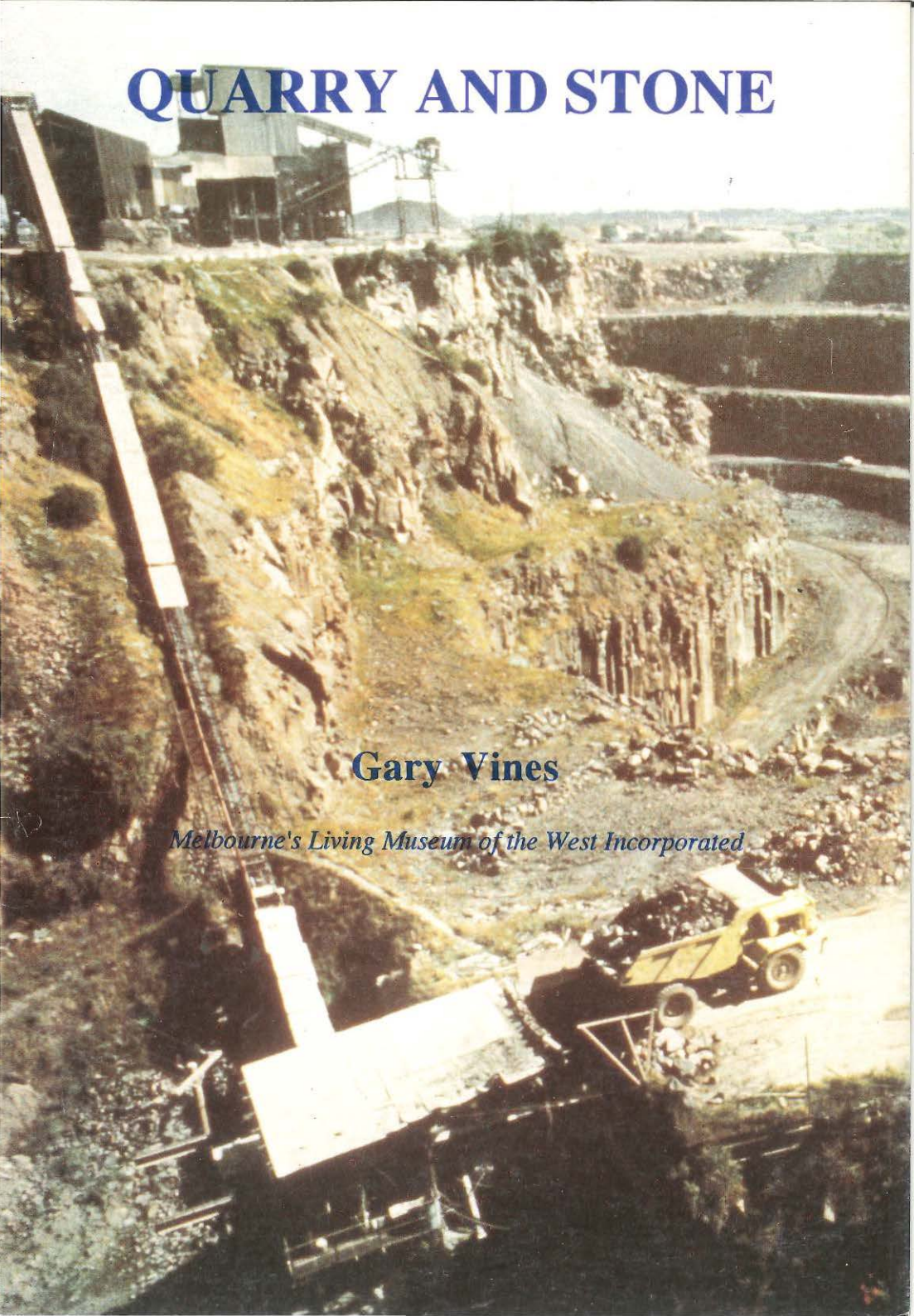
QUARRY AND STONE



Gary Vines

Melbourne's Living Museum of the West Incorporated

QUARRY AND STONE

Bluestone quarrying, stonemasonry and building in Melbourne's West

Gary Vines

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Quarry and Stone: Bluestone quarrying, stonemasonry and building in Melbourne's West

Written and researched by Gary Vines

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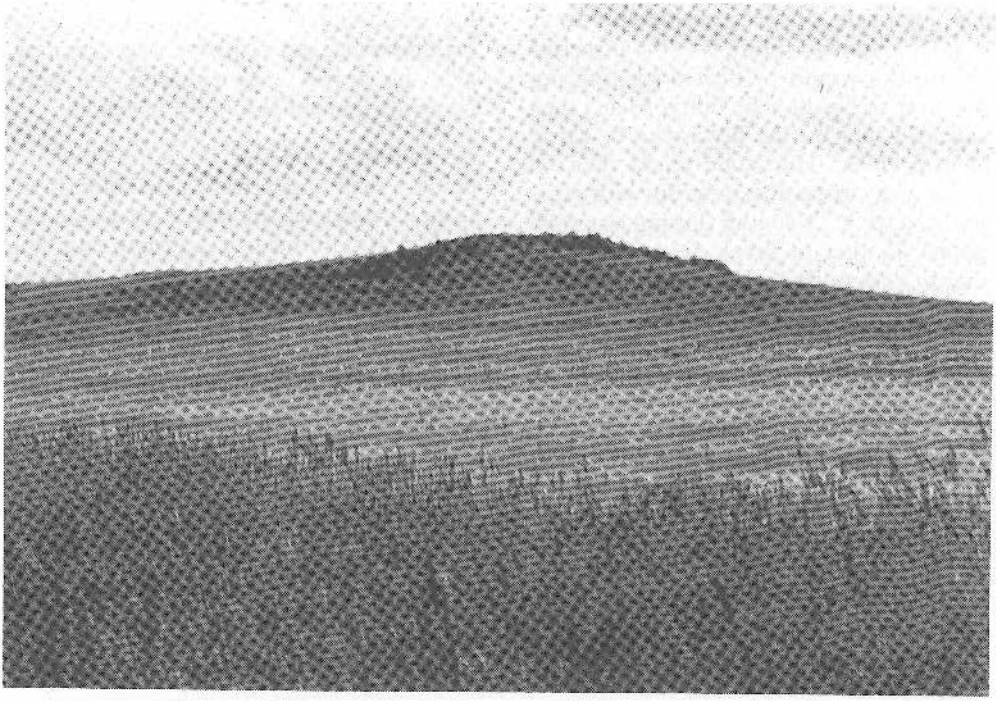
Cover illustration: Market Street Quarry, Sunshine. The basalt plains west and north of Melbourne have unlimited quantities of bluestone just below the surface. Only cost and the encroachment of urbanisation have hindered its exploitation.

Title page: Quarrymen at Roberts' Quarry Sunshine, the owner, Bill Roberts stands second from the left. By the 1920s many migrants, like Jo Camilleri sitting on right, were working in the quarries of Melbourne's western suburbs.



Mt. Kororoit near Rockbank in Melbourne's west. Low hills such as this are the remnants of the volcanic eruption points from which lava flowed over the region to form the bluestone now found up to 80 metres thick.

INTRODUCTION

Aboriginal quarrying

Stone was an important resource for Victorian Aborigines, or Koories as they are known today. They built shelters, dwellings and eel traps such as those at Lake Condah and stone fish traps across the Maribyrnong at Braybrook. Natural basalt boulders were the most common material used by Aborigines in South East Australia, but the most extensive use of stone was for tools, basalt, greenstone, and flint for hand axes and choppers as well as other fine-grained stone such as silcrete and quartzite for hafted implements, spear points, scrapers, etc.

Stone was an important trading item across the continent. Perhaps the most significant was greenstone from Mt William, near Lancefield, which was trading as far as South Australia and New South Wales. This prized stone was more than just a trade commodity, it had a very important social function. Giving 'presents', and the obligation of the recipients to do the same, strengthened bonds between groups already linked by kinship ties, ritual and language. Aboriginal trade was part of a network of social obligations which bond individuals and groups. Aborigines also opened up smaller quarries in the region, especially silcrete in Green Gully near Keilor and at Bacchus Marsh.

The techniques employed by Aboriginal quarry workers differed considerably from those of Europeans. Fire was the principal tool. Rocks would be heated by lighting fires over or beside rock outcrops and then pouring water on the hot rocks to cause them to crack. The stone could then be prised away from the outcrop with fire-hardened sticks. Napping (hitting one rock against another to break away flakes of stone in a controlled manner) was then used to reduce the quarried stone to a more convenient size and shape, and to prepare the cutting edges. This was a similar process to that used by European quarry-men when they broke up bluestone into 'spalls' or shaped building stone.[1]

European traditions

Before the advent of man-made building materials such as steel and concrete, buildings in rural and urban areas throughout the world often had the appearance of having grown out of the landscape. Whether they were the oak-framed, half-timbered cottages of Bavaria, the mellow limestone terrace houses of Bath in England or the mud-brick cities of the Middle East, the character of the buildings was dictated by the local material. In a considerable part of Victoria, the most common building material is the underlying basalt rock. Although thick forests grew in Victoria, when Europeans first settled here, they found the tough and often twisted eucalypt hardwoods too difficult to work with their simple and easily blunted hand tools, and prone to splitting and rotting once cut for building timbers. However, timber was the first building material used in the early settlement. The colonists built timber-framed houses, clad in weather-board, shingle or wattle & daub, but used bricks sparingly for chimneys and the more substantial government buildings and public houses. Bricks for these still had to be imported. However, when prosperity led to substantial and permanent buildings being erected, and skilled workers became available, it was stone and brick that were chosen in preference to other materials.

No building material is harder or more durable than basalt, known as 'bluestone' from its characteristic colour when freshly broken. It is formed by volcanic eruption and found in great abundance on the lava plains extending west of Melbourne as far as the South Australian border. George McCrae recalled how, in the 1840s, 'a good deal of the ground was bumpy and sown broadcast with volcanic boulders', and the family home, near the Yarra river was built 'very stoutly of the hard, cindery-looking boulder stones abounding in the neighbourhood, dressed with the mason's hammers'.[2]

Bluestone was the material of choice for engineering applications, foundations, bridge and tunnel construction, machinery foundations and maritime structures such as docks, wharves and lighthouses.

Bluestone was also used extensively for industrial and commercial applications, factories and warehouses. While many churches were built of bluestone, most major public buildings were of other stone such as limestone and granite or Grampians sandstone in the case of Parliament House. The stone was often brought a considerable distance from its source, and used as thin facing over brick and almost universally on bluestone foundations.

