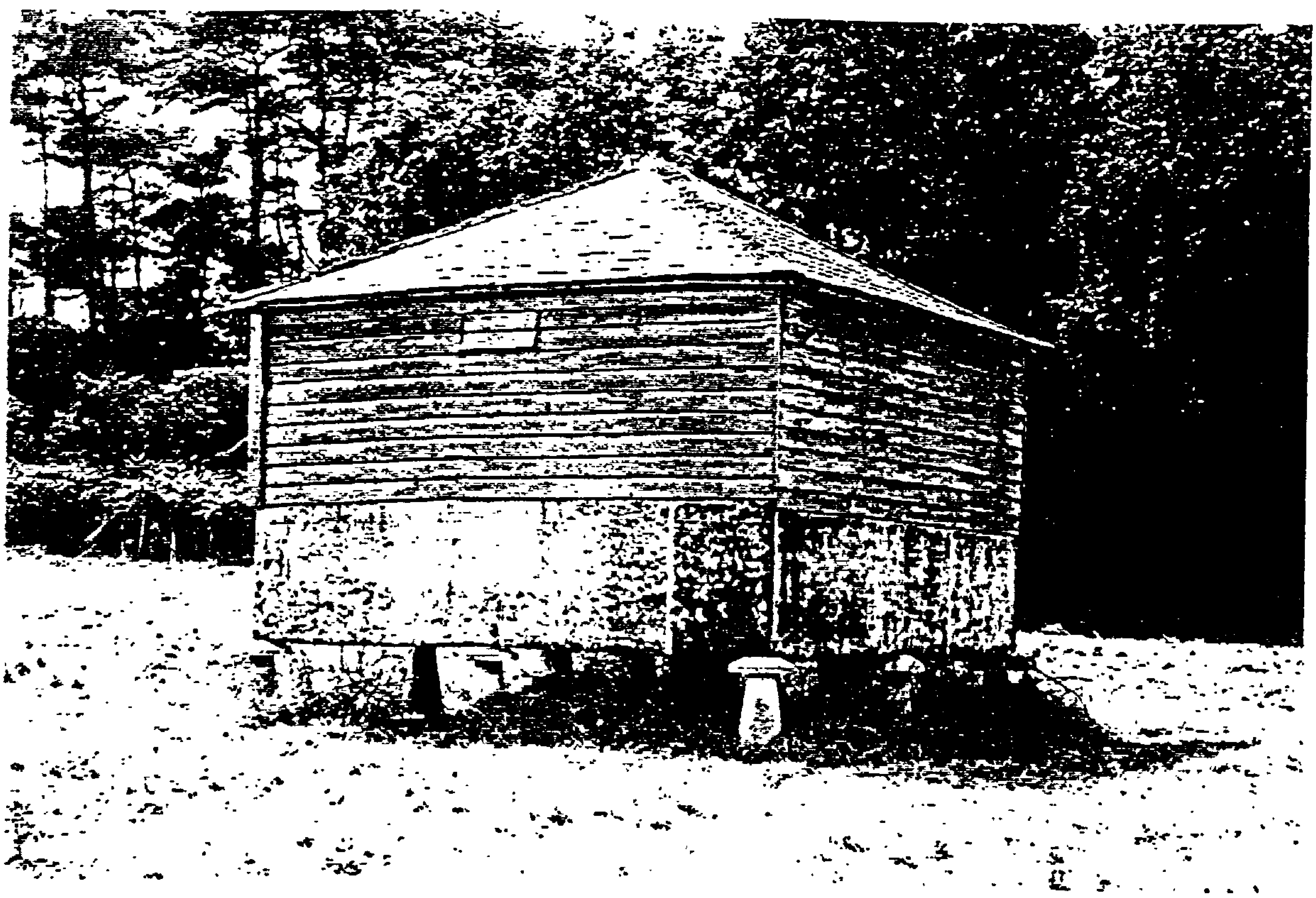


Plate 8.4 Barn mounted on staddle stones

Plate 9.4 Staddle stone ornaments

Plate 10.4 Sagging stone roofs, Corfe Castle

Plate 11.4 Mortar flushing of tiled roof, Corfe Castle

Plate 12.4 The Old House, Blandford Forum

SCALE 1 INCH TO A MILE (1900 A.D)

ORDNANCE SURVEY

FIG. F 1.4

THE LOCATION OF THE 9 PURBECK LIME KILNS

Plate 13.4 Dry stone walling, Acton.

Plate 14.4 Lime Kiln, Langton

LANNEN	- for tombstones, paving, walling and marine work
FREESTONE	- for kerb, steps, tiles, masonry blocks, road metal, railway ballast and lime burning
DOWNS VEIN	- for tombstones, paving and roof tiles
NEW VEIN	- for slabs, steps and tombstones

At Swanage the 4 seams were mined down to a depth of 100 ft, but as the seams became overworked, quarrying moved to Langton Matravers where the required stone lay not more than 20 ft below the surface. Because of what it yielded Downs Vein was the most popular seam.

Most of the original quarrying at Swanage and Langton Matravers took place underground but today only open cast quarrying is allowed. Plate 16.4 shows Suttles quarry at Swanage today and this clearly shows the beds of Purbeck stone that lie beneath the surface. Underground quarrying enabled the required stone to be extracted without having to remove the poor quality stone to gain access to it and it also left the surface of the land undisturbed except for the quarry shaft area. Improvements in earth moving machinery now enables overburden to be moved more economically in relation to the yield of saleable stone.

Between 1796 and 1801, 38,750 tons of stone were exported, mainly to London, as flagstones for paving ie an average of 7,750 tons per annum, but only 150 tons per year were carried inland (Cockburn, 1971). By the end of the 18th Century 400 people were employed in the Purbeck stone industry (Claridge, 1793). Exports in 1812 were estimated at 40,000 tons (Stevenson, 1815) but by 1861 they had fallen to 20,000 tons Hutchins, (1861-74) and fell again to 12,000 tons in 1877, which was extracted from approximately 92 stone mines (Mason, 1984). Flagstones being the major export.

From around 1830 Swanage was becoming a watering place and to eliminate both the carting of stone through the streets and the bankers on the foreshore it was proposed to construct a pier with a horse drawn tramway to connect with the quarries out to Langton Matravers. In 1860 the pier opened but the tramway was only completed to the bankers and as the railway arrived in Swanage in 1885 the pier only had a short life exporting stone, although it was used for importing coal from steamers until the 1920's (Popplewell, Dorset Year Book, 1975/6).

Plate 15.4 Cleavage Planes

Plate 16.4 Suttles Quarry, Herston

Building Stone

Stone from the cliff quarries was used in the construction of Westminster Bridge from 1738-1747. In 1748 a violent storm struck the south coast and the small haven behind a rubble pier at Ramsgate was the only haven for vessels running for shelter in that area. An Act of Parliament in 1749 authorised the building of a new harbour at Ramsgate and Purbeck obtained the order to supply the stone. From 1750 to 1752 the Harbour Trustees transported 15,000 tons from Purbeck to Ramsgate in a fleet of 50 sailing ships and Ramsgate Customs records show that a further 94,000 tons were shipped there between 1764 and 1771, some being used for house building in the rapidly expanding town (Cockburn, 1973).

It is interesting to note that a letter from J Bishop the agent for the Rempstone Estate in 1771, reveals that stone from quarries on the estate had been shipped to Ramsgate for the past 30 years and the royalties on the stone were never higher than £20 per year on average over 10 years and for the future £10 a year was an optimistic estimate. (D R O, D/RWR/T504).

End of the Cliff Quarries

By the end of the Napoleonic wars many of the Purbeck quarries had ceased operation, demand was slack with the expenditure on fortifications ceasing and from 1810 to 1812 only 110 tons of pitchers were shipped from Tilly Whim Cliff Quarry which then closed. Fortification enlargements at Portsmouth eased the decline in demand and vast quantities of stone were shipped there from the cliffs at Durlston Bay and Plate 17.4 shows some of the Portsmouth fortifications and Plate 18.4 shows the round tower there all constructed in Purbeck stone.

Cliff stone was taken from Winspit Cliff Quarry from 1840 to 1890 for construction of the Thames Embankment and stone from cliff quarries was used for bridges, harbours, fortifications, troughs, columns, rollers and staddle stones.

Most of the stone taken from the cliff quarries was lowered into flat bottomed barges for transfer to sailing ships at Swanage, although some stone was carried inland up rough tracks, notably Seacombe and Winspit.

Winspit reached peak production between 1840 and 1890 but between the two World Wars trade revived when thousands of tons of rubble stone were removed, by open cast means, for hardcore which was used for the construction of roads and airport runways, the quarry finally closing in the late 1950's. Seacombe quarry operated until the late 1920's, the stone being taken inland by steam or petrol lorries which had replaced the earlier horse drawn wagons. At Seacombe the Whitbed seam is 8 ft thick and in 1871 a 3.5 ton stone trough was made from a block of stone 8' x 4' x 4' for the North Woolwich Galvanising Works.

With the arrival of the 20th century demand for stone fell dramatically and although small individual quarries produced kerbs, channels and setts for roadworks, walling and rockery stone, garden ornaments and crazy paving the main demand was for crushed stone for tarmacadam and roadstone, which is the situation today. Many quarrymen were unemployed and left the industry and although a co-operative was formed in 1920 to help the industry market its stone it petered out in 1930.

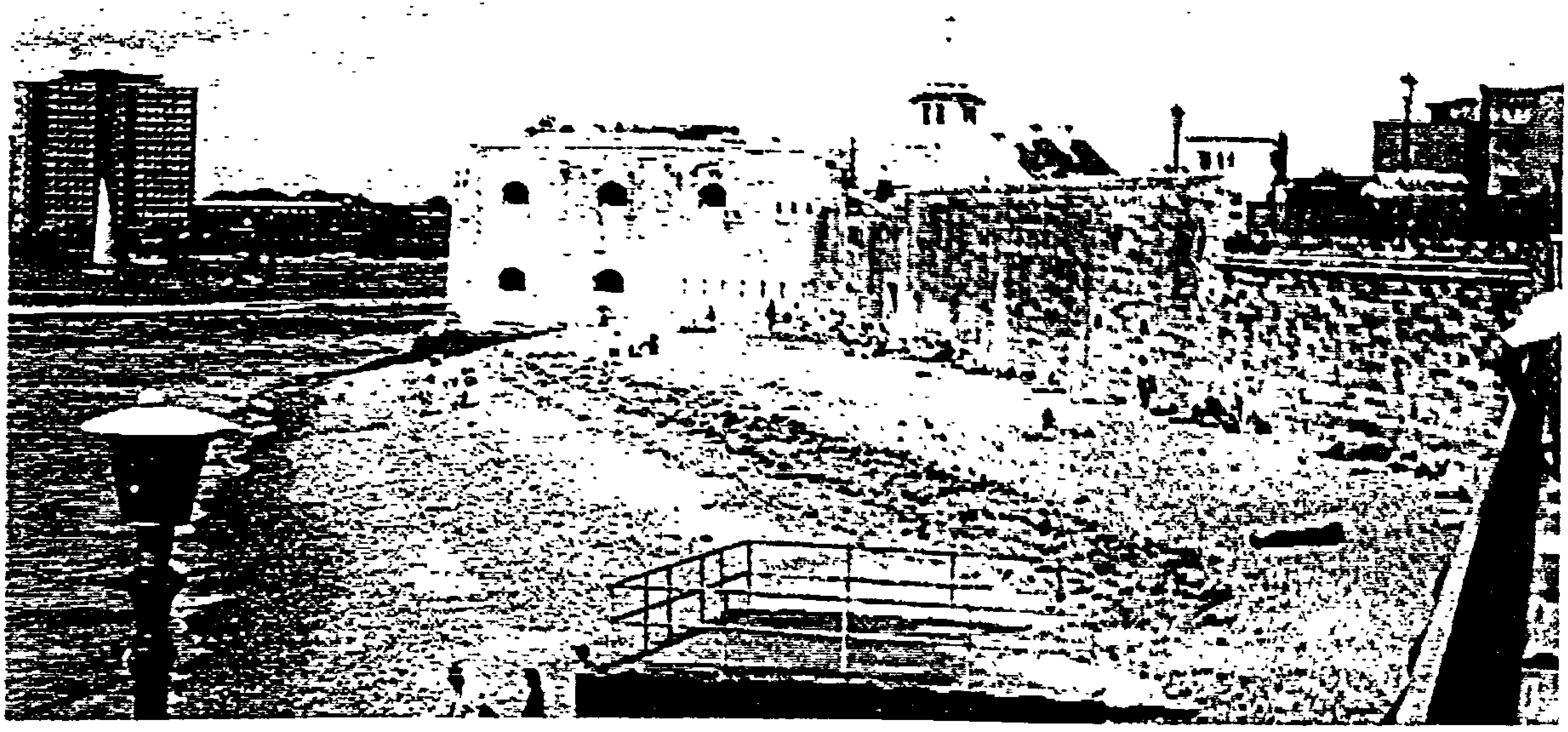


Plate 17.4 Point Battery, Portsmouth

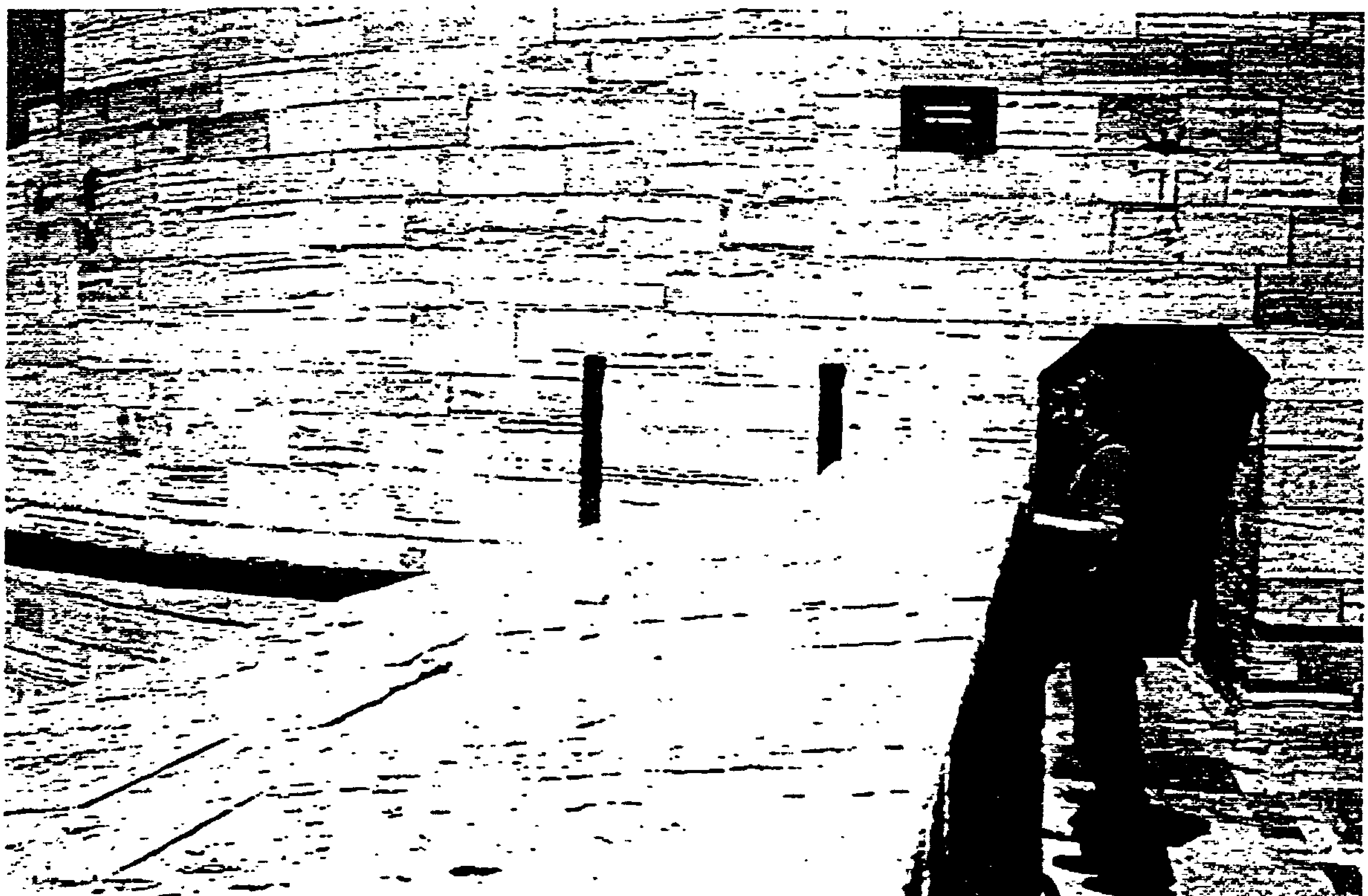


Plate 18.4 Round Tower, Portsmouth

House Building

Up to the 15th Century stone was primarily used for Cathedrals and churches and for church properties such as Bishops palaces, refectories and vicarages, it was also used for castles and bridges. Houses before this date are rare and only several dozen houses or parts of houses, widely separated geographically, have been identified. With growing prosperity in the land largely resulting from the wool trade, stone became in the 15th Century one of the normal materials for the medium-sized as well as the larger houses (Clifton-Taylor, 1962). Buildings in Purbeck constructed from local stone follow this trend and St Aldhelms Chapel was built from Purbeck stone in the 12th Century.

Lulworth Castle dates from 1608, built as a private dwelling it was badly damaged by fire in 1929, being reduced to an empty shell and English Heritage are now engaged on preserving the shell and making it safe for the public to be admitted. Leeson House dates from 1690 and this is shown in Plate 19.4, Smedmore House dates from 1620 and is shown on Plate 20.4 and Plate 21.4 shows a Purbeck marble fireplace at Smedmore House. Encombe House, which dates from 1734, is the finest example of a house built from Purbeck stone, the stone being quarried adjacent to the house, and the house is shown on Plate 22.4.

Stone Villages

A notable characteristic of the Purbeck quarrying industry is that villages originally housing quarrymen have houses that are predominantly stone built. West Street, Corfe Castle, where the marble carvers were based, is dominated by the Castle ruins and the houses are of stone, see Plate 23.4 High Street, Swanage, shown in Plate 24.4, is where the stone carts travelled with loads of dressed stone from the quarries to the bankers, again the houses are stone built. Behind Swanage Town Hall are more stone buildings including the tiny lock up or blind house erected in 1803 and this is shown in Plate 25.4 Langton Matravers is shown in Plate 26.4 and Worth Matravers in Plate 27.4 These are both stone villages along with the hamlet of Acton shown in Plate 28.4.

Although Kingston village has houses built of stone, it is not a true quarry village as

Plate 19.4 Leeson House

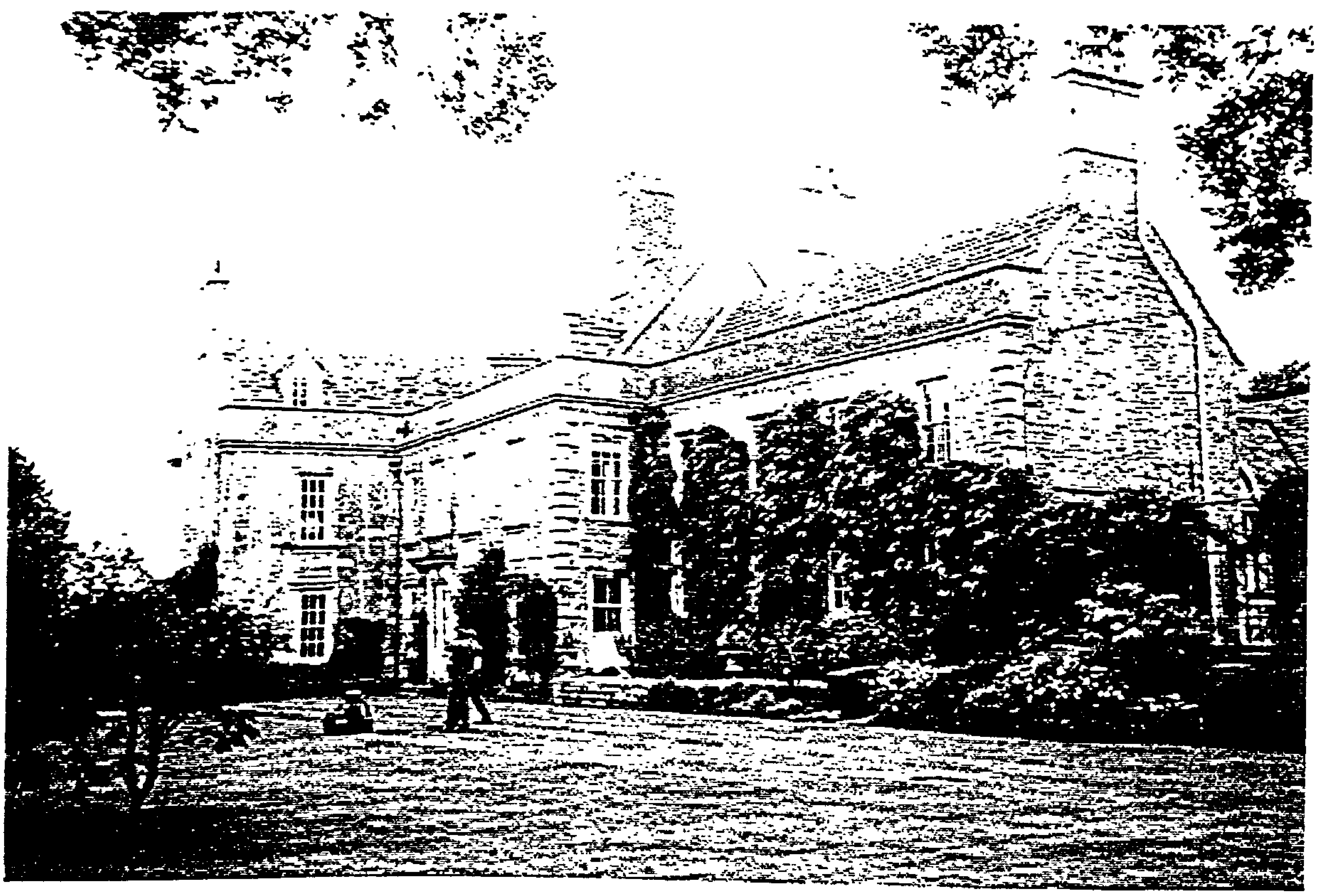


Plate 20.4 Smedmore House

Plate 21.4 Fireplace, Smedmore

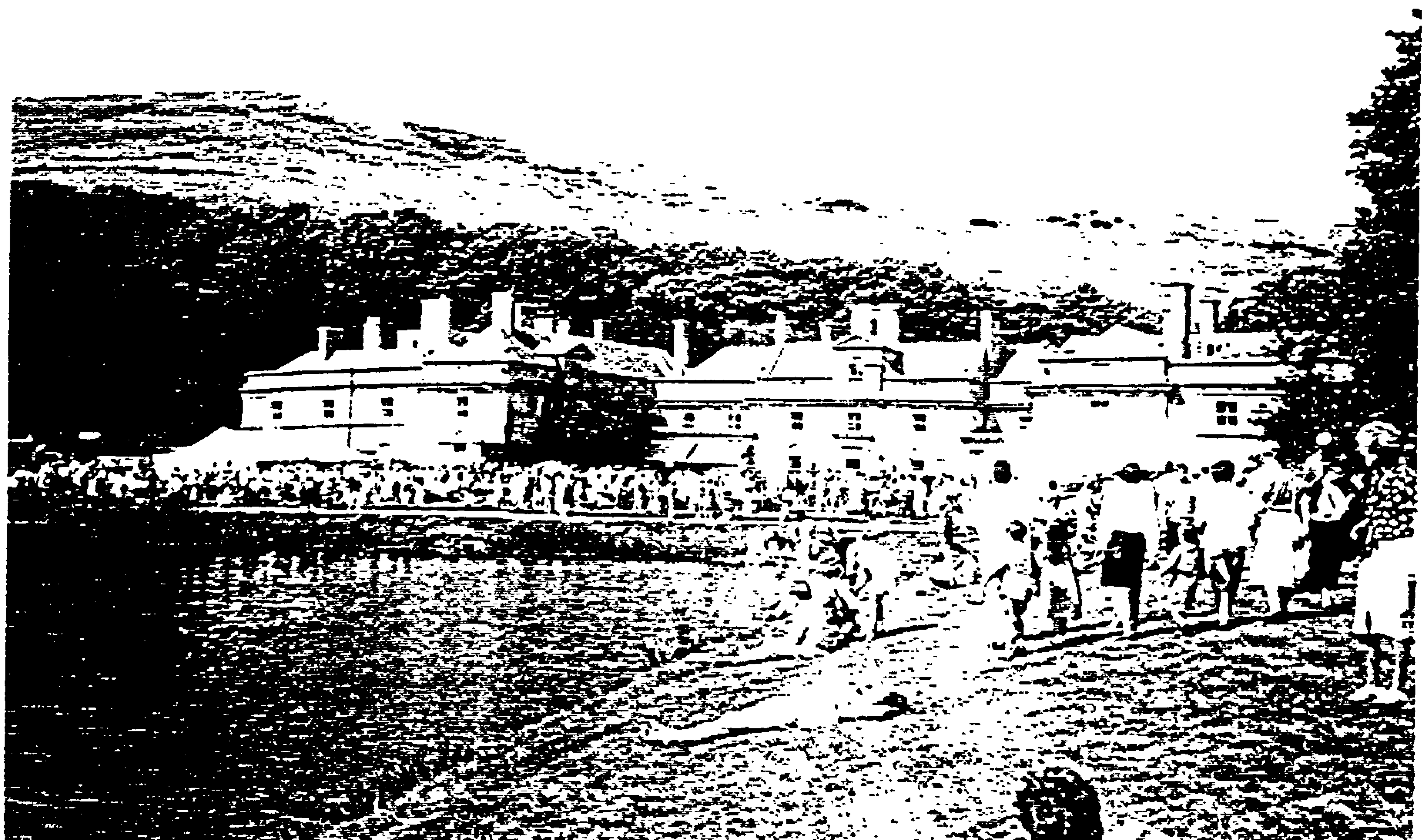


Plate 22.4 Encombe House

Plate 23.4 West Street, Corfe Castle

Plate 24.4 High Street, Swanage

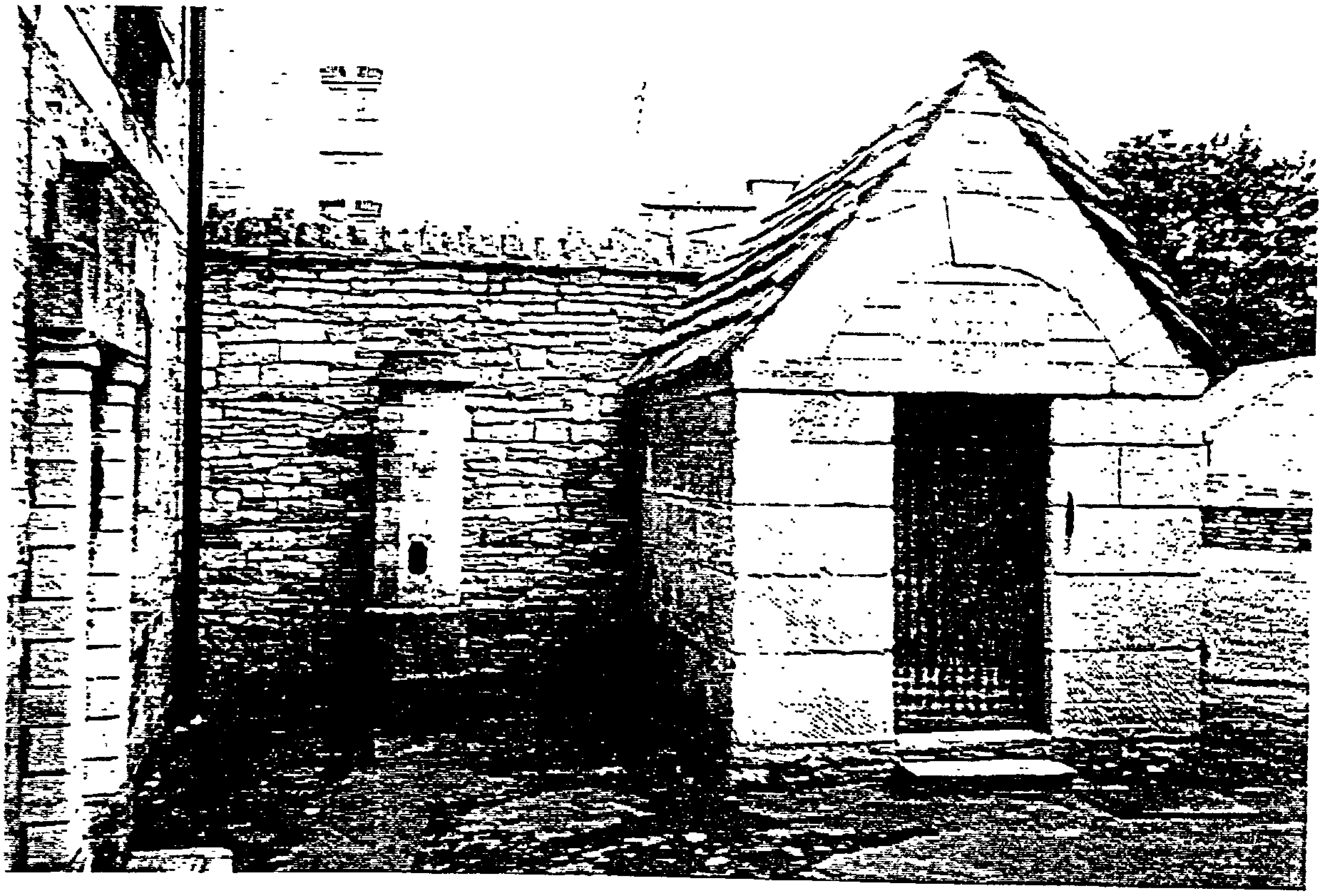


Plate 25.4 Old Town Jail, Swanage

Plate 26.4 Langton Matravers

Plate 27.4 Worth Matravers

Plate 28.4 Acton

it is linked with the Encombe Estate and Plate 29.4 shows Kingston village along with its splendid church. Built by local masons from Purbeck stone in 1870, the church is a splendid example of the Gothic style. Inside the church are found Purbeck marble pillars Plate 30.4 and a Purbeck marble and stone font Plate 31.4. Local masons left their quarries to work on the church, which took seven years to build, to get a steady income, but when they returned to their quarries the demand for stone had gone and they were unemployed.

Corfe was originally fortified by King Alfred to protect Wareham from coastal attack by the Danes and has been the Purbecks major township since then. Although it is only 4 miles from Corfe Castle the township is primarily brick built and is shown in Plate 32.4. This proves that very little stone came inland from the quarries, the road from Corfe to Wareham being level, it was only used for prestige buildings such as Lady St Mary Church shown in Plate 33.4.

Purbeck Stone Today

Another example of the use of Purbeck stone in building is the post war shopping centre at Shepton Mallett, Plate 34.4, which has stone facings at street level. Mary Spencer Watson is a well known sculptor who lives at Downshay Manor where the marble was quarried for Salisbury Cathedral. She carves in Purbeck stone as well as other materials and Plate 35.4 shows a completed work at her home entitled "The Vision" (Compton, 1991).

Three examples of products from today's quarries are shown, eg tombstones Plate 36.4, a gilded house nameplate Plate 37.4 and a fireplace Plate 38.4, these are typical products from the individual quarries still operating in Purbeck. There is a constant demand for crushed road stone which shows an upward future trend, although there is a depressed market at the moment due to the recession. Swanworth Quarry, which was opened in the early 1900's, crushes Purbeck/Portland for roadstone, being the only quarry to do so and today's crushing plant is shown on Plate 39.4.

At present there are only 20 operational stone quarrying units located in Purbeck producing the components listed above. Some quarries also undertake special commissions and supply components for the refurbishment of buildings when Purbeck marble and stone require replacement.

