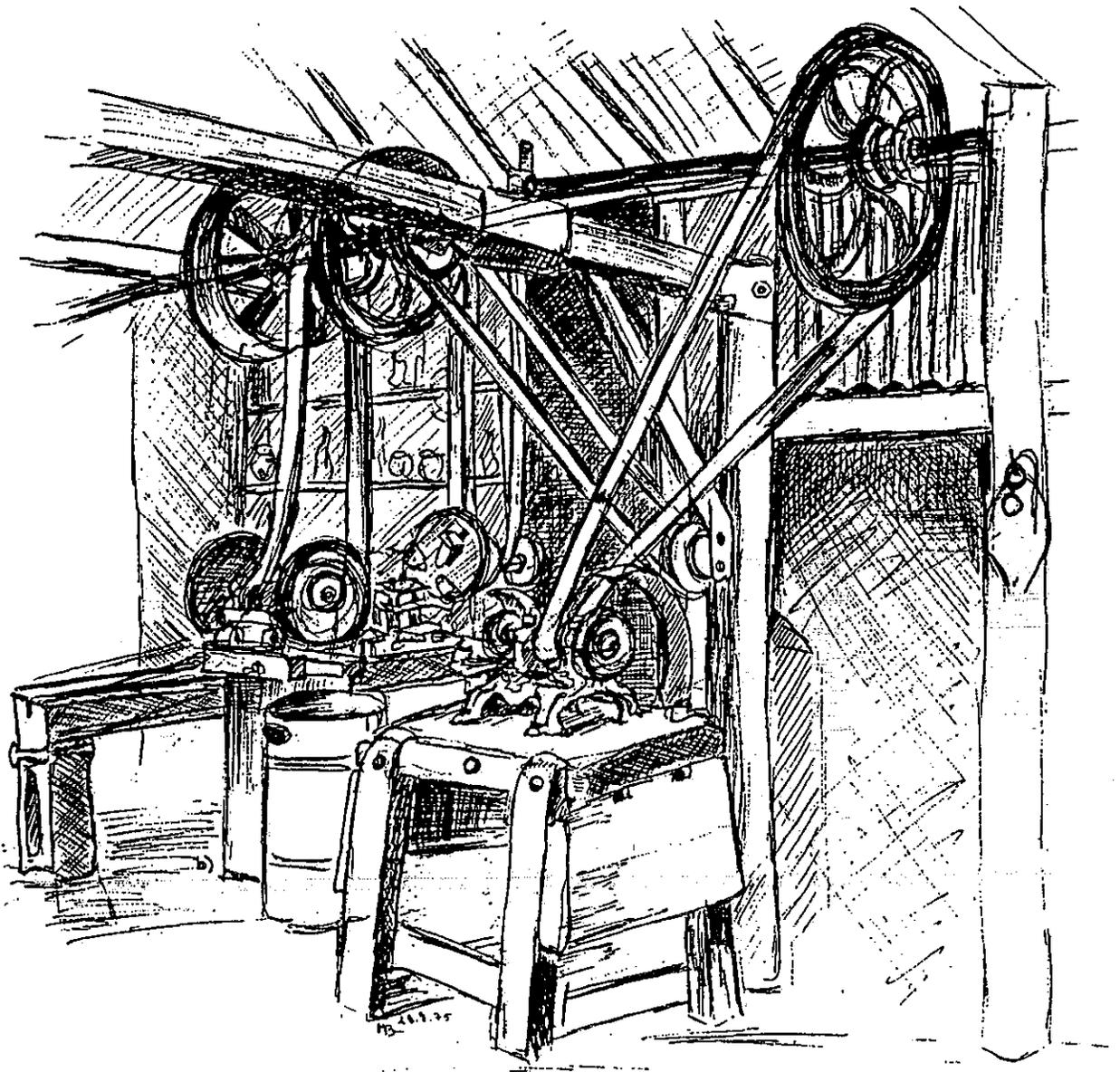


PAPERS IN AUSTRALIAN  
HISTORICAL ARCHAEOLOGY



Edited by Judy Birmingham & Damaris Bairstow

THE AUSTRALIAN SOCIETY FOR HISTORICAL ARCHAEOLOGY  
INCORPORATED

# **Papers in Australian Historical Archaeology**

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**Editors**

**Judy Birmingham & Damaris Bairstow**

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PREFACE

This publication is in response to the latest growth stage of Historical Archaeology in Australia.