Geological origins

The special qualities of bluestone are a consequence of its formation from 'effusive' volcanic eruptions. The lava which forced its way through fissures in the earth's crust poured out slowly, filling valleys and cooling to form a landscape of low hills surrounded by a level plain.[3]

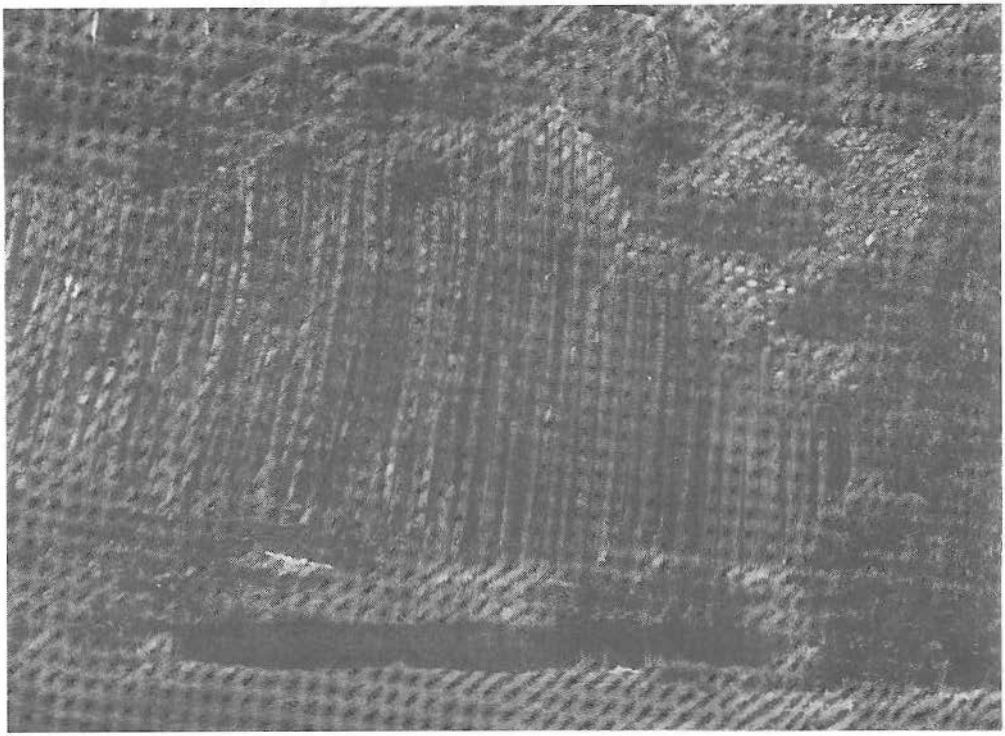
Eruptions occurred between one and four million years ago, but in Western Victoria they were more recent. Although the last eruption was probably thousands of years ago, the area may still be volcanically active and Aborigines retain oral traditions of the times when the land was on fire.[4]

The first stone to be exploited was found in natural outcrops along the coast at Williamstown and on the banks of the Maribyrnong River. Fine building stone was dug in dozens of hand-worked quarries in Footscray to help build Melbourne. 'Footscray bluestone' became synonymous with hard durable building stone, and gave an almost mythical quality to the district as expressed in this 1909 description:

Nature has lent us no adventitious aid in the way of picturesqueness and physical charm. All she has given us is some very good bluestone. Our prosperity will indicate hers - the foundations of her palaces will be hewn from our quarries.[5]

As suburbs grew, pressure from competing land-uses pushed quarrymen further west in search of new sites. The great change in the industry came after WWII when increased demand for crushed stone for railways, roads and concrete, replaced the old building and paving-stone quarries. Mechanised stone-crushing led to increased production and the continuation of the quarrying industry into the late 20th century, but with a much reduced work-force.

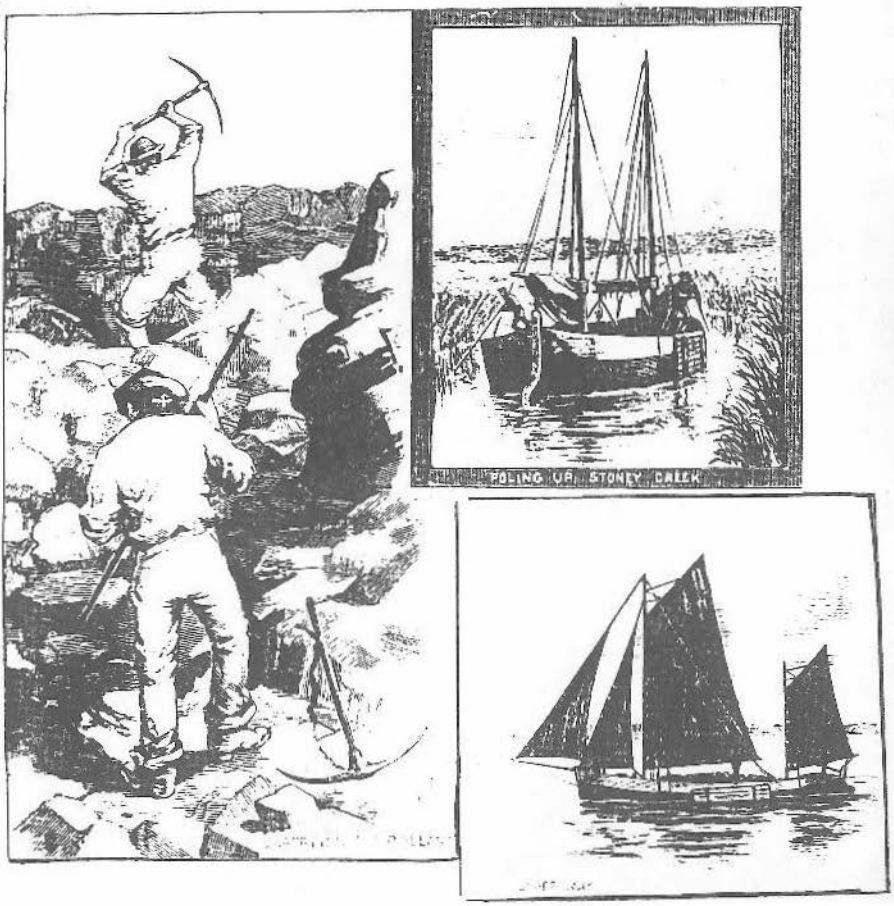
The unusual formation of the 'Organ Pipes' near Keilor. When lava cools, it sometimes fractures into six-sided columns, exposed here by Jackson's Creek. Similar formations are often found in the walls of bluestone quarries.



BASALT FOR BALLAST

The most basic use of quarried stone is for ballast in its various forms. 'Ballast' is any heavy material used to provide stability for ships at sea, especially sailing ships with no cargo. Stone, brick, iron, lead and concrete can be used, the main constraint being that they can be loaded and placed by hand. During Victoria's early days, importation of supplies and immigration of new settlers and goldminers brought huge numbers of ships to Melbourne which had to return home with little or no cargo. Blocks of stone about one foot square ($35cm^2$) were ideal for ballasting and at the end of the voyage could be re-used for building or paving stones. It is probable that considerable quantities of Melbourne bluestone ended up paving British streets and lanes. Ballast of another form was later used for the crushed rock foundations of roads and the beds of railway tracks.

Ballasting at Stony Creek, Spotswood in the 1880s. Stone was dug from outcrops near the banks and carried in wheelbarrows over timber barrow-runs to barges moored in the creek which were poled up the creek and sailed out to ships anchored in the bay or tied up at the wharves.



Ballast grounds were opened along the western banks of the Maribyrnong and Lower Yarra Rivers and the Williamstown coast by the early 1850s, a time when Williamstown was the centre of the ballast trade. Signs of small quarries can be seen at Point Gellibrand in Williamstown where gangs of convicts toiled during the day extracting the stone near the foreshore. At night they were taken back out to the prison hulk moored off-shore.

In May 1853 prisoners for the convict hulk *Deborah* were employed on improvements on the Williamstown roads and were 'engaged on Gellibrand's Point, and have been for some times past, in breaking of stones and forming a landing jetty for Government purposes'. Convicts were divided into masons and stone-cutters who cut the stone for Government buildings, the Telegraph Station, the Wesleyan Church and the embankments of the Railway and Breakwater Piers, quarrymen who raised the stone and stone-bearers who carried it from quarry to building site.

On 26 March 1857 fifteen convicts working on the construction of the breakwater attacked their hated superintendant, John Price, 'with stones and such other weapons as they could get hold of' (possibly picks and shovels) 'and literally hacked and trampled him into insensibility'. He died the next day of his injuries. In 1869 convicts quartered in the prison hulk *Sacremento* were working a quarry at Stony Creek owned by the Penal Department and building a training wall at the mouth of the Yarra River.[6]

Teams of ballast-getters quarried the natural outcrops at Stony Creek (a small tributary of the Lower Yarra) and loaded the stone by wheelbarrows along wooden planks to barges tied up on the creek bank. Early maps of the area show clearly how the stone was worked back from the creek, progressively undercutting the higher ground. The barges were then dragged, poled and sailed out into Hobson's Bay or brought up beside ships at their wharves so that the stone could be transferred into the ships' holds. Ballast barges raced to secure a ship and beat competing barges.[7]

Ballast wharves were constructed on the banks of the Yarra at Spotswood and Newport. Several operators had their own jetties on the Strand adjacent to their quarries in the 1850s or used the Ann Street and Stevedore Street piers for the trade. As late as the 1870s, complaints were made of holes full of water along the Strand, and Newport residents complained of quarries encroaching on streets. By 1879 the ballast trade was booming with 56 lighters carrying 2,400 tons of stone employing 108 men carrying for 200 quarrymen. The estimated value of the industry was £17,000.[8]

Ballast stone was supplied at different prices according to the distance transported and difficulty of transfer. In 1870 prices were quoted as follows:

Melbourne Wharves	3/6 per ton
Footscray	2/6 per ton
In Bay	4/6 per ton
Williamstown	2/9 per ton[9]

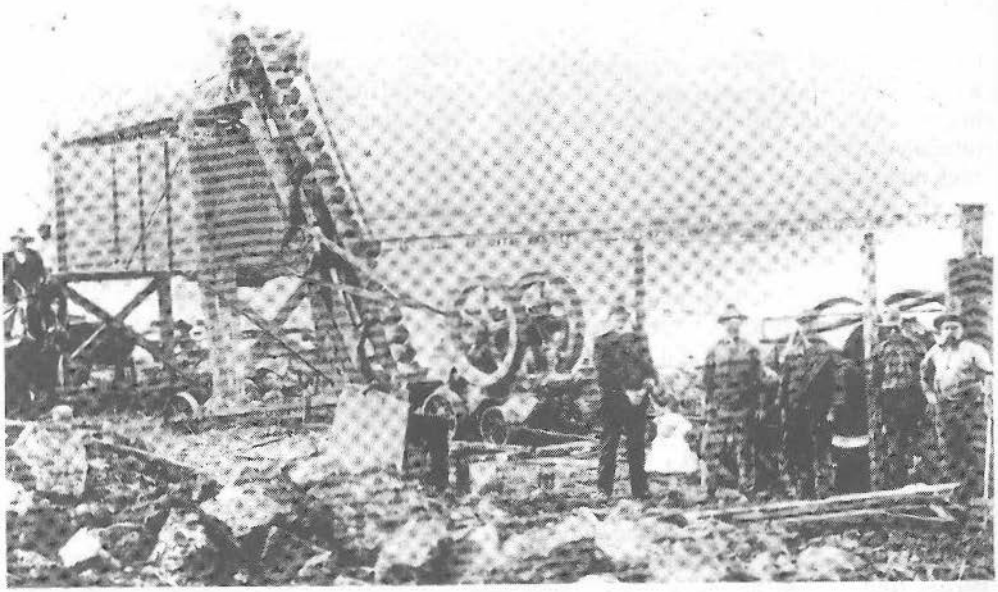
Opposition to quarrying began early and in 1870 the Council was attempting to stop quarrying at the back beach and prevent damage to streets. The Commissioner for Crown Lands was requested to issue no more quarry licences for the South Beach and lighters' licences were cancelled in this area, although quarrying continued with drays taking the stone away. [10]

The ballastmen were a picturesque lot, independent sorts who congregated on the Strand in Williamstown at 'Ballastmen's Corner':

In all weathers, wet or fine, they congregated at the foot of Stevedore Street; in particularly bad weather crouched shiveringly under the precarious shelter of the old stone wall. Yarns were 'swapped' and the tit-bits of the town's news exchanged, but always with a wary eye on the river and bay, for the occasional vessel in need of ballast. Therein was their livelihood. The business was based on the share principle - labour claiming two-thirds and the owner of the ballast craft one-third of the proceeds. As many of the men themselves owned their own vessels, each of which could be manipulated with a single individual, in such cases the profits were decidedly good. The craft varied in size from the proud 'Isabella' of 70 tons, down to 'The Pride of the Beach,' of 15 tons. They were all cutters with fore and aft rig. Each craft awaited its turn like cabs on a rank, but should the owner be absent from the 'Corner,' or aboard his vessel elsewhere when the ship hoisted the ever-welcome signal, 'Ready to take in ballast,' he was dutifully accorded a half-hour's grace ... A friendly and hard-working lot they were, withal invariably 'hard cases'.[11]

It was not at all unusual for two men to lift 70 tons of spalls over their heads into their respective craft well within six hours.