Plate 29.4 Kingston Village and Church

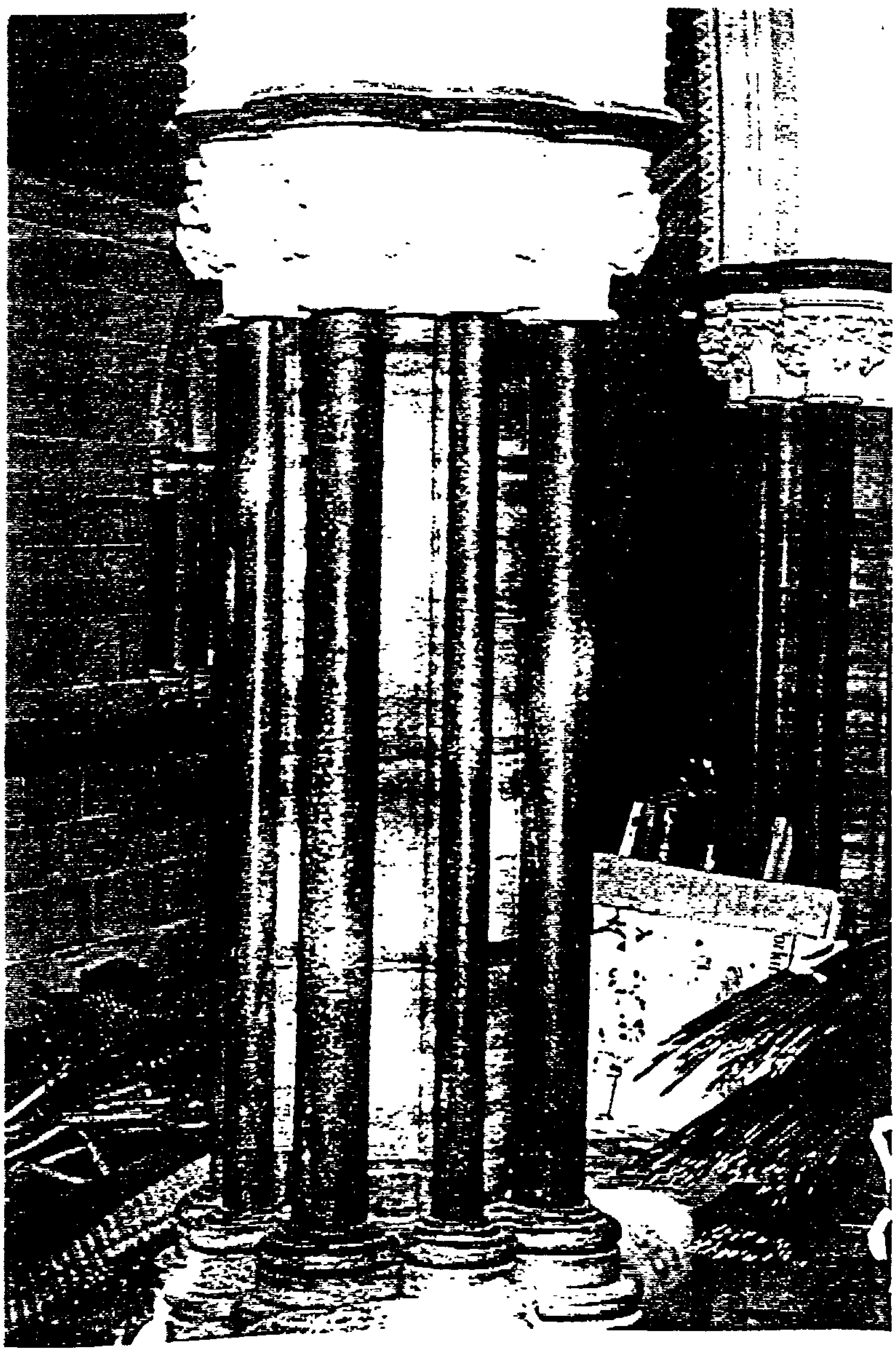


Plate 30.4

Purbeck Marble pillars

Kingston Church

Plate 31.4

Font in Kingston Church

Plate 32.4 Wareham

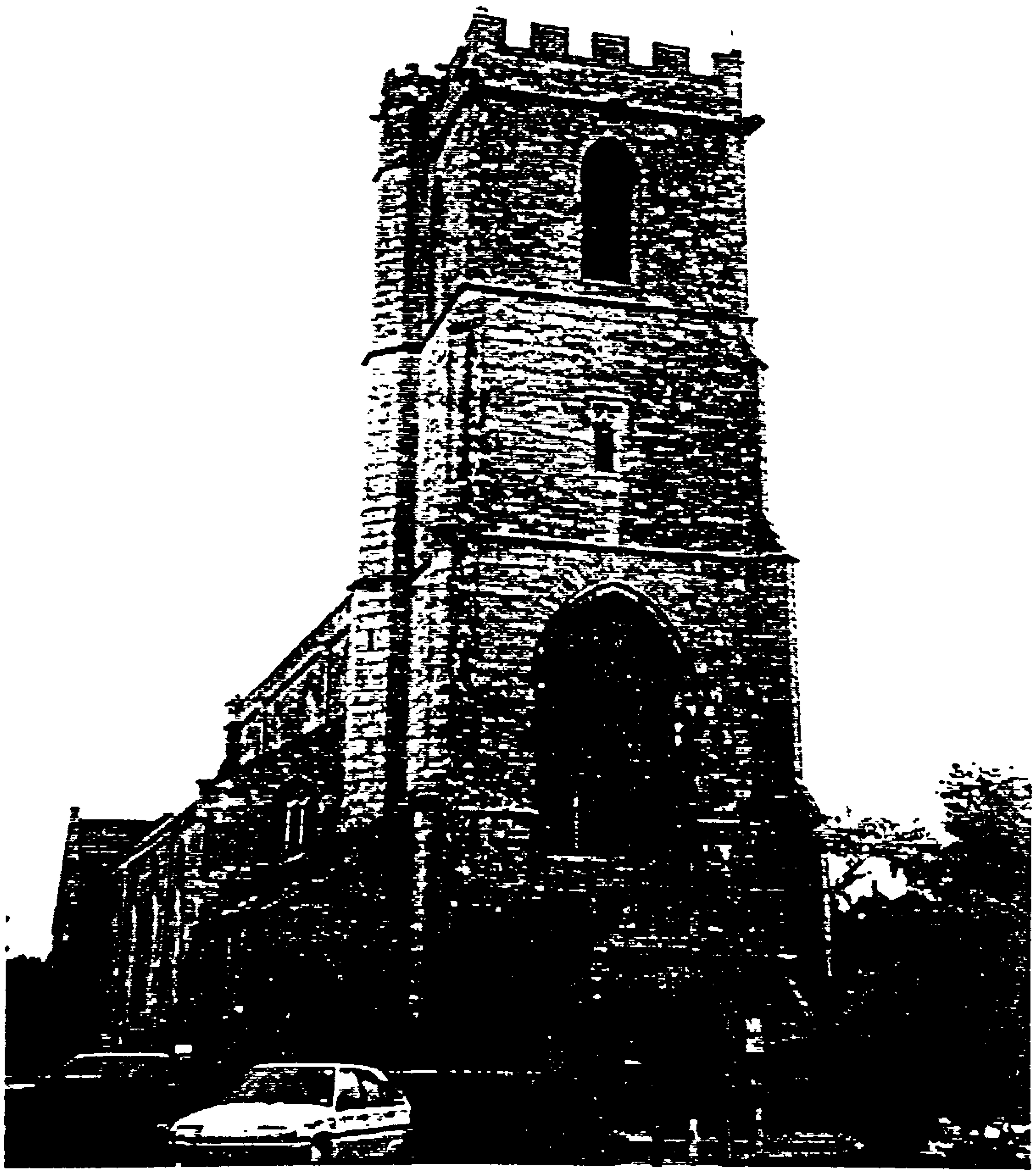


Plate 33.4

Lady St Mary Church

Wareham

Plate 34.4 Purbeck Stone, Shepton Mallett

Plate 35.4 Stone Sculpture, Mary Spencer Watson

Plate 36.4 Tombstones, Landers Quarry

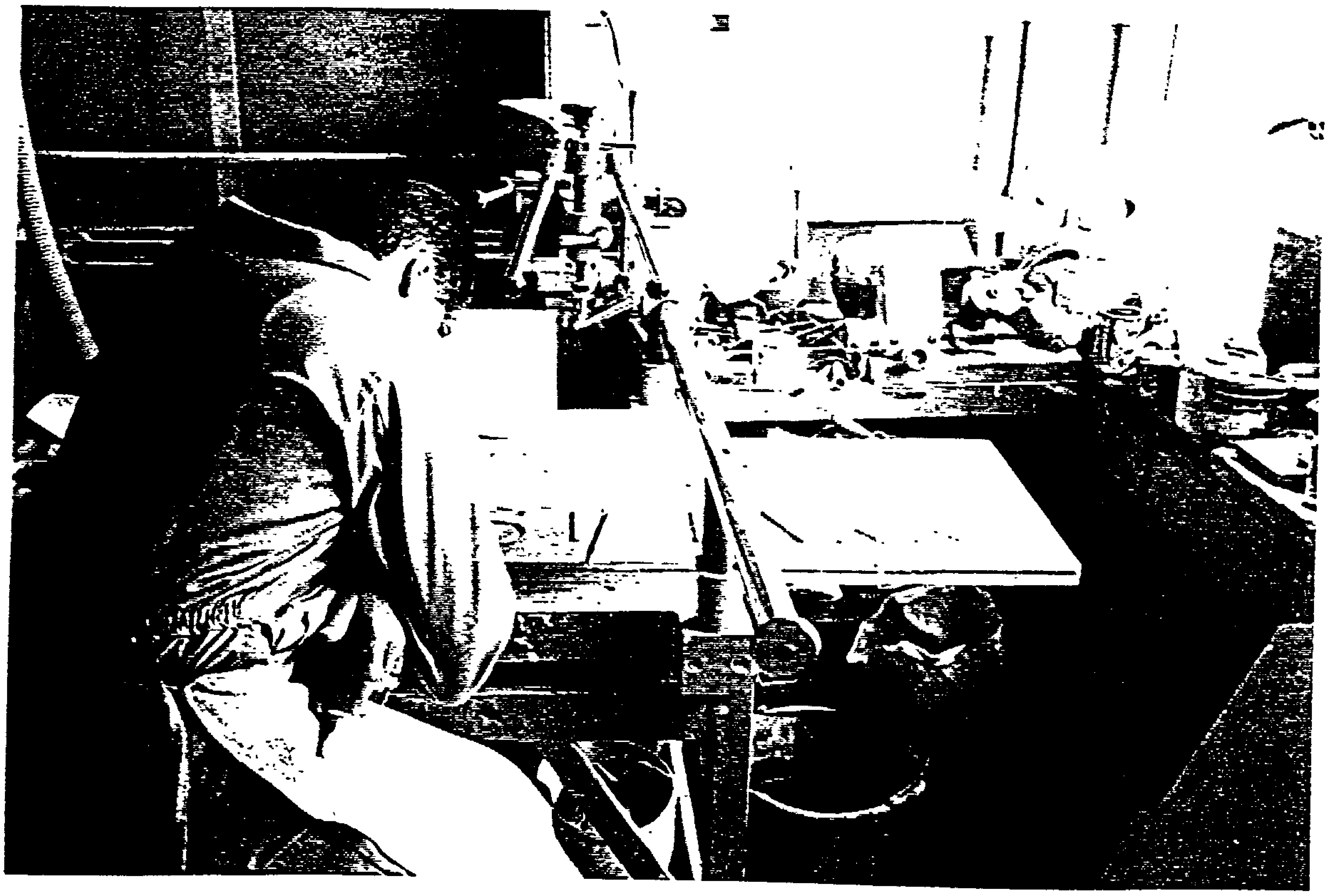


Plate 37.4 Stone Nameplate, Landers Quarry

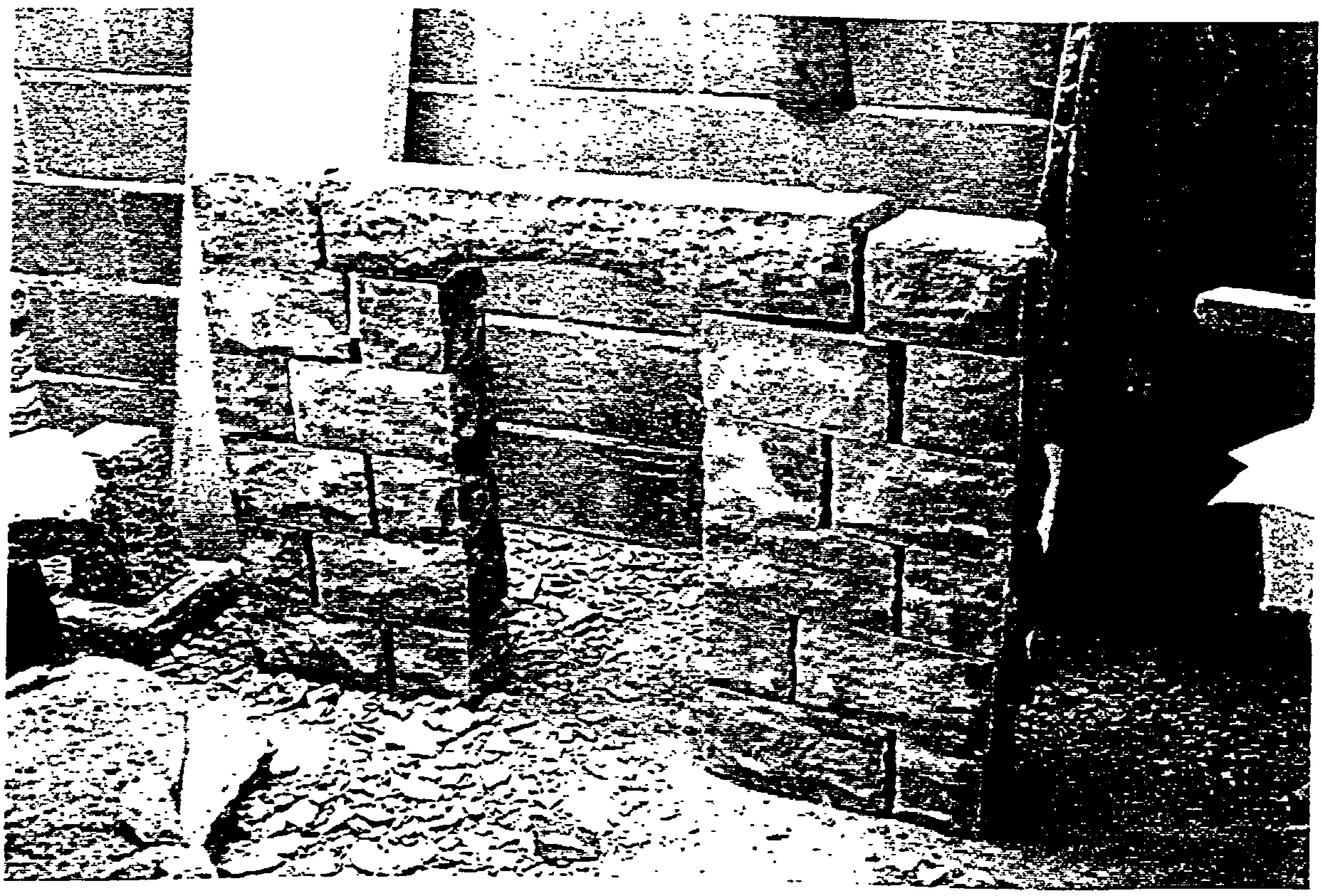


Plate 38.4 Purbeck Stone fireplace, Hardens Quarry

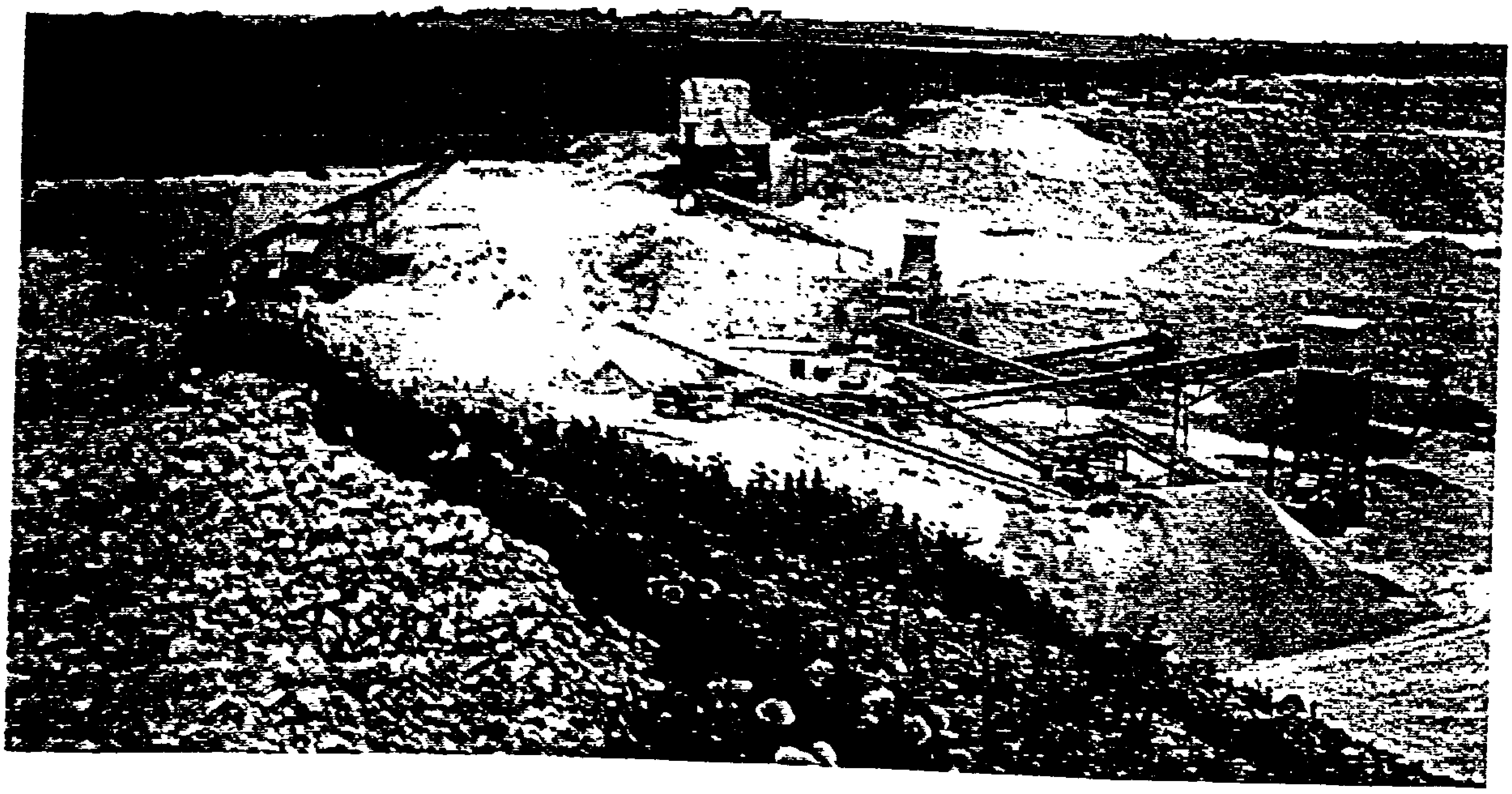


Plate 39.4 Stone crushing plant, Swanworth Quarry

Annual Production figures are:-

40,000 tons of Blockstone

450,000 tons of crushed stone

and the number of people employed in the industry at 60 to 100, although some are part-time (DCC, 1992).

The average number employed at a quarry today is $\frac{80}{20}$ = 4 per quarry and in 1800 it was $\frac{400}{90}$ = 4.5 approx

Tonnage of stone produced per man today is $\frac{450,000 + 40,000}{80}$ = 6,125 tons per year

and in 1800 it was $\frac{40,000}{400}$ = 100 tons per year (Blockstone only)

and 20 quarries today yield 490,000 tons per annum (av 24,500 tons per quarry) against 90 quarries in 1800 yielding 40,000 tons per annum (444 tons per quarry)

Today's blockstone production per man is
$\frac{40,000}{76}$ = 526 tons per year against 100 for the year 1800

which is a 500% increase in nearly 200 years.

Blockstone Production per quarry per week today

$$\frac{40,000}{50 \times 20} = 40 \text{ tons}$$

and 1 ton of stone per 12 cu ft gives 40 x 12 = 480 cu ft which is approx equal to a single block of stone

8' x 8' x 8' from each working blockstone quarry.

Chapter 5

Landowners, Tenants and Dues

This chapter illustrates how the landowners leased land to their tenants for stone quarrying in return for rent and stone dues. In particular, it examines the relationships between landlord and tenant, giving examples of disputes that arose. During the Middle Ages the control of the Purbeck marble industry was vested with the crown and the monasteries and most of the quarries were in their ownership. Knoop and Jones (1967) state that in the English building industry in Medieval times there were three methods of conducting these quarries.

1. Those immediately responsible for erecting particular buildings would open and work the quarry.
2. Quarrymasters would work the quarries and sell the stone to persons engaged in the building operations.
3. Quarrymasters would work the quarries, and, in the capacity of mason contractors, they would use the stone from their own quarries to erect buildings by contract.

The third method was uncommon, Mason Contractors being a relatively late development in the English building industry, although masons in addition to being sent to dress the stone, were sometimes employed as experts in the provision and purchase of stone.

In the 13th Century most of the quarries were private enterprises undertaken on behalf of the Lord of the Manor, or by quarriers working in partnership and holding a lease or licence from the Crown.

This is confirmed by documentary evidence furnished by the accounts of the Sheriffs of Dorset which contain the following items (Dru Drury, 1948).

34. Henry III (1250) "For one ship-load of marble bought and carried to the Tower of London and for four ship-loads of Purbeck marble bought and carried to the said Tower for the works there 30l-16s-4d."

38. Henry III (1254) "For carving a certain effigy of a Queen in marblestone, carrying it to Tarrant Monkton and placing it

there over the Queen of Scotland 100s."

41. Henry III (1257) "For marble bought at Corfe for the work of the church at Westminster 5 marks."

42. Henry III (1258) "For 35l paid to Nicholas Red and his fellows, surveyors, for purchasing the Kings marble in Purbeck for the Kings work at Westminster.

52. Henry III (1268) "For all the Kings marble which the purchasers, appointed for the purpose, bought in Purbeck for the works of the Church of Westminster, and for carrying the same from Purbeck to Westminster 16l-8s-6d."

2. Edward I (1271) "The Sheriff accounts for a marble altar made in Purbeck and delivered to the friars of Mount Carmel in London by the gift of the King Henry, and for three marble stones bought in Purbeck for repairing a tomb made there for the use of John the Kings eldest son 60s, and for carrying the same altar to London 5 marks-5s-4d."

A few of the letters sent by the Kings representatives at Purbeck with consignments are still extant, they are brief and businesslike, Robert de Bremele writes to Master John of Oxford:-

> "I am sending you one shipload of marble by William Justise, whom you must pay for freight 5.5 marks and 10 shillings and if God prospers us I will send you a shipload before Whitsunday, and a third if I can find a ship to carry the said stone. You may expect me in Whit week and not before because the season is now at hand in which, if I am absent, your business cannot be carried out well."
> (Victoria History of Dorset, 1975, Vol 2, p 333).

The most valuable supplies from Corfe consisted no doubt of the well known marble, but we also hear of a freestone. This may have been the stone called in modern times Purbeck-Portland, but the matter is uncertain as the Corfe Merchants supplied apparently more than one variety of stone.

On one occasion at least an attempt made by the Constable of Corfe Castle to obtain stone cheaply at the expense of his neighbours provided work for the lawyers. The officer in question, Elias de Rabayne, during his tenure of office was indeed peculiarly unfortunate in quarrelling with the Purbeck landowners. One of them, William de Claville, complained that on the Tuesday after All Hallows, 5 Edward I (1277), the Constable had caused five of his oaks to be cut down and carried to Corfe Castle, and furthermore in the Easter week following had ordered one John Doget to open up a quarry within the close of the aforesaid William at Holne, from which stone had been raised against the landowners will.

Claville complained to the King, and an injunction was served on the Constable ordering him to cease his infringements of Claville's rights and to offer compensation for the wrong, but this the aggressor ignored. The Constable in answer declared that his predecessors who had held the castle and warren of Corfe had been wont both to cut down trees and make quarries and thence carry stones for the repair of the Castle at Corfe when necessity required. He had simply followed precedent in the matter, and furthermore he had taken a part of the stone in order that he might send it to the Tower of London in obedience to the King's writ. He demands that inquisition should be made thereon but Richard de Colleshulle the Sheriff, however, deposed that the Constable had no right to take the stone or timber or meddle in the work of repairing the castle, since viewers were appointed to see to the business, to whom he as Sheriff made the necessary payments for the expense of materials.

When building operations and repairs were in progress a few years after this event, it is significant that large quantities of stone were purchased from Sir Peter Doget, Lawrence Cok, John Lenard and Thomas Cusyn, again confirming that during the 13th and 14th Centuries some Purbeck quarries were in private hands (Victoria History of Dorset, 1975, Vol 2, p 333-4).

Additional confirmation of these practices is provided by the record of Henry Yevele, the King's mason, who was Lord of the Manor of Langton Matravers in 1376, and in 1397 he was the Master Mason at Westminster Abbey. He was also the contractor who supplied stone from various sources as well as finished artefacts, having supplied a marble tomb for Richard II and his Queen (Knoop & Jones, 1967).

In 1374 the ship 'Margarete of Wareham', of 48 tons burthen, carrying two high tombs of marble for the Earl of Arundel and Eleanor his late wife, one great stone for the Bishop of Winchester and other things of theirs was seized by the Keepers of the Port of Poole for an expedition against France. A warrant for its release was sent to Poole ordering that it be taken with its contents to London and there unloaded, Master Henry Yevele "Masoun" being the principal surety for the procedure (Dru Drury, 1948, DNHAS, Vol 70).

This suggests proof indeed that Henry Yevele had the full support of the King in his work. Purbeck quarriers claimed the right to enter any uncultivated land in search of stone under the authority of an ancient charter, although such a right has never been legally established, the charter itself having been lost. The regular practice was to obtain a licence from the landowner, or, in the case of the Royal Demesne, the licence of the Constable of Corfe Castle.

Marble for use in Royal works being either bought from quarry owners or obtained from quarries belonging to the Crown, or from a quarry leased to the Crown during the progress of the Royal works. Officers of the Crown were often stationed in Purbeck to superintend the purchase and ensure a fair deal (Mason, 1984). Local landowners granted the right to quarrymen to raise stone from their land in exchange for a yearly rent plus a royalty on all saleable stone quarried, the royalty being one thirtieth of the stones value (Benfield, 1990). Each quarryman had to undertake to keep the quarry tidy to the satisfaction of the landowner's agent and a tallyman was engaged to determine the stone royalties to be paid to the landowner.

Until the 19th Century it was advantageous to the landowner to have quarrymen digging stone on his land as the landowner received rent and royalties from the quarries and the landowners' tenant farmers could supplement their incomes by transporting stone, in horse drawn carts, from the quarries to the stone bankers at Swanage for shipment by sea. It may have been a condition of the tenant farmer's lease that he provide this service to the quarries, indeed leases for Worth and Weston farms, drawn up in 1813 stated;

> "and find and provide sufficient carriages with horses to carry the stone from the several quarries working the same at the usual price or prices or permit them to employ other persons and carriages for that purpose." (Benfield, 1990).

The first leases seem to have been signed by quarrymen around 1719 for in March of that year a seven year lease was signed for Winsprit (Winspit) quarry and the adjoining cliff by Robert Pike and Benjamin Bersome for the full sum of ten pounds (DCRO, D/RWR/D86M9).

The two quarries at Tilly whim were leased in 1806 by W L P Taunton of Middle Temple, London to Henry Gillingham, Samuel Marsh, Peter Marsh and Thomas Randle, stone merchants at Swanage, for 16 years giving them the right to dig, cut, win or work all manner of stone. All useless and unsaleable stone, earth, clay and rubbish to be removed and thrown into the sea.

Royalties were to be paid of:-

6d per ton for block stone
3d per ton for smaller stone (pitchers)
Paving stone 2/- per 100 square feet.
Troughs, sinks & cisterns 1/2d per peck (1 peck = 2 galls)
1 pair staddle stones with caps 2d per pair
1 ton stone rollers or cylinders 1s - 6d
Smaller quantities in proportion
Owner to receive stone accounts for amounts shipped and may inspect workings at any time and stone rent to be paid quarterly

In 1846 WLTP Taunton leased land at Swanage to John William Cole Burt including quarries, the stone from which was to be carried to the bankers and royalties were payable. The Manor of Swanage was owned by the Dean and Chapter of Exeter Cathedral which they leased in 21 year terms. William Morton Pitt held the lease in 1753 but sold the unexpired portion of the lease to WLTP Taunton along with 2 other manors (DCRO, D/MOW/T9).

Fig 1.5 shows the locations of the major cliff quarries along with the stone mining and quarrying areas of Purbeck and the main landowners that had quarries on their land were the Calcrafts of Worth, the Bankes of Corfe and Earl Eldon of Encombe. In the 18th and 19th Centuries landowners were anxious to ensure that quarrymen signed leases to dig for stone in order to prevent unauthorised quarrying and to regularise the informal arrangements of the past. Leases were issued on lives to ensure security of tenure for the tenant and his family and a regular income for the landowner. As the structure of families changed with births, marriages and deaths new names were added to the leases on payment of a fee.

When a quarry was required either as a new venture or because an existing one was worked out the quarrier applied to the landowner for leave to open a quarry. If he consented and the quarrier found suitable stone when the ground was opened, then

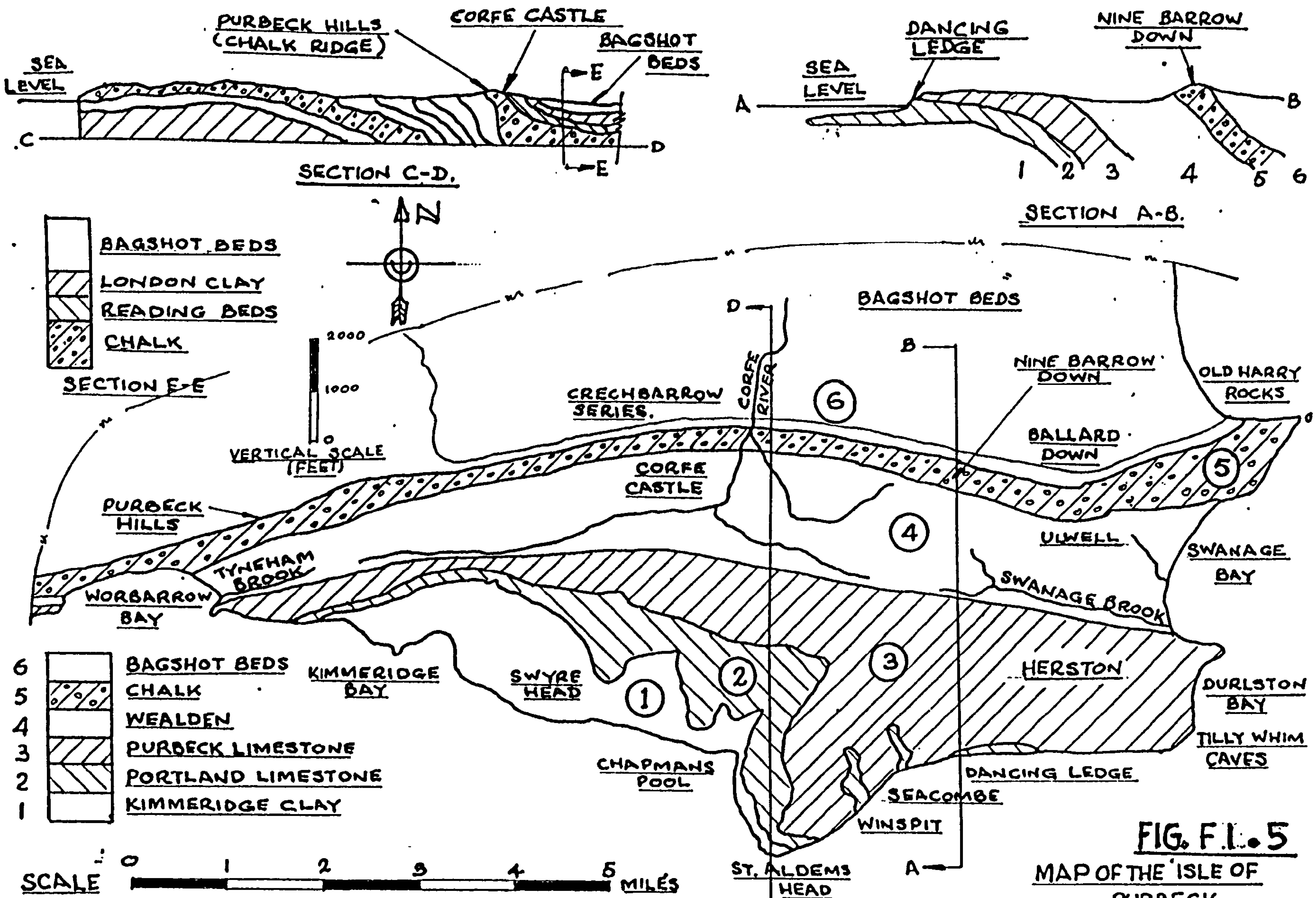


FIG. F.I. 5

MAP OF THE ISLE OF PURBECK.

DATA FROM: ANCIENT PURBECK BY J.B. CALKIN & GUIDE TO THE GEOLOGICAL MODEL OF PURBECK BY A. STRACHAN.

landowner the usual dues. As the quarrier did not earn money until he found stone and as he did not usually have a large capital sum to tide him over, the search for and mining of new stone deposits was carried out at a brisk pace.

Exclusive rights to quarry the stone are forfeited if, in accordance with a Purbeck mining custom, the quarrier deserts the quarry or leaves it unworked for a year and a day. This ensures that the landowner receives a regular income from a working quarry because he is free to re-lease the quarry to another tenant if the first tenant is no longer providing stone dues. In addition he seeks compensation for the unavoidable damage done to his land by the quarry.

An attempt was made by the local Company of Purbeck Marblers and stonecutters to have the mining rights transferred to them when a quarry had been vacated for a year and a day, or deserted, instead of reverting to the landowner, to allow him to re-lease as he saw fit. This attempt did not succeed and a verdict was obtained by a landowner in a case tried by a special jury at the Summer Assizes in Dorchester in 1784 and a judgement was obtained that the quarry is forfeited and reverts to the owner if the quarrier has deserted it for a year and a day (DCRO, ph 575b, Farrer).

A rule of the Purbeck Marblers states: "that no man of the company shall set into his fellow tradesmans quarr to worke there without his consent within 12 moneths and a day, nor to come into any part of that ground within a hundred foote of his fellow tradesmans quarr upon the forfeiture of five pounds to be paid to the owner of the quarr unto whom the offence shall be dun. Neither shall no man in this company worke partners with any man, except it be a freeman of the same company, upon the forfeiture of five pounds." (Victoria History, Vol 2, 1975). A quarrier had thus to pay his rent and stone royalties to his landlord, keep his quarry tidy and obey the rules of the Purbeck marblers that regulated his conduct to fellow members.

Opening a quarry requires a large amount of unproductive work by a quarrier in either digging a shaft for a mine, or removing overburden for an open quarry. It would be an attractive proposition to take over a deserted quarry with ample deposits of good quality stone if a quarrier was looking for another quarry.

On the occasion of his marriage a member paid his marriage shilling to the Purbeck marblers and this conferred on his wife the right to engage an apprentice to work for her, in her late husband's quarry, should she survive her husband (Hutchins, 1861-74).

Other customs of the Purbeck marblers ensured that quarries were only worked by Freemen of Purbeck and to gain the freedom one had to be the legitimate son (or grandson if the line of succession was through a female) of a Freeman and of the age of 21 years (Cockburn, 1973). Under this arrangement quarries were handed down from father to son for generations and the quarry was known locally by the name of the family that worked it, ie Phippards, Normans, Browns, Shorts, Whistlers, Ivanings etc (Saville, 1986). A map of Eight Holes Estate, Langton Matravers, dated 1806 is shown on Fig 2.5 and this shows quarries with the names of the individual tenant quarriers (DCRO, D65/E1).

Problems arose between landowners and tenants over quarry leases, the quarrier had to do all the hard physical work to quarry and work the stone into saleable form and then he had to pay a royalty which he saw as a penalty on his skill. On the other hand, the landowner wanted an income from his land, he had to try and control quarrying on his land by leases to ensure no illegal quarrying was taking place and in addition he had to check that he obtained the agreed royalty from all stone quarried.

Some examples of disputes have been discovered and the first one is a letter from J Bankes of Corfe Castle to his solicitor, Mr Filliter dated October, 1770 complaining about the conduct of Robert Benfield, marbler, of Corfe Castle. Benfield had at different times over the years opened several quarries on Bankes' land, without Bankes' knowledge or permission, and then sold them off to different persons. Bankes requires the ground to be levelled and Benfield prevented from quarrying in Purbeck and although Bankes has compassion for Benfield's family he desires to punish him in some degree as an example to others. Bankes wishes to know from Filliter at which of his courts should he (Bankes) hear the case; Corfe Castle, Langton Wallis or Rowbarrow, should he take an action of common law or should he send Benfield to Filliter at Wareham to give a security that he will behave in future. Should he refuse to go to Wareham then Benfield should appear before Sir Thomas Janson, Mr Lampard and Mr Hann at Corfe Castle. Here we have an example of a landowner protecting his interests and setting out his stall to make an example of the wrong doer, and as Bankes is a magistrate with friends in high places, he is able to be judge and jury in matters of this kind (DCRO, D/FIL/F29). Another landowner John Calcraft purchased the Manor of Worth Matravers and his agent in Purbeck, J Bishop, sent a letter to Calcrafts agent, T Williams, at Dartford, Kent, the letter is dated June 1771.

> "There is some dispute amongst the people who are now shipping stone from the quarries. They agreed a sale of stone ready to go to

FIG. F 2.5

MAP OF MANOR OF EIGHT HOLES ESTATE.
LANGTON MATRAVERS
1806.

CLARKE, SURVEYOR.