The papers included date from the early days of the discipline when archaeology at home was considered a poor relation of its more glamorous manifestation overseas. Times have changed. It is not only the imminent approach of the Bicentenary of Australia's foundation that has brought about a revitalised interest in our own past in all sections of the Australian community. Ruins, and the visible traces of the past have stimulated interest in archaeology in all parts of the world.

After the promising beginnings of excavation and historical documentation in the late 60s and 70s, Australian Historical Archaeology of necessity turned its attention to cultural resource management, the need for an inventory of the national archaeological resources and the problems of assessment of heritage significance; in brief, to the documentation of surviving structures. The wheel has now turned full circle. Excavation, artifacts and active archaeology are again in fashion. Thus much that was written a decade or more ago is again of immediate relevance.

This volume was compiled to fulfil the demand for those early researches by those who have recognized that our pioneer work is a springboard for the future.

*Judy Birmingham.*

President

*Annals of the Past*

Secretary

(Editors)



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## INTRODUCTION

After discussion as to the possibility of grouping papers under subject headings, the editors decided to reproduce them, with one exception, in the order in which they appeared in ASHA Newsletters. In this order they reflect the changes in the discipline of Historical Archaeology in Australia over the years and reflect also the present return to our origins in artefacts and excavation.

Wherever possible, these articles were returned to their authors for comment. The result is that one has been completely rewritten while others have had the addition of up-to-date bibliographies. These have been appended to the papers to which they refer.

The first six papers date from the days when the ASHA Newsletter was not merely compiled but almost entirely written by our then Secretary, now President, Judy Birmingham. Each has received an introduction that brings the research bibliography up to date and also fixes it in to the ongoing research programme of Sydney University's Centre for Historical Archaeology. Keven Fahy, the only other contributor from this period, was our then President.

The article contributed in 1973 by Dr. J.O. Ward reflects Historical Archaeology's then, indeed ever present, concern with the steam railway age. Although Dr. Ward is no longer engaged in research into this topic, he has presented a new introduction, one that covers also the next paper, that of James Walker, on Australian Railway Development which was first presented in the form of a lecture to undergraduate students of Historical Archaeology at Sydney University. The editors were unable to contact Mr. Walker direct.

'The Phoenix Iron Foundry, Uralla' was originally published under Ms. Simpson's maiden name of Barr. This paper has been completely rewritten but contains the original illustrations.

'The Mashman Bros. Pottery' was the result of preliminary research by Ernest Ungar and Judy Birmingham. Since publication, Ernest Ungar's further and more detailed investigations have established that some of the author's early hypotheses were incorrect. Mr. Ungar is soon to publish a major work on the pottery, its history and technology. The editors welcome this addition to Historical Archaeology in Australia.

The two following papers, 'Eucalyptus Distilleries' and 'Whaling and Whaling Sites' are again the work of the President of this Society and again each has received a new preface. The second of these papers acted as an introduction to two case studies, one by two then undergraduate students of Historical Archaeology, the other the more sophisticated work of Dr. Michael Pearson then of the N.S.W. National parks

and Wildlife Service, now the Assistant Director of the Australian Heritage Commission. As a result of his further investigation, Dr. Pearson now considers that the Bittangabee Ruin was the work of the Imlay brothers, not, as he had originally thought, of Ben Boyd. Dr. Pearson has supplied an addendum to his paper.

John Wade's analysis of the artefacts rescued from a building contractor's excavation in Mary Ann Street, Ultimo, is one of the few such analyses to be published at the time. Thus it is a forerunner to work presently being undertaken. Additional notes on the potters, Field & Sons, written by Mr. Wade were included in Sydneys Colonial Craftsmen published by The Australiana Society and the Historic Houses Trust, Sydney, in 1982.

With Dr. P.H. Sydenham's paper we return to Australia's technological history. Included in this article is a short but excellent 'ready-reference' to Australian technological development.

Robert Varman's work on nails as a dating criterion was part of research into building materials generally as criteria for dating, the results of which have recently been presented to the University of Sydney as a doctoral thesis. The paper here republished has been expanded in the final thesis but, in short form, provides another quick reference for dating Australian archaeological sites.

The joint report by Susan Bures and Barry Groom on the Wunderlich Project, sponsored by the Museum of Applied Arts and Sciences, Sydney, is of historical interest. This project was the first major industrial archaeological rescue operation to be undertaken in Australia. Although the article reprinted was but a report on work in progress, it supplied a summary of the various methods adopted to record and interpret with a view eventually to reconstruct, in part, the Wunderlich pressed metal and terra cotta roofing tile factory at the Power House Museum.