Williamstown Council set up a stone crusher on the old Stony Creek ballast ground seen in this view of 1911. The crusher is in the centre, with a bucket elevator delivering stone to the screen on the left. Power was provided by the steam engine on the right.



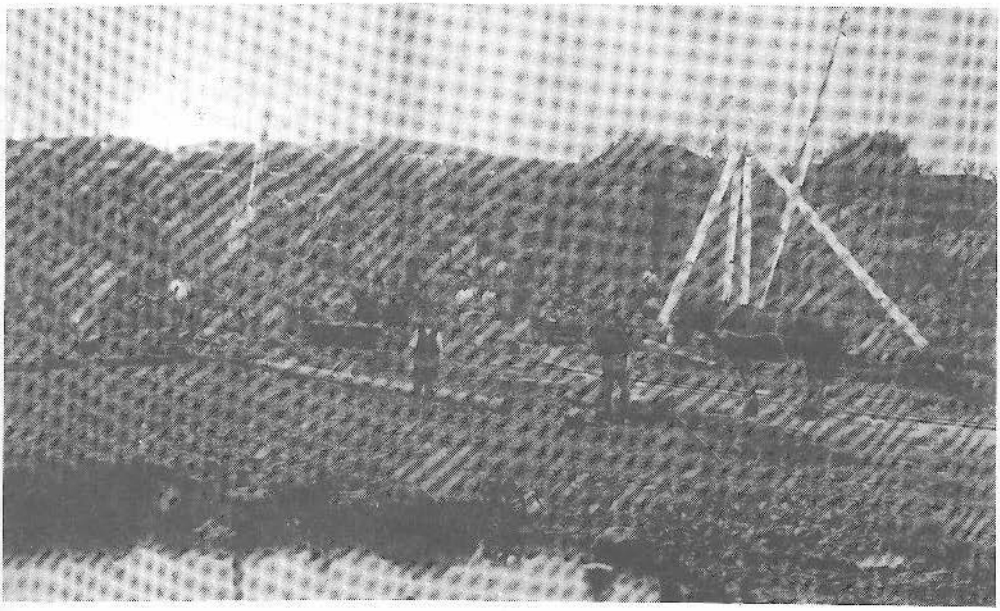
OPENING THE GROUND

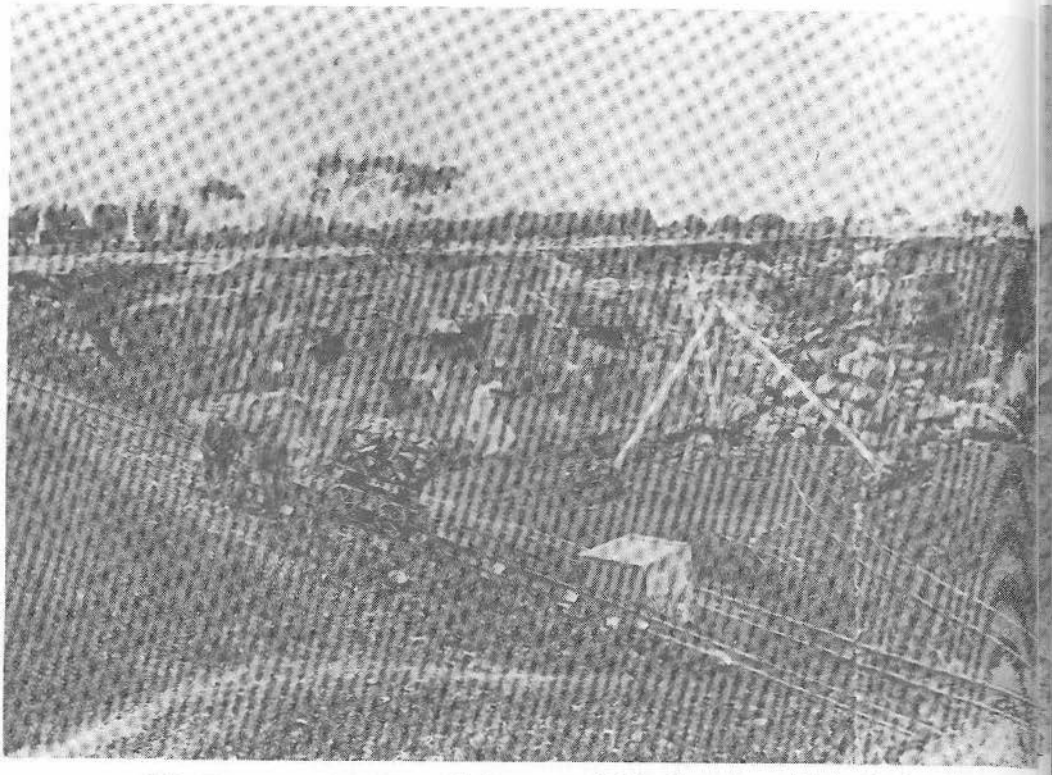
Many small quarries were opened up in Melbourne's Western Suburbs from the 1850s through to the twentieth century. These were often family concerns employing just a few men who extracted the stone by hand with the help of a little gunpowder, simple wooden cranes and a horse and dray. Some quarries were very small holes where stone close to the surface was dug out for a single building. These first quarry holes took advantage of surface outcrops where the stone was obvious to the eye, and sufficiently weathered to make extraction a relatively easy job. Blocks of stone, often just the right size for use in building construction, could be prised away by inserting iron wedges into the natural fissures and cracks.

Buildings constructed from this surface stone often betray their origins in the soft, brown, weathered surface and smooth edges of the stone. The ruins of the original Dodd homestead, now in Brimbank Park display this characteristic, while just a few hundred metres to the north east is a quarried outcrop of basalt from which the stone probably come.

Few records have been kept of this type of quarry and examination of the landscape is often the only way of detecting them. However, in the case of the Dodd homestead we are lucky enough to have some historical information. George Dodd came from Ireland in 1840, worked at stone-quarrying and building and settled at Keilor in about 1849. He was head quarry-man at the quarry which supplied stone for the 1850 Prince's Bridge, so it is reasonable to conclude that he built the original small stone cottage which is now in ruins at Brimbank Park.

A typical quarry scene from the late nineteenth century, probably at Walsh's Quarry, Geelong. Cranes and a horse-drawn tramway can be seen, the only machinery to ease the arduous manual work of extracting and moving the stone.



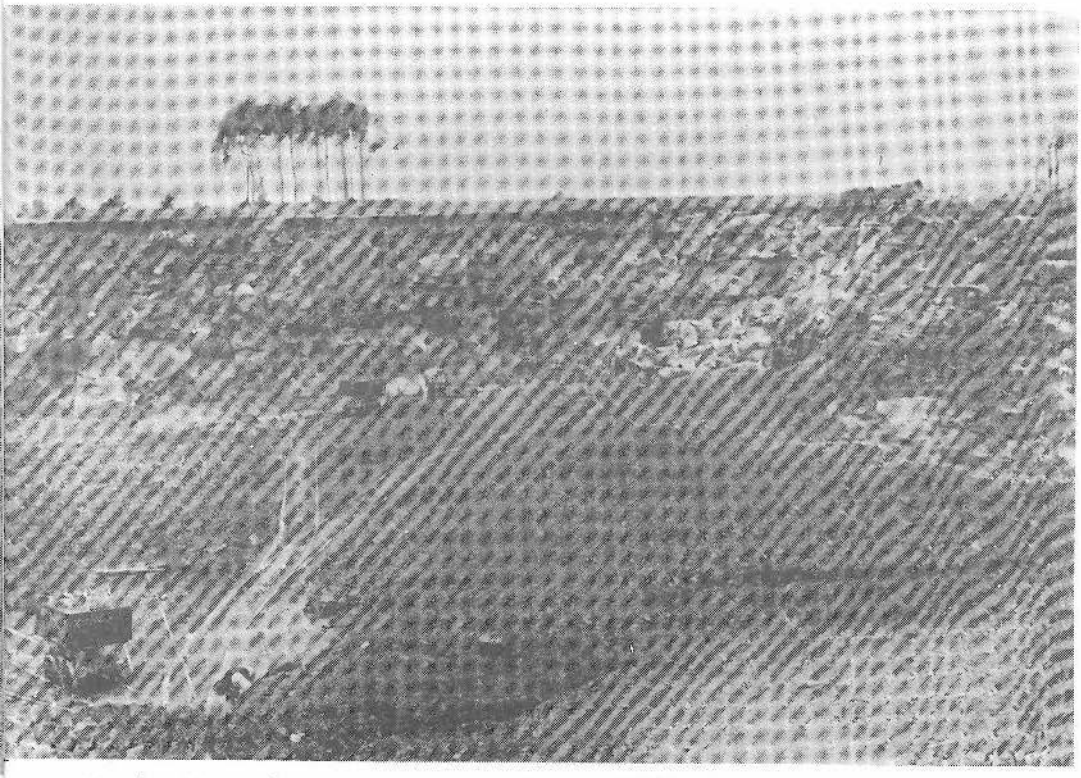


Panorama of the Footscray City Council Quarry in 1920. Note the cable-hauled incline tramway for raising stone from the floor of the quarry hole, and trucks loaded with spalls.

Larger quarries were worked in and near built-up areas. In Footscray and Williamstown, quarries were often located on suburban blocks close to houses, but some spread across wide areas impinging on, or cutting through surveyed roads. Quarries were opened in the 1830s and 40s at Eastern Hill, in the Fitzroy Gardens, off Nicholson St. Carlton and in Clifton Hill near Merri Creek.[12]

Expansion of Melbourne's urban areas pushed quarrymen out to the north and west. The demand for inner city land for new buildings and the desire to remove the hazard of quarrying and quarry holes in the midst of a densely populated area forced the closure of existing holes. As the available stone was exhausted, new quarries were prevented from opening. This trend of north and westward movement of bluestone quarrying has continued to the present day. After the closure of the Fitzroy and Carlton quarries, the industry moved to Brunswick in the north and Williamstown and Footscray in the west.

In the mid 1850s, the basalt country immediately west of the Maribyrnong River was still very sparsely settled. Thirty nine men were working 'in stone and clay - Masons, Bricklayers, Slaters, Plasterers, Quarrymen, etc.' Only a few of this number could have been working in quarries.[13]



By the 1860s, however, Footscray was known as 'Stoneopolis' and the vast majority of Footscray residents were described in the directories as 'quarrymen'. By the 1880s, urban and social pressures were already being felt by these quarries.

By the end of the nineteenth century, quarrying in the northern suburbs had moved to Coburg and Preston, and in the western suburbs the Shire of Braybrook (now City of Sunshine) had taken over as the principal producer of bluestone in the region. As early as the 1920s, quarrying had reached what is today the urban fringe of Melbourne's north and west, with some quarries established in Broadmeadows and Albion. Even these are now closed and the major bluestone quarries are in the Shire of Melton and City of Werribee.