Ramsgate pier and ordered a vessel or two to load it off, loading commenced but after taken on part of the load the vessels moved to other quarries to take stone on board there. Because the stone was not taken away there is no room to work more stone, the quarries thus have lost money and the landowner has lost royalties." (DCRO, D86/E107)

In another letter from J Bishop to a Mr Pyke dated March 1777 regarding the valuation of Worth Matravers: "I may venture to say that the whole profit if layed out would not be sufficient to put the lands in the order they would have now been in had those quarries not been opened. I did never hear of quarries being valued in the sale of an estate where they lye in the good lands, which being kept open do more damage than the profits will repay. There has been talk of the value of cliff quarries when stone is being taken from the quarries for a public building at the time the estate is sold but they never brought in £20 in a ten year average. As other countries are now supplying stone for the London market on much better terms, the inland quarries will be but little value for the future." (DCRO, D/RWR/T504).

From these two letters it would appear that Bishop had formed the opinion that as far as landowners were concerned there was little or no income to be gained by allowing quarries to be opened on the land. The Purbeck quarriers claim that they had the right to dig for stone on any uncultivated land, under the terms of an ancient charter, and this was challenged from time to time by the landowners. Three such cases are reported by Benfield (1990) and in two of these cases the plaintiff's did not actually dispute the rights of the quarrymen to dig the stone but they disputed the quarrymen's assumed right to carry the stone across their land. The first case was heard at Wareham in 1854 where a Mr Bridle disputed the rights of Messrs Stickland, Haysom, Thomas, Stevens and Collins to carry stone across his field, unfortunately the outcome of the trial is not recorded.

A further dispute arose between the Earl of Eldon and the firm of Burt and Burt concerning the latter's right to dig for stone from quarries in Durlston Bay which they claimed to have 'bought' from Messrs Butler, Benfield and Haysom. Quarrymen did not actually buy and sell their quarries but recouped the initial investment they had made by their own efforts in digging the shaft and building the sheds and banker. Earl Eldon claimed he had written agreements with the three men, who reputedly 'sold' the quarry and he would allow Burt and Burt six months to quit the Durlston Bay quarries. Wrangling continued for years but finally in 1893 Burt and Burt accepted £20 as final compensation for the "surrender and release of all rights" to the disputed quarries.

In February 1904 the most famous case came to a head when two hundred Freemen of the Company of Purbeck marblers met in a field at "Greasehead" (Herston) to discuss an injunction served on George Lander, Quarrier, by Ralph Banks, landowner, to stop him carrying stone across Broadmead from a quarry that Landers had re-opened after 40 years of disuse. On March 29 1904, Lander and several other respected quarrymen, together with a large number of local lads, defied the injunction by pulling a stone laden cart across the disputed field. A solicitor had been engaged by the Purbeck Marblers who were supporting Lander in the fight against Banks who had decided to test the right of the Marblers to dig stone at law.

Photographers were on hand to record the event and having made their point the wardens of the Purbeck Marblers instructed Lander to stop working the quarry. Landers, however, stubbornly refused their request and carried on working which led to him being arrested and sent to prison in London on 21 June 1904. It is interesting to note that the charge was contempt of court for ignoring the injunction to stop carrying stone across the land, thus again the rights of the quarrymen to dig for stone in uncultivated land were never actually tested at law.

When stone is dressed at a quarry the scrap stone, knocked off by the quarrier to produce a squared block of stone, gradually builds up into a big heap over the years. Known as 'scars' the small bits knocked off were used for making roads by spreading a few inches thickness of scars and letting wheeled traffic wear it in. Farmers and landowners once claimed the right to take the scars flung out from any quarry on their land until one quarryman refused to hand over the scars from his quarry and the landowner took him to court at Wareham. Benfield (1990) records that the quarrier wrapped a scar in his handkerchief and showed it to the Judge, stating that the scar had come from a block of stone on which he paid royalties to the landowner. He further reasoned that the block of stone was his and as the scar was a part of the block of stone it was his also. Fortunately for the quarryman the Judge agreed with him thus establishing that scars belong to the quarrymen and should farmers and landowners require them they are to pay for them. Although the going rate was only 3d per ton it must have given the quarriers great satisfaction to win a clear cut case against their landlords and obtain a judgement that had actually been tested at law.

A survey of the estate of George Cary (DCRO, D/FRY/11/12) undertaken by Will Burgess in 1737 and shown in Fig 3.5 shows the two quarries on St Albans (or St Aldhelms) Head. Plate 1.5 shows the cliff quarry, which shows how the cliff has been quarried back to yield the stone, also to be seen are concrete steps leading to the cliff top and part demolished brickwork. Seen from the sea St Albans Cliff quarry

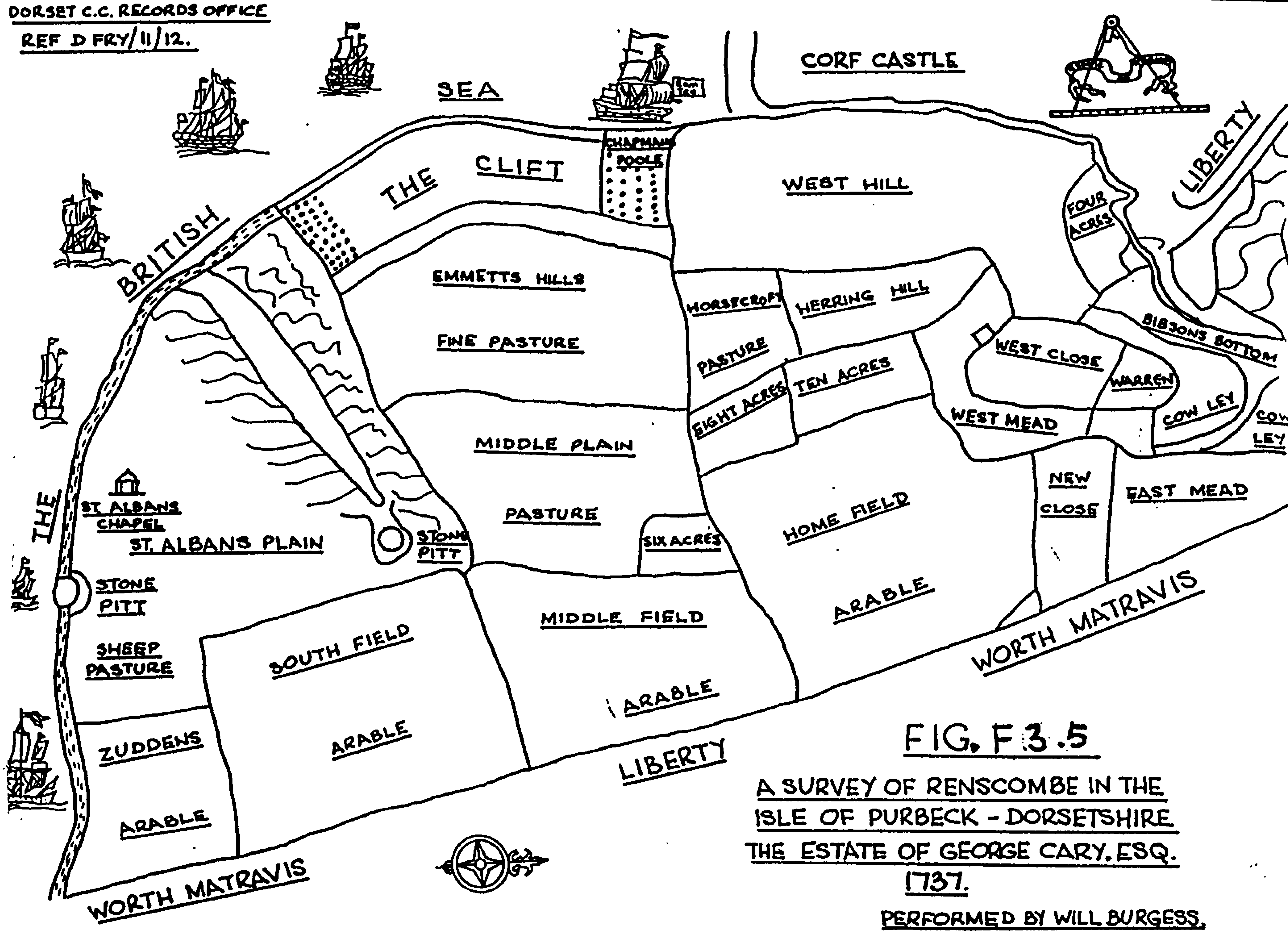


FIG. F3.5

A SURVEY OF RENSCOMBE IN THE ISLE OF PURBECK - DORSETSHIRE THE ESTATE OF GEORGE CARY. ESQ. 1737.

PERFORMED BY WILL BURGESS.

Plate 1.5 St Aldhelms Head Cliff Quarry

lies immediately below the cliff top, and this is shown in Plate 2.5, lower down the cliff face can be seen the quarry waste that was tipped from the workings. One can only be full of admiration for the quarriers who lowered stone down this 350 ft (108 m) cliff face and loaded it into boats for sea transport. An inland route was used in later years when transport by sea ended, the quarry finally closing in the 1930's and as can be seen nature is reclaiming the quarry. Lying inland from the cliff quarry is St Aldhelms (or St Albans) quarry, the second quarry shown on the map and this is shown on Plate 3.5. It quarries the same seam of Purbeck/Portland free stone that is quarried on the cliffs, but unlike the cliff quarries it is still operating today. George Cary's estate, mentioned on the map, was purchased by William Morton Pitt of the Encombe Estate, who was a major Purbeck landowner and he in turn sold the estate to John Scott the 1st Earl of Eldon in 1807.

A map of tenements in the Downshay area of Worth Matravers, surveyed by Samuel Done in 1772 is shown in Fig 4.5 (DCRO, D/RWR/E16/15) and this shows the location of the quarries there. Records of John Calcrafts estate, which incorporated the Godwins estate, dated 1775 state that Mr Pike, the tenant of Downshay Manor House is to receive the profit from the quarries that lie on the land that he rents with the house. Profits from the quarries are not therefore recorded but the rent for Downshay Manor House and 4 acres of pasture was given as £30 per annum (DCRO, D/RWR/E1). Samuel Done surveyed Godwins tenements in the Winspit area in 1772 (DCRO D/RWR/E16/14), later John Calcrafts estate, and this map showing quarries in the area is shown on Fig 5.5. A tithe map dated 1922 (DCRO T/WMT) and shown on Fig 6.5 shows other quarries in the Worth Matravers area owned by John Calcraft and records of his estate (DCRO, D/RWR/E11/1,2,3,4) give details of the stone account for Winspit and Worth Matravers quarries at various dates and they are as follows:-

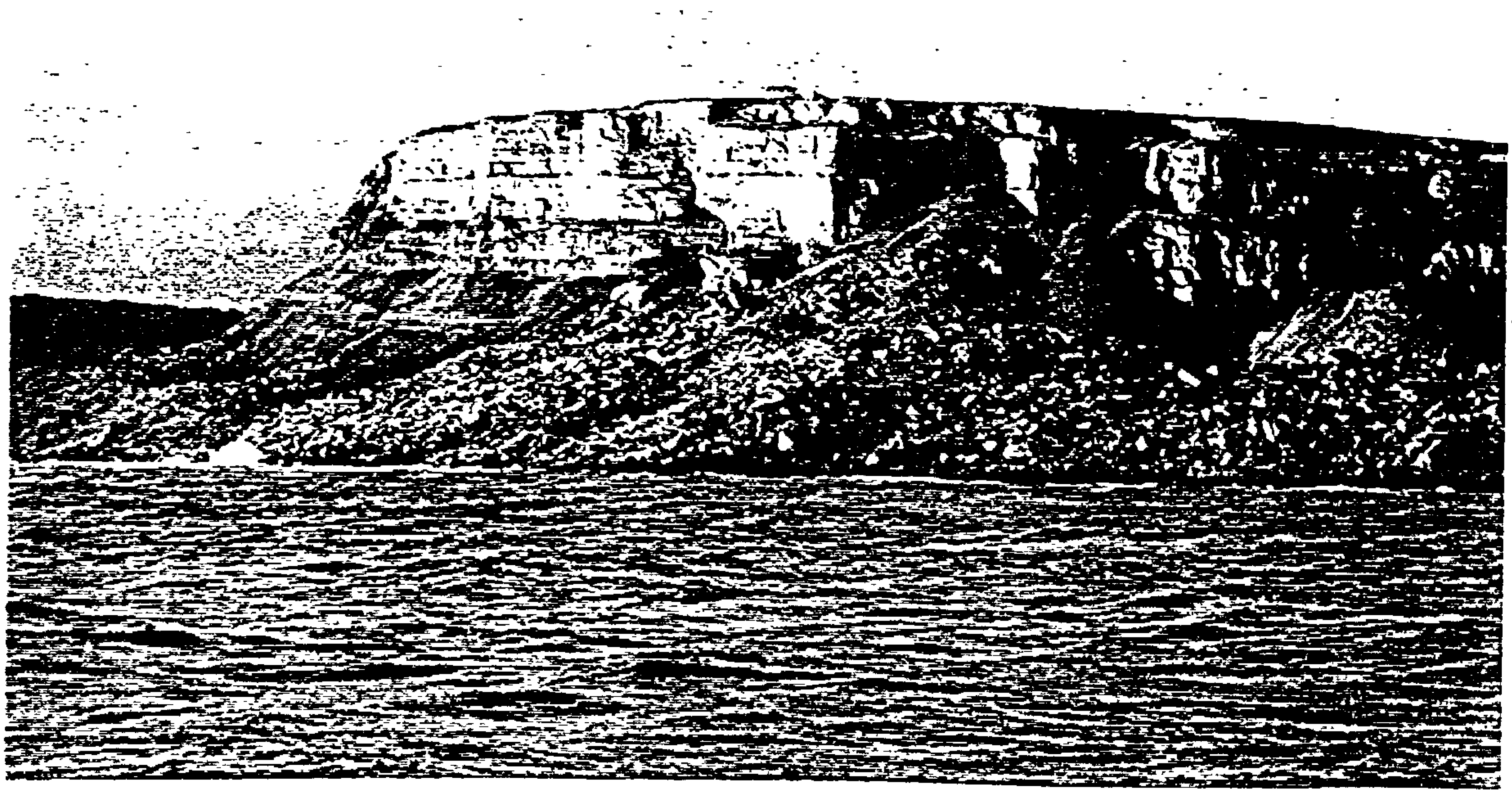


Plate 2.5 St Aldhelms Head from the sea

Plate 3.5 St Aldhelms Quarry

DORSET C.C. RECORDS OFFICE
(REF D/RWR/E16/15)

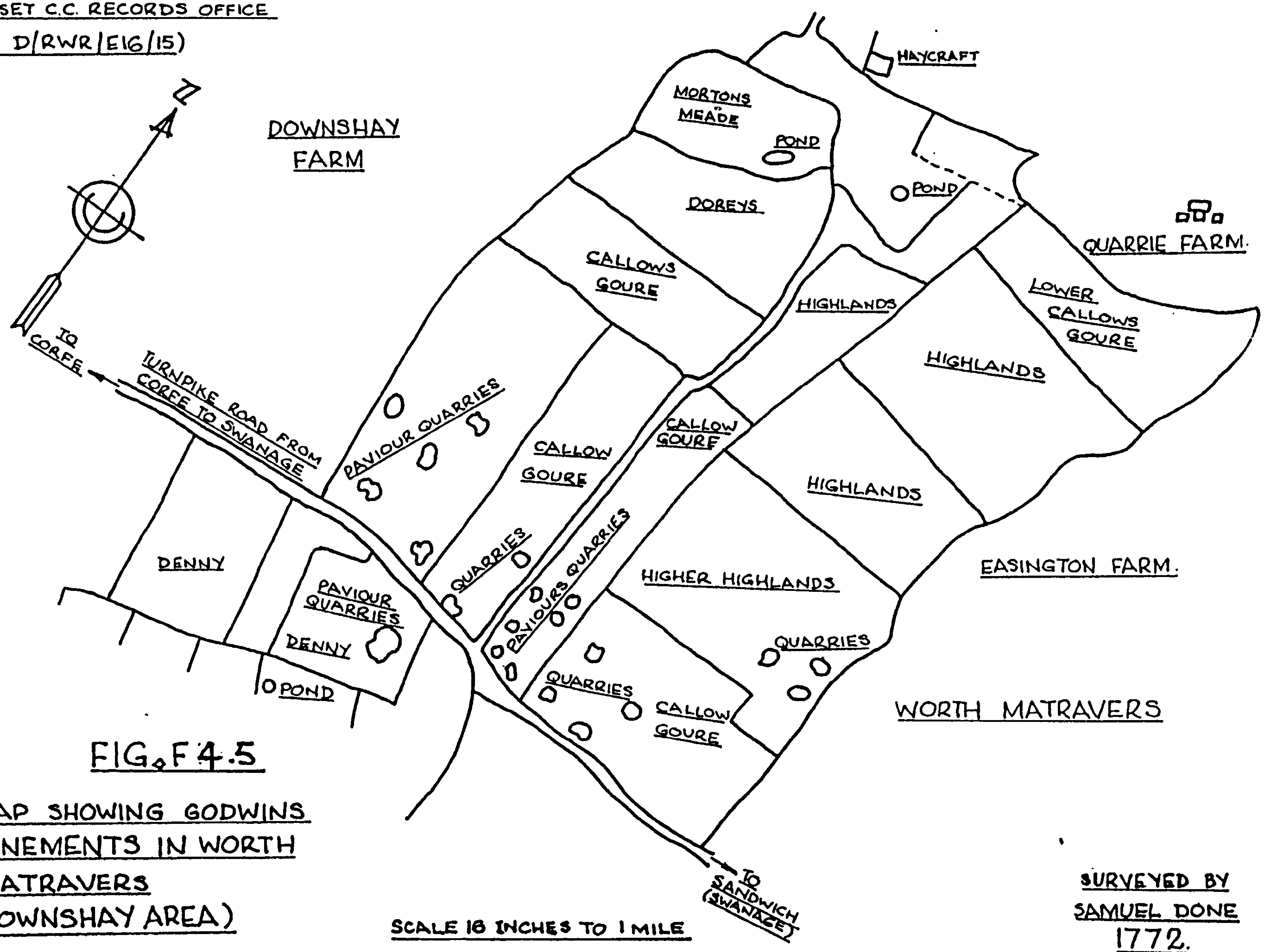


FIG. F 4.5

MAP SHOWING GODWINS TENEMENTS IN WORTH MATRAVERS (DOWNSHAY AREA)

SCALE 16 INCHES TO 1 MILE

SURVEYED BY SAMUEL DONE 1772.

FIG. F 5.5

MAP SHOWING GODWINS TENEMENTS IN WORTH MATRAVERS (WINSPRIT AREA)

FIG. F 6.5

TITHE MAP OF WORTH MATRAVERS
1922

DORSET C.C. RECORDS OFFICE
(REF. T/WMT)

Year	Total for Year		
	£	s	d
1701	42	10	2
1702	20	1	0
1703	37	9	4
	(persons in arrears)		
1704	10	19	6
1787	9	12	3
1790	13	4	9
1795	11	10	9.5
1796	9	7	4.5
* 1797	16	6	10
1799	7	0	4
1800	22	2	0
1801	23	6	10.5
1802	36	19	7
1803	28	1	1
1804	5	10	6
1805	32	4	4
1806	25	19	5
1807	19	4	8
1809	35	14	2
1810	23	10	10
1811	21	0	7
1812	23	0	10
1813	31	13	0
1814	11	2	8
1815	16	17	11
1816	19	7	8
1817	13	11	7
1818	36	3	0
1819	17	19	7
1820	23	2	7
1821	27	1	11
1823	26	19	5.5
1824	49	15	1
1825	34	6	2
1826	48	5	4
1827	71	1	1
1828	57	17	10
1829	56	10	5
1830	47	4	10
1831	58	1	1
1832	15	10	6

Some of the stone accounts are detailed and for 1787 they gave these details:

	£	s	d
William Cole	6	4	0
Joseph Chinchen		6	9
Thomas Landon		12	0
Joseph Bower		7	6
Robert Squibb	1	5	0
Samuel Bower		17	0
	9	12	3

The stone account for 1799 shows:-
Dr for stone dues to Michaelmas 1799

	£	s	d
5 tons ashlar @ 6d		2	6
3 setts legs & caps @ 1s		3	0
Joseph Chinchen			
30 peck sinks @ 1s per 30 peck		1	0
		6	6
84 tons ashlar	2	2	0
23 setts legs & caps	1	3	0
100 peck sinks		3	4
1/2 ton rollers @ 1s per ton			6
William Brown			
14 ton backing		3	6
250 feet paving @ 1s per 100 ft		2	6
	3	14	10
Samuel Lander			
400 ft paving @ 1s		4	0
Thomas Bower			
12 setts legs & caps @ 1s		12	0
14 tons ashlar @ 6d		7	0
		19	0

	£	s	d
Oliver Vye			
1100 paving @ 1s		11	0
John Roe			
300 paving @ 1s		3	0
Samuel Keates			
2203 paving @ 1s	1	2	0
	7	0	4d

NB 1 peck = 2 gallon capacity

An average kitchen sink is 1'6" x 1'3" x 9" = 1.425 cu ft
at 6.23 galls per cu ft then 1.425 x 6.23 = 8 galls app

then $\frac{8}{2}$ = 4 peck

The Stone account for 1797 shows:-

	£	s	d
1376 paving @ 1s		13	9
James Barnes			
378 - do -		3	9
		17	6
1186 - do -		11	9
980 - do -		9	9
40 feet step		1	0
Robert Barnes			
131 paving		1	6
	1	4	0
1139 paving		11	3
1000 - do -		10	0
Samuel Cates			
230 - do -		2	3
	1	3	6

	£	s	d
H Bower			
487 ft - do -		4	9
Officers of Langton Parish			
1350 ft paving		13	6
1689 - do -		16	9
	1	10	3
Peter J Bower			
800 ft - do -		8	0
533 peck sinks @ 1s per			
30 pecks		17	9
32 peck trough @ 1s		1	0
John Chinchen			
107 pair of stavil stones			
@ 1s per 9 (set)		12	0
	1	10	9
158 tons of Ramsgate			
Front @ 6d	3	19	0
182 tons of Ramsgate			
Backing @ 3d	2	5	6
37 tons ashlar @ 5d		18	6
23 Legs & Caps @			
1s	1	3	0
6 ashlar Block @ 6s		3	0
1551 feet paving			
@ 1s		15	6
64 - do - step @ 2d		1	3
William Bower			
63 - do - channel @ 1d			7
	9	6	4
Representatives of Reuben Bower			
192 ft of paving		1	9
	16	6	10

John Calcrafts estate papers for 1787 give the total income from his estate and this amounted to £88 - 9 - 3 when all expenses and taxes had been deducted. Stone dues for the year amounted to £9 -12 -3 and this income expressed as a percentage of total income is 11%. Also included in the stone accounts is an item of 10s. 6d per annum paid for 'keeping the account of the stone made at the quarries as per agreement for one year', William Bower received it until 1800 and then the task was taken over by William Brown. In the 1799 accounts was an item 'paid bill at receiving Lords rent and quarries due 1s. 11d' but no indication of who had made the demand. In his letter to Pyke, J Bishop (John Calcrafts agent), stated, "that he had never heard of quarries being valued in the sale of an estate where they lie in good lands" sale notices were examined to test this statement.

In September 1823 the Rev. John Dampier, the owner of Leeson House, sold off land at Swanage (DCRO, D65/E2). Two maps were provided with the particulars of the sale and these are shown in Fig 7.5 Durlston Bay and Fig 8.5 north from the signal house. Mr John Pushman (a Swanage stone merchant) is named as the yearly tenant of the Peveril quarries, which are stated to be productive. This land is held by the vendors under William Morton Pitt, Esq. (the owner of the Encombe Estate) dated 19 December 1774 at the yearly rent of 13s. and at the further yearly rent of £2 for the privilege of digging and disposing of stone. A piece of arable and pasture land called New Close with a stone quarry hereon in the occupation of Messrs Nathaniel and James Chinchen as tenants, size of land 3 acres, 3 roods, 7 perches. Rent of £3 per annum. Fourteen pieces of arable and pasture land in Sandwich North Field with the several productive stone quarries thereon, 9 acres, 3 roods, 7 perches. Twenty one pieces of arable and pasture land in Sandwich South Field. Tenants Messrs Nathaniel and James Chinchen, Yearly rent £10. 5. 0. Piece of arable and pasture land called Shads Croft with a stone quarry thereon 5 acres, tenants N & J Chinchen rent £5 per annum. Eight bankers or deposits for stone, total 1 acre 5 perches situated as follows:

Three on the West shore of Swanage Bay, three opposite Mrs. Colsons land and Two in front of the Ship Inn, all in the occupation of Mr John Pushman as yearly tenant with the privilege of shipping stone. Two further bankers opposite the mansion, with the tenant again John Pushman. The whole estate amounting to 75 acres was purchased by a Mr Voss for £2,400 (DCRO, ph 652).

Weston Farm, Worth Matravers, was offered for sale by Fox and Co. in 1919 (DCRO/D/COO: J/292) a map was produced for the sale (DCRO, D/RWR/P4) this is shown in Fig 9.5 and the sale particulars state:-

FIG. F7.5

SALE OF LOTS OF THE SWANAGE ESTATE SOLD BY AUCTION. SEPTEMBER 1823.

DORSET C.C. RECORDS OFFICE (REF. D65/E2)

FIG. F 8.5

SALE MAP OF SWANAGE ESTATE SOLD BY AUCTION SEPTEMBER 1823.

FIG. F 9.5

PLAN OF LAND AT WORTH MATRAVERS SOLD BY AUCTION SEPTEMBER 1919

Weston Farm - 362 acres

The purchaser of this lot will be entitled to the benefit of the 'QUARRY ROYALTIES' payable from the working of the quarries included in this lot. The Royalty amounts to 4d for each ton of stone removed. The Purbeck Stone Co have recently recommenced working and are spending a considerable sum of money in making a good approach road from the quarries into the village of Worth Matravers, therefore there is a likelihood of this benefit producing a considerable sum in the near future.

In 1919 Richards sold a 2000 acre estate on behalf of Captain Marston, RN, which comprised land at Swanage and Worth Matravers. At Swanage the sale was mainly of property including Durlston Head Castle, Great Globe, Tilly Whim caves plus 38 acres of land but there was no reference to stone quarries.

For the Worth Matravers land a map was produced (DCRO, D/RWR/P4) and this is shown on Fig 10.5 and the sale particulars (DCRO, D795/9) offered:

Downshay farm

Quarry 2.4 acres
Quarry 0.497 acres
Quarry 1.310 acres

Worth Farm

Quarry 4.6 acres

There was no reference to rents or stone dues in the sale particulars but these may have been verbally disclosed by the auctioneer on the day of the sale to tempt buyers. All the estate sale particulars given as examples plus others examined in the Records office gave no estimate of the potential stone reserves in the land offered for sale, neither were estimates given for the value of stone royalties to be expected, based on past performance. Land was sold without either undue emphasis on quarry income or future potential. John Bishop's statement in his letter, written in 1777, was proved correct and still holding up in 1919.

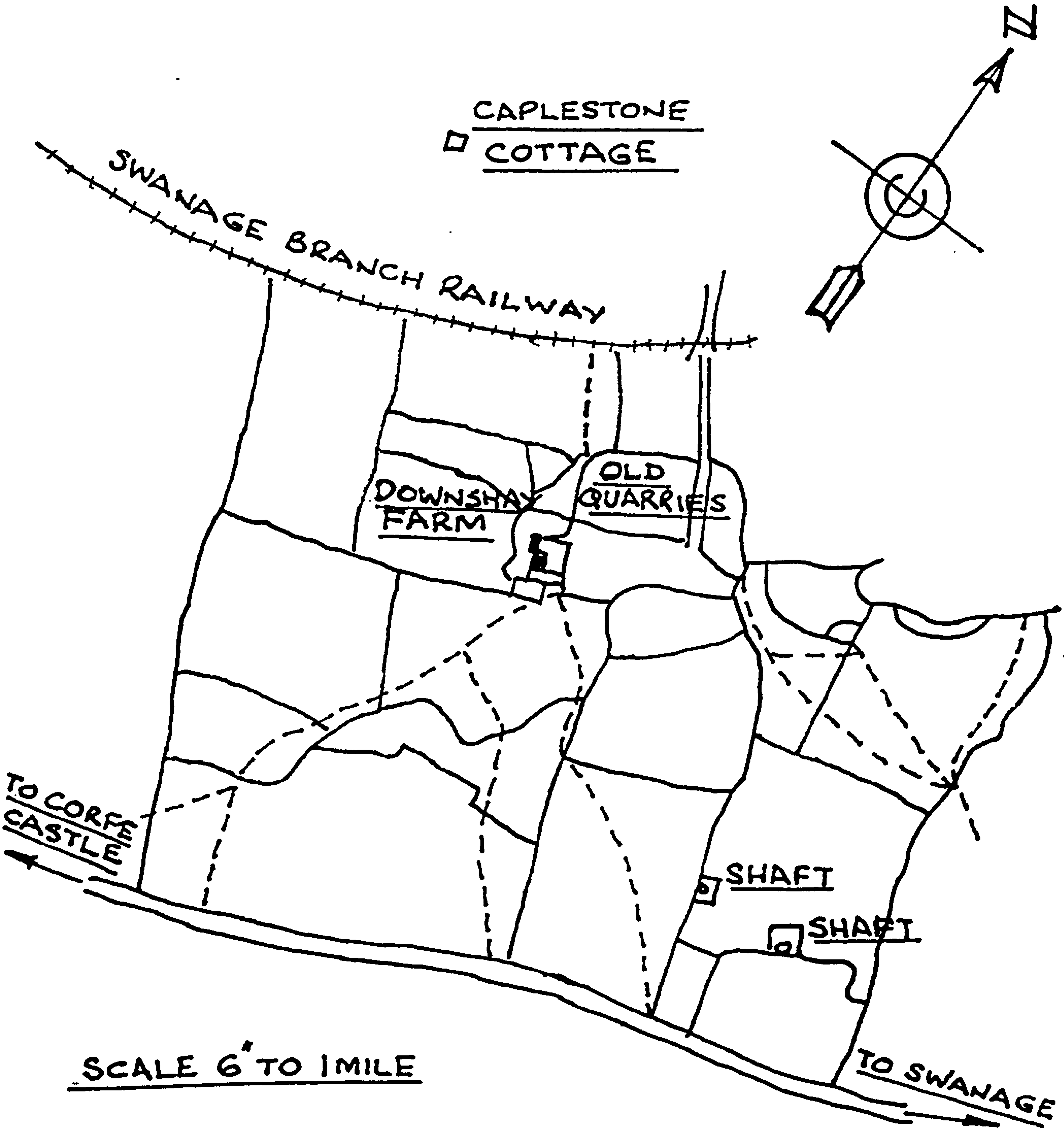


FIG. F10.5

A SCALE PLAN OF LAND THAT WAS AUCTIONED BY H. RICHARDS & SON DOWNSHAY FARM 1919

DORSET C.C. RECORDS OFFICE
(REF. D/RWR/P4.)

Leases

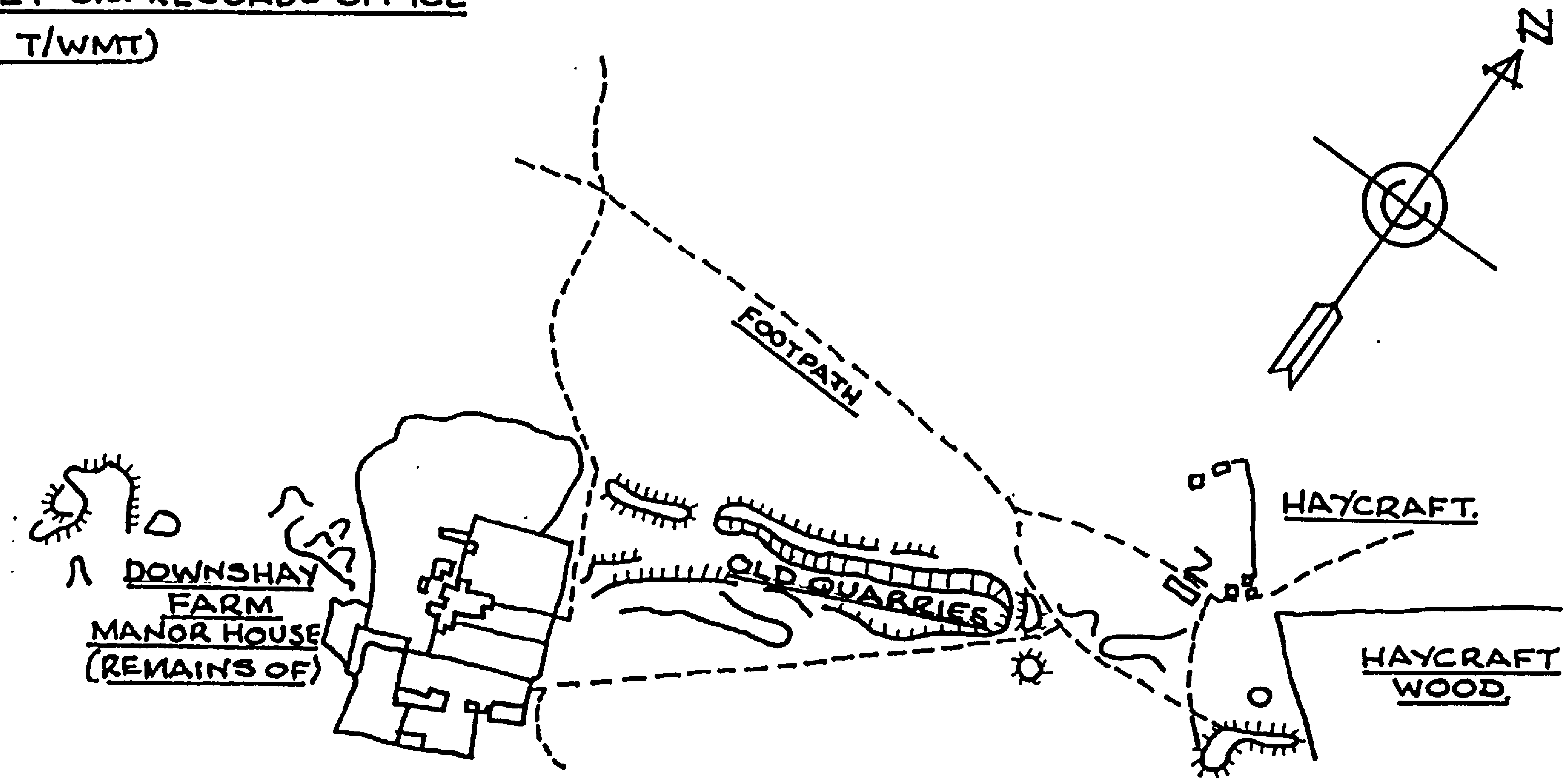
A lease dated 1886 between William Maurice Calcraft (landowner) and William Bower with James Bower (quarriers) leases a stone quarry at Downshay Farm, Worth Matravers for a yearly rent of £5 (DCRO, D/RWR/T510) and quarries at Downshay Farm are shown on the 1922 Tithe map (DCRO, T/WMT) and this map is shown in Fig 11.5.