Damaris Bairstow's catalogue of black bottles found in Raglan Street, Darlington, still has validity as one of the few reports available of a homogeneous collection of a single artefact type from a closely datable site. A brief introduction has been added.

Dr. Kerr's account of fencing during the 19th century was originally presented orally at the Society's Annual Conference in 1980. Hence it is reprinted here under that date as well as by its date of publication.

The word 'recent' should perhaps be deleted from the title of Michael Lorimer's account of maritime archaeological investigations in New South Wales since the paper was first published in 1980. It is republished here as being the only

paper submitted to this Society by our underwater colleagues.

Mr. Cumming's first paper, which provides instructions for recording engineering and industrial sites, was adapted from field instructions published by American engineers. The instructions, often unfortunately ignored, remain valid.

David Hutchinson's criteria for identifying bottles were not published by this Society until 1981 though, as the article states in its introduction, it was first produced some eight years earlier. Indeed, many of us, including the editors, had the benefit of the work in its first roneod form. When replying to the editors' request to republish, Mr. Hutchison expressed his surprise that there was 'still a demand for this key to dating bottles.'

'I thought that it would have been superseded long since. That it has not may confirm that we still have too few historical archaeologists in this country - too few for all the field work which needs to be done, and far too few for the preparation of basic analyses of and keys to artefacts. I have not had time in recent years to do any research which would enable me to modify the key, therefore it must be used as it stands, noting the cautionary advice in my original introduction. My experience as a museum historian, until my retirement on 31 December 1985, brought home to me forcibly the great need for keys to a wide range of artefacts, so that dating and identification can be made much more efficient.'

The last paper to be reproduced is the second contribution by Mr. Cumming, this time a few notes on early copper smelting in South Australia. Though short, it is an appropriate end to this volume since it heralds in present and future historical archaeological investigations in Australia. A major recording project is under way at Burra in South Australia, the site of the first spectacular finds of virgin copper in this country and it is hoped that similar investigations may be made at Smelters Beach south of Newcastle, New South Wales, where what appears to be the furnace floor of a contemporary smelter lies buried beneath the sand.

Judy Birmingham

Damaris Bairstow

April, 1987.



## RECORDING BOTTLE DUMPS.

Judy Birmingham.

This short item reads interestingly after the intervening years. In most states such activity is illegal unless a permit is obtained, and the wholesale looting and despoliation of bottle dumps in rural areas so prevalent in the 1960s and early 1970s is under some degree of control.

The Movable Cultural Heritage Act (1986) will also control the export of items either of major significance in themselves or as part of a collection or set of items. Whatever the circumstances, however, the techniques are essentially the same, except that processing massive quantities of recovered data is now considerably simplified by the use of MINARK or some similar computer programme. That is, provided a policy decision is made that it is worth doing.

Many new books on both world and Australian bottles have appeared in the interim. The Canada-Parks glossary and key is a must for all serious archaeological publication henceforward. So will J. and M. Boow's work on dating glass when it appears (Department of Environment and Planning, N.S.W., forthcoming). Other useful works include the following:

Jones O., and Sullivan C. 1985 The Parks-Canada Glass Glossary for the description of containers, tablewares, flat glass and closures. Studies in Archaeology, Architecture & History. National Historic Parks and Sites Branch, Environment.

Baugher-Perlin, S. 1982 Analysing Glass Bottles for Chronology, Function, and Trade Networks, in Dickens, R.S., The Archaeology Of Urban America. Academic Press: New York.

Jones, David. 1979 One Hundred Thirsty Years: Sydney's Aerated Water Manufacturers From 1830 to 1930 David Jones: Sydney.

Vader J. and Murray B. 1975 Antique Bottle Collecting in Australia. Ure Smith, Sydney

J.M.B. March 1987

At present the looting of bottle dumps is not controlled, however valuable a source of 19th century information they may be. Some procedures for salvaging information, according to circumstances, are given here, together with the sort of objectives we might expect to have in mind while carrying them out.

Objectives: Information from a bottle dump will bear

1. On the associated site (pharmacy, hotel, factory, domestic) depending on the various proportions of bottle types present.
2. On the date range of both site and dump
3. On the trade and economic connections of the site, depending on the manufacturing source of the bottles present, i.e., foreign imports, local imports, locally made bottles etc. and the proportions of each class present
4. On the social and economic implications of these activities.