In the first two decades of European settlement in Melbourne bluestone quarrying was carried out primarily to provide stone for building and for paving the streets. Because of this, most quarry holes were quite small and the work was labour-intensive. Blocks were individually cut away from the quarry face using 'plug and feather' wedges inserted either into natural cracks in the stone, or specially drilled holes. Stones intended for building were then roughly squared using the 12 inch long (35cm), square-faced 'napping hammer' and transported by dray directly to the building site. They were then more carefully squared by the stonemasons who would select and shape them for their unique position in the wall.

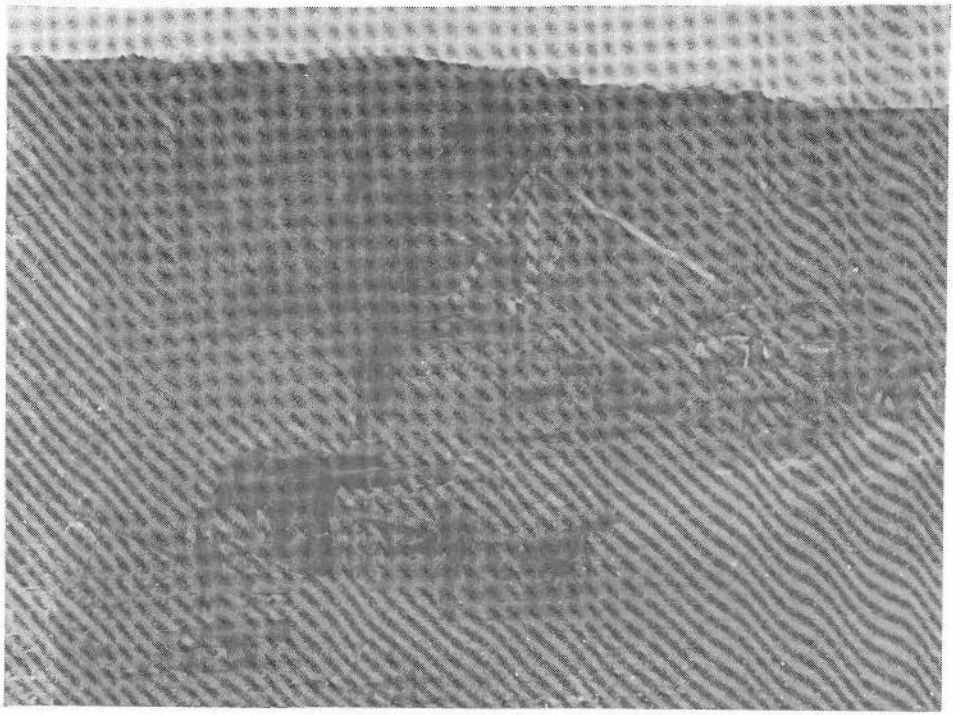
Production of building stone was closely tied to its demand for engineering use and

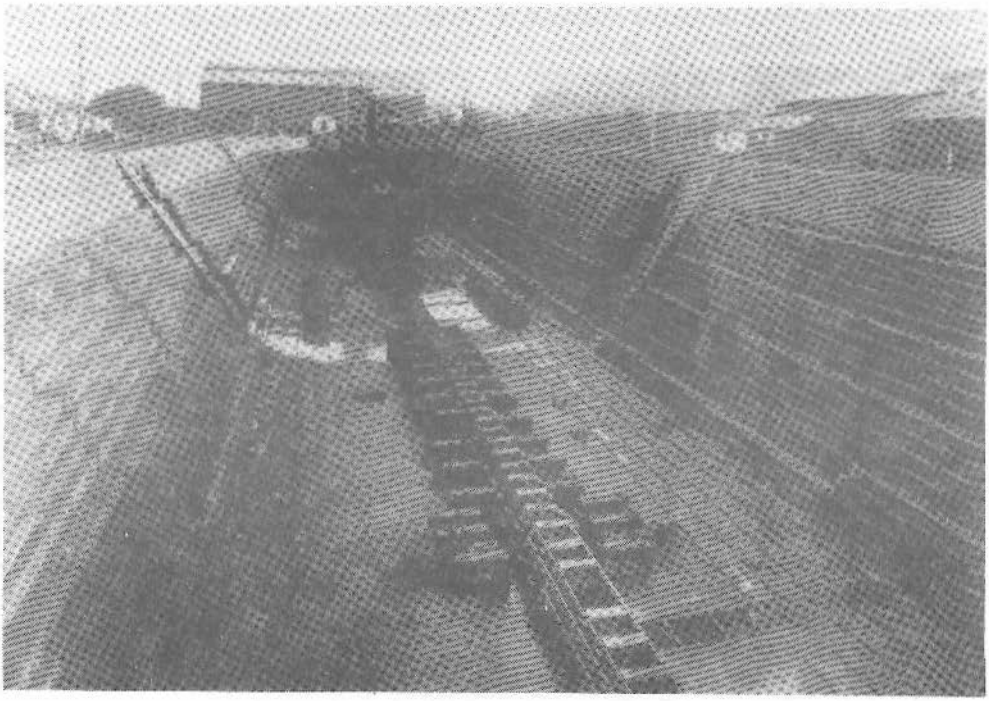
commercial buildings, since few houses used bluestone once brick became widely available. Between 1896 and 1915 there was an eightfold increase in the value of building stones produced in Victoria.[14]

Stones for paving streets and lanes and for forming gutters and drains were more often given their final shape in the quarry hole and then sent out by dray as 'street or kerb sets' (blocks of even size for making kerbs and gutters on the edge of roads), or as cobble-stones or 'pitchers'. The latter varied in size but were generally around 12 by 8 inches (35 x 25cm) and 4 to 6 inches (15-20cm) thick. Councils specified the size of pitcher required. A characteristic of cobble-stones is that the sides angle inwards to the bottom so that the top edges meet closely and the base of the stones can settle into the soil or sand in which they are set. Constant wear by iron-shod horses and wagon wheels have given old cobble-stones a very smooth surface. Pitchers were also laid in a variety of patterns, usually with the gaps off-set like brickwork, and using different alignments to take into account wear and water-flow down gutters.

The major demand for pitchers for road-making came from local councils. In 1856-7, for example, Williamstown constructed six and a half miles of footpath, 600 yards of paved street crossings and 404 yards of paved gutters and used 3,650 cubic yards of broken stone and 81,000 eight inch pitching stones.

Bluestone pitchers stacked on a dray in a Footscray quarry awaiting transportation to a road construction site in Melbourne. The large blocks from which the pitchers are made are stacked near the cranes.





Alfred Graving Dock, Williamstown, built 1864-74. The stepped sides are formed by thousands of massive blocks of finely cut Footscray bluestone.

BLUESTONE BUILDINGS

It is interesting to note the range of uses to which bluestone was put. It appears to have been a stone with low prestige value relegated to functional applications such as industrial buildings and foundations. While lighter and softer sandstone and limestone could be worked more easily and therefore made into more elaborate forms, they were also more prone to erosion and deterioration. This can be seen in dramatic consequence on buildings such as the City Court in Russel Street or Burley Griffin's Newman College where the surface of the sandstone is flaking off in huge slabs.

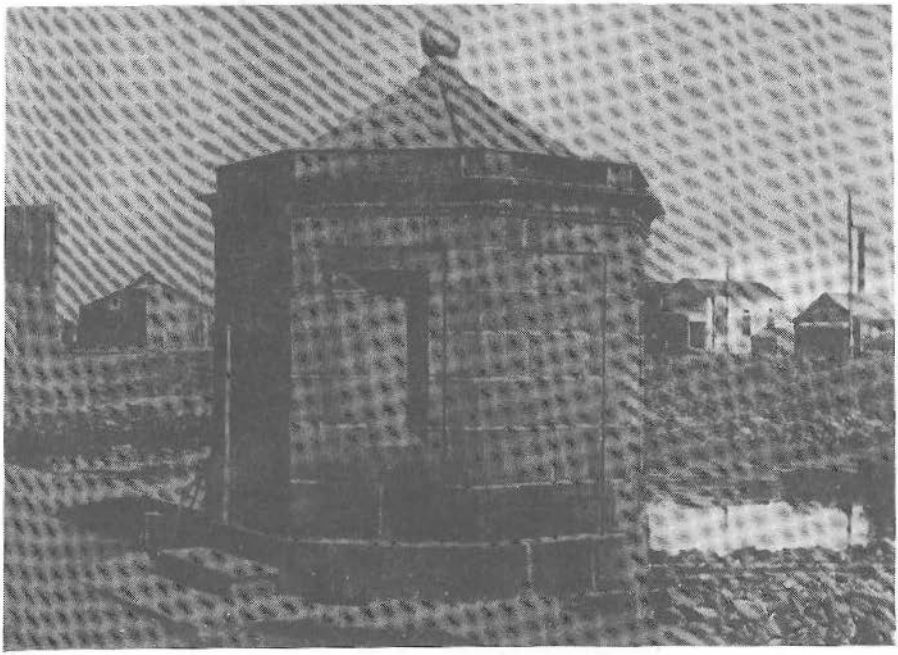
By the 1840s, bluestone quarries close to the city were supplying stone for major public buildings which were erected on behalf of the growing colony. St. James Church, Melbourne's first cathedral, was begun in 1840 and later moved to its present site in King Street. Bluestone was used for the foundations and quoins (the stones in the corners and around windows and doors). One of Melbourne's most distinctive groups of bluestone buildings, the old Melbourne Gaol, was begun in 1841. Unlike the rough, unfinished stonework of St. James, which incorporates weathered surface boulders (i.e. freestone), the gaol was built of finely worked masonry chiselled into regular rectangular blocks with elaborations such as drafted edges and ornamental carvings.

This transition from the use of freestone to shaped, quarried stone was an important development in building in Melbourne. It indicates that the specialist techniques of professional quarrymen and masons had been developed and adapted to local conditions and the especially hard and intractable basalt. A good example of this transition could be seen in foundations of the recently excavated Stanley Arms, possibly Footscray's first building. This revealed the early structure was built on freestone foundations, natural boulders. A later reconstruction of the hotel used foundations of quarried basalt to enlarge the building and fit it into the surveyed street grid.

A visitor to Williamstown in 1840 was able to remark: 'the place wore a thriving look, of which we have abundant proof in the magnitude and solidity of its warehouses, numbers of which rose above the houses that lay scattered in every direction' [15] He was probably thinking of Langhorne's wool store, one of the first stone buildings to be erected on the Williamstown foreshore, probably in about 1839. It was soon joined by the Harbour Master's office, the watch-house and the Tide-Waiter's office and quarters, now unfortunately all demolished.

A surviving structure from the early days of the Williamstown port is the tide gauge house, now moved to the Commonwealth Reserve. This is a fine example of just how precisely bluestone could be worked. The octagonal form, moulding details and false 'window' recesses create complex angles matched perfectly between blocks of stone. The surface of the stone has been painstakingly smoothed with progressively smaller and sharper chisels.

The tide gauge house in its original location in the 1930s, at the foot of Breakwater Pier, Williamstown.



Construction of the Alfred Graving Dock to the design of Public Works Department architect William Wardell, was commenced in 1866 and completed in 1873. The dock is built from thousands of huge blocks of smoothly cut bluestone set in giant steps. It measures 476 feet long and 35 feet deep, 100 feet wide at its widest point with walls 10 feet thick. It can hold 6,000,000 gallons of sea water and is now part of the Amecon Dockyards.