Leases for property, land and quarries were drafted by a solicitor and written up by his scribe in copper plate handwriting on vellum. Even the smallest parcels of land or property leased by the landlord to a tenant were accounted for and a full blown lease drawn up. One such lease was for Winspit Cottage with 40 perches of land (DCRO,D/RWR/T510) between William Montague Calcraft (landowner) and Ambrose Bower (tenant). Drawn up in 1882 the lease states that the land is bounded on the South by a quarry in the occupation of William and Henry Turner and the years rental for the cottage and land was £3. 12. 6.

A tithe map dated 1922 of the Seacombe area (DCRO, T/WMT) is shown in Fig 12.5 and on this map is shown Seacombe Quarry which was owned by Henry Banks Esq and papers relating to his estate have been examined (DCRO, P11/M134). By examining these records it was revealed that rent and royalties for the quarries were paid to the landlord by the quarrier in dressed stone and these were detailed on various odd slips of paper. Dated 1808/9 they relate to payments in stone for quarries named Seacombe, Cowlease, Highlands, Idbury, Landers, High Land, Cliff Quarry and Wilkswood. There are also slips of paper recording deliveries of stone to customers from these various quarries with the name of the carrier who transported the stone, to enable the quarrier to prove that his debt to the landlord had been paid in stone equivalent. The customer would pay the landowner in cash to convert the value of stone received into coin of the realm. Ground rent for the quarries were paid monthly in stone equivalent and the tallyman appointed for the task recorded how much stone had been dressed and delivered to either the bankers at Swanage or local customers and royalties were paid on the tonnage or products produced. The quarrymen were:

Thomas and Edward Sander, Thomas Bower, Joseph Chinchen, Henry Bower, James Chinchen, Samuel Marsh, George Cull, Henry Pushman, James Squibb, Joseph Curtiss, James Hayward, Samuel Dowland, Charles Chinchen, James Barnes and William Brown.

DORSET C.C. RECORDS OFFICE
(REF. T/WMT)



SCALE 1:2500

25·344 INCHES TO 1 MILE

FIG. F 11.5

TITHE MAP OF WORTH MATRAVERS.
(DOWNSHAY AREA).
1922.

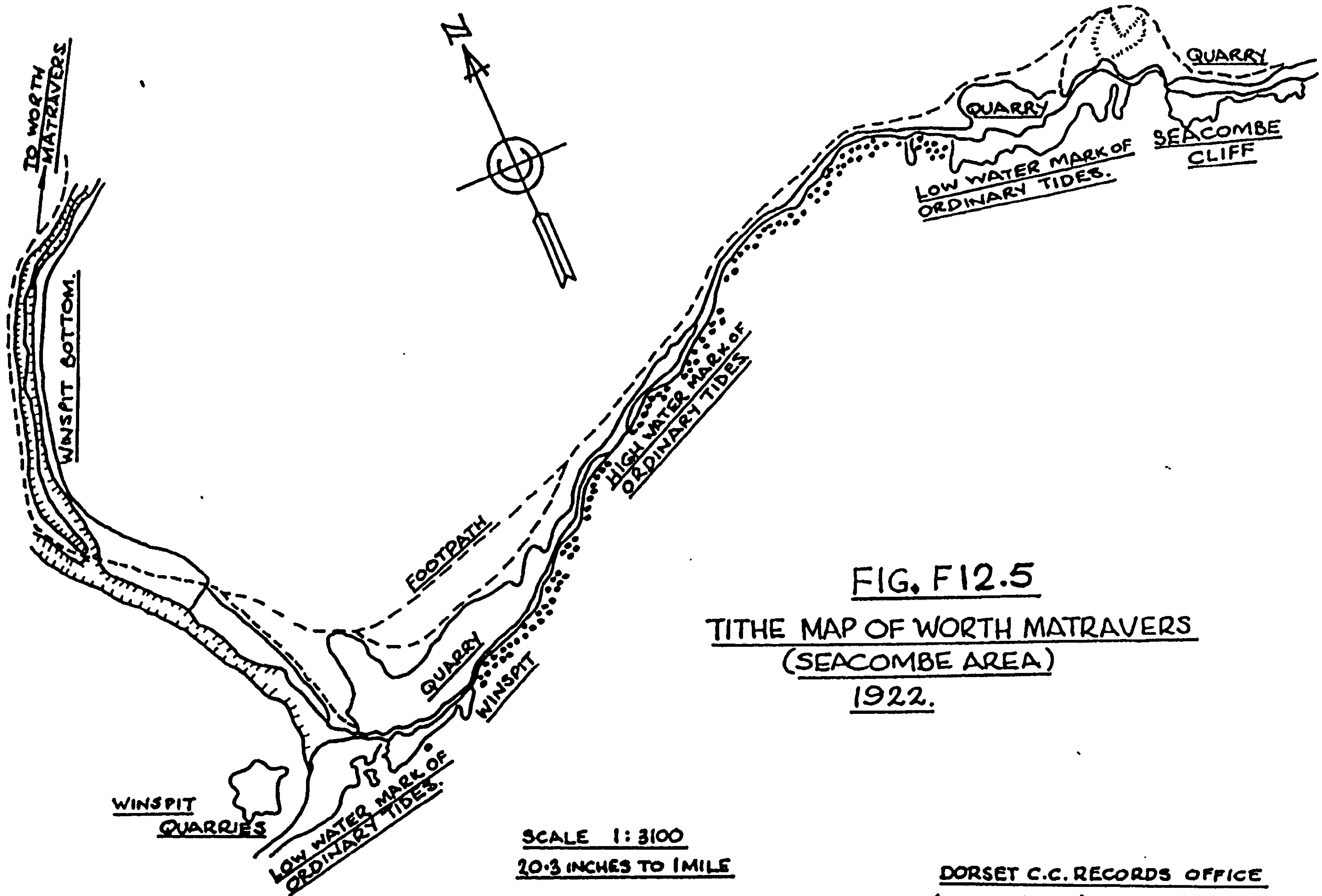


FIG. F12.5

TITHE MAP OF WORTH MATRAVERS
(SEACOMBE AREA)
1922.

SCALE 1 : 3100
20·3 INCHES TO 1 MILE

DORSET C.C. RECORDS OFFICE
(REF. T/WMT)

Mr Richard Taylor administered the stone account and the returns from the quarries were recorded on 108 scraps of paper of various sizes. Some records gave quantity of stone produced, some gave value in money, some were a mixture of stone quantity and money value, many were undated but as far as could be determined they covered a years output from the quarries in question. Quarry returns would appear to have been taken monthly and as 15 quarrymen are listed 180 returns (i.e. 12 x 15) for the year would have been the maximum possible. In the event 108 slips of paper were produced, but some of the quarries made nil returns for the month, others would not be working and no doubt small outputs would be grouped on one return so the records seem to be approximately correct.

A scale of royalties to be paid was given and this is as follows:-

6d per ton for ashlar
1s per 30 peck for sinks (1 peck = 2 gallons)
1s per 30 peck for trays
1s per 100ft of paving (100 square feet)
1s per set of legs and caps (9 per set)
2s per 100 ft run of ashlar

The years income for stone royalties to Henry Banks estate dated March 1809 was £61. 16. 5.5d.

Although the records for 1810 (DCRO, P11/MI36) for the Banks estate were examined no total value was given for the stone returns but there were many slips of paper and when the quantities were totalled and compared with the 1809 records of quantities it would appear that 1810 showed a 15% increase in royalties. In 1811 there was a dramatic fall in production, most quarries recording nil production.

Adding together the years production and applying the royalty rates scheduled we get:

	£	s	d
9793 ft paving at 1s per 100 ft.	4	18	0
49ft channel at 2s per 100 ft		1	0
93 peck sinks at 1s per 30 peck		3	0
111 ft steps at 2s per 100 ft		2	0
	5	4	0

Thus the estimated stone royalties for 1811 was £5. 4. 0. which was only 8% of the 1809 returns.

Although Banks estate for 1811 showed a dramatic fall in revenue compared with the 1809 returns, this was not mirrored in the returns from the Calcraft estate whose income fell from £35. 14. 2. to £21. 0. 7. which was 40% of the 1809 returns. Nevertheless 1809 was a year when demand for stone fell dramatically and this would be the direct result of the Napoleonic wars.

Examination of maps of the area show that the maximum number of mines and quarries are recorded on the O.S. map of 1900 and these total 132 shaft mines and 12 open quarries but many of these would be closed down.

Leases for this number of mines and quarries, distributed amongst the various landowners, must have created problems of administration and recording stone dues on scraps of paper must have been a nightmare for the estate managers. The fact that debts were paid in stone gave the landowner a further problem in that he had to sell the stone himself to convert it to cash. Perhaps the most disturbing legacy from the past is the fact that there was no policy for filling in mineshafts when the stone mines underground were worked out, they eventually get filled in and forgotten over the years. In many cases details of the underground workings were not kept, neither were they filled in when mining ceased, only the shaft locations were recorded on OS maps.

A 1925 tithe map of Swanage (DCRO,DI/LX/35/10) Fig 13.5 shows the town gradually encroaching towards the mine shafts and problems have been caused in

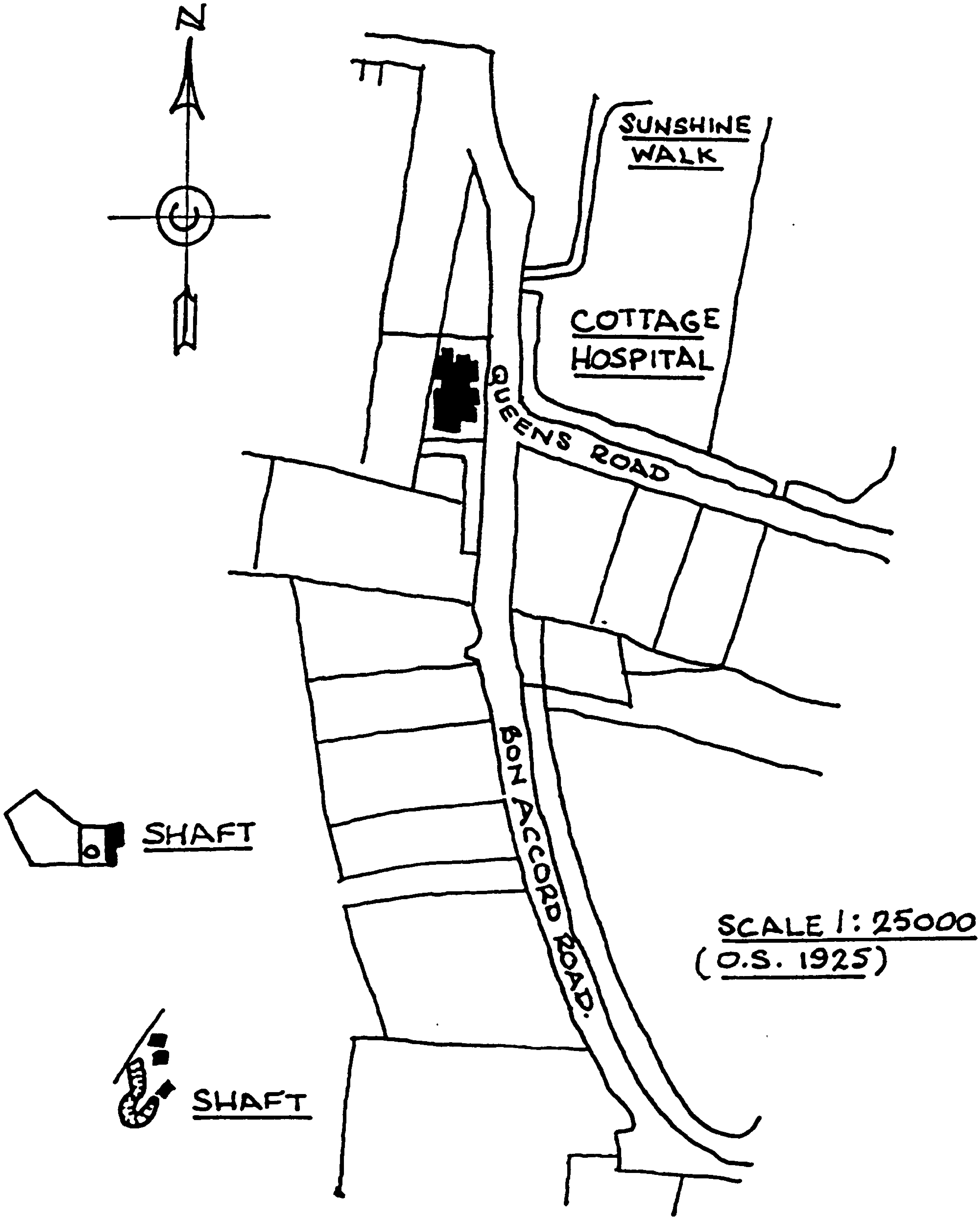


FIG. F:13.5

PART OF SWANAGE TITHE MAP
DATED MAY 1925.

DORSET C.C. RECORDS OFFICE
(REF. DI/LX/35/10)

the past when subsidence caused by underground workings has damaged property built over these workings. It is however a problem common to most mining districts when props in old workings fail causing the ground surface to drop, and old mine shafts suddenly appear when the shaft capping fails and falls down the shaft. Purbeck's problems in this area are minor when compared with Cornwall's, where the mines are numbered in thousands.

Acton village is now an active quarrying area, comprised of small quarries, and 22 leases relating to the village, dated 1680 to 1815, were examined (DCRO/D433A/T1-12) and only one dated 1711, mentions quarries of stone. In May 1894, 10 stone cottages at Acton, and the adjoining Blacklands, were sold at auction for £810 against a valuation of £1200 and again there was no mention of quarries in the sale (DCRO, D433/E5). Papers from a further small estate at Acton owned by William Hancock, a barber, dated from 1732 were examined (DCRO/D/NJH: A/E1-E4) and notes made by the estates rent collector in 1866/7 were found. He reported that the following quarrymen were in arrears:

George Bower owes		15s
Jesse "Coffin" Bower owes	£1. -	14s.
Isaac Bower an invalid		
supported by the parish owes		14s.

He also reports that the stone leaving William and James Saunders quarries between October 1866 and 1867 amounted to 9876 units and the royalties amounted to £4. 18s. 9d, this amount being outstanding. Again all the rent collectors findings were made on scraps of paper.

A lease dated 1736 was also found that specified that no stone was to be quarried on the land leased by the tenant and this clause was only removed in 1990 when the land was sold for quarrying. It would appear that even in 1736 some landowners did not want quarries in their land. A lease, dated April 1798, (DCRO, D37/8) was examined which related to the land and right in Herston Fields, Swanage, lately purchased of Robert Benfield, which is to be let to Mr Edmonds for 1s 5d per annum clear of all rates and taxes. Robert Benfield to pay 6d per annum as an acknowledgement for digging stone in a quarry belonging to the land lately purchased of him, a privilege that is to terminate with his life. This must surely be one of the earliest examples of the tax dodge which is known today as lease back.

Papers belonging to the Ilminster School Estate (DCRO, D/MOW/T7) were examined and the following Swanage leases were found:-

1855 -	land used for banking and working stone on the north side of Swanage bridge let to George Stickland, rent £2 per annum with a 1 year lease.
1855 -	Stone Banker to Thomas Randell, rent £4 per annum with a 1 year lease
1856 -	Bonfields Meadow with stone mining rights to Charles Burt, rent £25 per annum with a 7 year lease
1850 -	Bonfields Meadow to Joseph Curtis, rent £20 per annum with a 6 year lease
1849 -	2.5 acre meadow with mining rights to Robert Dugdale, rent £7-10s per annum with a 7 year lease
1849 -	2 acres called Green close with mining rights to William Vye, rent £17 per annum with a 7 year lease

Between 1817 and 1842 leases to quarry stone under similar terms were granted to:- Henry Pushman, Seth Marshfield, Moses Farwell, Robert Dugdale, William Hatchard, John Smith, Joseph Livington, John Pushman and William Vye Spencer.

There is no doubt that all these relatively short term leases for small plots of land created problems, not just for the land owner collecting rents and stone royalties, paid by the quarriers in stone that required converting into cash, but there were also problems of land ownership of small plots. The estate papers of Ilminster School reveal that in 1763 Howard Serrell lodged a claim for ownership of various plots of land against the estate (DCRO, D65/T3), his claim was as follows:-

Following is a memorandum of what ground, Bankers or boat haul is my right and property on the shore at Swanage in Purbeck this 13th day of December 1763, Howard Serrell.

1. One boat haul bounded by Mr Chapmans boat haul or banker on the east and Mr Neals boat haul on the west.

2. One banker opposite the apothecary's shop and lane from Mr Hordens and Mr Hurloits houses, by various houses bounded on the east, by Mr Neals banker and on the west side by Mr Chapmans formerly verges. Both the above were the property of my late grandfather John Howard.

3. One triangular piece of ground where I used to keep hauling stones laying between the two roads opposite Mr Chapmans great house on the south and Mr Vyes or Pushmans boat haul or banker was the property of my father Samuel Serrell.

4. One banker also on the north side the Swan now Best formerly Brines and bounded on the north by the banker belonging to Mr Chapman and on the south by the banker belonging to Mr Pushman. I bought of John Weeks, the grandson of Charles Weeks, the ground being of meadow.

5. One large banker further north and was given to my father Samuel Serrell by his relation Mrs Anna Verge (about 61 years past 1764) and is bounded on the north by half banker the property of Mr Chapman and on the south by the banker belonging to Mr Neales, the ground on West side against the meadow.

6. One banker which I bought of George Pushman and his mother Elizabeth Pushman, the ground on the west side of the meadow bounded on the north by the banker belonging to Mr Pushman formerly Vyes and on the south by the banker now Benfields formerly clerk to Mr Dollings.

Further particulars might be found in some papers and Church books delivered to the late Mr William Templeman, Attourney at Law, on account by an action at law by Chapman against Pushman for Mr Benfield and others and against Mr Cockram as Church warden to recover the houses of Brine and Smedmore held under the church of Swanage.

The books and papers are now in the hands of his son Mr William Templeman, Attourney at Dorchester, where I saw them about six weeks past.

Witness

Howard Serrell

There was no indication if the claim was recognised by the trustees of the estate but in Sept 1857, John Mowlem, a well known Swanage contractor who had made his fortune in London, purchased the estate from the Ilminster School Trustees (DCRO, D65/T3).

It was difficult to discover how the quarrymen and their families fared during this period because unlike the landowners records of their financial affairs were not kept. One example however was an appraisal of the goods and credits of Alexander Molmoth, marbler, at Tilly Whim quarry on his death in September 1704 (DCRO, MIC/R/307/4).

A full inventory of his possessions comprised:

	£	s	d
Furnishing and household items	41	8	6
Due to him on Bond	190	0	0
Quarry Tools	1	14	0
Stone at Tilly Whim Quarry	43	10	0
TOTAL	273	12	6

As land was sold in fairly large parcels, for example the 75 acre estate which had been the subject of a lease since 1774 was sold in 1823, 1838 and again in 1919 but it would seem unlikely that quarriers would be able to raise funds to purchase land, if Alexander Molmoth's affairs were typical of the quarriers considering that the 75 acres went for £2,400 in 1823.

Landowners had problems with getting a reasonable return from the quarries on their lands and the Calcraft Estate papers give a further insight into the stone accounts. A letter from J Card to T Williams (DCRO, D86/E78) reveals trouble:-

Trade accounts between Calcraft, Edmunds and Bishop.

To Thomas Williams, Solicitor, Dartford from J Card, Wareham, March 1779.

The stone trade account is so very intricate that the arbitrators will not determine which way it shall be settled, though they allow it to stand as on the other side.

	£	s	d
Sundry payments for stone etc	2060	6	11
Bad debts	199	4	0
	2259	10	11
Total amount of stone sold	2197	18	1.5
Loss	61	18	1.5

According to proposals Mr Calcraft is to bear half			
which is	30	19	0.75
Mr Edmund's one fourth part	15	9	6.25
Mr Bishop's part the same	15	9	6.5

Mr Edmunds insisted to the very last time of meeting that he knew nothing of the proposals and that he ought to have a third part of the neat profits of the trade. Since the time for settling this affair expired, which was Thursday last I have found amongst Mr Bishop's papers a letter to him from Mr Edmunds wherein he says his share was a fourth part, though he did not think himself entitled to quite so much on account of him having advanced less money than he should.

Everything I can find concerning the 1300 odd pounds I have herewith sent which are only rough copies.

J Card
(J Calcrafts agent)

All the land-owning families in Purbeck had at some time or another purchased their estates none being held as a gift from the monarch.

Corfe Castle was purchased by Sir John Bankes in 1634, Encombe estate was purchased by George Pitt in 1734 and his grandson William Morton Pitt sold it to John Scott 1st Earl of Eldon in 1807, Rempstone estate was purchased by John Calcraft in 1726 and John Mowlem bought land at Swanage from 1840 to 1860 from various sources.

Of the landowners only John Mowlem was a local boy made good, being a Swanage quarryman who had made his fortune as a stone mason in London and then returned. John Mowlem's nephew George Burt another Swanage quarryman had joined his uncle in London, becoming a partner in the firm and he too returned to Swanage in 1857, spending time and money in developing the town.

In general estates were run for the owner, sometimes an absentee landlord, by their agent who rendered a yearly account of income and expenditure, the records for stone royalties being supplied to the agent by tallymen at the quarries. Records of stone quarried were supplied, usually on odd scraps of paper, by the tallyman to the agent in return for a fee, usually 10s 6d per year, from which the agent compiled and collected the stone royalties due to the owner. As quarry rents and royalties were not paid in cash but in equivalent stone, the agent had to sell the stone to obtain cash on behalf of the landowner.

Leases were drawn up by a solicitor when land, property or quarries were rented to a tenant by the landowner and these were numerous, particularly when property was involved in Swanage, Wareham and Corfe Castle. Responsibility for accounting for the rents rested with the agent but the actual cash was collected in the towns by a rent collector. Quarrymen appeared to be in a catch 22 situation between the landlord who required rent for the quarry plus a royalty on stone raised and the merchant who purchased the dressed stone from the quarrier.

Each quarry seemed to be a small family business handed down (with a pair of overalls) from father to son. This fragmentation enabled stone merchants to extract a low price from quarriers by saying they could buy stone cheaper from another quarry when unbeknown to the quarryman it could have been a bluff. No doubt the company of Purbeck Marblers did their best to control the sale price of stone and present a united front against the merchants pressures to ensure that their member received a fair price. Some quarriers would, no doubt, yield to greater domestic pressures and be sorely tempted to undercut recommended prices in order to win a sale. A quarryman could fall on hard times if the demand for stone slumped, if he was sick, if his mine or quarry had problems or if he had not sufficient capital to tide him over till things improved.

In order to maintain a living wage other tasks such as farm labouring, fishing and smuggling had to be undertaken, but he dare not leave his quarry unworked for a year and a day in case the landowner repossessed it owing to the lack of stone royalties being paid to him. It seems that the Purbeck stone industry has had an almost feudal system for most of the time, a system that separated classes, ie King and serf, Lord and peasant, landlord and tenant, master (or merchant) and man.

Quarrymen, although skilled in a craft, seemed to be trapped on the under-privileged side of the class division. They were not able to accumulate enough capital to buy their freedom from the restrictions placed on them by the landowners and merchants. Messrs Mowlem and Burt would appear to be the only exceptions having made their fortunes elsewhere and then returned. When a quarry was exhausted the only legacy left by the quarrier was either a large hole on the surface of the land or a void many feet below it. All the stone that had been quarried, dressed or carved by his skill and labour is to be found many miles away either performing a useful function or adorning cathedrals and churches.

Landowners still had the opportunity to further capitalise on his mining legacy, open cast quarries could be used for landfill and then grassed over, mine shafts could be filled in with the old pit head buildings and rubbish then the land over the underground workings could be utilised for purposes not unduly affected by mining subsidence such as grazing or even caravan parks, as they are today.

Chapter 6

Masons and Marblers

This chapter examines how stone mining and quarrying in Purbeck is controlled to a large degree by an ancient order or guild known as the Company of Marblers and Stone Cutters, the origins of which are difficult to trace with absolute certainty. According to local tradition King Alfred in 877 AD granted privileges to Purbeck quarrymen as a reward for their assistance in repelling invading Danes by using their pickaxes and bars as weapons.

Elizabeth I was anxious to stimulate all mineral output by granting charters and she too was reputed to have awarded one to Corfe, the centre of the stone industry, along with two seats in Parliament in recognition of services rendered against the Armada, the Guild proving yet again how well it responded in times of national emergency.

Some say that the most likely person to have granted the Charter was Henry III who rebuilt Westminster Abbey, using Purbeck marble for many of its embellishments. He granted it to prevent the Purbeck men being cheated by the London Merchants (Johnson, 1985) and safeguard supplies of stone and marble for the company of Master Marblers then established in London, many of whom had come from Corfe Castle (Legg, 1989).

Queen Anne, however, was reputedly the principal patroness of Purbeck quarrymen and the charters that she granted both improved and consolidated their ancient rights. She treated them with such favour that they became known as Queen Anne's men (St Leger Gordon, 1950). They were reputedly empowered to cut timber in certain royal forests and sales of land were also made subject to concessions on mineral rights in favour of the marblers. Johnson (1985) stated that this charter was thought to have had the seal of every reigning monarch up to and including Queen Victoria added to it.

Similarities can be found in other quarrying and mining areas, in the Forest of Dean, Gloucester, the free miners enjoyed the right to work coal and iron, the operations being regulated by a mine law court under a series of orders drawn up between 1668 and 1754, a 'Gaveller' being appointed by the Crown to collect the 20% royalties (Mining Commissioners Report, 1839).

In Cornwall the mining was regulated by the Stannery Courts and this gives three examples that show that the operatives themselves exercised control over mining and quarrying of minerals before formal control was exercised by the State, when safety and the employment of women and children began to cause public concern, as mineral extraction expanded throughout the country during the Industrial Revolution.

Although Purbeck quarrymen claimed their ancient right of access to uncultivated land to quarry and mine stone, landowners circumvented this right by claiming protection under a later law of trespass which prevented stone being carted across the landowner's field after it had been quarried. It is not possible to substantiate the rights claimed by the marblers because their original charter has been lost, leaving no record as to which sovereign(s) actually bestowed the privileges. Some say it was burnt or stolen or, worse still, sold by a warden of the company of marblers to one of the many landowners who wished the folk ill (Wymer, 1953). What better way for a landowner to` remove these bitterly resented privileges than by destroying the charter that granted them, it seems however, most unlikely that a charter, no doubt written in Latin and bearing the signatures and seals of monarchs would be deliberately destroyed by anyone for fear of retribution.

All is not lost however, and a fragile document, confined to the archives, dated 1651, is lodged in Dorset County Records Office (D/MOW/Z3) which sets down the articles drawn up from ancient records.

Farrer (1859) recorded the articles (DCRO, Ph 575b) and they are as follows:-

Articles which are to be performed used and kept by the whole Company of Marblers inhabiting within the town of Corfe Castle in the Island of Purbecke in the County of Dorset ffor the good and well ordering of the company which they have generally with one consent agreed upon to fulfill performe and keep and now to be ordered and governed by under the penalties and forfeitures in the articles expressed as they are drawen out of the auntient records and the same renewed and confirmed by them at their accustomed day of meeting on Shrovtewsday yearly this Shrovtewsday it was done being the Third day of March. In the year of our Lord one thousand five hundred fyfty one as their hands and seales doewitnes.

Ffirst

That no man of the Company shall set into his fellow-tradesmans Quarre to worke there without his consent within twelve moneths and a day nor to come into any part of that ground within a hundred foote of his fellow-tradesmans Quarr upon the forfeiture of ffive pounds to be paid unto the owner of the quarr unto whom the offence shall be dun. Neither shall no man in this Company worke partners with any man, except it be a freeman of the same company, upon the forfeiture of ffive poundes.

Seconly

That no man in the company shall take any Apprentice but that he shall keep him in his owne house uprising and downe lying for the terme of Seaven years upon the forfeiture of ffive poundes to be paid unto the Wardings of the company for the use and benefitt of the whole Company.

Thirdly

That no man after his Apprentice shall take any other Apprentice in the whole terme of seaven years upon the forfeiture of ffive pounds for every moneth for as many moneths as he shall keepe him: and to be paid to the Wardings for the use of the Company.

Ffowerthly

That no man in this Company shall sell or make sale of any Stone within this Island but by his owne proper name, upon the forfeiture of ffive poundes to be paid unto the Wardings for the use of the company that no man of our Company shall under-creep his fellow tradesman to take from him any bargaine of work of his trade upon the forfeiture of ffive poundes To be paid to the Wardings of the Company for the use and benefitt of the whole Company.

Ffivethly

That every man of our Company upon notice from the Wardings of the Company be the Stewards To appeare at any place appoynted and doe not there appear according to order shall paie for his neglect Three shillings ffower pence To be paid unto the Wardings for the use and benefit of the Company, without a very lawful excuse And that noe man of our companie shall take any Apprentice that shall be base born or of parents that are of loose lyfe upon the forfeiture of ffive poundes To be paid to the Wardings of the Companie for the use and benefit of the whole Company: or that the said servant or apprentice is or have been a loose liver.

Sixthly

That upon any acceptance of any apprentice into the Company He shall paie unto the Wardings for the use of the Company six shillings & eight pence (half a mark) a penny loafe and two pots of beere That no man of the said Company shall set a Laborer worke upon the forfeiture of ffive poundes.

Seaventhly

That any man in our Company the shrovtewsdaie after his marriage shall paie unto the Wardings for the use and benefit of the Company twelve pence and the last married man to bring a football according to the Custome of our Company.

Eightly

That upon any appointed meeting at any time or at any place together ther shall any noyse, hindrance, or disturbance to the Company, upon the command silence from the Wardings and not observed, the man in default shall paie twelve pence to the Wardings for the use and benefit of the company.

Ninthly

That the Wardings of the country shall have the Company's Stocke: always provided that the Warding of the towne shall have securytie for ye use and benefit of the Company.

Tenthly

That if any of our Company at any time reveale or make knowne the secrets of this company or any part thereof, upon notice given and just proofe be made, he shall pay for his default to the Wardings for the use and benefit of the Companie five pounds.

The above Articles were signed by the Marblers of the day pledging themselves their heires, executors and assignes to maintain and uphold these Articles for ever, offering a surety of £10 each should the Articles every be breached. In 1655 the signature of Anthony ffurzman, Major, was added presumably to confirm, maintain and uphold the said Articles. No mention is made of a charter or any of the privileges it was supposed to contain.

Farrer (1859) reports the existence of a document dated 1687 which; "calls on certain persons being inhabitants of several parishes of Sandwich and Lanckton within the Isle of Purbeck and County of Dorset, Marblers and Merchants in the said Trade to resist an imposition, as they thought it, on the part of the London buyers who were claiming the right to have the stone examined and deduct the cost of the search from the price of the stone delivered. The necessity of searching (or inspecting) seems to intimate a deterioration of the stone supplied although power of search by London free masons reported by Knoop & Jones (1967) and referred to earlier in this thesis was being carried out from 1580. Fees for searching the stone were paid to the free masons, for 1621 they were £9 - 16 - 6d, in 1623 they were £7 - 18 - 4, expenses claimed by Wardens of the Lodge who carried out the search amounted in 1620 to £1 - 13 - 8, which were deducted from the fees charged.

It would appear that in 1687 the London merchants were trying to offload the search charge onto the stone suppliers in Purbeck. Two alternatives remain, either carrying out the search themselves and keeping the difference between income and expenditure on searches, or trying to wring a disguised price reduction from the suppliers.

In a minute book of Purbeck Marblers held at Swanage in 1845 (DCRO, DI/OM17) is a reference to an agreement regarding Ower Quay which states:

> A copy of the agreement between John Collins of Ower and the
> Quarriers or men called Marblers in the Isle of Purbeck concerning
> their privileges at Ower Quay.
> in the year of our Lord 1695.

To all Christian people whome this shall or may concern, this four and twentieth day of October 1695.
Being an agreement made between John Collins of Ower and the company of Free Marblers of Corfe Castle, Swanage and others of the Isle of Purbeck and County of Dorset, All who it shall or may concern:
For and in consideration of a pound of pepper and a football to be paid by the said company of free Marblers on the next day following shrove tuesday or in four or five days after, except sabbath day, then to be paid the next day following, to be paid to the said John Collins his executors, administrators or assign's at or in the New Dwelling House of the said John Collins being at Ower above saide all which being performed and paid for by the free marblers above said, they shall have use, occupy and possess the way which was formerly allowed to the said company, without any hindrance trouble or molestation of the said John Collins his Heirs or Assigns:

The bound of the way being as followeth:-
Beginning at the said house of John Collins at the East side Down along the Lane to the Strand and so to the Quay.
In witness whereof the said John Collins has hereinto set his Hand and seal this day and year above written sealed and delivered in the presence of us
Joseph Hart
Thomas Chapman, Jnr   John Collins   William Cull

Ower Quay had been the main Purbeck port for centuries, in 1090 when Corfe Castle was being built timbers for the Castle from the New Forest were landed at Ower so the agreement with Collins in 1695, some 600 years later, indicates a change in land ownership or a desire to regularise the concession. As Ower closed down as a port around 1710 when shipping moved to Swanage this agreement was only in being for 15 years.

Farrar (1859) reports that the Articles of 1651 were amended in 1697 in an attempt to place the whole trade on the footings of a Joint Stock Company thereby eliminating the problems caused by numerous small dealers possessing no capital and securing for the small quarries a fixed payment per foot for their stone. These provisions run as follows:-
And for the future improvement and better management of the decaying Trade of the said Company and to prevent the many greate and growing Evills that have and doe dayly attend the severall dealers in the Stone Trade who by reason of the deadnesse of the said Trade having of late yeares made it their practice to carry the said stone to London in Small Quantities having but little Stocks And in order to dispose thereof have and still doe Endeavour to undersell one another to the infinate prejudice of the Stone Trade by meanes whereof the price and vallue of the said stone is soe lessened and beate down that scarce any thing can now be gotten for it and consequently the wages for labour in drawing and working the said stone is reduced soe very lowe that many members of the said Company are thereby rendered incapable to support their ffamilys by the said Trade. Which mischeifes and inconveniencyes if not timely prevented will tend to the greate impoverishment if not the utter ruin of the said company. Wherefore it is hereby further agreed and consented unto as follows:

Then followed a series of six articles which in substance were

Firstly
Every member of the Company to have capital resources of £50 and all his stone to be delivered to London, to be placed in the custody of the Joint Stock Company at Swanage for collective shipment. Any member sending paving or other stone direct to London, will be fined £20, paid to the Warden for the benefit of the Company.

Secondly
The Joint Stock Company will be managed by seven persons chosen at the meeting of the Marblers on Shrove Tuesday next and they will remain in office for five years. In case of death a new person will be chosen to fill the vacancy at the Shrove Tuesday meeting next.

These managers shall have power to receive any quantity of stone that is good and merchantable with any poor quality stone being broken to maintain quality.

The value fixed for stone received by the managers will be sixteen shillings for every hundred foot of paving stone and pro rata for all other stone delivered to the waterside and these fixed rates are for the better support and maintenance of the poor labourers employed in quarrying and working the stone.

Managers of the company will then arrange to ship the stone to London, to be sold at prices fixed by the Company. Money received for the stone will be credited to members account in proportion to the amount of stone that he had delivered to Swanage.

Thirdly
Managers to be responsible for the conduct of the Company business with full power and authority to contract and pay for freight, wharfage, expenses and the staff wages. Records will be kept of each members account and twice a year the clerk shall send to each member details of his account.