Similarly, the time ball tower, at Point Gellibrand is an early example of the skill of the stonemasons, in this case, probably using convict labour for the less skilled tasks of extracting the stone from the nearby outcrops of basalt, and roughly shaping and sizing them.

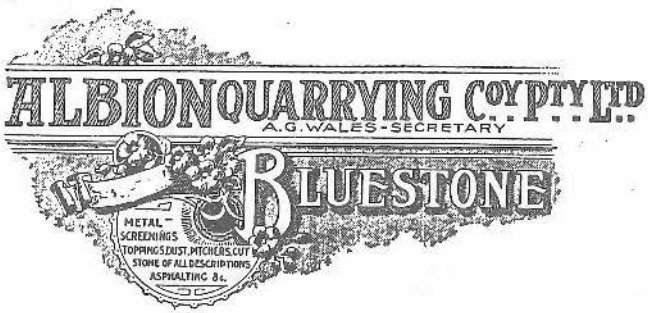
The ruggedness of bluestone contributed to a sense of mass and weight in churches, schools and government buildings, but builders often found it cheaper to use brick. Substantial bluestone schools were built in many parts of Melbourne's west, including Williamstown, Footscray, and Melton, though little remains of smaller schools which once stood at Braybrook, Rockbank, Deer Park, Truganina and Mt. Cotterell.

Many bluestone churches survive in Melbourne, particularly in the city and the northern and western suburbs. St. Patrick's Cathedral is built almost entirely of Footscray bluestone, as are the foundations and base courses of many of Melbourne's public buildings.

Commercial buildings such as Goldsbrough Mort in Bourke Street and the York Butter Factory in King Street used bluestone to present a solid image of the firm. Other factories such as the Alfred and Yarraville woollen mills and the Yarraville sugar refinery used it for its strength and practicality. All these survive but their massive bluestone walls are now hidden behind more recent brick extensions. Henderson's Piggery, (now the Footscray Community Arts Centre) and the bluestone buildings of the Melbourne Meat Preserving Company can still be seen on the Maribyrnong at Pipemakers Park.

Elsewhere in Melbourne, bluestone was less common and so few bluestone factories are found - Nettleton's wool works on the Yarra in Richmond and the Carlton Brewery in Bouverie St. Transport costs made bluestone uneconomic, particularly when the main brick works were to the north and east of the city. From the early 20th century, widespread use of reinforced concrete displaced bluestone in many areas of building and engineering.

Letterhead of the Albion Quarrying Co. c.1920.

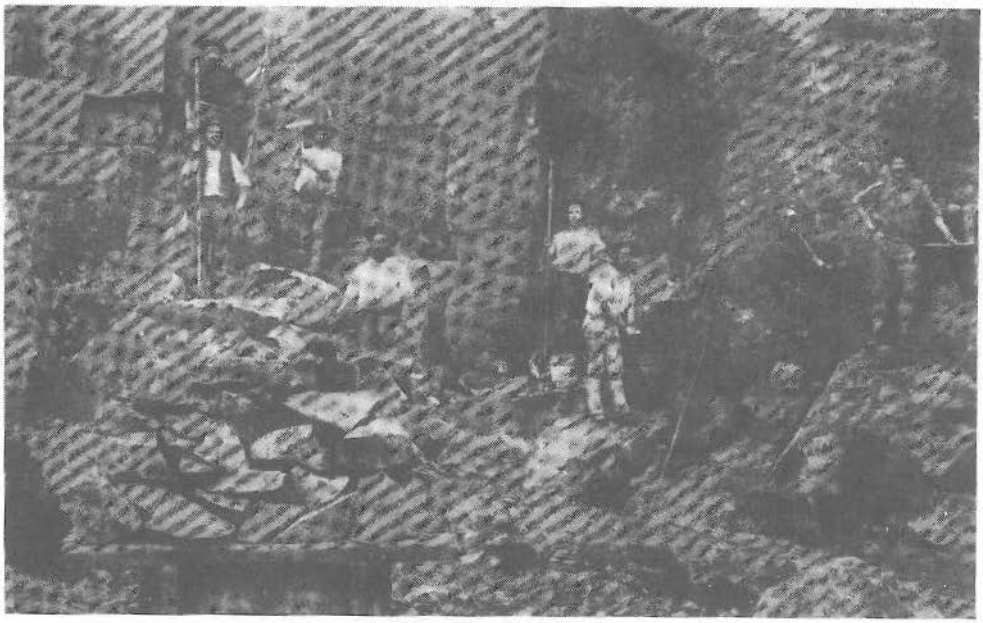


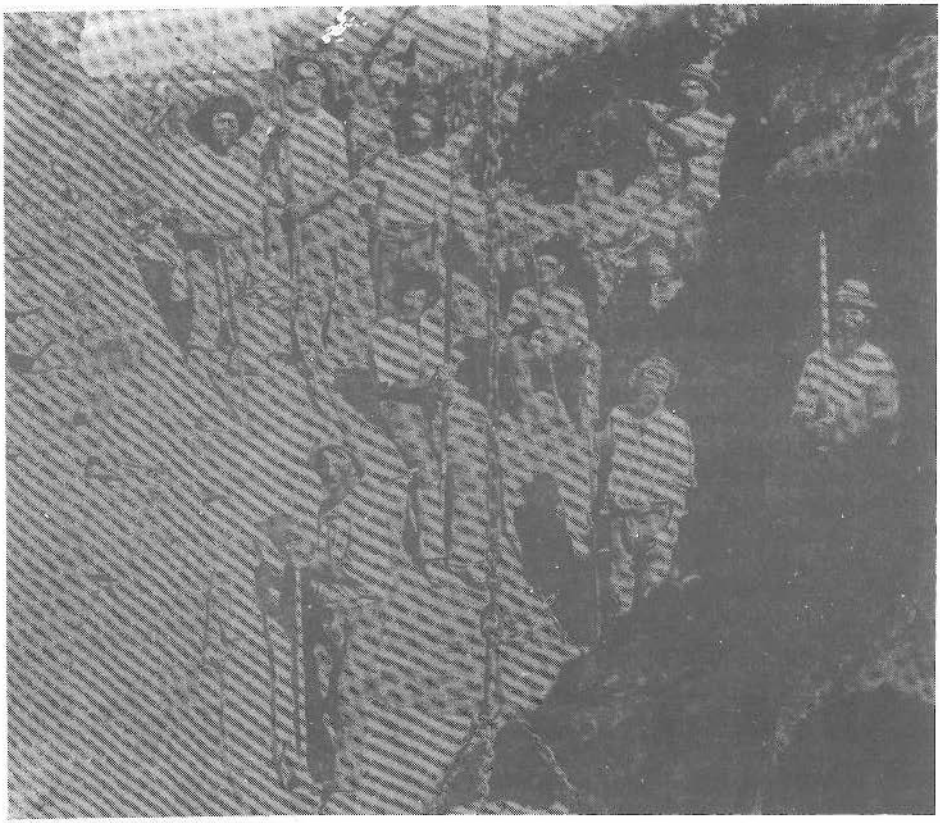
THE STONE-MASON AND QUARRYMAN

Quarrying was labour-intensive, with only hand tools: picks, shovels, hammers, long steel drills and iron levers and splitting wedges to aid the work. Like the workers in Egypt thousands of years before, quarrymen cut and split the rock by hammering wedges in the joints. They usually began where there were outcrops of rock, removed the 'overburden' of earth and loose boulders and worked along the seam of the rock. Often, they cut the stone away in steps so that they retained a ledge or 'bench' to stand on as they worked.

By the 1850s, quarrymen were using explosives. Blasting of the rock could move hundreds of tons of rock in one charge. First, the quarrymen drilled a series of holes with long steel bars, then the 'powder monkey', traditionally the highest paid worker in the quarry, placed the explosives in the holes and lit the fuse, crying out 'fire' to warn others to stay clear. Originally, the only explosive used in quarries was black powder, which was poured into the drill holes and ignited with slow burning fuses. This was replaced in the late 19th century, by dynamite, a nitro-glycerine-based explosive invented by Alfred Nobel, and later gelignite. Gelignite was inserted in a series of holes up to 25 feet deep and when exploded, created cavities in the rock, a process known as 'bulling'. The bulled holes were then filled with black powder which was exploded to shift the quarry face. Secondary blasting or 'popping' involved exploding large rocks with gelignite plugs to create smaller blocks.

The quarry face at Walsh's Quarry, Geelong. In the centre of the picture is a gunpowder barrel, and the man to the right appears to be ramming a charge into one of the drill holes. Others are holding rock drills and spalling hammers.





Raising stone by crane in a newly opened quarry. A basket of stone hangs at the end of the chain while the men pose with their long rock drills.

Nobel's dynamite was imported into Victoria, but a similar explosive called 'lithofracteur' was made at Deer Park, by the Australian Lithofracteur Company (Krebbs Patent) from the late 1870s. This company went through many changes of ownership becoming the Australian Explosives and Chemical Co. in the 1890s. It was bought out by Nobel in 1920, and finally became ICI Australia. Today mining explosives are very different, now liquid ammonium nitrate and oil are transported in bulk, and do not become explosive until they are mixed on site.

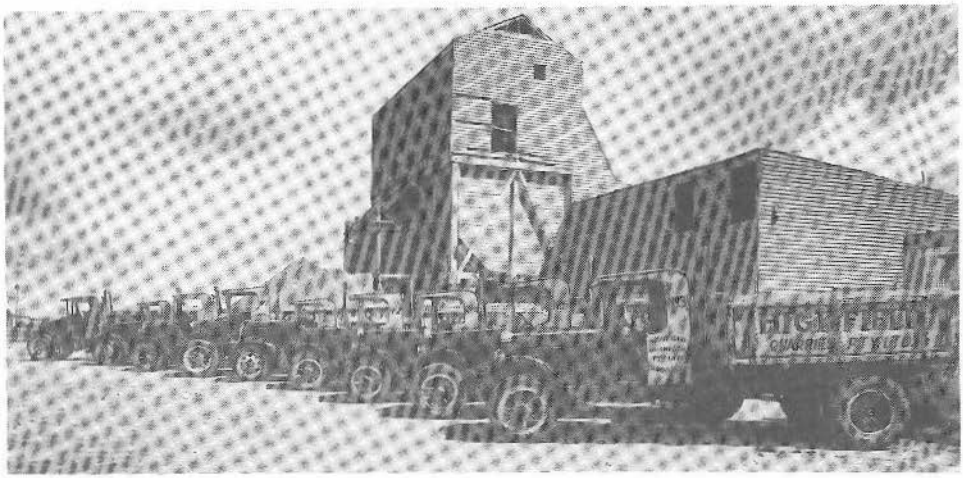
Moving the stone once it has been broken away from the quarry face was perhaps the hardest job until large excavating machines and conveyor belts came into use in the 1940s. Trolleys in narrow gauge tramways were filled with rock and either pushed by hand or hauled by cable winches to the top of the quarry hole. Horses and drays were used in most quarries and timber derrick cranes with hand operated winches were used to lift the very heavy stones onto the drays. Drays headed for sites in the City of Melbourne used Dynon Road which had special steel rails laid down to take the impact of heavy loads. As a boy Tom Shone got casual work as a 'jockey' for the Eldridge quarry to supervise second drays in convoys into the city.[16]