All books and papers of the company may be examined by the members.

Fourthly
If any member of the Marblers who has the required £50 resources, refuses to join the Joint Stock Company the other members will neither work for him or sell him stone, should they do so they will be fined £10. Every member of the Joint Stock

Company has to agree to abide by this rule.

Fifthly
Every manager chosen to manage the Joint Stock Trade shall deposit with the wardens of the company a bond of £1,000 and faithfully perform and discharge the trust reposed in him without favour or affection and make true accounts of the proceedings and report to the Shrove Tuesday meetings.

Sixthly
All stone sent to London will be by the authority of the Joint Stock Company no member to sell stone direct to London or to sell to any master of a ship or vessel which could take it to London or within 30 miles of London. Penalty for not abiding by this rule £10.

These Articles were then signed by all members of the Joint Stock Company, each paying £20 to get the company funded and agreeing to abide by the rules.

Farrer (1859) states that he was not aware how long this Joint Stock Company was kept on foot but probably to it we are partly indebted for the practice of keeping masses of stone ready on the shore for shipment at such times as there may be a demand for it. He also stated that these were the old Articles of Agreement which bound the Company; and the same are still signed and adopted by the Quarriers of the present day, with the exception of the provisions about the stock.

Searching for the original charters has proved inconclusive. Woodward (1908) took part in the search and reported that he interviewed a lady whose husband had been imprisoned for contempt of court (Mrs George Lander, no doubt) and she stated that about 30 years ago (1878), when she was a very young girl, she saw the charter, which bore the sign manual of Queen Anne, but that it was now lost. He then interviewed a Warden of the Company of Marblers and his opinion was that the charter had been destroyed in the fire at Corfe in the 17th Century. The Warden referred Woodward to the solicitor, who had acted for the quarrymen in George Landers lawsuit with Ralph Banks, in whose possession were all the papers of the company of Marblers.

At the solicitors office Woodward found:-

1. The original articles of agreement of the Company of Marblers, dated March 3, 1551, and signed by a large number of quarrymen, those who could not write making strange hieroglyphics as their mark (presumably their

masons mark). The little pieces of parchment still form a fringe at the bottom of the deed but the seals are gone.

2. A copy of the same, unsigned, and dated March 3, 1651.
3. An enlarged edition of the articles, having more signatures appended than the earlier one, and the seal of the Company of Marblers. This has an heraldic device, on a pale, three roses slipped proper.
4. An original agreement of the Company of Marblers to object to the payment for the examination of stone required by London buyers.
5. A copy of the charter granted by Charles II to the Borough of Corfe. This charter ratifies one granted by Elizabeth I to Sir Christopher Hatton, the then Lord of the Manor of Corfe, and gives to Sir John Bankes privileges formerly Hattons. The Charter begins
'Charles II by the grace of God, King of England, etc. We have seen a charter or letters patent of the Lady Elizabeth..... Queen of England'.

Woodward (1908) considered this a very important point, he says; 'there probably was once a charter which gave the company of marblers the rights they claim, but this, if it ever existed, has been destroyed, possibly in the fire, and the quarrymen, seeing the copy of Charles II charter to the borough, and reading the opening sentences, believed it to be a ratification of their own ancient charter. It is impossible to prove a negative, so one cannot say absolutely that the charter does not exist, but I am assured by the lawyer for the defence in the trial of February, 1904, that every effort was made to find the missing grant without success. At the trial the defendants asked the Court to presume that the Company of Marblers is a corporate body incorporated by a lost grant from the Crown.

All the papers of the Company of Marblers were kept in the guild-hall at Corfe till 1830, when they were removed to Swanage. From that time they were kept by one of the Wardens of the company until 1904, when they were handed over to the Company solicitors at Poole'.

A minute book of the company of Marblers of a meeting held at the New Inn, Swanage on Shrove Tuesday 4th February 1845 has been examined (DCRO, D1/OM 17). In the front of the book are hand written the ten Articles of the company dated 1651 and the agreement to pay a pound of pepper and a football to John Collins for the right of passage to Ower Quay. There is no mention of the agreement made to inaugurate the Joint Stock Company so this seems to confirm Farrers (1908) statement that the marblers no longer renewed their allegiance to the Joint Stock Company at their Shrove Tuesday meetings. The minute book also records the following:-

'At a meeting of the Company of Marblers this day held at the New Inn, being the anniversary of the said company, it is agreed to admit the following persons, who have served their lawful apprenticeship, as freemen of the said Company of Marblers, by paying the sum of six shillings and eight pence together with one quart of Beer and one penny loaf, according to ancient custom

		Marriages	
George Alford	6. 8	Samuel Collins	1
Wm Bower	6. 8	Robert Harden	1
Saml Collins	6. 8	Henry Hurlock	1
Robt Harden	6. 8	William Collins	1
Henry Webber	6. 8	Moses Corban	1
Jos Chinchen	6. 8	Peter Bower	1
Thomas Burt	6. 8	Robert Chinchen	1
Thos Shott	6. 8	William Melmoth	1
Chas Edmunds	6. 8	George Stickland	1
John Harrast	6. 8	Martin Stickland	1
Saml Manwell	6. 8	Charles Phippard	1
Peter Bower	6. 8	Charles Chinchen	1
Robt Chinchen	6. 8	Joseph Chinchen	1
Robt Norman	6. 8	Phineas Melmoth	1
	£4. 13. 4d	Thomas Stevens	1
		Robert Norman	1
		John Meader	1
			18s

Disbursements Shrove Tuesday February 14th 1845

Carrying money to the bank at Wareham	2. 6
Steward	2. 6
Clerk	2. 6
Ball	1. 0
Paid Edmund Phippard for going to Corfe	2. 6
Paid Cornelius Webber for going to Corfe	2. 6
Paid Stephen Hayson for going to Corfe	2. 6
Paid Peter Webber for going to Corfe	2. 6
	18. 6

Henry Webber, Steward for the ensuing year

Charles Chichen) Wardens for the ensuing year
Robert Burt, Sen)

Brought over	4. 13. 4
Marriage shillings	18. 0
	5. 11. 4
per contra	18. 6
	£4. 12. 10

carried to bank account £4, remaining 12s 10d kept in part payment of a box ordered to be made.

Although from the accounts the Company appeared to be small in size it did ensure that its members abided by the Articles of Association. About the period that these minutes were written Woodward (1908) reported an incident in 1859 showing how tenacious the quarriers were of their customs. A person who was neither a freeman nor the son of a freeman was employed in a quarry at Swanage. The Company objected to his employment and threatened to carry off five pounds worth of stone (the fine) from the stock of the delinquent. They would have been justified in doing this by their own law, but by no other, and the employer realising that the company was right, discharged the offending labourer.

A further example of industrial trade restrictions being enforced by the Marblers is quoted by Legg (1983) stating that four lads were thrown out of work in the quarries because the operative trade union, the Company of Marblers and Stonecutters, disapproved of their employment - because they thought it deprived their own members of jobs. The youngsters were regarded as cheap alternative labour. The four lads had been in the employ of Nathan Chinchen White and his agreement to dismiss them and abide by the rules of the Marblers in future is as follows:-

Swanage March 29th 1865.
I do hereby agree with the wardens of the Company of Marblers and Stonecutters of the Isle of Purbeck to discharge from my employ on Saturday April 1st 1865 two lads viz

Dowland and Cole

I further agree to discharge from my employ in June 1865
one lad viz Damon

I further agree to discharge from my employ in June 1866
one lad viz Mitchell

Frederick Arney to continue in my employ but not to become a member of the Company. I also further agree not to employ any more lads contrary to the wish of the said Company of Marblers and Stonecutters. Signed at a meeting of the Company held in Greyshead March 29th 1865.

The agreement was signed by the said Nathan Chinchen White and was witnessed by the two Wardens of the Company Richard Benfield and Henry Ferymouer. The agreement carried a sixpenny fiscal stamp. Legg (1983) refers to a report by the Governments inspector of factories and workshops issued in March 1880 and published in the Globe newspaper stating:-

The 'islanders' of Purbeck and Portland as remarkable in their habits and having a settled idea that the workings of the quarries in those localities is a privilege of their own, and they not only resent the intrusion of other workmen but go so far as to qualify the latter and, indeed, the whole world outside Purbeck and Portland, by the approbrious title of 'foreigners'. The Purbeckians of Swanage maintain that this privilege is secured to them by an ancient charter providing that no person may establish himself in their trade who is not a direct descendant of some local quarryman.

This, however, is far from being the whole extent of the immunities claimed by the islanders .... Both people have a strong objection to being interfered with, the Purbeckians especially holding a sort of tradition that they are beyond all laws, and that they would have a sort of right to make regulations for their own government, the general sum of which appears to be to arrange that they should do as much, or as little, work as they please, have unlimited beer, and send their offspring to school, or not, at discretion, which would result in about ninety per cent growing up uneducated as their parents boast that they are themselves.

So tenacious are both races of their individuality that they will not even contract matrimonial alliances with the foreigner, but intermarry amongst themselves so that nearly everybody in both localities is related to everybody else. Notwithstanding this fact, it appears that the evils which are generally supposed to result from intermarriage are not particularly noticeable but, on the contrary the health of the community is so good that no one could fail to be struck by their unusually fine appearance, and at Portland boys of thirteen or fourteen are often found to look as if they were two years older. An example showing that Purbeck people thought that the laws of the land did not apply to them is given by Legg (1983) who records that in a court case in 1880 it was heard that a young boy, Jesse Stickland, was working full time stone dressing at Swanage and had not been sent to school. In his father's defence, it was said that Swanage quarrymen were under the impression that "lads working in the mines do not come under the Elementary Education Act. They thought the inspector was carrying out the spirit of an obnoxious act which was hostile to them. They think they can do what they like with their own children".

The case was found to be proved but no fine was imposed. The magistrates only "wished the defendants to comply with the law of the country" and ordered payment of costs. It was pointed out by the inspector that the stone workers could send their children to work at ten years old, providing they kept them at school half time until they were thirteen.

George Burt, one of the justices, remarked that Purbeck men were rather strong headed but he would advise them to look upon the inspector as a friend rather than an enemy. The inspector replied: "We are on the best of terms except when it comes to keeping the law". The Earl of Eldon (Encombe Estate) supported the backlash against the Act and was in the chair at a meeting of the Wareham and Purbeck Union which came out in favour of ending "the compulsory sending to school by the labouring and industrial classes of children after the age of twelve, and allowing their full employment at that age.

The Langton burial registers, however, show that several children met horrible deaths when working in the mines.

It would appear then that the documents that have influenced the Purbeck Stone industry are the lost Charter(s) and the Marblers Articles. The lost Charter(s) reputedly conferred certain privileges on the Purbeck quarriers, in recognition of their services to the crown, the foremost of these appearing to be the right to quarry stone from uncultivated land, but his supposed privilege was circumvented by the landowners and thus never tested at law.

Keeping children away from school because quarrymen in Purbeck were under the impression that 'lads working in the mines were exempt from elementary education' was surely never a privilege granted by some ancient charter.

It would appear that the Marblers Articles, the privileges granted in a lost charter and local customs have to a degree become intertwined and no doubt over the years imaginary privileges were added, to the conveniently lost charter, when an alibi was required. Local customs and privileges set down on a lost charter can not be substantiated by law. Thus the only documentation that can be substantiated in the Purbeck stone industry are the Articles of the Marblers which seem to date back to 1551.

Because of its date of commencement it seems to have its roots as a Craft Guild and this definition is reinforced by the rules of apprenticeship imposed on its members. Although Trade Unions evolved later with the commencement of the Industrial Revolution, Elbourne (1949) defines Trade Unions as "the regulation of the relations between workmen and workmen, or between masters and masters, or the imposing of restrictive conditions on any trade or business, and also the provision of benefits to its members", and this definition surely applies to the Marblers Articles as well.

Every Shrove Tuesday the Purbeck Marblers meet at Corfe Castle to renew and confirm their Articles and admit new members, in earlier times the ex apprentice 'freeboys' or members were allowed to kiss any female who took their fancy on that day and on Candlemas Day 14 February all persons wishing to take out their Freedom of the Company would assemble with the Stewards of the Company of Marblers, and accompanied by a band, parade through the streets of Corfe Castle and Swanage (Farrer, 1859).

When an apprentice had served his seven years unpaid apprenticeship he had to submit to the Wardens, for their inspection, his test or apprentice piece, usually a stone mantel clock case or a miniature tomb chest. If he passed this trade test and satisfied the members that he met all the other necessary qualifications, birthright, etc., he was admitted to membership and received his certificate (Saville, 1986).

The Articles of the Marblers were presumably enforced throughout the year by the Town Warden, who supervised Corfe Castle and the Country Warden, who looked after the country districts. They have the power, under Article 5, to direct the Steward to summon members to attend at any place in order that they may settle problems arising.

St. Leger Gordon (1950) reported that the company remains an exclusive body and no one is allowed to work upon ground within its jurisdiction unless he is a Member of the Company. As a concession to present difficulties this rule has been modified to admit labourers, that is to say unskilled men working at a lower rate of pay.

To qualify for skilled membership a candidate must still serve an apprenticeship but admission can, however, be gained by a back door process. Should an outsider desire to become a member by a shorter route he may 'commit an offence' upon ground within the jurisdiction of the marblers. By paying the fine that they imposed he admitted to the authority of the marblers, became subject to their laws, and so automatically one of its members.

Persons of suitable standing who have given support or rendered a service to the company or exhibited a high degree of skill in carving and working stone may be invited to join by the members. It must, however, be appreciated that the Company of Marblers is a secret society and members may refute what has been stated here on admissions to membership. As they are sworn to secrecy it may be difficult for them to put the record straight without breaking their vows.

The afternoon of Shrove Tuesday, when the marblers meet, is a recognised holiday for apprentices throughout the country. At noon they leave their place of employment, in a highly decorated state if they have been caught by tradesmen who lost the holiday concession when their 7 year apprentice ended. Apprentices then adjourned to the local recreation ground for a football kick about and then the over 18's (?) visited the local public house.

Guilds are celebrated in other parts of the country, probably the most notable being held in Preston, Lancashire every 20 years. Preston Guild occurred in 1992 when various events took place during the year culminating with a 4 mile long procession through the streets of the town. Every Shrove Tuesday the company of Marblers meet at mid-day at Corfe Castle and they call members to the meeting by ringing St. Edwards Church bell. At the sound of the bell the Marblers assemble in the Town Hall, the smallest in England, which is next to the church and this is shown in the Plate 1.6. Opposite the Town Hall is the Fox Inn, dated 1568 and shown in Plate 2.6 where some of the marblers were partaking of pre-meeting refreshments, but at the sound of the church bell they filed across the road into the Town Hall for their meeting, Plate 3.6. When the meeting of the company of marblers and stone cutters commenced, in this case the 3 March 1992, the doors of the Town Hall were closed to outsiders and the meeting was held in secret. Part way through the meeting a member of the marblers left the meeting to escort two 'apprentices' from the Fox Inn to the meeting . Each apprentice carries a penny loaf, a quart of beer, and presumably 6s. 8d, they are shown in Plate 4.6, leaving the Inn to be admitted into

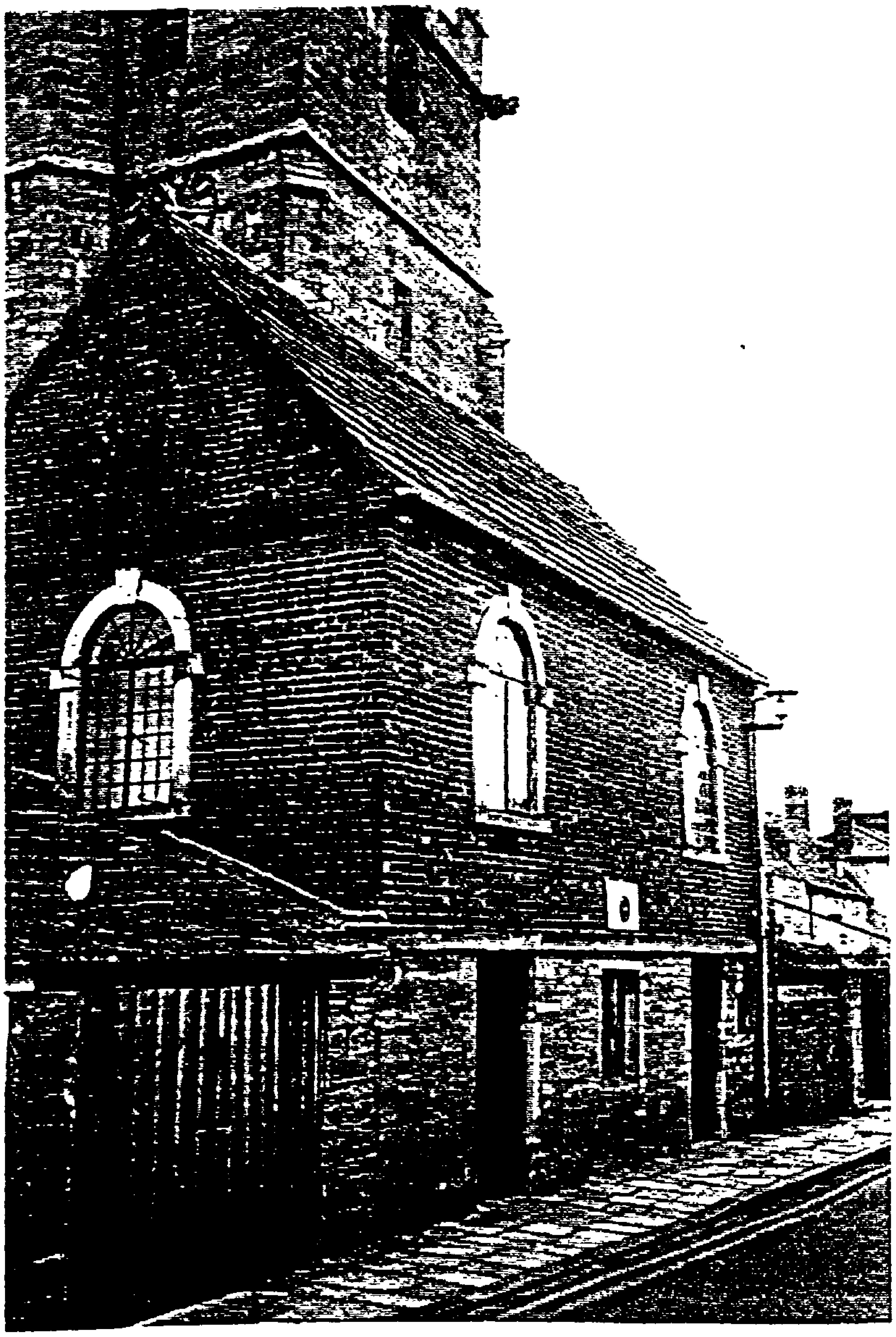


Plate 1.6 Corfe Castle Town Hall

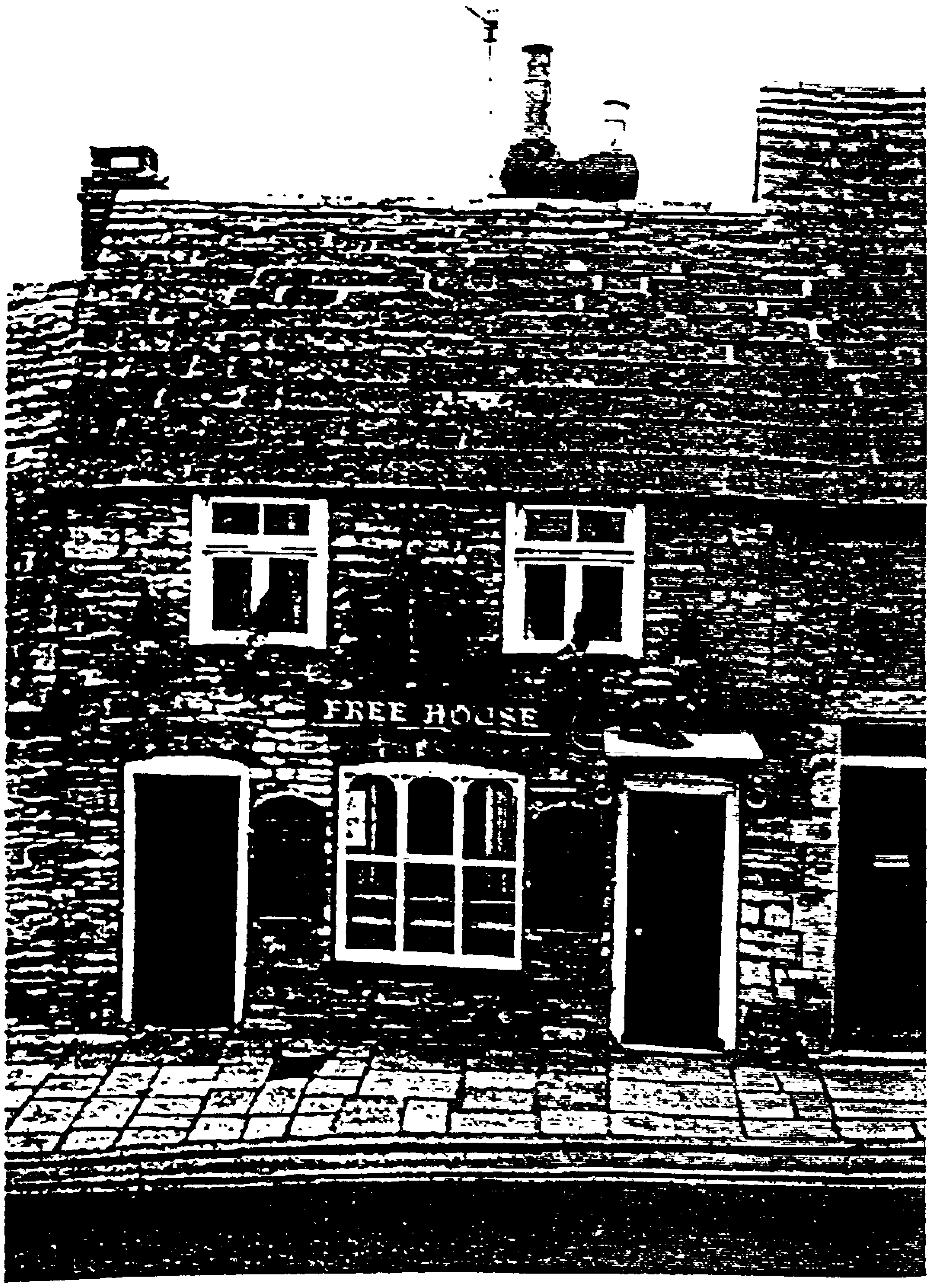


Plate 2.6 The Fox Inn, Corfe Castle

Plate 3.6 Marblers attend their meeting

Plate 4.6 Apprentices leave the Fox Inn

membership. At the conclusion of their secret meeting the members left the Town Hall and proceeded to kick a football around Corfe Castle, first, as shown in Plate 5.6, across the 'halves' and then, as shown in Plate 6.6, down the main street and back to the Town Hall to symbollically keep open their right of way. Also at the conclusion of the meeting a pound of pepper and the football were taken to the New Dwelling House at Ower in payment for their right of passage to Ower Quay which stands on the shore of Poole Harbour and shown in Plate 7.6.

No crowds lined the street to witness this ancient ceremony, as the photographs show, and a young policeman, unaware of the annual ritual, and witnessing a football being kicked through the main street by a gang of grown men, which disrupted the traffic, wanted to book all of them until the significance of the event was explained to him.

A report in the Western Gazette (1976) stated that the newly retired Rector of Corfe Castle was to remain as chaplain to the Marblers having conducted their service for 21 years. Farrer (1859) reported that the Mayor of the Borough of Corfe Castle used formerly to be present at the meetings, but his presence has of late years been discontinued but the Bailiff of Corfe Castle Borough still attends and receives a fee of two shillings and sixpence. Thus the tradition of the Marblers lives on and their ancient rites are performed every Shrove Tuesday in Corfe Castle.

Plate 5.6 Marblers crossing the halves

Plate 6.6 Marblers play football in the street

Plate 7.6 Ower Quay

Chapter 7

Development of the Industry

With the introduction of turnpike roads in 1780 followed by better road construction using Macadam's methods 1820 roads into Purbeck gradually improved. It was, however, only with the introduction of the railway in 1885 that Purbeck ceased to be considered an island. Prior to these improvements in communications stone was in the main transported by sea, only passengers and light goods travelled inland by road and because of cost and weight, stone was only carted locally. Prior to the introduction of metalled roads, land transport was confined to horse and foot traffic over trackways and bridlepaths.

Although the railway improved communications to Purbeck and allowed stone to be transported by land over long distances it also brought competition from other areas, York stone and Aberdeen granite etc., became easily obtainable in areas where Purbeck stone had a virtual monopoly in the days of sea transport. Between 1850 and 1900 the stone boats leaving Swanage gradually decreased in number and the last stone shipments were made in 1896.

In the heyday of sea transport 60 ships were engaged in the Swanage stone trade and were known as the 'stone armada' and up to 1860 all contact was by sea. Coal, provisions, clothing, etc., were transported by the ships returning to Swanage for more stone, so there was no great demand for transport inland and this sense of isolation must have contributed greatly to the feeling that Purbeck was indeed an island when all contact was by sea.

In an attempt to improve the transport of stone by sea a pier was built at Swanage and this is show in Plate 1.7. In 1859 it was proposed to link the pier to all the quarries as far away as Langton Matravers with a tramway to eliminate horse drawn traffic through the town, the bankers of stone on the shore and the horse drawn stone carts wading out to the stone barges.

Although the pier was built the tramway shown in Plate 2.7 only connected to the stone bankers and a later proposal to connect it to the railway never materialised. Swanage began to change from a stone port to a holiday town, the first day trippers arriving by paddle steamer in 1871 and the number of day trippers increased when Bournemouth built a pier in 1880. To handle this influx of day trippers by paddle steamer a second pier was constructed at Swanage in 1896 and this is shown in Plate 3.7 but when the stone shipments ended in 1896 the first pier became redundant, but continued in use until 1920, mainly receiving ships bringing coal to Swanage. The Swanage branch line to the main line at Wareham enabled holiday makers from far

Plate 1.7 Pier at Swanage for shipping stone

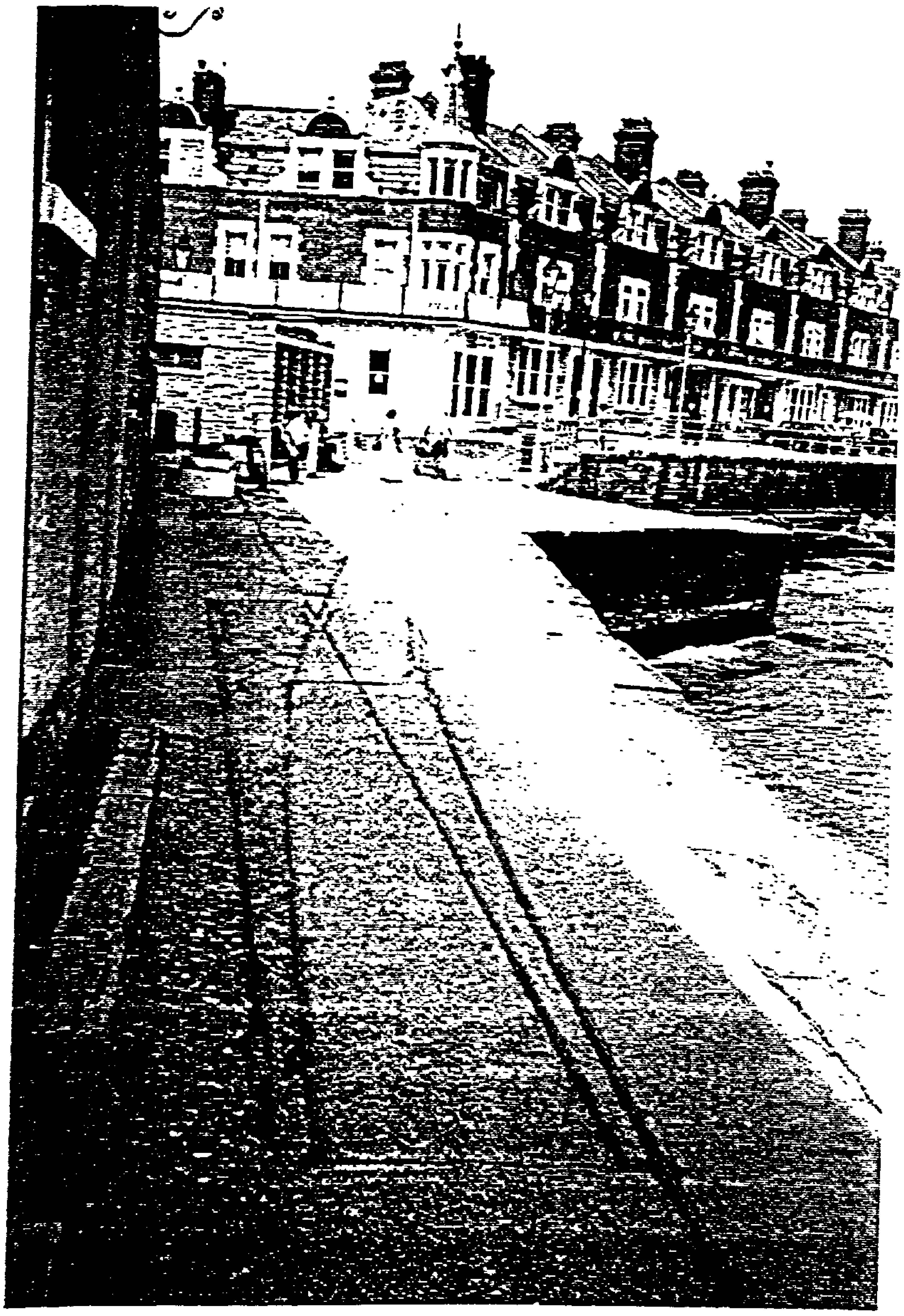


Plate 2.7

Swanage Tramway

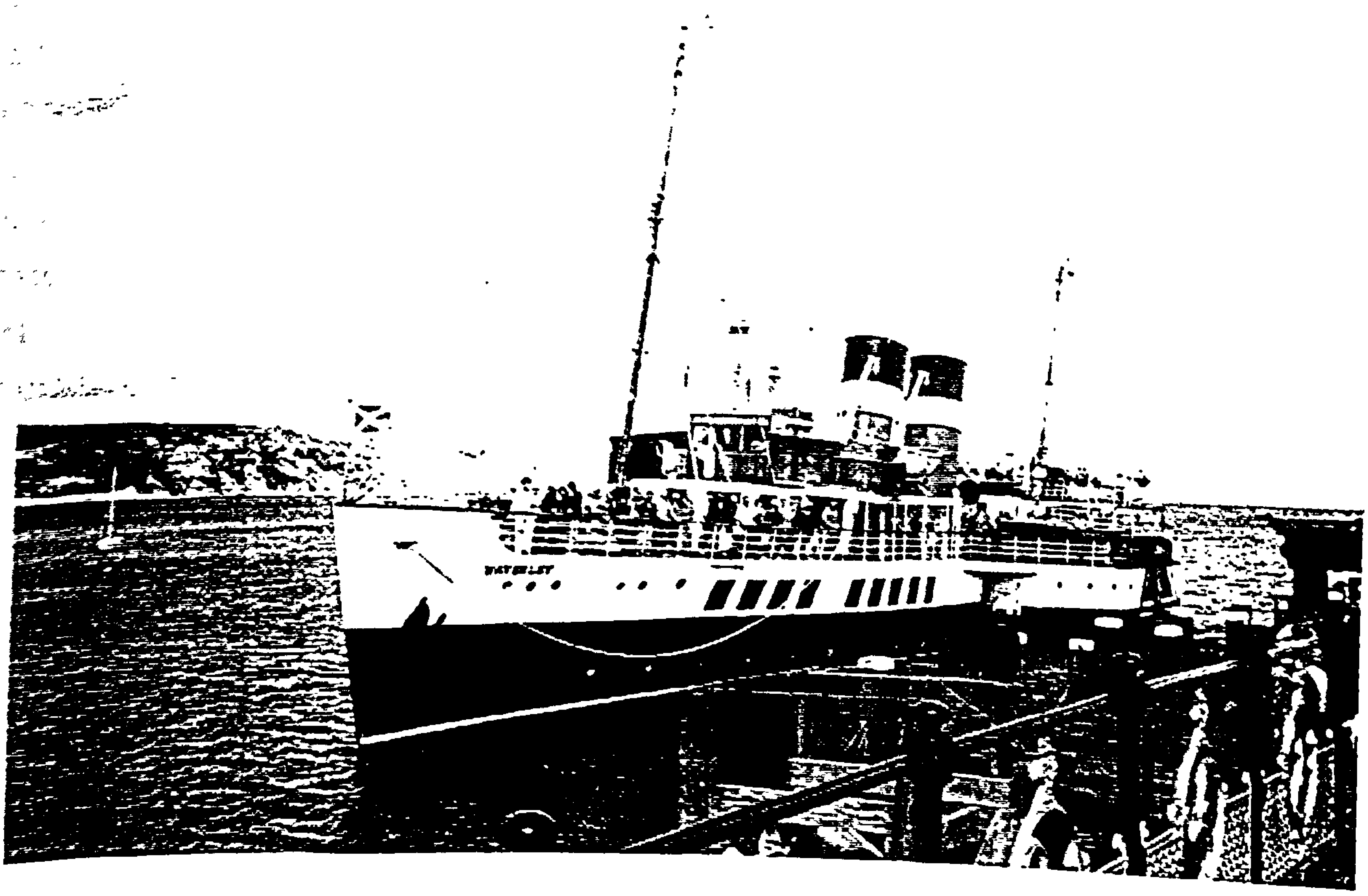


Plate 3.7 'New' pier at Swanage

afield to visit Swanage and the stone bankers disappeared to be replaced by the Parade and Institute Road (Legg, 1983) and the site is shown in Plate 4.7. Quarrying began to move further inland as the Swanage quarries became worked out so from 1900 Swanage became basically a holiday town, breaking with its industrial past.

Stone was transported by train following the opening of Swanage station and the large goods yard adjacent to the station is now a car park, this is shown in Plate 5.7. Road transport gradually took over the transport of stone from the railways and when the Swanage line closed down in 1972 stone had not been carried for many years.

Shipments from Swanage commenced in 1700 when Ower closed down and although Purbeck paving was being shipped into London, and being inspected by freemasons in 1580 (Knoop & Jones 1967) the boom years occurred when Swanage was the stone port. Around 20,000 tons per annum were being shipped in 1700 when the port opened rising to 50,000 tons per annum in 1800 and falling to 40,000 tons per annum when shipments ceased in 1896. Claridge (1793) recorded that there were 400 males employed in the stone industry, Stevenson (1815) recorded that the number had fallen to 300 but Payne (1850) stated that 600 males were employed in the industry. Weinstock (1967) carried out a survey of the Corfe Castle Census returns for 1801 and found that the population was 1,239 and of the male population 27 were engaged in the stone trade against 55 clay cutters. Some of the males who were listed as labourers could also have been employed in the clay trade.

It was interesting to note that men were moving away from Corfe, i.e. their births were recorded but not their deaths, to seek employment elsewhere and this is reinforced by the fact that 241 of the total male population of 613 were under 15 yrs of age. As well as the usual trades of butcher, baker, etc., Corfe Castle had 16 shoemakers and 10 Blacksmiths and sadly 1 person in 17 was receiving parish relief. A national census takes place every 10 years with a 100 year embargo on the detailed returns but for later years various bulk statistics are given which because of the 100 year embargo preclude a detailed analysis of the figures.

First the detailed returns for the Purbeck district were examined to determine how many men were engaged in the stone industry and this covered the period 1841 - 1891. Next the bulk statistics for the years 1911 to 1991 were examined in order to extract the relevant figures for stone workers in Purbeck. Detailed statistics for the period 1841 - 1891 include in the totals, masons, stone masons, quarriers, merchants, apprentices and stone masons labourers. They also give retired stone masons and stone masons widows, but it was not recorded if the mason had retired through injury or if the widows husband had been killed at his workplace, but as some were

Plate 4.7 Site of the Stone Bankers, Swanage

Plate 5.7 Old Goods Yard, Swanage

relatively young there is a strong suspicion that this could have been the case.

Records, particularly those for 1851, show that amongst the paupers some are recorded as pauper stone masons and these are not included in the totals as it is assumed that they were not working. It was not possible to determine from the records if they could not find work through lack of demand for stone, if they were bad employees, if their mine was unworkable or if they were injured. As many masons were still employed in their seventies and as demand for, and production of, stone were then at their peak it seems highly unlikely that pauper masons who were relatively young would choose not to work if they were fit to do so. An additional clue that they were unfit to work is provided by the fact that apprentices were still being taken on to satisfy future demands for stone.

Census returns provide a fairly accurate record of the number of men engaged in the stone industry at one point in time. There would not be any workers travelling in from outside the stone villages because the travel to work area was at that time within walking distance of the place of work. Itinerant workers may have arrived in the summer months, when the quarries were at their busiest, but because of Purbecks isolation, the closed shop policy of the stone workers and the resentment of 'foreigners' this appears unlikely. As the numbers employed in the stone industry fell the numbers employed in the ball clay industry rose and as a comparison these are shown for Corfe Castle in the years 1841, 1861 and 1881, see Table 1(3).

CENSUS RETURNS
(NOS. OF STONE WORKERS, ie MASONS, QUARRYMEN & LABOURERS)

THE STONE VILLAGES OF PURBECK

Year	WORTH MATRAVERS	LANGTON MATRAVERS	SWANAGE	CORFE CASTLE	TOTAL	BALL CLAY WORKERS CORFE CASTLE
1841	26	89	214	16	345	48
1851	46	108	302	10	466	
1861	27	95	281	2	405	87
1871	21	103	249	2	375	
1881	27	142	274	12	455	88
1891	9	76	141	0	226	
Avge	26	102	243	7	378	74

TABLE 1(7)

Examination of the bulk census statistics for 1911 disclosed that 260 were employed in the stone industry in Purbeck and for 1921 there were 214. Thus from 1891 to 1921 the number employed in Purbeck was fairly constant.

Bulk census returns from 1921 to 1991 discontinued the categorisation of workers concentrating instead on the more social issues of housing densities, the number of people in houses and institutions etc., so no meaningful information could be gleaned. There was however a downturn in trade in the 1930's when quarries closed down and men serving in the forces in the second world war never returned to the quarries when they were demobilised. Closure of underground mining in the post war period on safety grounds accelerated the drift from mining and quarrying. During the post war period the demand for houses led to the introduction of cheaper manufactured buildings, bricks made from clay and concrete and blocks made from concrete, cinder breeze and foamed slag replaced stone in housing construction and these components could be manufactured in all areas against having to be quarried in one district. Ordnance survey maps were examined to determine the number of mines and quarries shown at various dates and thus obtain some idea of the rise and fall of the stone industry and these are shown in table 2(3):

QUARRIES AND MINES SHOWN ON O.S. MAPS 1900-1987

	LANGTON/WORTH/ACTON			SWANAGE			
YEAR	SHAFT MINES	QUARRIES	TOTAL	MINES	QUARRIES	TOTAL	TOTAL IN PURBECK
1900	72	11	83	60	1	61	144
1929	62	4	66	45	0	45	111
1938	82	8	90	40	0	40	130
1987	21	1	22	15	3	18	40

TABLE 2 (7)

The maps are shown as follows:-

Fig 1.7 (1900), Fig 2.7 (1929), Fig 3.7 (1938) and Fig 4.7 (1987).

As the quarrying industry at Swanage decreased development of the town increased and the current 1987 O.S. map of the town Fig 5.7 shows 3 open cast quarries and 15 mine shafts. The stone industry was at its peak in 1900 so by taking the mines and quarries shown on the O.S map of 1900 and superimposing them on the O.S map of 1987 it can be seen that some parts of the town must be built over the underground workings. This is shown in Fig 6.7.

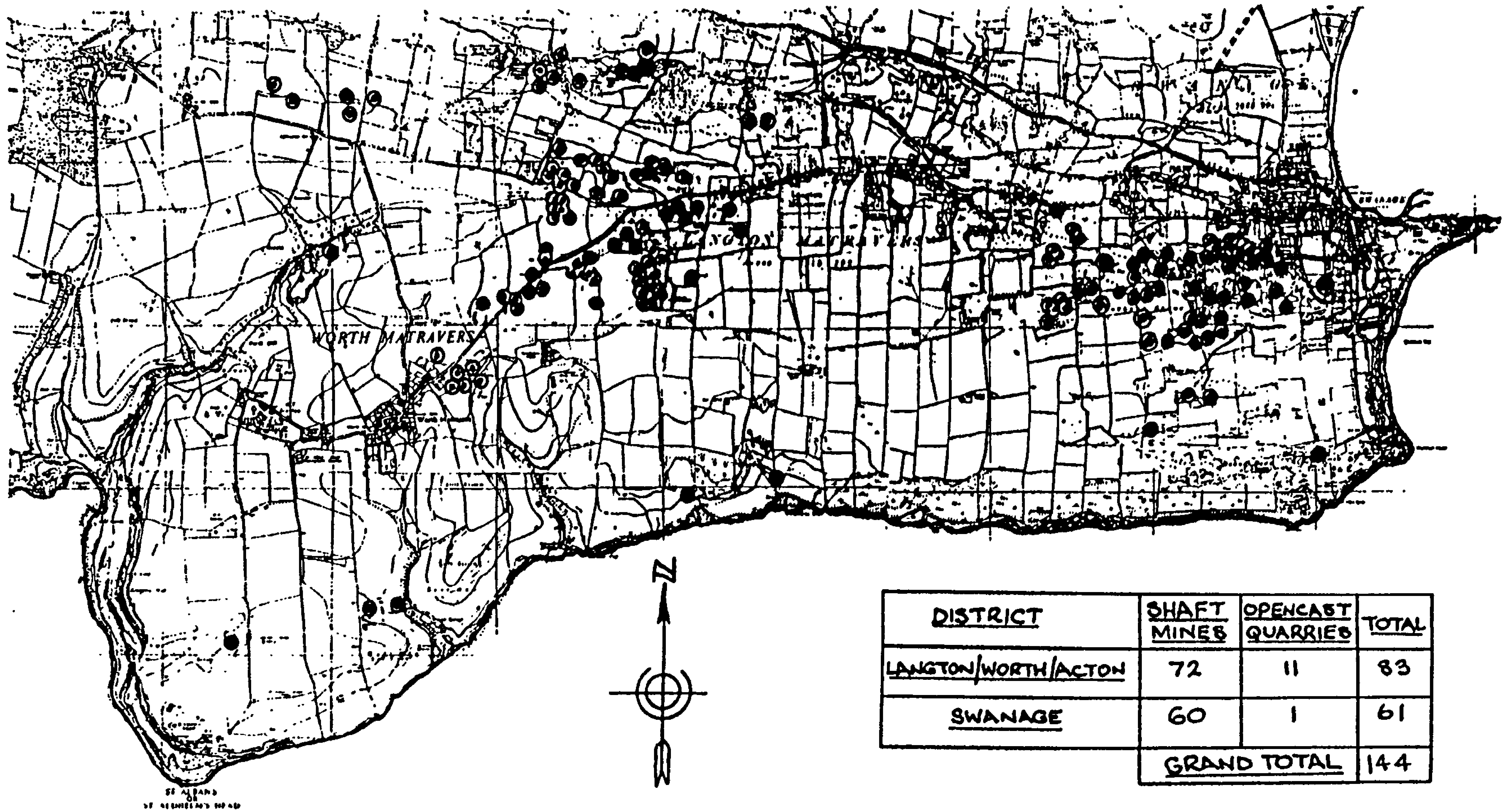
Because of their low weight caravan sites are allowed to be located over known underground workings any future mining subsidence will not cause structural failure to a caravan as it would to the rigid structure of a brick or stone building. Plate 6.7 shows the Herston stone mining area at Swanage with the caravan site located on the edge of the town. Similar conditions arise at Langton Matravers where the old mining area, shown on old maps as Tom's Field, has become Tomsfield camping site and this is shown in Plate 7.7.

The ancestors of Mr. A.G.L.Hardy, Swanage, owned three ketches, Industry, Purveyor and Rising Sun, which were part of the 'stone armada'. A cargo book owned by Mr Hardy dated 1832 was examined in 1992 and 40 ton cargoes of limestone were being carried to Southampton at 5/6d per ton, steps were rated at 12/- per ton and flatteners 3/- per ton.

Cliff quarrying ended in 1860 and this was the date that the fast revenue cutter 'Tartar' was introduced which heralded the end of smuggling. In the early 19th century 800 items in England were taxed and this rose to 1200 items by the middle of the century. Napoleon encouraged English smuggling to reduce Government revenue for the purchase of arms to be used against him. As well as taxing tobacco, wine and spirits, salt which was used for food preservation was also highly taxed and if a pig was to be salted it cost half the pig to buy the salt to preserve the other half. It was also reckoned that one third of the illegal tea in the country came through the Isle of Purbeck .

To encourage people to abandon smuggling (and wrecking) William Morton Pitt promoted industries such as rope and sail making, flax growing and spinning and supplement their own income. John Calcraft, M.P, a local landowner promoted a bill in Parliament which repealed the salt tax in 1830 and as taxes were reduced the incentive for smuggling was removed.

It can be seen that the stone industry reached its peak in the late 1880's, in 1881 the



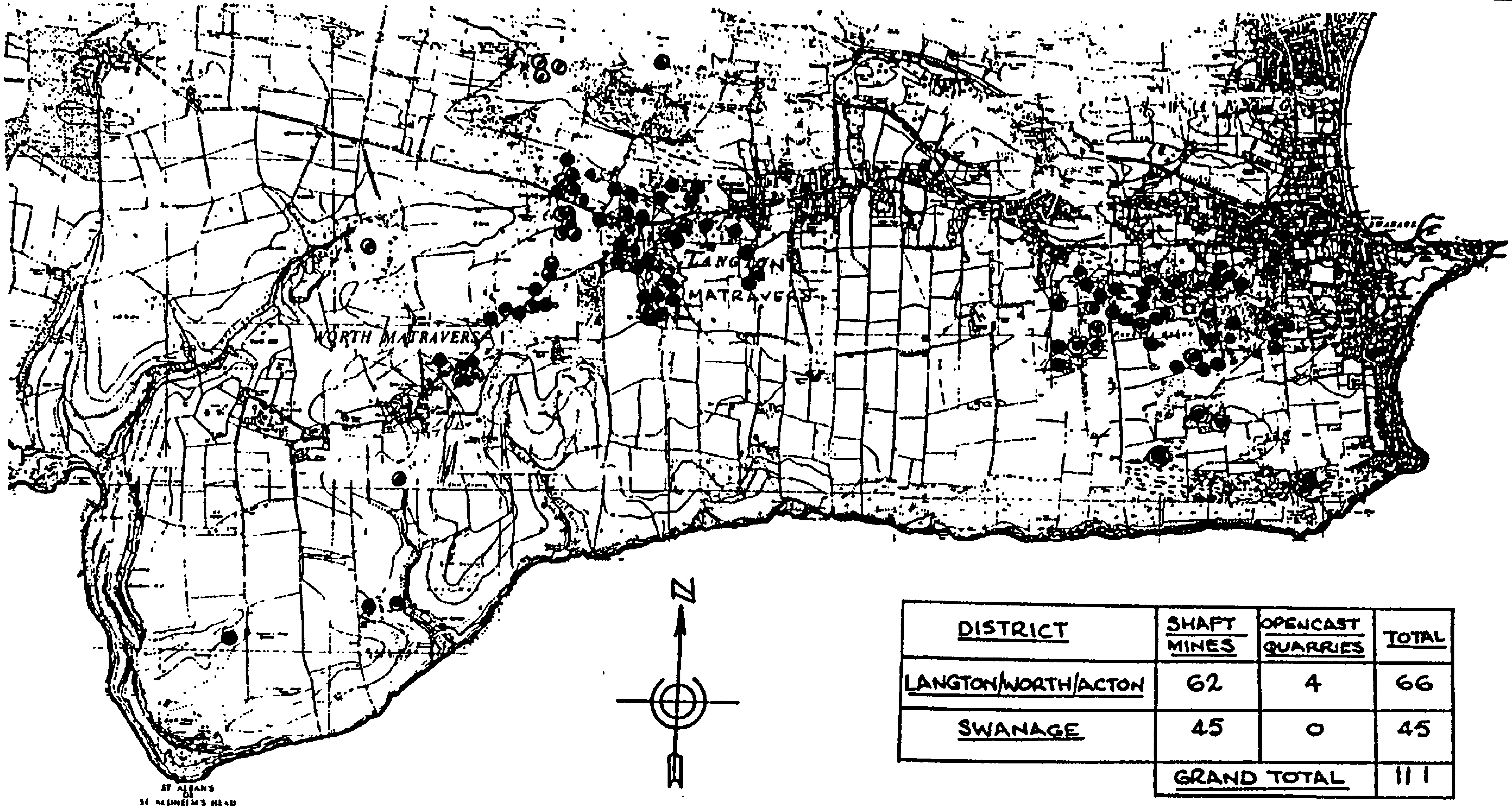
DISTRICT	SHAFT MINES	OPENCAST QUARRIES	TOTAL
LANGTON/WORTH/ACTON	72	11	83
SWANAGE	60	1	61
		GRAND TOTAL	144

SCALE 1:25,000

FIG. F.1.7

PURBECK STONE INDUSTRY 1900 A.D.

ORNANCE SURVEY.



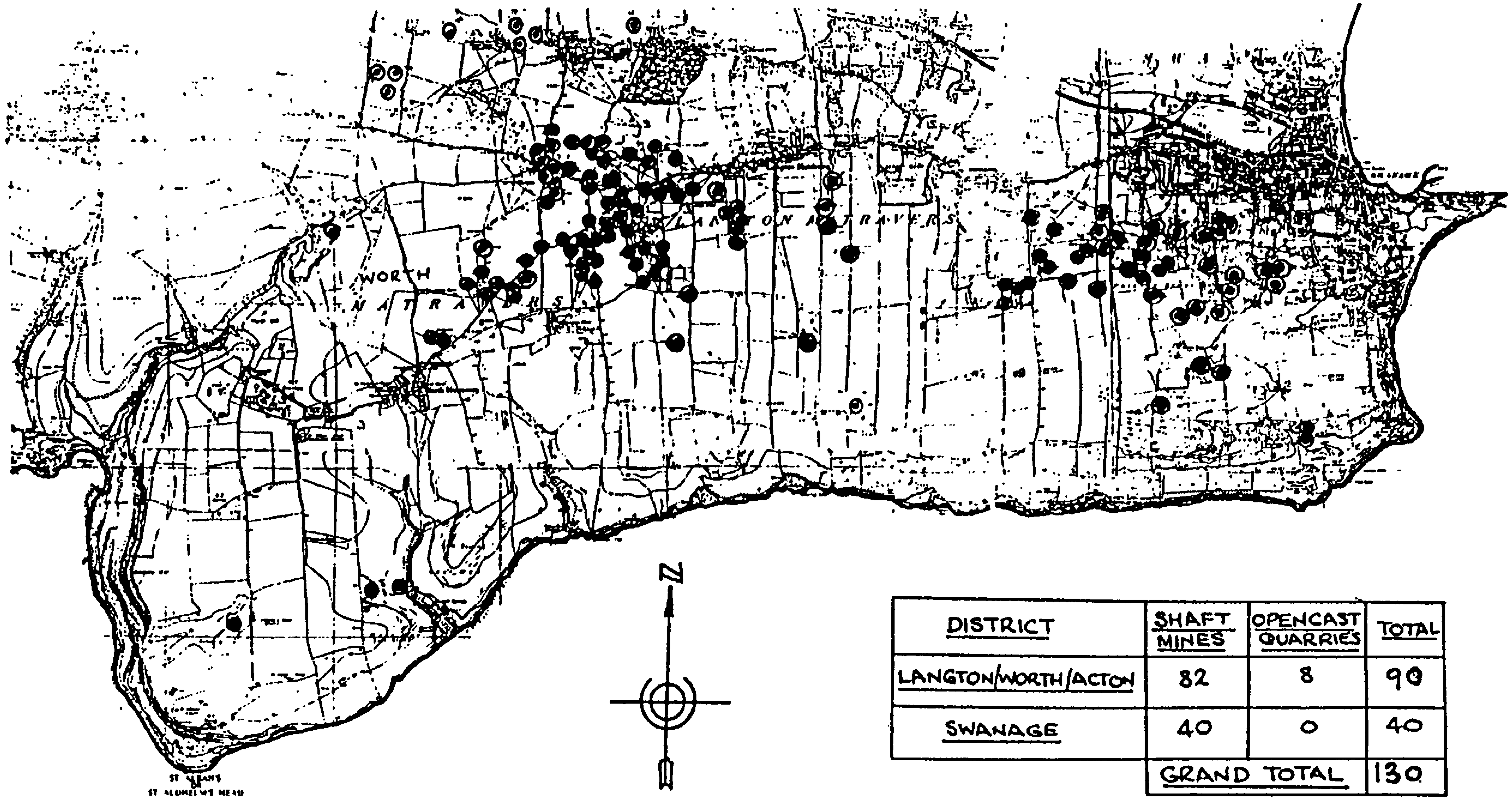
DISTRICT	SHAFT MINES	OPENCAST QUARRIES	TOTAL
LANGTON/WORTH/ACTON	62	4	66
SWANAGE	45	0	45
	GRAND TOTAL		111

SCALE 1:25,000

FIG. F 2.7

PURBECK STONE INDUSTRY 1929 A.D.

ORDNANCE SURVEY



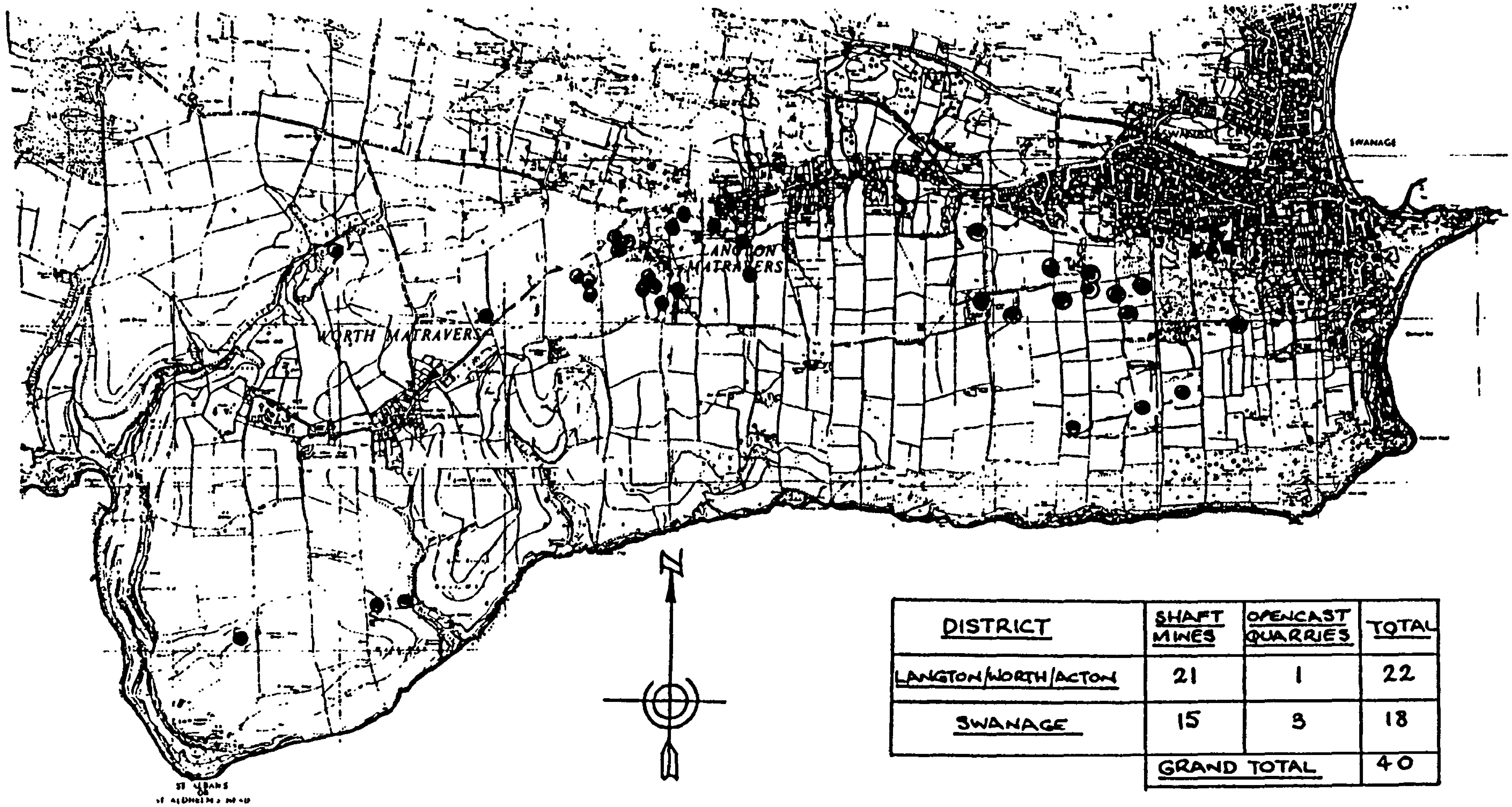
DISTRICT	SHAFT MINES	OPENCAST QUARRIES	TOTAL
LANGTON/WORTH/ACTON	82	8	90
SWANAGE	40	0	40
	GRAND TOTAL		130

SCALE 1:25,000

FIG. F 3.7

PURBECK STONE INDUSTRY 1938 A.D.

ORDNANCE SURVEY.



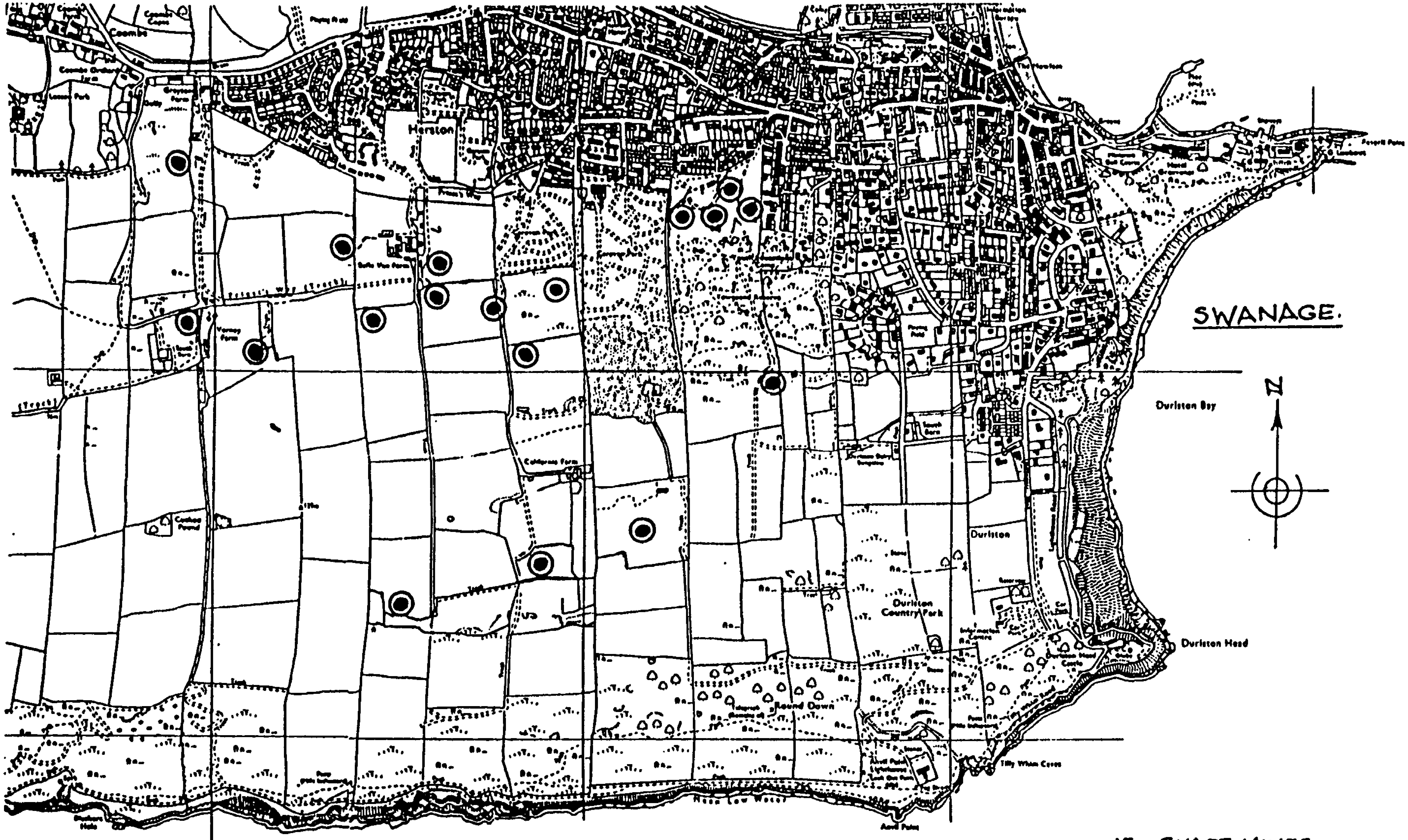
DISTRICT	SHAFT MINES	OPENCAST QUARRIES	TOTAL
LANGTON/WORTH/ACTON	21	1	22
SWANAGE	15	3	18
	GRAND TOTAL		40

SCALE 1:25,000

FIG. F.4.7

PURBECK STONE INDUSTRY 1987 A.D.

ORDNANCE SURVEY



15 SHAFT MINES
3 OPEN CAST QUARRIES
18 TOTAL.

SCALE 1:10,000

FIG. F 5.7

MINES SHOWN ON AD 1987 MAP.

ORDNANCE SURVEY

60 SHAFT MINES
1 OPEN CAST QUARRY
61 TOTAL

FIG. F 6.7

SCALE 1:10,000

MINES SHOWN ON A.D.1900 MAP
SUPERIMPOSED ON AD 1987 MAP.

ORDNANCE SURVEY

Plate 6.7 Caravan park at Herston

Plate 7.7 Tom's Field, Langton Matravers

number employed in the industry was 455 but by 1891 this had fallen to 226, a 50% drop in employees. From the census returns this level of employees was maintained at least until 1921 when meaningful records ceased. Quarries however began to close down and from the O.S maps it was seen that from a peak of 144 quarries and mines in 1900 this had fallen to 40 in 1987.

Today there are 20 operational stone quarrying units in Purbeck, it is still an important local industry as well as a living element of Purbecks history and between 60 and 100 people are now employed in the quarries although some are only part time. This gives a figure of around 3 or 4 employees per quarry. Production is running at 40,000 tonnes per annum and this is expected to be maintained over the next 20 years, so the numbers of employees in the stone industry in Purbeck should remain at today's level, say 50 full time employees. (Dorset County Council, 1992).

A report in the Dorset County Chronicle (1858) when reporting a meeting on the proposed Swanage tramroad and pier stated "In these days of mechanical advancement it is certainly somewhat surprising that Swanage, surrounded by quarries of the most excellent and durable stone, should yet have none of the modern appliances of science to develop the traffic in its staple produce, and that the operations in a trade which might be vastly extended, are now, in the middle of the nineteenth century, carried out in the most primitive style imaginable. Purbeck stone has been long held in great repute, and the only obstacle in the way of its taking that position in the market which it holds in the opinion of engineers and others engaged in the construction of great works, appears to be the expense attendant upon the bringing of it down from the quarries to the vessels which convey it to different parts of the coast"

This problem was similar to the one faced by the ball clay industry on the other side of the Purbeck hills, which had to get the clay from open cast pits and underground mines across the heath to the shores of Poole Harbour. Barges then took the clay across the Harbour to Poole Quay where it was loaded onto sailing ships for sea transport. It was reported in the Western Gazzette (1877) that 40,000 tons of clay were exported annually (against 45,600 tons of stone) and to transport the clay from the mines and quarries to the waters of Poole Harbour 3 plateways were in use, they had been opened in 1806, 1830 and 1840. By 1866 and 1868 two of the three plateways had been converted to steam operation and from 1844 steam driven tug boats were in use to tow barges filled with clay to the ships at Poole Quay.

Further research by Norris (1990) revealed that in 1877 production of ball clay had in fact reached 56,345 tons per annum. Thus on one side of the Purbeck hills the stone industry is criticised for its primitive operations and reluctance to apply science to improve the transport of stone whilst only a mile from Corfe the ball clay industry is operating steam locomotives and steam tugs to overcome the same problem. It would appear that there was a great reluctance to adopt new ideas in the stone industry even though they had been adopted a mile away, but as the stone industry comprised many separate operating units it did not seem possible to get co-operation to solve a common problem. The coming of the railway in 1885 enabled the transport of stone to be improved, it also brought holidaymakers into the area but it also enabled stone workers to leave and seek their fortune elsewhere. Until it became possible to move away from the area generation followed generation into the industry, it was not possible to do anything else. Whole families were tied to the fortunes of the stone trade, prospering when demand and prices were high and struggling to exist when demand and prices fell.

The industry permeated the whole society, debts were paid in stone, merchants paid for stone by allowing credit at their stores where the womenfolk obtained the family provisions. Conversation would be dominated by the fortunes of the stone industry and every male member would have his future prospects defined in his own homestead by his father. Quarrymen's daughters were obliged to marry quarrymen's sons to preserve the line and enable quarrying to continue in the families offspring. To become a freeman of the Purbeck marblers would seem to be the high point of a quarriers life.

CHAPTER 8

Opportunities and Economics of Stone

This chapter discusses how some quarriers seized the opportunity to become merchants and make substantial profits from the traditional industry.

Men of Stone

Quarriers

Payne (1953) records that George Hancock, a quarrier, told him that some Purbeck families had worked the quarries there 'time out o'mind' and records of two hundred years or so ago show the same names that you find today. Bower, Chinchen, Benfield, Norman, Warren and Haysom are families as old as the quarries themselves. Payne later saw a 17th century list of quarry owners and saw the names given by Hancock and they appeared again in a Rate book assessment dated 1815.

The Articles of the marblers and stone cutters dated 1651 were agreed by 160 members who either signed their names or made their masons mark. Saville (1973) stated that of these signatures and masons marks 138 are decypherable. A document concerning the searching of stone in 1687 carried 16 signatures and 10 of these members had signed the Articles dated 1651. Some of today's quarrymen have the same surnames as those who signed the documents and can trace their ancestors back to 1651 and beyond. Local church records show how the families intermarried and from birth to death lived in the same village.

Some of the well known names are: Bonfield, Bower, Benfield, Burt, Cole, Brown, Corben, Chinchen, Dowland, Harden, Haysom, Harding, Edmonds, Thickes, Turner, Norman, Webber, Lander, Phippard, Eidbury, Harris. The list is not comprehensive but the surnames of the marblers that signed the original agreements are still to be found in the local telephone directory. Jones (1984) suggests that the original Bowers and Landers probably took their names from their work, because heavy blocks of stone were moved from the cliff quarries into the waiting stone boats.

Intermarriage between families engaged in quarrying gave so many families named Bower, some related, some not, that to distinguish them they were given secondary names. Some were awarded their wives names as a prefix to their surname others were awarded a nickname. Thus we get Ivamy Bower, Ball Bower, Brown Bower, Brownsea Bower, Trink Bower, Coffin Bower, Gad Bower, Short Bower,Whistler Bower, etc. (Saville, 1986). Some bore their nicknames with pride and some exercised the Bowers rights to walk down the middle of Langton Matravers main street in the expectation that traffic would give way to them. Was this another privilege deemed to have been granted under the long lost charter (Jones, 1984).

To put the Dorset quarriers in perspective the Reports on the Mining Districts, British Parliamentary Papers (1839-97) were examined and these show that in 1881 there were 677 quarriers in Dorset against 25,801 in England and in 1891 there were 640 against 33, 093. These figures include those engaged in underground stone workings .

In 1897 Dorset produced 9,041 tons of limestone and 145 men were employed below ground and 96 above ground. Although the Purbeck marblers and Stonecutters had a great deal of influence locally they were not recognised nationally. The recognised Trade Union throughout the country was the Operative Stone Masons Society and in 1888 there were 10,238 members, but not surprisingly there were no lodges of the union in Dorset.

It is very difficult to discover the achievements of the quarriers in the past because they were never recorded. When studying a cathedral it usually states that the nave was built by Bishop X and the bell tower by Bishop Y. Sometimes the architect or master mason is given but only exceptionally is the name of an artisan mentioned and even then it is confined to a particular section of the building or a single carving. Unlike TV programmes today, which carry a long list of credits, credits in the stone quarries were sparse indeed.

<u>Merchants</u>

The quarriers sold their stone to the merchants who then sold it on to the customer, the difference between the buying and selling price gave the merchant his income. In order to be a merchant it was essential to either own or rent a piece of land on the foreshore on which the dressed stone was piled (Banker) until it could be taken out to the waiting stone boats in a horse drawn stone cart. The stone boats were then rowed out to the sailing vessels anchored in the bay for the stone to be transferred for the sea voyage to the waiting customer. As well as owning the bankers the merchants owned the horses, stone carts and stone boats. Customer contact was through the merchants who were able to fulfill large orders by purchasing stone from many small quarries to make up the required amount. Cockburn (1973) refers to a report dated 10 May 1749 by Mr Preston the mason at Ramsgate Harbour who says:-

"The propriety and the estate of Purbeck belongs to a clergyman, Mr Serrel, and others but all men who have served their time on the 'island' become free and have the right to work the quarries. These workmen are dependent from time to time for supplies on others which are called merchants and must also be Freemen. The names of the merchants are Timothy Chinchen, Howard Serrel,William Chinchen, Henry Vye, John Pushman, Francis Warren, John Melmer, William Melmer, John Cole, John Collins, John Harding, John Marsh and Matthew Benvil and these are the persons most proper to treat or make contact with". So it would appear that even in 1749 there was a list of recommended suppliers drawn up by a customer. Hardy ((1970) recorded that in the mid 19th century Nathan Chinchen, who was also manager of the Dorset Bank, was in business as a stone merchant at the Swanage bankers and his business was still in the family in the 20th Century. The usual Purbeck surnames were in evidence amongst the stone merchants in the early 20th century, Randall, Collins, Haysom and Burt operated at the bankers.