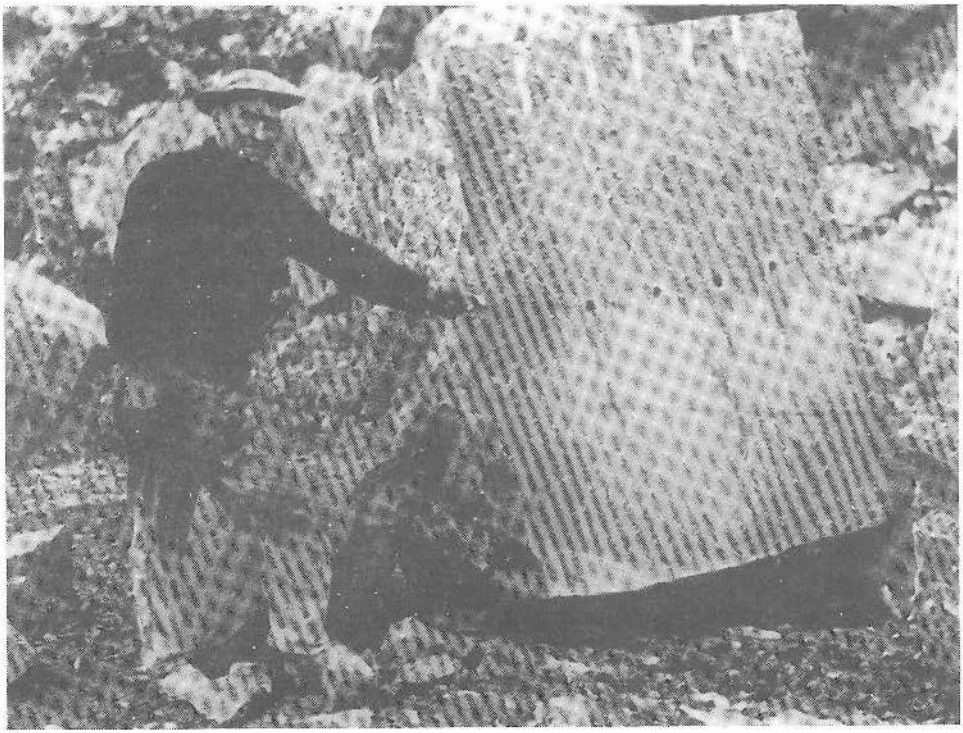
A useful description of operations in a nineteenth century quarry comes from the *Footscray Advertiser* of December, 1886.

There are about a dozen ordinary quarry cranes on the ground, and a half a dozen steam cranes for lifting the huge blocks from the immense quarry into the trucks. There is also a locomotive on the ground which draws the loaded trucks to the main Sandhurst line by a siding to where the trains are made up. Broken metal is supplied to the Government and others, and for the purpose of breaking it six of Hope's best crushers are erected, being driven by one of Munroe's own powerful horizontal engines, working up to about fifty horse power. Steam is supplied from a 36 feet Cornish boiler. ... There are also hoisting engines and other appliances for lifting weights, all of which are in full swing. There is a locomotive shed, lifting shop, smithy, stores, offices and cottages for some of the leading employees. Besides those working at the stone, there are fitters, blacksmiths, carpenters, carters, a time keeper, engine drivers, &c. The works are evidently a great benefit to Footscray, for nearly all the men employed find habitations in the district. The place is a living hive: full of life and energy, every body being at work, and scarcely a word can be heard within the gates; thus proving that men can be got to do a fair day's work without bullying; and this rebounds to the credit of the gangers. [17]

Stone intended for crushing was first broken by hand into 'spalls', which were of a convenient size to be lifted by one person. This was done using a long-handled spalling hammer, weighing 16-18 pounds. They were also broken down so that they would fit into the jaws of the stone crusher. By the 1940s, front-end loaders and continuous conveyors were widely used to move stone from the quarry face to the stone crushers and from there to hoppers for loading onto either road or railway trucks. The demand for crushed stone and 'screenings' led to bulk handling using rail transport on private railway sidings so that most large quarries in the twentieth century were opened close to railway lines.

The fleet of trucks at Highfield Quarries, Brooklyn in the 1930s. This large quarry, opened around 1917, was one of many in the area between Kororoit Creek and Jones Road.





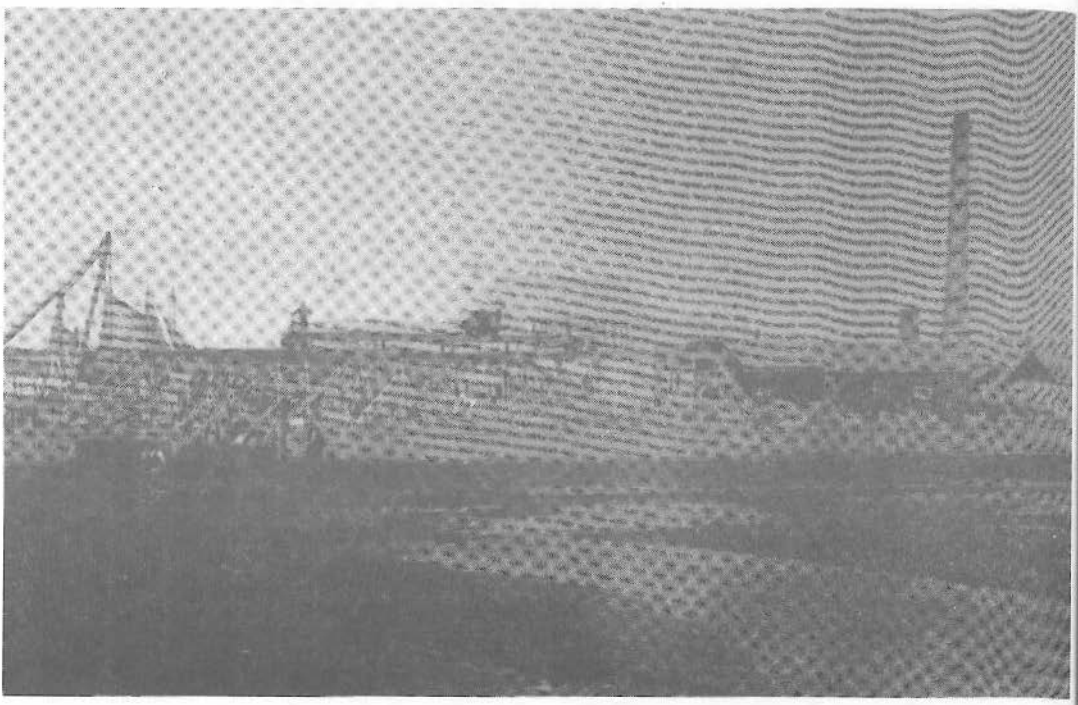
Quarry foreman and powder monkey, Ned O'Brien at Lords Quarry, Brooklyn points out the row of holes drilled to take plugs and feathers for splitting the block. Marks from the previous splitting can be seen across the top of the stone.

Victorian quarrymen used 'plugs and feathers' to divide large blocks of stone into smaller pieces, a method used in Britain since about 1800. A line of holes are drilled into the rock. Into each hole a large steel *plug* or tapering wedge is inserted between a pair of *feathers* or thin iron plates and hit with a hammer. This splits the rock along the line. Peter Simpson describes the process:

It's like a chisel only it's got liners on the side of it. It's wide on the top and narrow at the bottom. The wide part goes down the hole, one each side. The chisel-shaped plug goes down the middle. You drive it down. It's a work of art. If anyone drives it too fast or too hard it will scallop the top. They'll drive it and when it starts to ring they'll turn the hammer over and line it up and go bang and split it open.[18]

Bert Wiggins has described the making of 'pitchers', by the so-called 'pitcher dressers':

All those guttering pitchers were done by hand. They get a big stone, they cut a piece off it then they gradually cut it down and down and down. And in the last run they clean all the little bits off it. You wouldn't do it nowadays. They might have a little ridge on it and they used to have a little hammer and they used to just scallop the sides and it'd be just as square as anything, just the measurement they wanted. [19]



Footscray Steam Stone Cutting Company, in about 1880. The overhead gantry and derrick cranes for moving blocks of stone around the yard are clearly shown along with the boiler house chimney for the steam-engine powered saws.

Stonemasons squared and 'dressed' the blocks of stone, using chisel, mallet, boning-rod and mason's square. In later years, machines cut and polished the stone. Specialist firms such as Luke Greenwood's Footscray & Malmsbury Stone Cutting and Quarrying Co. Ltd., established in 1887, worked on highly-finished stone. Rough blocks were cut into slabs and building stone by large band and frame-saws and smoothed on polishing tables. The company, situated in Moreland Street dressed stone for many important buildings in the City of Melbourne. [20]

Another similar business was J. Taylor and Sons, Australasian Pioneer Granite Polishing and Monumental Works which started in Bendigo in 1860 and transferred to Footscray around 1884. The business was situated in Nicholson Street, alongside the Footscray railway goods yard. [21]

The bigger quarries had their own stone-dressing section. A 'dressed' block of Footscray bluestone won a gold medal at an exhibition in Europe in 1908. Standard Quarries became famous for their stone work, producing, for example, the 100 ton memorial in honour of the men and women of the Second World War at Melbourne's Shrine of Remembrance. The sculptor, Stan Hammet, chose Footscray bluestone as the most durable Australian stone.

WORKING CONDITIONS

Working in a quarry was heavy, dusty and dangerous work. Accidents came from falling rock, moving trucks, machinery and explosions. Fatalities were common, and in the 1950s at least, fatal and non-fatal accidents in quarries exceeded those in gold and coal mines combined. While few figures on accidents are available, it appears that quarry work was always highly dangerous and conditions sometimes deplorable. For example, in reference to Munroe's Footscray quarry, Michael Cannon states:

... like many capitalists he was harsh on his employees and in the temporary slump of 1887 cut their wages from 7s. to 6s. 6d. a day. Unmoved by protest he told the men that their union leaders were ' vermin to be squelched.[22]

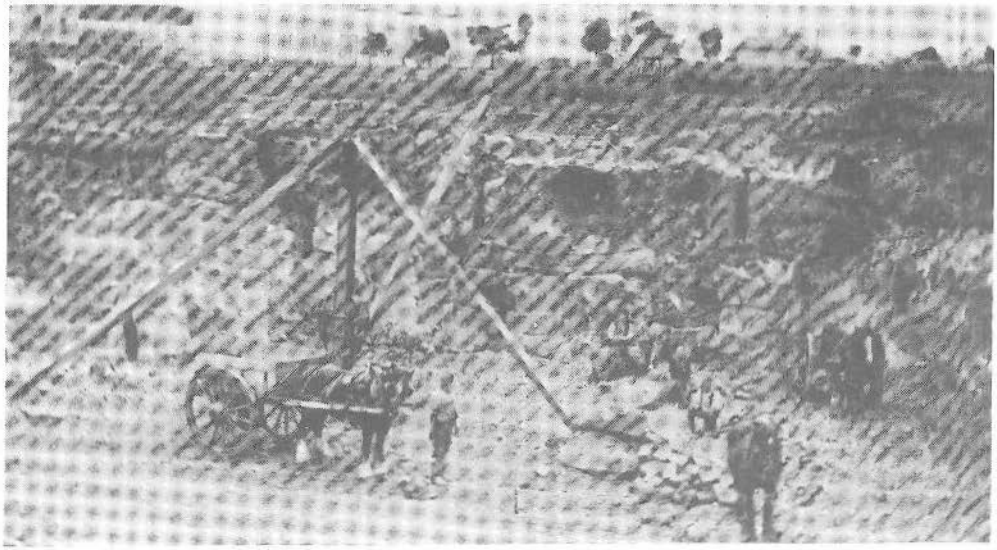
Twenty-five-year old Hugh O'Brien, of Footscray, was killed while at work in the Maribymong quarries:

He was on the floor of the quarry cutting a stone when it canted and he fell. Another piece of stone fell on top of deceased. He was jammed about the chest and abdomen. He was released but he died before he reached [hospital]. Deceased was an experienced quarryman and occurrence was said by witnesses to have been purely accidental.[23]

At the Albion Quarries, sixteen year-old Patrick O'Shannassy, was caught in machinery and badly injured:

About the premises is an inclined tram track, on which the stone from the quarries is hoisted to be sent away. By some means he was engaged close to the gear and became entangled with it. His cries brought assistance. The shrieks of the poor lad were said to be something terrible as he became drawn in by the wheels. The machinery was at length stopped, and it was seen at a glance that he was terribly injured. One leg and one hand was simply reduced to pulp. The limbs were amputated later on.[24]

Roberts Quarry, Sunshine, showing the usual hand-operated crane and horse-drawn wagons.