Shortly after the railway opened Mssrs Burt and Burt moved from the bankers on the shore to the railway yard with their own rail siding. As well as employing masons to carve stone they also had a lime kiln. All the stone merchants had horses and stables and Randall was a coal and stone merchant who owned two sailing vessels for transporting both coal and stone. The coal came from Newcastle and landed at the pier, loaded into trucks on the tramway, pulled to the bankers, loaded into horsedrawn carts and taken to the coal yard. From the coal yard it was delivered to house holders by 4 old men using donkey carts and wheelbarrows and even with so many handlings it retailed at 1/- per cwt + 1d for delivery. Mssrs William Haysom and Sons were the last firm to use the stone depot at Swanage before the Urban District Council bought the site, his son Mr Walter Haysom transferred the business to St. Aldhelms, where it still operates.

There is no doubt that the Swanage stone merchants operating at the bankers enjoyed a higher standard of living than the quarriers. A report in the Chronicle and Swanage Times (9.6. 1938) stated that:-

'Ashlar House' the last of the stone merchants houses has been pulled down, it was built of dressed blocks of Purbeck stone , hence its name. Mr Randall had lived in the house whilst another merchant Mr Nathan White lived at 'Yew and Pine'. The latter name was probably 'HUON PINE' a valuable timber imported from Tasmania and used for the house. Both these merchants had coal yards, the only ones in Swanage.

Contractor/Merchants

John Mowlem

John Mowlem was born 12 October 1788 in an ancient cottage at Carrants Court (now Court Hill) and died in his 80th year on 8 March 1868 at Old Purbeck House, thus he was born and died in Swanage. He was one of six children and with his 3 brothers followed his father into quarrying. His father and brothers being the last to work Tilly Whim which closed around 1812. He was no longer working there having left to seek his fortune elsewhere, his first port of call was the Isle of Wight where he worked as a mason on Norris Castle. James Wyatt, the architect there recommended him to Henry Westmacott, a London sculptor mason and Mowlem arrived in London around 1811. In 1812 he married Susan Manwell, of Swanage and in the same year his friend Robert Burt married his wifes sister and in 1816 George Burt, Mowlems nephew and future partner was born. (Mowlem having no children of his own.) In 1816 Mowlem was appointed Westmacott's foreman at the age of 27 and in 1823, at the age of 34, Mowlem set up in business on his own account.

Baines (undated) records that at the time that Mowlem set up on his own small contracts for masons work could be obtained ie floors, steps, sinks, coal cellars, kerbs for iron railings etc. Mowlem's depot was in Pimlico and he had a Yorkshire stone wharf at Paddington Basin.

There was an insatiable demand in London for paving work and paving materials such as paving stones, flint, granite setts, granite pebbles etc. Before the formation of London County Council in 1888, London was administered on a villages basis with vestries being responsible for roads and pavements. In 1825 Mowlem began supplying stone to St Marylebone and he is referred to as a footway stone contractor.

About 400 turnpike trusts were in action by 1750, the trustees repaired the roads and made them passable for traffic in their district (Bodey, 1975). Attention was paid to road surfaces and engineers emerged who specialised in road construction. John Metcalf was responsible for several roads over the Pennines, while Thomas Telford surpassed all others by the number of trusts he advised. Telford insisted that roads should have deep foundations, with stones decreasing in size towards the surface, where there was a covering of loose gravel. This made a good surface for a few months, but passing vehicles soon threw out the gravel to the edges, and the bumpy foundations had to be recovered.

John Macadam devised a cheaper way of improving roads, using stones of an even size as fairly shallow foundations. The iron tyres of passing vehicles ground off chips which wedged between the stones and bound the road surface together. Macadamed roads were cheaper to lay and required less maintenance and the idea was copied by many trusts which Macadam advised.

In 1823 the MacAdam system of road construction began because the pebble and pave' road system previously used for urban road construction proved noisy. Popplewell (1989) stated that it was John Mowlems meeting with MacAdam (Surveyor General) in 1829 which really spelt the end of Swanage as an old stone port. Thereafter the capitals parish and vestry roads would be paved no longer just with Purbecks oolitic limestone, but rather as the city swelled in size, and public health priorities loomed ever more pressingly, with crushed granite instead.

Mowlems new firm was prominent in the change over and Mowlem quickly became known as London John. Swanage trade began to decline as Mowlem switched to Guernsey granite as his chief source of supply and from 1832 began to purchase quarries there. Later, as the railway network spread across the country he was to bring in granite from Aberdeen and Cornwall. When Swanage was shipping 20,000 tons per annum of stone Mowlem was shipping 200,000 t.p.a. He still carried on with his jobbing building and paving business in London and in 1835 his nephew, George Burt joined the firm. Burt was then 19 years of age, having served his apprenticeship, like his uncle, in the Swanage quarries. In 1837 Joseph Freeman, from Yorkshire, joined the firm and in 1839 he married George Burts sister. With two young partners in charge of the London operations Mowlem travelled to Guernsey to buy granite quarries and get them organised to ship granite to his merchants depot in London. To improve production Mowlem engaged masons in England to work in his quarries in Guernsey to enable him to ship worked granite cubes into London that did not need further work at his London depot.

In 1843 the new company of Mowlem, Freeman and Burt was formed and in 1844 John Mowlem retired to Swanage. For part of the time that he was at Swanage he kept a diary (Lewer, 1990) which records how he continued, as the senior partner, to administer his business. Travelling by horseback, stagecoach, sailing ship and railway to quarries in Guernsey and Aberdeen, making business contacts and travelling to London for meetings with customers and his partners. John Mowlem began to take an increasing interest in the development of Swanage until his death in 1868 and in 1863 the Mowlem Institute was opened for the 'benefit and mutual improvement of the working classes'. Sadly this has now been demolished and the Mowlem Theatre stands on the site. Realising that Swanage was changing into a tourist resort Mowlem began to buy development land and in his seventies he purchased most of the land previously owned by the Illminster Estate.

<u>George Burt</u>

George Burt was born in Swanage in 1816 and served his apprenticeship in the local quarries. In 1835, when he was 19 years of age, he joined his uncles firm, John Mowlems, in London and when Mowlem went into semi-retirement at Swanage 1844 Burt, along with the other partner Freeman, directed operations. By examining the estimates issued by Mowlem's firm for work between 1831 and 1850 it is clear that they were not undertaking major works. The number of estimates issued per annum vary between 16 and 103 with an average of 64 per annum, just over 1 a week. The largest job they undertook during this period was the paving of Blackfriars Bridge in 1840. The firm carried on under Burt's direction when Mowlem retired to Swanage in 1844 and in 1850 the firm begin to lay sewers in addition to their usual work. They carried on as jobbing builders after Mowlems death in 1868. In 1857 at the age of 41 Burt retired to Swanage, so for 11 years until Mowlems death, both Mowlem and Burt were living in Swanage. Burt was, like his uncle before him in semi-retirement and made regular trips around the country seeking contracts and supervising the firm. In 1875, 7 years after Mowlems death, the firm received their first large contract to rebuild Billingsgate Fish Market at a cost of £178,000. This was the turning point for the firm which began to become a major contractor, the name of the firm was changed back to John Mowlem and it still trades as a major contractor today under that name. In 1864, following his retirement to Swanage, Mr George Burt, J.P. ex Sheriff of London and Middlesex purchased land at Durlston head. At the time that he purchased it Durlston head was a sheep run and rabbit warren and not many people from Swanage ventured to the summit, the main occupations at Durlston were quarrying, lobster fishing and smuggling. Burt put the infrastructure into Durlston Park Estate and sold off serviced building plots for high class executive homes. Burt joined his uncle in improving the town of Swanage and they were instrumental in constructing the first pier in 1860.

From the contracts carried out by their firm in London, demolished material found its way back to Swanage as ballast in the returning stone boats. One of the items was the Wellington Clock Tower, erected in Southwark, London as a memorial to Wellington and when it was no longer required it was brought piecemeal to Swanage in 1867 and re-erected on the shore near the lifeboat house. Plate 1.8 shows the re-erected memorial at Swanage. Burt lived at Purbeck House, shown in Plate 2.8, and Legg (1983) refers to it as an extravaganza of second hand taste. It incorporates salvaged material from Londons Billingsgate Market, Royal Exchange, Grosvenor Place, Palace of Westminster and the Albert Memorial. It contains salvaged granite, Portland stone,

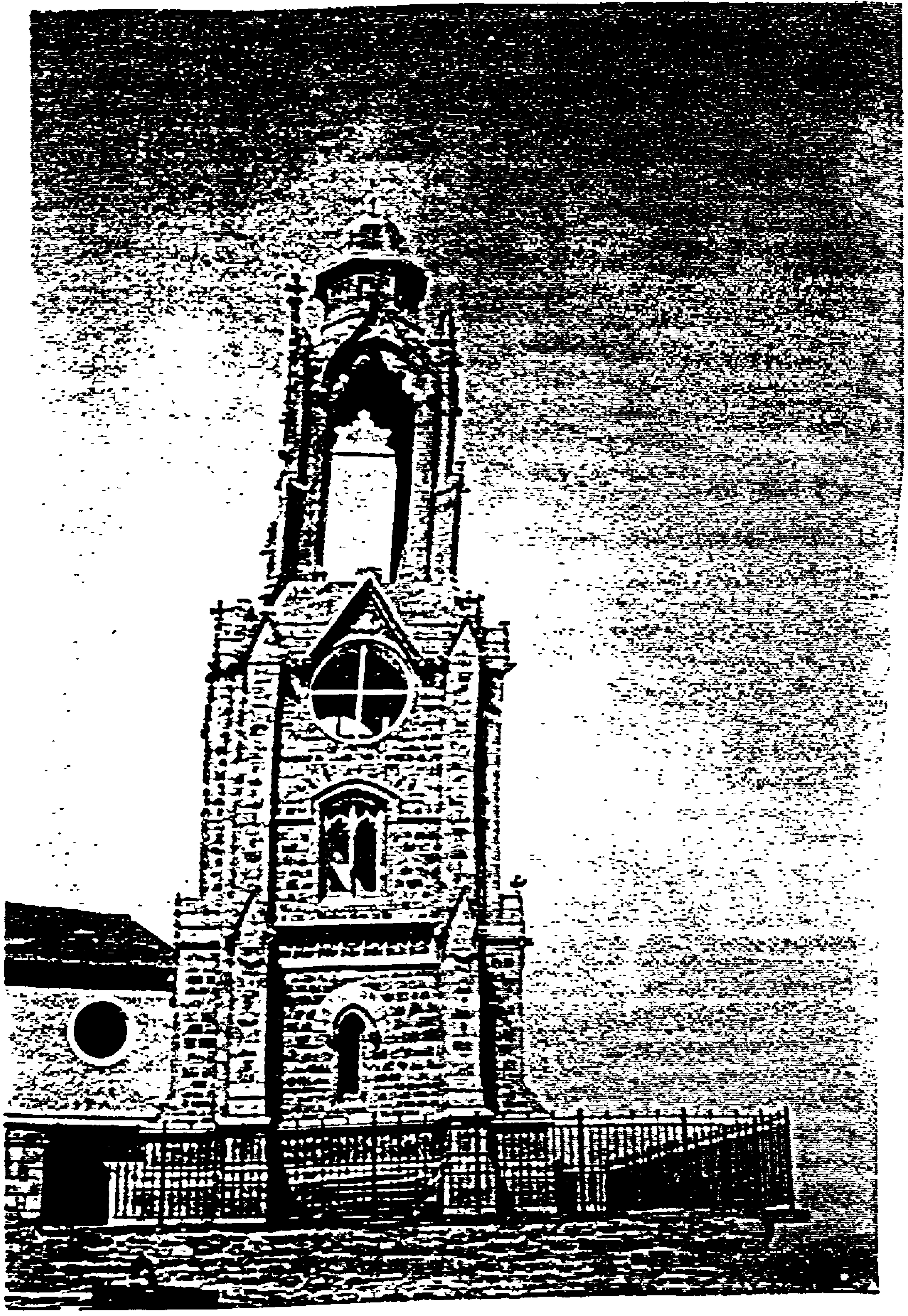


Plate 1.8

Wellingtons's Memorial

Swanage

Plate 2.8 Purbeck House, Swanage

cast iron columns, 15th century windows and 17th century statues.

Burt also built Durlston Castle a turreted restaurant set on the cliffs which incorporates 3 granite pillars which were originally intended for Trafalgar Square. Below Durlston Castle stands the Great Globe, shown in Plate 3.8, this was constructed at Mowlems stoneyard at Greenwich in 1887 and erected at Durlston Head in 1890. It weighs 40 tons and consists of 15 sections (Hayson & Bragg, 1991). Burt built Swanage Town Hall, which opened in 1883 and the frontage of the building was originally part of the facade of the Mercers Hall which was designed by Edward Jerman after the Great Fire in 1661. It was demolished around 1861 and Burt shipped the section he required to Swanage and Plate 4.8 shows the frontage of Swanage Town Hall. Burt collected all kinds of London relics lamp standards, cannon posts, railings, cast iron columns, etc., some are still in position and carry the name of the London Borough where they originally stood. Burt moved so many relics from London to Swanage to improve the town that it became known as 'Little London by the Sea'. George Burt is the central figure in the history of Swanage he was the prime mover in constructing the second pier, introducing a steamer service, bringing the railway to Swanage, provided a police station with cells, the Gas Works, Swanage Water Works, laid 3 gravity sewers and constructed roads between High Street and Durlston. He also brought pressure to bear to get the lighthouse erected at Durlston Head to prevent shipwrecks and had proposed that a breakwater be constructed to give shelter to the ships in the bay. Burt co-operated with the Swanage Board of Health (Emms, 1985) who were concerned about the sanitation and water supplies in Swanage because typhoid epidemics were the order of the day. It cost Burt £4,500 to build the Town Hall and he leased it to the Health Board for £50 per annum, the Board sublet offices for £25 per annum. This seems to prove that Burt was more of a philanthropist than businessman in that transaction. Burt became a member of Dorset County Council and gave Swanage Urban District Council land, previously part of the bankers, for gardens but following Burts death in 1894 the land was used as building land. Thomas Hardy called George Burt the King of Swanage.

Mowlem and Burt were responsible for the rapid expansion of Swanage as it changed from a stone port to a holiday resort in the period 1845-1890. The only other person to support the change prior to Mowlem and Burt was William Morton Pitt the former owner of the Encombe Estate who in 1825 converted a Manor House, by adding two wings and a stable block, into the Royal Victoria Hotel. He also built the stone quay to serve passengers arriving by boat and he also built the sea baths at the site of the Marine Villas and these were in use until 1855.

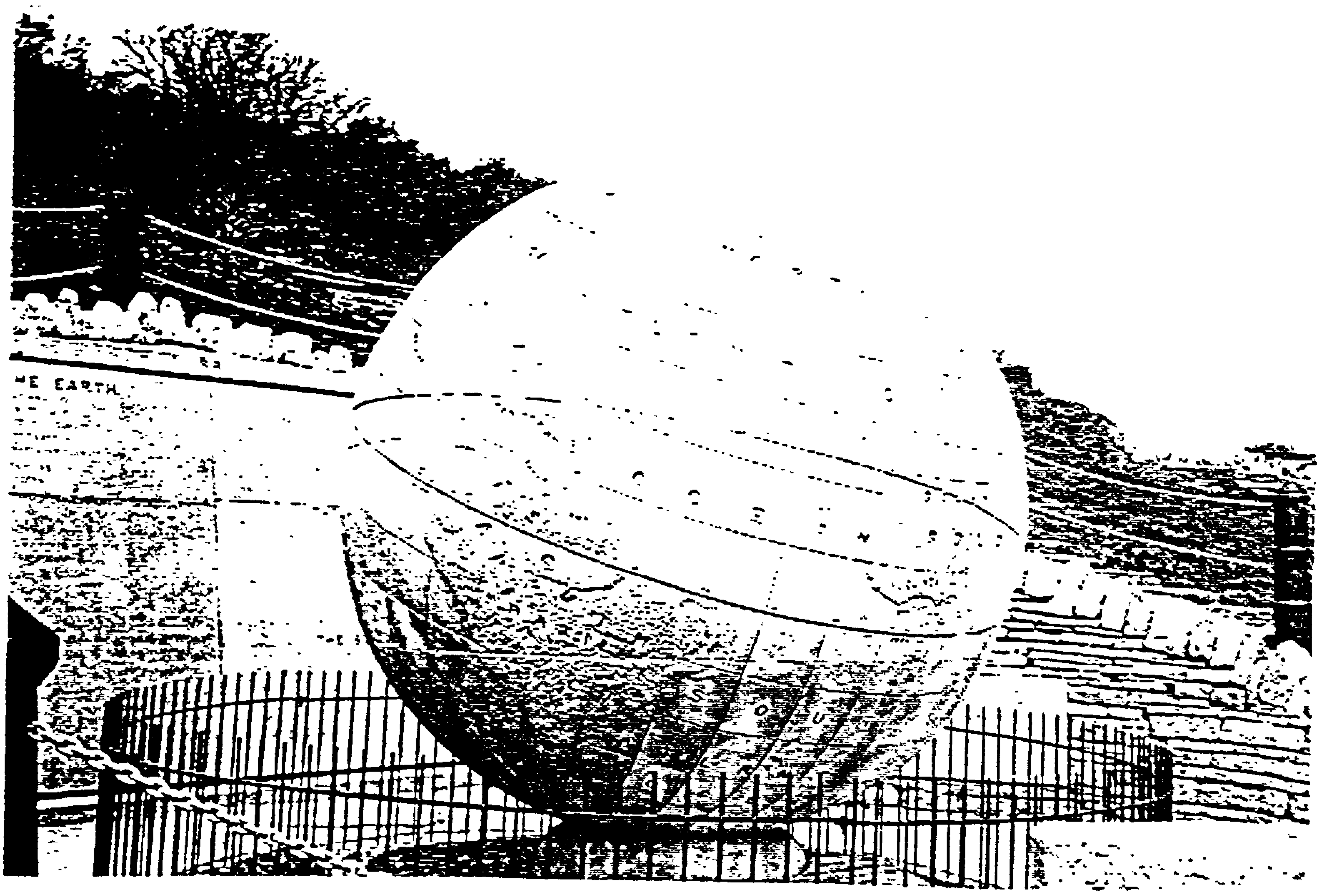


Plate 3.8 Great Globe, Swanage

Plate 4.8

Town Hall, Swanage

When the Swanage Railway was completed new houses began to be built in the area of the station from 1885 to 1910.

The Stone Economy

Until the Truck Acts of the mid 19th century ended the practice the quarrymen were paid for their stone by the merchant in kind. When the quarryman delivered stone to the bankers the merchant allowed credit at his general store to the value of the stone. Thus while the men were busy in the quarries their womenfolk would be at the merchants shop buying their groceries, meat, clothes, pots and pans etc., and the value of the goods would be deducted from the family credit at the store. Such goods were never given in direct exchange for stone, instead a running account was kept, when the merchant received stone from a quarryman the account was credited and when his wife shopped for necessities the account was debited with the value of the goods. How fair and accurate the records were depended upon the honesty of the merchant and since quarrymen could not usually read or write, none could dispute them.

If a quarryman requested payment in cash he was usually informed that this was not possible as he was already in debt. On the other hand the merchants seldom pressed for settlement of those debts because in order to continue making money at the expense of the quarryman the quarrymen themselves had to feel reasonably secure and that credit was available at the shop for his wife. Thus in and out of debt as long as he continued to supply stone the merchant supplied the quarryman's family with their basic needs and kept them in his control (Wymer, 1953). When he needed a drink at the local alehouse the quarryman paid for it in stone and it was not an uncommon sight in the district to see a quarryman wheeling a paving stone in a barrow from the quarry to the pub to exchange it for a drink.

Hardy (1908) stated that he had seen quarrymen carrying stones on their backs to pay for their beer, 'baccy and other commodities. He also stated that coal, bread, boots, clothes and almost every article required for home consumption was bought with stone currency. During the early 1800's when stone currency was the norm coins that were pieces of stone were issued as quarrymens wages and traded across shop counters in the same way as the legal tender of the day, King George pennies.

Legg (1989) stated that stone tender came in units of 12 lb and 144lb in weight, the 12 lb unit was shaped like a paving stone and was known as a Swanage penny and the larger unit, twelve times the weight, was known logically as a shilling. Tradesmens counters were slabs of stone to take the rough treatment from the Swanage pennies and although it was a form of barter the shopkeepers accepted stone currency as a direct fixed price equivalent of the normal bronze coin. Their stone counters were known as bankers, which were used in the quarries for dressing stone and some Swanage traders resisted payments in stone but only when they dealt in small items such as snuff, pepper, vinegar and salt or if they had women shop assistants who would have difficulty handling the stone currency.

Similar problems with the truck system of payment existed in other mining areas and a report by the Mining Commissioners, British Parliamentary Papers (1839-49) stated that in 1842 paying Shropshire miners in notes to provision shops will be discontinued. They will also no longer be paid in beer shops but will be paid in cash at the pit cabins. The system was further complicated because a 'butty', or middleman, negotiated wage rates between the mine owners and the miners, some of whom were on contract whilst others were members of a butty gang sharing the profits equally. Notes for provisions were exchanged for goods at 'tommy shops' and these were owned by the mine owners.

In Staffordshire the truck system was still operating and Rev. H Pount giving evidence to a Select Committee of the House of Commons revealed that truck shop prices had been reduced, tea from 8d to 6d per lb, sugar 10d to 8d, cheese and bacon by 2d per lb, butter by 4d per lb. It was also disclosed that rancid salt butter had previously been sold at the fresh butter price.

One of the essentials of the 'tommy' system in the Midlands was to pay wages every 4 to 7 weeks and as miners can not last that long without wages they apply for credit at the 'tommy shop' and this is deducted from his cash wages on pay day. If the butty, or middleman, was in difficulty the miners could be short of money on pay day making him dependant on credit at the tommy shop. Rents, doctors bills etc., had to be settled in cash so some men were paid part in shop notes (tommy) and part in cash (butty). Thus a £1 wage was paid as 4/- cash and 16/- tommy note. If wages were paid in cash, goods could be bought cheaper in shops not controlled by the mine owner, for example cheese was 3d per lb cheaper, bacon 2d cheaper and salt butter 3d cheaper. Thus it can clearly be seen that payment in truck was heavily loaded against the workman and the Purbeck quarrymen were in a situation that it was very difficult to escape from without the necessary capital.

Further evidence of the Purbeck stone economy is disclosed in a Public Notice dated 1796 (D.C.R.O., PE/COC/MI 31) which states:

Notice is hereby given that all persons who have any claims or demands on the stocks of stone in hand in the several quarries within the Parishes of Swanage, Corfe Castle, Langton and Worth be requested to bring in their respective accounts thereof to the Committee appointed to meet at the Red Lion Inn, Wareham, on Saturday 23 May 1796 as it is the intention of the said committee to advance money on and take possession of the said stone in hand in the course of the following week. Stone was valued at 18/6d per load and this was taken to pay rates and the number of loads taken is recorded along with the donors. In order to convert the stone taken in into cash the Parish of Corfe Castle sold it on and there are accounts giving the money received for the stone, i.e.

835 ft of stone @ 15/- per hundred	£6 - 5 - 3
414 ft of stone @ 6/- per hundred	£1 - 5 - 0
	£7 -10 - 3
Deductions for loading and carting	£1 - 8 - 0
Amount Received	£6 - 2 - 3

Signed:- Richard Taylor

There is evidence that stone taken by Corfe Castle Parish for the payment of rates was sold to Dorset County Council , and a receipt records the cash received.

Received 15 April 1797 of Thos. Curme the sum of £45 - 2 - 0 for paving stone delivered at Woolbridge for the County Hall in Dorchester from the Parishioners of Corfe Castle in Purbeck.

Signed:- Thomas Kent

£45 - 2 - 0 . this is to certify that this is a true copy of the receipt given by Mr. Thos. Kent the day and year above written.

Witness:- John Wheeler

In 1803 the rateable income for Corfe Castle Parish was £19 -12- 0 of which £7 -17- 6 was the value of the stone taken in lieu of cash.

In 1797 the rates required were £18 -17- 11 of which £8 - 9 -6 was paid as stone value in lieu of cash.

CHAPTER 9

Future of the Industry

This chapter considers the possible future of the industry in Purbeck by determining the demand for stone products and the various sources of supply. In particular, the effect of Government directives in favour of reducing inland quarrying and promoting coastal super quarries will be examined along with the structure plan and planning views of Dorset County Council. Finally, quarry operation and reclamation, stone preservation and replacement and the training of apprentices to meet the future requirements for dimensioned stone will be studied.

Planning

For the majority of its life the Purbeck Stone Industry has only had to face, in the main, the problems of supply and demand but since the turn of the century more and more controls have been placed on the industry. Regulations have been introduced covering Mines and Quarries, various Factories Acts and the more recent Health and Safety at Work Acts. These regulations were introduced to ensure that the day to day work complied with current safety rules, but the Acts that control the future development of the industry are the Planning Regulations instituted at National, County and Local levels. Until 1947, when the Town and Country Planning Acts came into operation the industry had been little troubled by planning regulations. Today's planning regulations, however, are concerned with preserving the environment as far as possible and strike a balance between the demand for stone, the impact of quarrying in the area and the need to preserve the visual amenities. In order to achieve this objective today's planning regulations require a detailed submission of proposed developments including phasing of operations and final land re-instatement when quarrying ceases to ensure that planning regulations are complied with.

In 1946, just after the second World War, local authorities issued Interim Development Orders to quarrying companies under the statutory powers of an Act of Parliament of 1943 which was intended to establish control of all surface mineral working. In 1947 the Town and Country Planning Act introduced the planning rules we have today and required all local authorities to keep a register of all new applications for planning and what planning permission had been granted. It did not require them to register Interim Development Orders (IDO) and most County Councils would be unlikely to guarantee that they knew of all I.D.O permissions granted in their area. These old I.D.O permissions last until the year 2042 and many of the original records are no doubt missing. Current minerals planning has evolved to include conditions on dust control, noise levels, screening, access, output levels, blasting, hours of work, water resource protection, restoration and environmental impact.

I.D. O permissions supersede, because they predate, later designations such as Sites of Special Scientific Interest (SSSI's), National Parks and Areas of Natural Beauty (AONB's). Very few conditions attach to an I.D.O and in 1971 another Town and Country Planning Act encouraged local authorities and quarry operators to sign binding legal agreements to improve standards. Some quarry operators signed them, but those in possession of IDO permissions negotiated good terms with local authorities for new quarries. The 1981 Town and Country Planning (Minerals) Act allowed local authorities to pay compensation to quarry owners if permissions granted were modified or revoked and this Act was further updated in 1990.

Permissions granted to quarry operators under I.D.O's issued before 1947, create problems across Britain from time to time when quarrying restarts or drastically increases in size. Wallace, C. (Geographical Magazine Jan. 1991) reported that John Moore moved into a farmhouse near Llandeilo in 1982 and 18 months later discovered that a local quarry (McAlpines) had planning permission which, they claimed, entitled them to dig up his farm. Legal searches instituted when the farm was purchased did not reveal this permission, the local authority were equally surprised and a costly legal battle began. McAlpines claim that they have both the mineral rights and the necessary planning permission given under an I.D.O to mine 470 acres and a High Court hearing is awaited to resolve the difficulty.

Demand

Somerset County Council (1971) in a report on Quarrying in Somerset stated that Somerset was the third largest rock producing county and exported 500,000 Tonnes of rock to Dorset each year. In 1969 the total production of limestone in the U.K. was 80,000,000 tons per annum. 42% of Somerset's output is in the form of dry roadstone and 90% of the total output of limestone dispatched by road is delivered to customers within an 80 mile (130 Km) radius of the production area and the average daily movement was 2,200 loads out of the production area. In addition to supplies from Somerset, Dorset also received supplies from Devon.

In 1968 the Devon and Dorset area produced nearly 3.5 M tons (3.56M tonnes) of limestone compared with 0.8 M tons (0.813 M tonnes) in 1948, but over 3M tons (3.05 M tonnes) originated from Devon.

Only three Dorset quarries produce crushed rock for aggregate, Broadwindsor, Swanworth and Portland and only two have long term reserves which could meet expanding markets in the East Dorset/Bournemouth area, the area currently served by Swanworth quarry. The policy of Dorset County Councils Planning Authority is that any new stone workings for which the need may be demonstrated should be confined to the vicinity of existing quarries but generally it considers that reserves of roadstone in at least 2 units are ample to meet any foreseeable demands in the area.

In 1971 Somerset's report gave the forecast of the UK demand for Aggregate and compared it with demand dating back to 1948, this gave the demand as:

1948	-	70.1 M tonnes
1968	-	238.4 M tonnes
1970	-	247 M tonnes
1980	-	347.7 M tonnes
1990	-	461.5 M tonnes
2000	-	598 M tonnes
2010	-	759 M tonnes

The last figure was based on an average demand of 10.21 tonnes per person with an estimated population figure of 74,190,000. This is required to meet the constructional, manufacturing, service and maintenance needs of the resident population, as a comparison in 1971 the figure was 4.32 tonnes per person with a population of 55,970,000.

A working party reported to Dorset County Council (1977) on the Stone Industry in Portland which stated that the removal of the railway in 1965 had seriously handicapped the Portland stone industry and in particular the supply of crushed rock. British Rail's objective for 1980 was to move 10,000,000 tonnes per annum from the Somerset/Avon area to the South East of England, expanding to 15,000,000 t.p.a. Crushed Mendip stone is imported to Southampton and Poole, crushed Mendip stone being cheaper than crushed Portland stone. Markets are not easily accessible to Portland stone, and this applies to Purbeck, only local markets are served. This is true of Swanworth quarry in Purbeck which supplies crushed stone by road over a 40 mile radius, principally the S.E. Dorset/Bournemouth area. Mendip stone is also delivered by road to this area and the Mendip lorries often return with loads of sand into the Bristol region which is deficient in land supplies of sand. If the Portland railway line was re-instated the steep gradients would make transport more costly than aggregate from the Mendip area 2.82 HP per ton against 1.75 HP per ton. The rail routes from Portland are limited to Bristol and eastwards to London via Bournemouth, this would mean direct competition with Mendip stone which is shipped to both Bristol and London. Rail transported crushed Portland stone could not compete against Mendip crushed stone also transported by rail.

Mendip quarried crushed rock is marketed in Dorset by road transport, it competes to the West of Dorchester with crushed stone and gravel from Devon, West Somerset and West Dorset, whilst in the area around Wareham crushed limestone from Swanworth quarry shares the market. All over the market area the gravel fields of West Knighton, Moreton, and Worgret compete for concrete aggregate but not withstanding this fact there is a steady flow of Mendip limestone into Dorset. Crushed stone can be used for both dry crusher run for road making as well as for concrete production and only faces competition from gravels in the concrete sector because gravels are not suitable for crusher run.

The working party studying Portland suggested that crushed Portland stone could be transported, using the harbours in the area, to the wharves of the lower Thames and help to satisfy the shortage for crushed stone in the South East of England. Although the reserves of crushed rock aggregate at Portland are large and it is a coastal quarry the present inland transport route hampers increasing production and without coastal transport, using bulk carriers of not less than 3000 tons d.w., there are no prospects for growth at Portland. Stone for aggregate utilises material beneath the traditional beds of dimensioned stone and this creates a new breed of quarry 26 Metres deeper than the dimensioned stone quarries at Portland and quarries with existing planning permission could thus be deepened. Although a working party was not appointed to study Purbeck, the problems are similar except that Portland has the advantage of a Naval harbour soon to be vacated.

Whitbread (1992) produced a report on the need for coastal superquarries to supply S.E. Englands aggregate requirements. The aims of the report were to identify suitable broad locations not confined to the United Kingdom with potential for establishment of coastal superquarries capable of producing 5 M tonnes p.a. and with reserves of at least 150 M tonnes, a 30 year life (Portland reserves are 125 M tonnes). The report examined the broad environmental impact of these quarries, the distribution problems in the S.E., the contribution they could make to aggregate supply and whether these resources are capable in economic and environmental terms of supplying substantial volumes of crushed rock to the S.E.

The report concluded that there are no reasonable prospects for coastal superquarries along the coastlines of England and Wales and in particular there is insufficient winnable stone remaining along the Dorset coast to support a superquarry. Possible sites for coastal superquarries were identified in Scotland, Shetland Isles, Norway and Spain, the greatest potential being in Norway and Scotland. A minimum size of vessel to economically transport crushed rock would be 37,500 tonnes d.w. with a target size of 75,000 tonnes d.w., but a ship this size would require a sheltered deep water mooring at the superquarry.

A Guardian report (7. 6. 1992) stated that the Western Isles Council is considering a £20M proposal from Redlands Aggregate to extract 600M tonnes of coarse grained igneous rocks from Lingeraby on the S.E. tip of Harris in the Outer Hebrides, classified a national scenic area by the Countryside Commission. Redland and the C.B I. Minerals Committee claimed coastal superquarries are the only realistic solution to a demand made worse by environmental constraint on English quarries. By the year 2000 it was stated that the annual shortfall of hard rock in the S.E. alone would be 12.M tonnes rising to 40 M tonnes by 2010.

A D.O.E. team is assessing the potential of coastal superquarries, an idea that was first mooted 30 years ago and would go some way to reducing heavy traffic on many roads. Scotland could earn an annual income of £300 M exporting its granite rising to £700 M if the shipping element is included. Notice of Opposition was served by Environmentalist Groups. Further evidence of the constraint on inland quarries was contained in a report by Clover, C (1993) Daily Telegraph, which stated that curbs on the amount of sand, gravel and roadstone which can be extracted from inland quarries were announced by the D.O.E.

A 20% cut in the amount of materials for roads, housing and industrial buildings is to be made in England and Wales in the next decade because the Government wants more materials to come from super quarries in Scotland. Until now it has said that minerals should come equally from all areas of the country but public concern about damage to the countryside caused by quarrying and the desire to make use of recycled building materials has brought about the change in direction.

It is also proposed to reduce the 10 year landbank of materials which local authorities are required to set to 5 years. In 1991, 240 million tons of constructional materials were used in England and Wales and this is expected to grow to between 370 million and 440 million tons a year by 2011. A total of 6,500 million tons of aggregates will be needed which, due to the recession, represents a 10% cut in the 1991 estimates. Environmentalists gave a guarded welcome to some of the proposals but criticised them for moving the pressure for mineral extraction from one end of the country to the other. Demand for aggregates in the year 2010 was estimated in 1971 to be 759 million tons per year, but the current estimate is 440 million tons by the year 2011 and although this shows a 42% reduction there is still an expected shortfall of 40 million tons of hard rock in the S.E. alone by the year 2010.

Crushed Stone Production in Purbeck

Current production of blockstone in Purbeck is 40,000 tonnes per annum, there is only one quarry, Swanworth, that produces crushed limestone and in 1988 Tarmac, who own the quarry, submitted a planning application to increase the size of the quarry.

Dorset Evening Echo (14.5.1988) reported that the submission to quarry limestone at the rate of 400,000 tonnes a year up to the year 2045 between Kingston and Worth Matravers over an area of 117 acres had been submitted to Purbeck District Council. Supply of minerals is a national issue and a working party had suggested that Dorset's present production of 700,000 tonnes a year of crushed rock could rise to 1.1 M t.p.a. and sand and gravel from 2.2 M t.p.a. to 3.5 M t.p.a. by 2005. It was agreed to advise the regional working party that Dorset County Council had reservations as to what the counties contribution would be and would itself retain responsibility for Dorset's contribution to regional demand for aggregates. Fig 1.9 shows the site of the quarry, located in the Heritage Coast area, the size of the proposed extension alongside the existing quarry and the site of a previous proposal, dismissed on appeal by the D.O.E. Purbeck District Council (1987) commented that their Purbeck Heritage Coast Joint Policy Statement states that no new mineral workings will be

FIG. F1.9

PLANNING APPLICATION.

PURBECK DISTRICT COUNCIL.

permitted in the Heritage Coast Area unless it can be shown that adequate resources are not available elsewhere. A D.O.E. circular (1982) on guidelines for aggregate provision in England and Wales states that in all areas policies for aggregate extraction, including the release of land, must balance the need for the mineral against the environmental, social, agricultural and other relevant considerations. It also states that the need to protect the flow and quality of water supplies in accordance with British and European community legislation should be taken into account in developing policies for aggregate extraction and when determining new planning applications . These considerations are especially important in relation to sand and gravel or limestone aquifers.

The proposed new quarry at Swanworth would be situated on a hillside between Kingston and Worth Matravers, limestone would be extracted and crushed into aggregate, 90 acres would eventually be excavated to a depth of 100ft and it would produce 16.6 M tonnes of limestone aggregate at a minimum rate of 400,000 tonnes p.a. up to the year 2045. An earlier application was dismissed on appeal in 1968 by the D.O. E for an area of 11 acres on the grounds that the quarry would become visible as a scar on the hillside. If consent is granted for any extension of the present quarry it will set a precedent for the future and it will be difficult to turn down other planning applications for limestone aggregate quarrying and ancillary operations in the surrounding area. Tarmac plc, who own the quarry, have mineral rights over another 300 acres in the surrounding area. In 1985, 456,000 tonnes of roadstone and construction aggregate was extracted from Swanworth Quarry, representing 64% of Dorsets total production of crushed rock.

Tarmac plc are applying for planning permission to supplement the remaining reserves and continue to satisfy the demand for crushed rock, utilising the existing process plant, on site facilities and public road access. Tarmac plc are committed to safeguarding the natural environment whilst winning resources essential to Dorset, including carefully detailing the progressive restoration of Swanworth Quarry and during each phase of the operation the overburden will be used progressively to restore the floor of the quarry extension. Field boundaries will be recreated and scree slopes and surrounding margins will be developed as a carefully managed natural habitat.

The residents of the nearby village of Kingston objected to the proposal and Purbeck District Council considered the proposal against the directive given in the Dorset County Councils Minerals Structure Plan that states that any increase in crushed rock production from existing limestone working areas poses a threat not only to the environment but also to the future of the blockstone industry which Dorset

County Council are pledged to support. The County will also resist the conversion of blockstone quarries to crushed rock aggregate production. Purbeck District Council therefore refused the application on the foregoing grounds and Tarmac PLC gave notice of appeal.

Structure Plan

Dorset County Council (1992) produced a Structure Plan for S.E. Dorset which sets out the minerals and Waste Disposal Policies to be adopted. It states that as a result of its environmental quality, varied mineral wealth and growing population, Dorset faces a range of pressing issues in planning for minerals and waste disposals. The quality and diversity of the environment is exceptional in a number of respects which are recognised in both national and local policies. It has two areas of Outstanding Natural Beauty (ONB) covering more than half its area, numerous Sites of Special Scientific Interest (S.S.S.I.) and other habitats of high conservation value, many features of archaeological and historical interest and an extensive undeveloped coastline designated as Heritage Coast.

Dorset has a range of minerals available and although not a major producer of minerals in overall volume terms, Dorset provides building stone, sand and gravel, ball clays, oil and gas and small quantities of other materials including chalk and common clay. The Council's aim is to achieve a balance which enables operators to win the materials that society needs and dispose of its waste, in ways which safeguard the environment and the amenity of residents and secure benefits from the after use of sites. The Minerals and Waste Local Plan will be the key document. Dorset has been one of the fastest growing counties in terms of population and thus current planning policies envisage restraint compared with past rates of development. The plan will define areas of preferred working and the criteria against which proposals will be judged. Its horizon date will be 2001, in order to tie up with the Structure Plan but its policies aim beyond this date to provide a basis for long term planning of mineral and waste operations.

Government advice on minerals Planning (Minerals Planning Guidance Note 1) was incorporated in the plan and this stated that 'each authority should make a contribution to meeting local, regional and national demand which reflects the nature and extent of minerals in its area and other relevant planning considerations'. General policies will be dealt with such as minerals exploration, resource protection and supply, constraint on locations, associated plant, transportation, reclamation and planning information for use by local authorities. Consideration will be given for the provision of land banks for aggregate materials, in line with Government and Structure plan policy and control will be exercised on their release for mineral working.

The need to reclaim sites to some beneficial after use will be examined to reduce the problem of unsightly and under-used areas at active, dormant or derelict sites. For all new developments full reclamation conditions including, wherever possible, progressive reclamation and bonds or indemnities may be required in order to guarantee completion of the work. Landfill is likely to continue to remain the major option for waste disposal and mineral workings may offer such opportunity in cases where landfill would secure beneficial restoration. The council will support facilities required to receive imported aggregates (and minerals such as marine dredged aggregates) at existing ports plus the development of rail depots provided that serious traffic problems are avoided.

Within the areas of O.N.B, SSSI and Nature Reserves proposals for new mineral workings or waste disposal sites or substantial extension to existing sites will be rigorously examined and will only be approved where the need for the development outweighs the policies to protect these areas. They will not normally be permitted where they would cause serious disturbance to local residents.

For the control of stone quarries, the salient rules are as follows:-

1. Extraction of minerals will not normally be permitted on coastal cliffs and beaches.

2. The continuation of block stone quarrying by extending existing quarries will normally be supported provided that scale and output can be controlled.

   Operators must:-

   Control noise, dust and traffic
   Screen operations and keep the site tidy
   Reclaim old working areas
   Maintain safe and adequate access

3. Applications for new blockstone quarries will not normally be permitted unless:-

   a) Need cannot be met from existing quarries in the County or Region.

   b) Scale and output can be controlled.

   c) There are no over-riding environmental and/or traffic problems.

4. Conversion to aggregate production of quarries producing blockstone will normally be resisted.

5. Applications must include a scheme of working, the need to work the site and an appraisal of alternative sites, design and appearance of plant, pollution control, transport, screening, reclamation and an environmental statement.

It is inevitable that continuous demands will be placed on Dorset's aggregate resources even though, in national terms, Dorset is a small producer of aggregates.

Reclamation of Quarries

Coppin (1982) states that quarries with little overburden or spoil that are excavated in the ground do not generally immediately backfill the excavations because this would sterilise the reserves, and this statement applies to the quarries in Purbeck. When quarrying has ceased bulk fill may be used to restore to original level and stored overburden and topsoil replaced to match the surrounding land. Overburden and spoil is usually from 10% to 30% of the material extracted and these have to be tipped away from the site, unless the operation has been planned so that tipping onto worked out sections of the quarry is possible without sterilising future reserves.

Hard rock deposits are found in areas, such as uplands, important for their scenic or scientific value and these should be restored as soon as possible . Although quarries on flat land are fairly easy to screen those on hilltops or hillsides present problems because the excavation intrudes into the landscape. Spoil and waste tips that will eventually be used for backfilling should be carefully sited to form temporary screening, that can be vegetated, until final re-instatement is under way.

After use possibilities of re-instated quarries are:-

Housing and Industrial Land

Sport and Intensive Recreation

Agriculture

Forestry

Country Parks

Wildlife Conservation

Water Storage

Landfill and waste disposal

Water sports

Gunn (1992) stated that because of their small size old disused quarries, of the type found on Purbeck merge into the landscape relatively quickly under the influence of natural processes of weathering and the current methods of stone excavation produced relatively straight faces which if untreated are likely to remain as conspicuous engineered features in the landscape for years. Planning permissions for limestone quarries may specify phased extraction including progressive reclamation of the quarry margin and faces.

One method is to reduce the height of the face by the construction of screes and indent the top edge of the quarry face with a series of cut backs. If the face is very high produce a series of butresses in the rock face projecting out of the screes. Try and produce a profile similar to the limestone profiles to be found on unquarried land. Finally cover the screes with fine reject quarry waste, sand etc., cover with 15cm of soil and peat and plant grass and wild flower seeds native to the area.

Future of the Industry

Dorset County Council (1992) produced a discussion paper for consideration by Dorset's Planning Committee which states that there are currently 20 operational units quarrying stone on Purbeck. These are located in 4 general areas:- South of Swanage, north of the Kingston Road and to the West of Acton, in the immediate vicinity of Acton and, at St. Aldhelms Head. For a number of existing sites permissions granted in the late 1940's under Interim Development Orders have expired. These sites are therefore unauthorised. Resolution of this situation will be sought through the submission of retrospective applications and this will offer the opportunity to review conditions for working and restoration.

Between 60 and 100 people are now employed in the quarries although some are only on a part-time basis. The stone resource is wholly within the AONB and partially within the heritage coast and the area is of value to a wide variety of interests being well used for recreation/leisure activities by both locals and visitors. There is a nature conservation interest in the area (much of it reflecting the legacy of past quarrying) which has led to the designation of 3 sites of SSI. Durleston Country Park is managed for conservation and recreational objectives.

Langton Matravers, Acton, Worth Matravers, Herston and parts of Swanage are all designated building conservation areas (Purbeck District Council, 1992). Much of the charm of the Purbeck villages is due to their traditional construction in local stone, thus stone will be required for restoration and new buildings.

Although quarrying has wide acceptance in the area, current operations, particularly those at Action, are prominent in the landscape. Restoration options include infilling to bring land back to original levels or simply to replace overburden and restore to lower levels. Sites could then be used for nature conservation or amenity purposes. Roads in the Acton area are narrow and unsuited to heavy traffic, routes are often through residential areas and traffic may prove both a nuisance and a hazard. Support for quarrying should be a key theme in the strategy but limited to a production rate similar to that traditionally operated, ie small units. Significant production increases will be resisted for markets which are not dependent on the specific quality of the materials. The use of this quality material for use as crushed stone aggregate will be resisted.

It would be appropriate to plan over a 20-year period to give investment confidence. It is estimated that 800,000 tonnes would be required in total to maintain supply at existing levels over the next 20 years (ie 40,000 tonnes per annum). It is estimated that 1 hectare of land in the stone areas would yield about 25,000 tonnes and this has enabled 'Preferred Areas' for future working to be defined. 800,000 tonnes of saleable stone over 20 years would require about 32 hectares of land in total. The majority of existing workings, particularly around Acton were under IDO consent granted in 1948 which have now lapsed and Dorset County Council has not been able to register them under the Planning and Compensation Act of 1991.

To avoid green field sites that fully comply with Planning Regulations it is recommended that existing working areas be extended provided they are acceptable in environmental terms. The greatest concentration of working is at Acton, owned by the National Trust, and the landowner limits the release of land (and the output), thus 2/3 of the 32 hectares of land would be at Acton. With all the limitations now placed on the Purbeck stone industry by the government and planners it seems fairly certain that it will remain at its present level. Future increase in demand will be for crushed stone, which will not be met from Dorset because increased inland production and coastal super quarries have been ruled out.

Stone Restoration and Conservation

In the present economic climate it is difficult to foresee a dramatic increase in demand for block stone and this appears to be the governing factor for the Purbeck stone industry's future. However the extent of stone decay in both major buildings and monuments will ensure that there will be at least some continuing demand, albeit limited, for Purbeck stone.

Limestone has provided the fabric for many important buildings in Britain, particularly the southern part. Great cathedrals such as Wells, St Pauls and Ely are constructed from limestone as well as houses such as Audley End and Montacute. Whole regions including the Cotswolds and cities like Bath, Oxford and Cambridge are largely built of limestone. Stone has proved its worth over the centuries and where it can provide durable walls and decorative cladding, within budget constraints, architects specify its use.

Because it is difficult to carve, Purbeck stone is seldom used for intricate features but is mainly confined to plain blockwork. It can be seen at Ramsgate harbour, Portsmouth sea front and other ports along the south coast where it was used for defensive work against the sea or to protect the towns from attack. Many streets were paved in Purbeck stone, particularly in London, but its uses in house building is mainly confined to Dorset, the most notable example being Encombe House. Purbeck marble was confined to church and cathedral decoration and in the main it has been protected from the ravages of the weather and the worst of the atmospheric pollution.

Whatever purpose it has been used for, limestone is subject to decay and much effort is now being expended on the restoration and conservation of limestone, much of it the result of neglect over the centuries. It is very difficult today to see a cathedral completely free from scaffolding, erected to enable remedial work to proceed, and fund raising to provide the necessary capital is also evident at every site. For example, it now costs £3,000 per day to maintain Salisbury cathedral, this is in addition to the £6.5 million raised in a separate appeal to save its 404 ft high spire and tower (Petre, J, 1993, Daily Telegraph).

Stone Replacement

When selecting stones for a particular project todays architect possesses something that the builders of the past did not have, the benefit of hindsight. Buildings that date back to Roman times can be examined to see how a particular type of stone has withstood the rigours of the weather during the known exposure period. It would be true to say that had the medieval builders had the advantage of today's information they would never have used Purbeck marble in a location that exposed it to the weather. Salisbury Cathedral provides a very good example, for the cloisters contain exposed Purbeck marble and Plate 1.9 shows how some typical pillars there have eroded, particularly on the side directly exposed to the elements.

Fig 2.9 shows Bay 15 in the cloisters and it can be seen that the stone arch is supported on both single and multishaft pillars. Each pillar is provided with a base and cap which vary in design, depending on the number of shafts incorporated in the pillar. The centre pillar incorporates 5 shafts with single shaft pillars on each side of it, these were badly eroded and needed replacement.

Plate 1.9 Eroded pillars, Salisbury cloisters

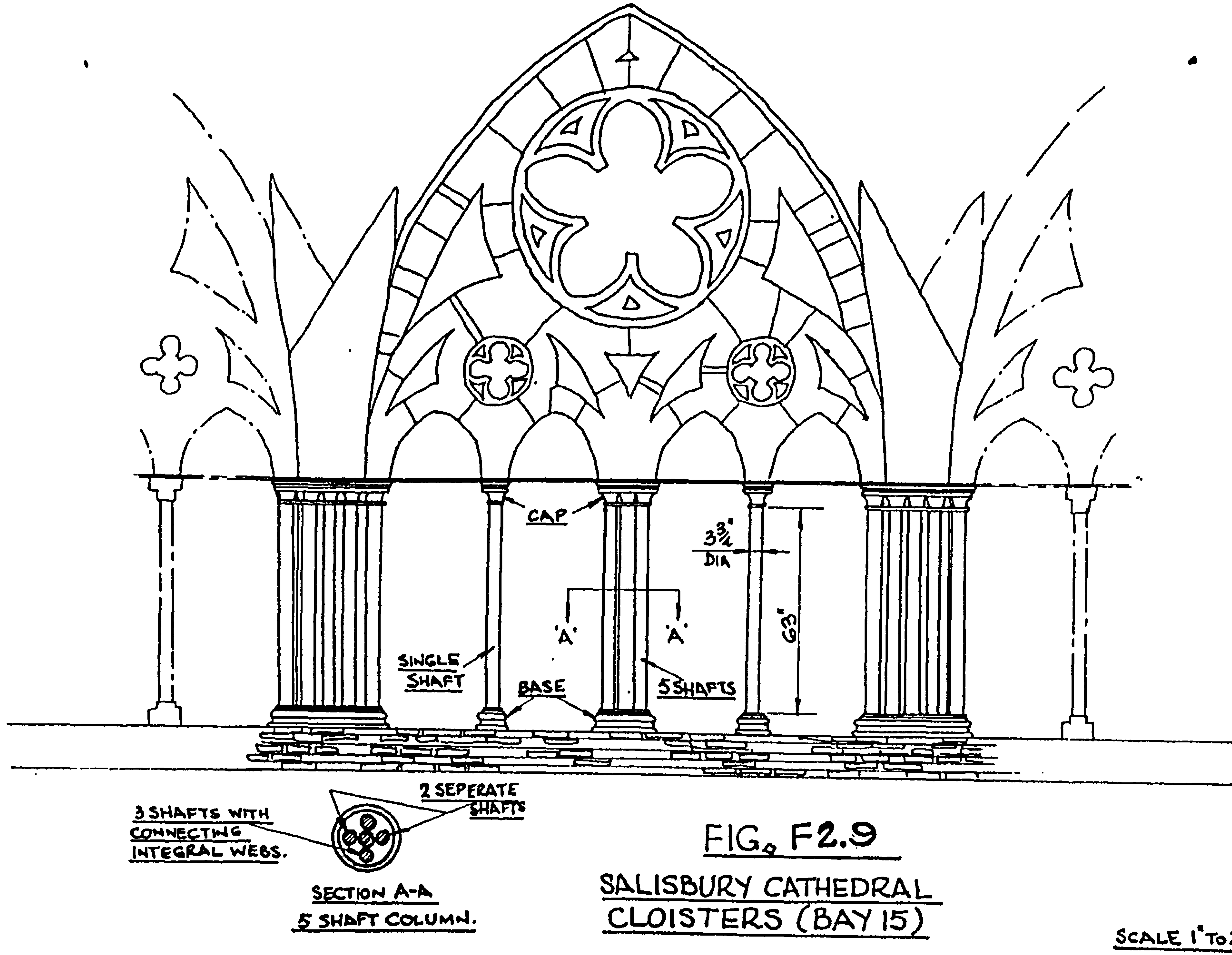


FIG. F2.9

SALISBURY CATHEDRAL CLOISTERS (BAY 15)

SCALE 1" TO 2'-0"

Section A-A taken through the 5 shaft pillar shows that the three centre shafts are connected together by integral webs with separate shafts on each side to make up the 5 shaft pillar. It can be seen that the base and cap of a 5 shaft pillar will be far more complex than those required for a pillar that comprises of a single shaft.
In order to remove and replace the defective columns scaffolding was erected to support the stone arch above and Plate 2.9 shows this operation in progress. The central 5 shaft pillar has been removed along with its cap, but the base is still in position and the centre of the stone arch is now supported by scaffolding.

Plate 3.9 shows the template for a single shaft cap alongside the rough machined Purbeck marble from which it was being made at St. Albans quarry workshop. Simple cylindrical components such as bases and caps for single shafts, as well as the shaft itself, are turned on a lathe and Plate 4.9 shows a cap for a single shaft pillar being turned. Three shafts connected together by integral webs cannot be turned and are carved by hand and one is shown in Plate 5.9 alongside 3 single shafts. Bases and caps for 5 shaft pillars are also carved by hand, a base is shown in Plate 6.9 and a cap is shown in Plate 7.9.

When the components have been fabricated they are erected on site and the scaffolding removed and re-erected in another bay that requires stones to be replaced. Many of the Purbeck marble pillars in Salisbury Cathedral cloisters are in need of replacement and if the original material is again specified then marble will need to be quarried in Purbeck. The easily won marble, mainly quarried in medieval times, has gone and deeper excavations will be required to obtain the marble that remains. This poses an interesting environmental problem, on the one hand planners may resist opening up new quarries or re-opening quarries that have lain dormant for centuries in order that the countryside remains undisturbed and on the other hand there is the requirement to repair the cloisters of Salisbury Cathedral.

Marble quarrying can be classed as a short term project because it is a single seam approximately 2ft thick which would not require much backfilling to allow the land to be returned to its original level and condition.

Salisbury Cathedral is one of the jewels in the architectural crown and must be maintained. Far more people visit the Cathedral than the Purbeck quarrying area also there really are no grounds for objecting to a slight disruption whilst further supplies of marble are obtained to repair Salisbury and other cathedrals.

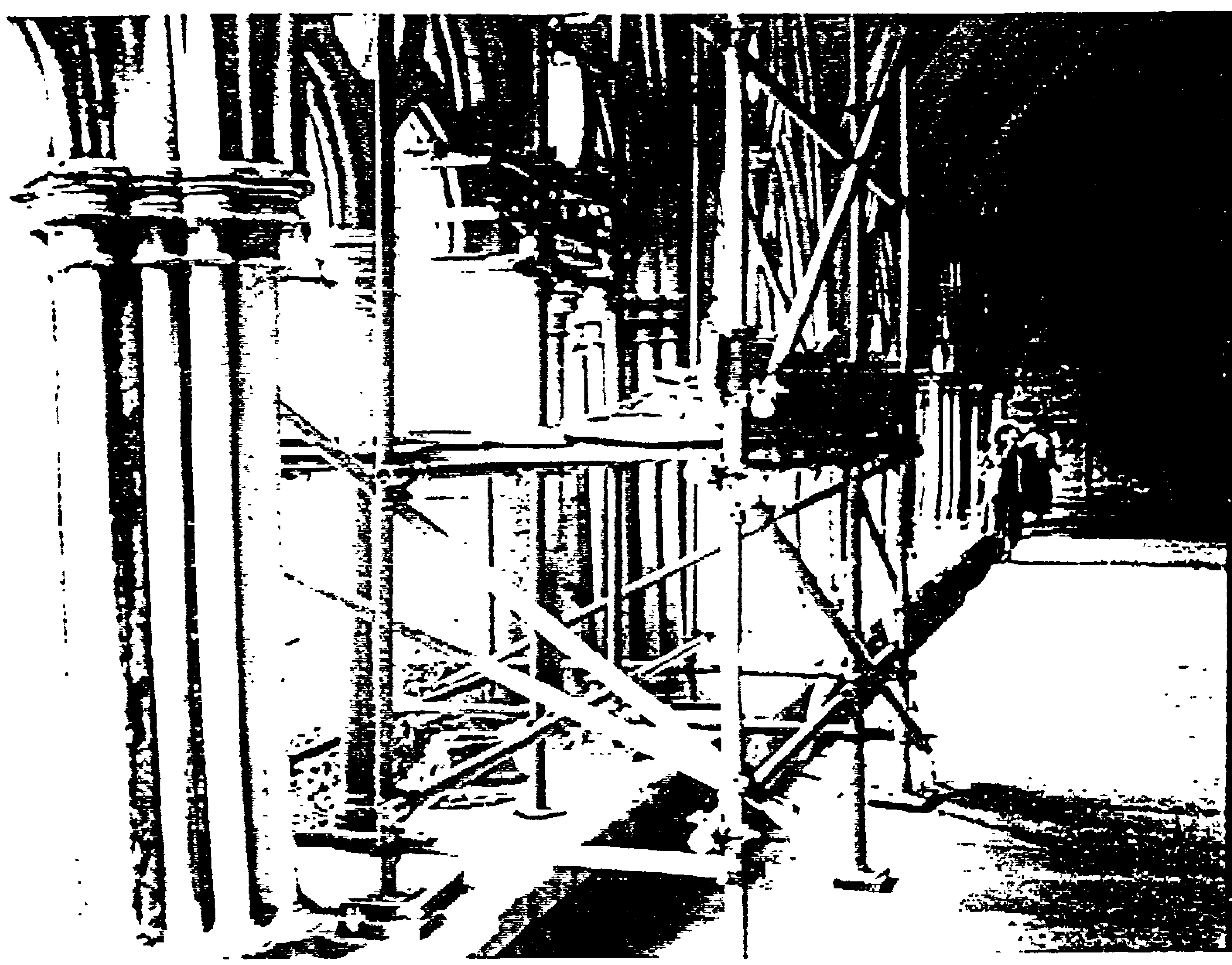


Plate 2.9 Marble pillars removed, Salisbury cloisters

Plate 3.9 Template and Purbeck marble cap

Plate 4.9 Turning a Purbeck Marble cap

Plate 5.9

Marble pillars for

Salisbury cloisters

Plate 6.9 Hand carved base

Plate 7.9 Hand carved cap

CONCLUSION

The Purbeck stone industry dates back to the Roman period with the production of mortars and inscribed tablets from Purbeck marble and burr quarried from shallow pits. This production ceased when the Romans departed around 400AD and the inhabitants of Purbeck concentrated on farming. During the Saxon period it would appear that stone was only used locally because no Purbeck stone from this period has been recorded outside the district.

Stone carving was introduced into England by the Normans, following their conquest in 1066. The stone was required for building and in order to obtain the desired stone, the Normans began to transport stone from local quarries to building sites in other districts.

Fortunately for Purbeck the black and white marble used to decorate Italian cathedrals was introduced into England by the Normans, but being prohibitively expensive, they began to use white limestone as a substitute for white marble. As a substitute for black marble, a certain type of Purbeck limestone which was capable of taking a high polish was used. When the stone had been polished it was rubbed with lard to darken it and although it was not a true marble, it began to be known as Purbeck marble.

Canterbury was the first English cathedral to be decorated in this manner and the style was adapted in many cathedrals and churches, mainly in the south of England. Purbeck marble was quarried from shallow pits along the 11 mile length of the 'marble' seam and taken to Corfe Castle for carving before being transported to the shoreline for shipment.

Corfe Castle became the carving centre for Purbeck marble from the 12th century, but from the 14th century trade began to decline as fashions changed in church decoration. There was however, a demand for carved tombs, fonts and slabs and this continued until the end of the 17th century.

As the demand for Purbeck marble decreased a demand for Purbeck paving stone was created by the rapid expansion of towns and cities in the south of England. Purbeck paving stone from open quarries was entering London in the 16th century, because records show that it was being subjected to inspection by London freemasons. This was strongly resisted by Purbeck quarriers who were being called upon to meet their inspection expenses.

In order to obtain paving stone and leave the unproductive overburden in place, mining began at Swanage in 1700 which also became the stone port. Mining eventually moved inland towards Langton Matravers, where the required stone lay nearer the surface. Stone from mines, quarries and sea cliff galleries was shipped out of Swanage until the end of the 19th century. In 1697 an attempt was made to form a Joint Stock Company to both secure a fair price for stone produced by the many small quarries and prevent quarriers undercutting each other. There was also an attempt to introduce quality control by having the power to break up any stone of poor quality.

It is not recorded how long the Joint Stock Company operated but it was at this point that a golden opportunity was missed. The mechanism was in place to cut out the merchant middlemen and supply good quality stone at a fixed price direct to the customer. There was also the opportunity to make a fresh start because the whole industry was beginning to use Swanage and not Ower as the stone port.

A somewhat primitive beach loading operation was used at Swanage to get stone loaded onto ships which continued until 1859 when the first pier opened. A more ambitious scheme to connect the pier direct to the quarries never materialised and stone trundled through the town to be loaded at the pier until the railway arrived in 1885. Stone transport gradually transferred to motor wagon, the goods yard closed in 1965 followed by the railway itself in 1972.

The lack of a comprehensive and co-ordinated transport plan seriously handicapped the stone trade. This seems particularly incredible when the ball clay industry on the other side of Corfe Castle had made great strides in overcoming similar transport problems. The first ball clay tramway to the coast opened in 1806 and by 1840 three were operating. A steam tug to tow the barges to Poole was introduced in 1830 and in 1866 steam locomotives were introduced to the tramways, some 20 years before the railway arrived at Swanage.

Since the start of the 20th century, the stone industry has been declining nationally and the demand for crushed stone outstrips demand for dimensioned stone. This was first demonstrated in Purbeck in the 1930s when prime stone from Winspit was used to construct roads and runways. This trend continues today because the crushed stone output from one quarry is ten time the total Purbeck blockstone output.

By the end of the 19th century, 600 men were employed in the Purbeck stone trade against 60 today. The output tonnage produce per man has drastically improved by the use of machines but this is influenced by high output of crushed stone which is machine-intensive. The increasing national demands for crushed stone are to be met from the recently proposed coastal super quarries none of which will be located in Dorset. Government policy is to reduce the output of crushed stone from inland quarries and Dorset County Council's planning policy is to limit crushed stone production and prevent existing blockstone quarries switching to crushed rock production. There is little demand for blockstone for new projects although replacement stone is required for the maintenance of buildings.

It seems that the industry will remain at its present size but future prospects do not appear good. Until the railway arrived in 1885, Purbeck was virtually an island, transport being mainly by sea, the returning stone boats bringing in essential supplies. This helped to create a captive population on whom the influence of the stone industry was considerable. To comply with the rules of the Purbeck marblers' families intermarried so that male issue could enter the industry. Women were enmeshed in the Truck system that forced them to buy goods at the merchant's shop. Quarries were rented from the local landowner, who in many cases owned the quarriers' cottages and being the local magistrate, the landowner also administered the law. Because of its isolation methods never changed and tools of the trade were passed down from one generation to the next.

In 1947, most of the underground mines were closed on safety grounds although special dispensation allowed some to continue until 1984 but since then all stone has been quarried by the safer open pit method.

Examination of the extensive range of published literature and archive documentation on the Purbeck Stone Industry supports the view that previous authors have placed relatively little systematic effort into developing an understanding of the engineering and technical aspects of the physical operations of this important industrial activity. By bringing together the majority of the available information from these sources in combination with a large scale field examination and photographic record based upon researches undertaken in 1992 and 1993 this thesis has sought to illumine the archaeology of the industry: in particular this work has been able to provide additional understanding of the surviving underground and surface remains from all past production periods. In addition, the documentary work has allowed additional insights to be developed in the broader field of the social and economic history of the industry, although this was not a primary initial objective of the work. Indeed, it is in this area of academic interest that the most fruitful continuation of this research might be found, for there remains considerable scope for further detailed investigations making use of sources such as Parish records and Estate documentation to develop greater insights into the social, demographic and economic structures of the stone villages. There also remains an opportunity to study the related urban growth in Swanage, and possibly for some comparative work with the industry on the Isle of Portland.

Nevertheless, this survey has been able to bring together and evaluate a substantial proportion of the surviving written evidence of the industry in Dorset, illuminating documentary sources by the detailed field investigation of sites. Greater understanding of the technical approaches developed within the industry has been developed by reference to both historical and contemporary knowledge of stone working and the masonry trades and also by the production of drawings and technical illustrations based upon archaeological evidence designed to develop an increased understanding of the historical identification of resources, techniques of quarrying, mining and extraction, and of the treatment and use of the stone. The research has reinforced previous work by confirming the key role in the industry's development and control by local landowners, merchants, quarriers and the company of Purbeck marblers and stone cutters, and has provided further illumination of the relationships between these important groups. Use of a wide range of sources has also allowed some consideration to be given to the effect of the industry on the local community.

Although the Purbeck stone industry supplied a wide regional and national market its geographical and social isolation was considerable, and it was slow to adopt innovation. Even the examples set by the nearby ball clay industry with regard to methods of transport, were not adopted by the quarriers, even though both industries rented quarries and mines from the same landowners! It also shows in a marked reluctance to use power tools and equipment to increase production in the modern era. The quarriers were not willing to join together in the common aims of improving transport, supply and marketing, choosing instead to work as individuals and in the hope that every quarrier would abide by the same code of fair play.

Future demand calls for increased supplies of crushed stone, which in Purbeck will be resisted by the planners, but demand for blockstone is likely to fall and these two factors determine that there is no realistic possibility for future expansion, and it is not surprising that apprentice training is minimal in reflection of this projected future. The current workforce is around 60 full time employees, and blockstone production may not in the future be sustainable as a viable commercial undertaking as men retire without the trained apprentices to replace them. Crushed stone can be produced by machine operators and this is likely to continue, but as this part of the stone industry is capital intensive rather than labour intensive the workforce required is greatly reduced.

Obtaining the stone from Purbeck over the centuries has been a lonely, hard and dangerous occupation, and the efforts of the Purbeck quarrymen in supplying the stone have been overshadowed by the magnificence and splendour of the completed buildings at locations many miles away from the quarry. It is hoped, especially in view of the uncertain future of the industry, that this thesis may help to ensure that their work and the evidence of their labours are not overlooked by future generations.

APPENDIX 1:

ARCHIVE SOURCES

Dorset County Records Office, Dorchester

D/MOW/T9	(1806-1846)	Sale of lease at Swanage Pitt to Taunton
Ph 575b	(1859)	Papers on Marblers by O.W. Farrer
D65/E1	(1806)	Map of Eight Holes Estate
D/FIL/F29	(1770)	Letter from Bankes to Filliter
D86/E107	(1771)	Letter from Bishop to Williams
D/RWR/T504	(1771)	Letter from Bishop to Pyke
D1/FRY/11/12	(1737)	Survey of George Cary's Estate
D/MOW/Z3	(1651)	Articles of Purbeck Marblers
P11/MI31	(1797)	Parish Stone Account. Corfe Castle
Ph 575a		Hand-written notes on Swanage by T.H. Hancock
D/RWR/E16/15	(1772)	Map of Godwins Tenements at Worth Matravers
D/RWR/E1	(1775)	Lease of Downshay Manor
D/RWR/E16/14	(1772)	Survey of Godwins Tenements at Winspit
T/WMT	(1922)	Tithe Map of Worth Matravers
D/RWR/E11,1,2,3,4	(1700-1832)	Records of John Calcraft's Estate
D65/E2	(1823)	Sale particulars of land at Swanage
Ph65	(1823)	Sale of Carrant Court, Swanage
D/C00: J/292	(1919)	Sale particulars of Weston Farm, Worth Matravers
D/RWR/P4/1	(1919)	Map showing Weston Farm, Worth Matravers
D/RWR/P4/2	(1919)	Map showing land at Downshay Manor
D795/9/	(1919)	Sale particulars for Downshay and Worth Farms
D/RWR/T510	(1882)	Winspit cottage and garden lease
D/RWR/E31	(1886)	Lease of Quarry at Downshay Farm
T/WMT	(1852)	Tithe Map of Downshay Quarries
T/WMT	(1852)	Tithe Map of Worth Matravers (Winspit area)

P11/MI34	(1808)	Henry Banks estate papers (1)
P11/MI36	(1810)	Henry Banks estate papers (2)
D1/LX/35/10	(1925)	Tithe map of Swanage
D433A/T1-T12	(1662-1815)	Details of Leases at Acton
D433/E5	(1894)	Sale of 10 cottages at Acton
DNJH: A/E1-E4	(1732-1894)	William Hancock's estate at Acton
D37/8	(1721-1813)	Leases of land at Swanage
D/MOW/T7	(1817-1855)	Ilminster School estate papers
D65/T3	(1763)	Claim by H. Serrell against Ilminster School
D65/T3	(1857)	Ilminster School estate at Swanage, Sale to John Mowlem
D/RWR/D86 M9	(1719)	Lease of Winspit quarry
MIC/R/307/4	(1703)	Appraisal of goods A. Molmoth (Deceased)
D86/E78	(1779)	Letter to Williams from Card
D1/OM.17	(1845)	Articles of Purbeck Marblers taken from minute book

Abbreviations

DNHAS	Dorset Natural History and Archaeological Society, County Museum, Dorchester
LMLHAPS	Langton Matravers Local History and Preservation Society, Coach House Museum, Langton Matravers
DCRO	Dorset County Records Office, Bridport Road, Dorchester
SDNQ	Somerset & Dorset Notes and Queries. M. McGarvie, Frome
DYB	Dorset Year Book. Society of Dorset Men

APPENDIX 2:

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