Lords Quarry (later Standard), Brooklyn, in the 1950s. Roughly finished pitchers are stacked in the background behind the large blocks which are being progressively broken down.

In 1893, a fatal accident at Parson's quarry caused the death of Dan Reidy, an experienced young quarryman. He had, '...put in a shot and as he called out "fire" it was supposed he was lighting the fuse but almost instantly the shot went off and Reidy was blown about twenty feet in the air.'[25] He did not live long after reaching hospital. At the inquest one witness stated that 'Reidy had bored a hole and charged it with gelignite when it prematurely exploded and deceased was struck with a shower of falling stones.' Other witnesses said there had been a premature explosion caused by the fuse burning too rapidly.

The poet John Shaw Neilson described his experiences of working in quarries in his autobiography:

In Melbourne I met my brother Frank who had been working in Gippsland. We got work together in a quarry near Yarraville The loading was too heavy for Frank. He only stayed a couple of days.

I hung on to it till Cup time, when half a dozen of us were put off as the owners were reducing hands. The ganger was one of the old type who stood on the bank and roared. An unpleasant man to have anything to do with. I could keep my end up as far as the work was concerned although the spawls [spalls] were rather too heavy for me. When a man gets over forty-five his lifting power is not so good. The following year I got a job in the same quarry and kept it for seven weeks.

He described the Yarraville quarry as a pretty safe quarry and very deep and hot.[26]

Bert Wiggins, a quarryman for many years, had severe injuries in a quarry explosion.

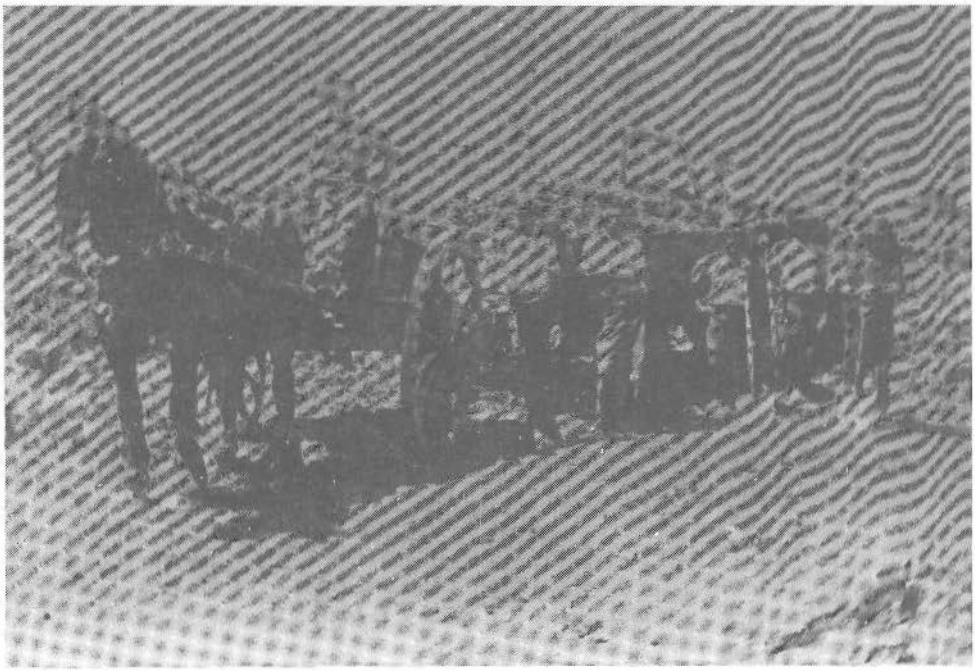
Up one end of the detonator there's a charge and the other end you clamp on. I might have clamped too far down. I don't know what happened. I had seven dets in my hand. I might have been smoking and a spark went down in the box. That's all I remember. I blew half my leg off. I was in hospital about four months. You could say it's dangerous but you've got to be careful.

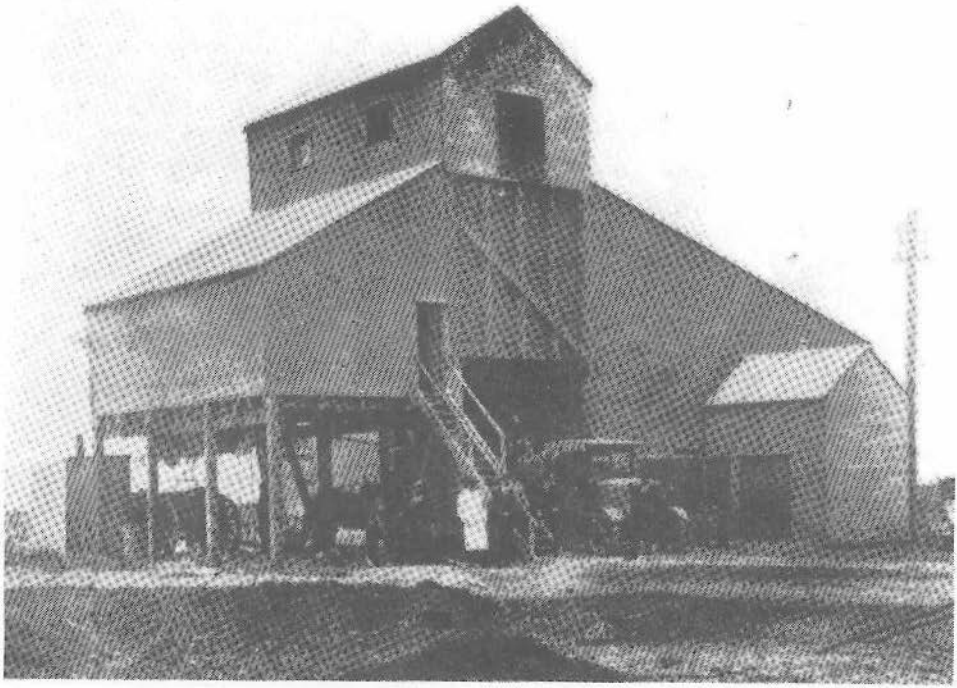
Quarrymen, like miners, may suffer from the effects of dust on their lungs, though this is little-documented. Members of local quarrying families have suggested that the hazards of quarry work contributed to the early deaths of their relatives (in their 40s). One quarry worker suffered a heart attack after 'he had done some extra strenuous job shortly before the fatal attack'.

Quarrymen's housing

Quarrymen usually lived close to the quarry where they worked and some quarry owners built houses or huts for their workers. In 1891, four Italians were camping near the Albion Quarry and in the 1920s-30s a number of single Maltese men were living down in the quarry hole in rough humpies. The 'quarry masters' lived locally in the early days, notably in Yarraville and Newport.

A dray loaded with overburden at Roberts' quarry, Sunshine, 1920. The first task in quarrying was to dig away the soil and clay to expose the stone which was usually about two to three metres below the surface.





Footscray Council's stone crusher in the 1920s. Crushed rock was raised into the tall hopper above the truck into which it was discharged for road-making sites in the municipality.

CRUSHED STONE

Since ancient times road makers have used broken or crushed stone, sometimes described as *road metal*. Local councils and contractors in Melbourne's west employed men as *stone breakers*, using hand tools. A number of quarries used mechanical stone crushers by the 1880s such as the six steam driven crushers at Munroe's West Footscray quarry and the extensive crushing works at the Albion Quarry which was the first to export road metal to Britain. The quarry was turning out vast quantities of road metal in 1888-90, its peak period of production. In the twentieth century, under new management, it supplied stone for hundreds of miles of city and suburban streets. For many decades it was 'the largest road-stone producing quarry in Victoria.'[27]

When it was established in 1910, the Essendon Council Quarry in Maribyrnong (now Highpoint City shopping centre) installed new crushing plant, a 'Jaques' horizontal lever stone crusher, 'of the latest design', with 16 in. x 9 in. jaw opening, revolving screen and hoppers for dust, toppings, screening and metal and driven by a Crossley suction gas engine. The crusher was 'a greedy, all-devouring, insatiable monster that chews up to road metal and fine screenings all boulders that will enter the jaws of the monster'.[28]

Most of the crushed stone used in Victoria has come from basalt quarries since the greatest demand and largest quarries are in Melbourne. Bluestone comprised about 90% of total Victorian crushed stone production in 1961. [29]

Screenings are small pieces of stone obtained after the crushed rock has been passed through a series of different seized sieves. These produce various sizes of rock, from 2 inches (50mm) down to half an inch (12mm) in size. The smaller sizes of crushed rock are important in making concrete.

Toppings are the finer grades of screenings used for making hard packed gravel roads. *Metal* refers to the larger sizes used to mixing with bitumen to produce asphalt road surfaces. *Dust*, sometimes referred to as *fines* is, as the name implies, the very finest material from the screens.

To provide stone for its road construction program, Footscray Council had its own quarry employing 30 men and a stone crusher, at Tottenham 1921-57 and at North Altona 1957-79. Braybrook Shire operated its own quarry in Anderson Road and then North Sunshine, while Essendon's quarry was at Maribyrnong.

Several types of stone crushers are in use today. The oldest type is the *Jaw Crusher* which consists of a pair of strong plates, one fixed and the other arranged to move in opposition to the fixed jaw. There are two main types in use: single-toggle machines used for primary crushing and double-toggle machines for secondary crushing.

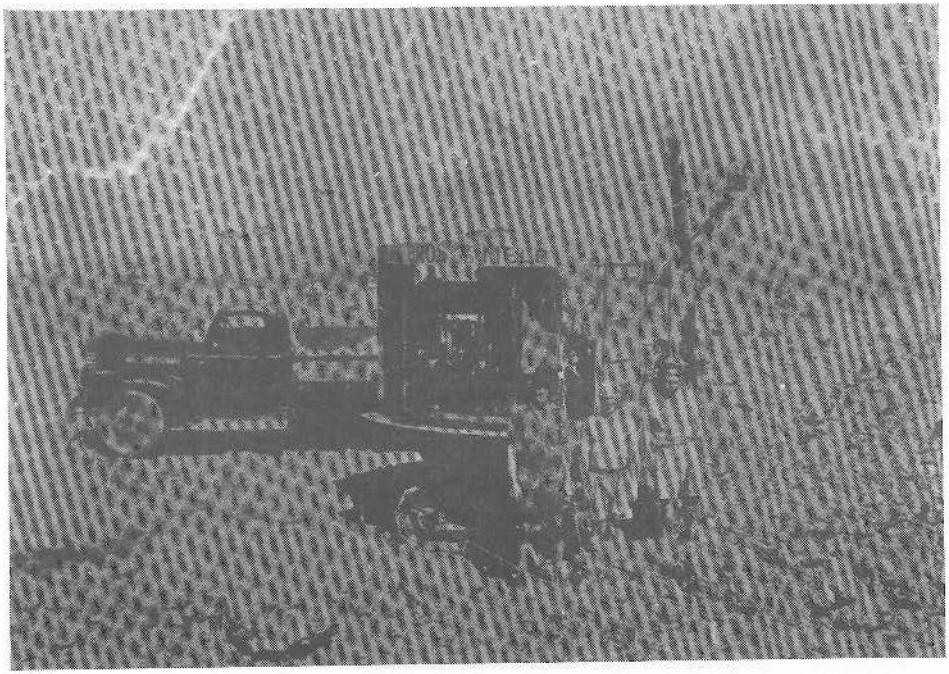
A more recent development is the *Gyratory crusher* which works on the principle of an inverted pestle and mortar, the stone being crushed between a stationary inverted bowl and a moving cone mounted on a vertical axis.

Impact crushers or *hammer mills* break the stone by a series of blows from hammers either fixed or hinge-mounted on a high-speed shaft enclosed in a steel body, the inside of which consists of breaking-plates against which the stone is flung. The breaking is by impact, not pressure, and the product has the best cubicle shape of all types of crushers, and the different particle sizes are produced in roughly equal proportions.

Roll Crushers also come in two main types, the single-roll in which the material is crushed between a rotating cylinder and a fixed breaker-plate and the two-roll (occasionally up to four-roll) in which the crushing occurs between two rotating cylinders. The single-roll is normally used as a primary breaker for soft materials. Two-roll crushers are used with soft or hard rock for primary, secondary and subsequent crushing.

Stone is fed into the primary crusher through a *Grizzly*, which prevents large rocks, dirt and fines from entering. Grizzlies are of three main types: the bar grizzly feeder, the vibrating bar grizzly and the live-roll grizzly.

Screens include *rotary screens* or *trommels* and *vibratory* or *oscillating screens* which are often arranged in banks of two or three, giving grading into four sizes, the smallest passing out of the bottom screen.[30]



Mechanised excavator and truck at Pavey's Hole, Kingsville in the 1950s. After World War Two labour shortages led to rapid mechanisation of the quarrying industry.

THE QUARRY INDUSTRY

The quarries of Melbourne's western region produced over a third of all stone quarried in Victoria in the latter part of the nineteenth century. Richmond, Brunswick, Coburg and Collingwood were also major quarrying areas. Williamstown and Footscray were the leading producers of bluestone in the 1870s although employment and production varied widely with building demand. There were 30 to 50 quarries in Footscray in the 1870s, employing as many as 676 workers in 1871 and as few as 79 in 1879. The number of operating quarries also fluctuated from year to year so employment opportunities were uncertain. Melbourne's boom led to the opening up of large quarries by big companies in the 1880s, especially in the Braybrook and Brooklyn area. The developers of the time needed stone for foundations, paving slabs, new roads and railways. A prime example of such a firm was David Munroe & Co. a major contractor for public works and private development schemes.

In December 1886, Munroe's extensive quarry and stone cutting works was described as 'one of the largest, if not the largest in the Footscray district':

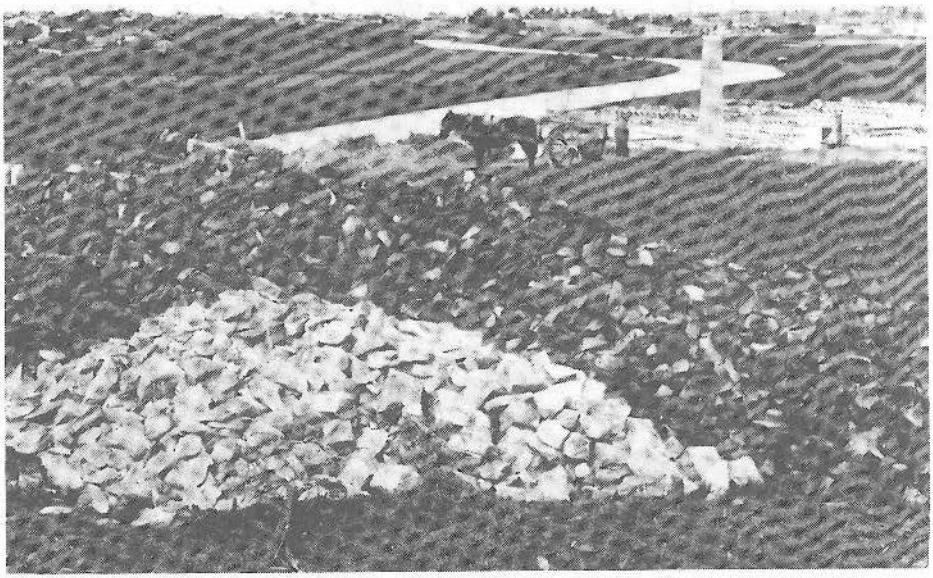
The area was securely fenced in and contained within the pale all the plant and material for carrying on an extensive quarry and stone - cutting works. Some idea can be formed of the magnitude of the operations of David Munroe and Co. when

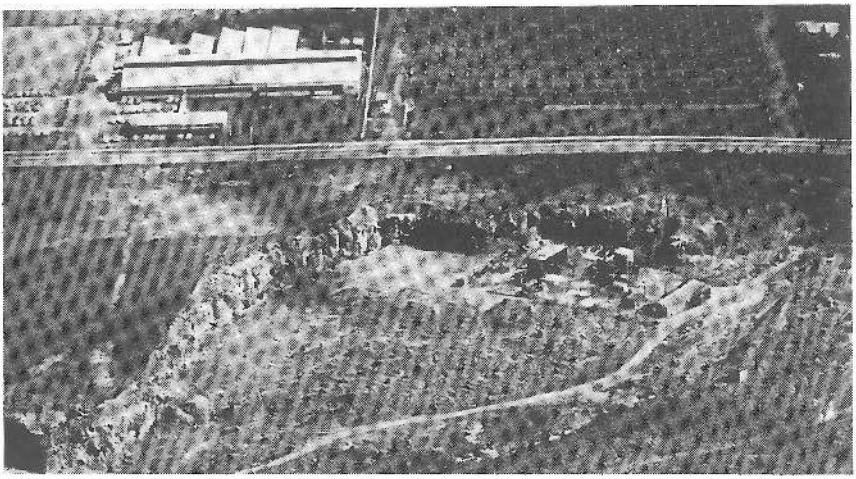
it is stated that fully 250 men are employed on the works by the firm, and the average wage list is 500 per week. One large and continuous quarry has been opened, which employs about fifty quarrymen and a large number of stone cutters, dressers and labourers, the latter body numbering about 100 men. There are also about twenty to thirty masons continually employed dressing stone, some of the blocks weighing nine tons. The output is about 300 tons of stone per day, taking 55 to 60 trucks for its conveyance by rail to the bridge at Swanston Street, Melbourne, where the stone is principally used.[31]

James Govan began one of Footscray's early quarries in 1870 behind his two storey bluestone house on the corner of Summerhill Rd. and Essex St. The Govan family worked a series of quarry holes from Summerhill Rd, along Essex St and as far as Blandford St, several of which are now parks or sports fields. By 1917, Govan's main quarry covered the block between Summerhill Rd, Essex, Market and Graham Streets.

Close business and family connections existed between the quarrying and contracting families operating in this area. For example, the Govans and the Rayners co-operated in the supply and laying of bluestone pitchers. In September 1918, Govan, acting as quarryman, and the firm of Loch and Rayner, entered into a contract with the Footscray Tramway Trust for the supply of six thousand cubic yards of spall at a rate of 75 cubic yards per day suitable for the purpose of metal crushing and bluestone cubes, rough dressed suitable for street paving works.[32]

Piles of spalls at the Maribyrnong quarry . Horses and drays stand in the background ready to cart the stone . Behind is the Hume Pipe Works, which used crushed stone for making concrete pipes.





Aerial View of the Maribyrnong Quarry in the 1960s, now the site of Highpoint City Shopping Centre.

QUARRY HOLES

The landscape has changed dramatically since the days of the early bluestone quarries. Some quarry holes became rubbish tips and, once filled, were used for recreation grounds or sometimes for housing.

Because of unstable ground, filled quarries are not often suitable for development. As a result, many have been converted to parkland and playing fields providing valuable open space which is in short supply in the western region. Unemployed people worked on developing reserves during the Depression, for example Hanmer Reserve in Footscray. Other parks and reserves on former quarries included Hansen and Gaudion Reserves, West Footscray (Gaudion's quarry), Sharten and Barrett Reserves, Maidstone, (Govan's quarry), and Cruickshank Park, Mappin, and Angliss Reserves, Yarraville and the Yarraville Botanical Gardens.

In more recent times, entrepreneurs have constructed large shopping centres out of quarry holes including Highpoint City, Altona Gate and Sunshine Plaza. In the basement carpark of Highpoint City, it is still possible to see the bore holes in the rockface from quarrying operations. More unusual examples of re-cycled quarries are the old quarries at Newport transformed into 'Newport Lakes', and the innovative methane gas-powered electricity generating plant developed by the City of Sunshine from the old Sunshine Tip/Albion Quarry.

Few rock faces from early quarries are still visible, except in shopping centre carparks. Once geology students came specially to this region to study the rock formations, but few today recognise the unique value of the quarry walls, as evidence of geological and historical events.

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[16] City of Footscray *Annual Report* 1923/4.

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[18] Peter Simpson, in an interview with Dianne Parsons, 1987.

[19] Bert Wiggins interview with Dianne Parsons, 1987.

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[26] J.S. Neilson, *The Autobiography of John Shaw Neilson*, Canberra, 1978, pp.97,106.

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[31] *Footscray Advertiser*, 17 Dec. 1886, p.2.

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PLACES TO VISIT

Time Ball Tower, remnants of convict quarrying and lava formations can all be seen along the Point Gellibrand foreshore, Williamstown, Melways Map 56 F10 & E12.
Highpoint City and Altona Gate Shopping Centres are built in former quarries. Some of the rock faces can be seen in the car parks. Melways Maps 41 B12 and 28 A9.
Market St. Quarry, Brooklyn, has views from near the car park. Melways Map 40 J5.
The former McGrath's Quarry, Duke St. Sunshine, large quarry holes on either side of Duke Street. Melways Map 27 B7.
Melbourne Meat Preserving Company buildings in Pipemakers Park, Van Ness Avenue, Maribyrnong, Melways Map 28 B10.
The Homestead, Queen Street, Altona. Melways Map 54 H11.
A fine bluestone bridge spans Kororoit Creek at Brooklyn. Melways Map 40 G11.
St. Monica's Church, Footscray, Melways Map 42 E4
Henderson House, now the Footscray Community Arts Centre, Melways Map 42 E5
Govan's house in Essex Street, West Footscray, Melways Map 41 J3
Keilor has several fine bluestone buildings from its early days such as the Keilor Hotel, Melways Map 14 J6, St. Augustine's R.C. Church, Map 15 A7, Overnewton Map 14 E2 and the bridge over Maribyrnong Map 14 K7.
Melton once had many small rural buildings in bluestone, but many have been lost in recent decades Survivors included *The Willows* Map 115 C10, Exford off Exford Road and the Deanside pastoral property, off Reed Ct. Rockbank. Melways Map 355 H8

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The *Statistical Register of Victoria* provides detailed information on quarries in Victoria, 1869-1900.
The reports of the Dept of Mines give information relating to quarry production in Victoria as a whole.
Maps showing quarries include, the Geological Survey of Victoria 1860, Ordnance Survey Map, 1933 and the MMBW sewerage plans of the 1890s and early 1900s.

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