Methods:

1. Systematic excavation of the total dump. Ideal, but rarely practical through lack of time, labour, money and/or skill. Dumps in the city are usually revealed in the course of hasty demolitions; in the country, dumps may cover very considerable areas, containing thousands of bottles, most of them broken. In a total excavation, whole bottles would be used to indicate type classes, necks shoulders and bases would be sorted into the same classes, while undifferentiated broken glass would be roughly sorted and weighed to give a rough estimate of the total number of each bottle type.
2. Since total excavation is clearly impractical, sampling the dump is more likely (just as middens which are also a form of rubbish dump are sampled). This is combined with a measured sketch of the total area of the dump, together with an estimate of its depth. Measured trenches or cuttings are dug, perhaps 3' or 4' square, at different points, and the total yield of artefacts from each cutting (broken glass as well) is collected, sorted, counted and weighed as outlined above. These are the quantitative procedures, concerned with proportions of types represented, in terms of the sample as related to the estimated total volume of the dump. Selective procedures must also be used - special bottles noted, inscriptions listed, dated bottles watched for, so that inferences based on both approaches can be drawn. The major problem here lies in the selection of areas for sampling. Random sampling is difficult to carry out, and not necessarily valid; rational attempts to space cuttings in perceptibly different aspects of the dump appear at least equally useful.
3. Emergency measures involve getting as much as possible of the type of information pursued in (1) and (2) above in a situation where it is impossible to work more systematically. In practice this usually amounts to listing and sketching notable individual bottles (often looted by others), together with quantitative impressions only.... "much black glass, shoulders often showing double mould seams a quarter up neck; very few modern moulded beer rims; much green glass from champagne-beers, about half of it very flawed"....and so on. Such notes are no substitute for a measured sample, but are considerably

better than no note at all. It should be accompanied by sketch plan of dump with dimensions, and a map reference or other locality identification.



OLD AUSTRALIAN POTTERY.

Judy Birmingham & Kevin Fahy.

Australiana has never lacked popular interest, and books on the collection and study of Australian-made pottery have begun to bring a welcome sense of order into this field. Marjorie Graham's pioneering work has been published in her book Australian Pottery of the 19th & early 20th Century, 1979, David Ell Press:Sydney, and Ian Evans has produced a definitive book on the Lithgow pottery of N.S.W. The Epsom Pottery at Bendigo was the subject of a book by P.A. Scholes (Bendigo Pottery 1979 Lowden, Victoria). The recent publication Ceramics in South Australia 1836 - 1986 by Norris Ioannou (1986, Wakefield Press, Adelaide) is arguably the best book yet to have appeared in Australia in this field, and its bibliography well covers the subject.

The excavation of a large quantity of 1860s wares from a cistern at 300 Queen Street, Melbourne, complements recent excavations at Hyde Park Barracks and First Government House in Sydney. All will presumably be presenting important new information on ceramics both locally made and imported when publication catches up. Finally, the processing of the 90,000 odd sherds from James King's Irrawang pottery is now nearing completion largely as a result of the MINARK programme, and publication although not imminent is well on the way.

On the more archaeological side of ceramics in general, the work of South, Miller and others has stimulated many new and interesting studies in the United States and elsewhere.

Miller, G.L. 1980, Classification and Economic Scaling of 19th Century Ceramics. Historical Archaeology 14,1:1-40

South, S. 1978, Evolution and Horizon as revealed in Ceramic Analysis in Historical Archaeology, in Schuyler R.L. Historical Archaeology: A Guide To Theoretical and Substantive Contributions Baywood Press: Farmingdale.

J.M.B. March 1987

Pottery was made in the colony virtually from its beginning, but as yet there are few marked pieces located that date before the later 19th century. A random selection of some early potters known from records would include:

- Sydney: Samuel Skinner, Jonathon Leake, Anson Moreton, Baldock and Co., Bradford and Co., William J. Carter, T. Field, Gilbert Macarthur, Liebentritt, Enoch Fowler, Bakewell Bros., H. & W. Mashman.
- Newcastle: Irrawang, Anthony Hillcoat, Nathan Wellam, Robert Turton.
- Lithgow: Lithgow Pottery.
- Melbourne: Luke Nolan.

Bendigo: Bendigo Pottery.  
Hobart: William Sherwin.  
Launceston: Cornwall's.

Much of our information about these 19th century potteries comes from their catalogues and bills, where these still exist. The oldest surviving in Sydney to our knowledge is a Lithgow catalogue of 1889, and a Fowler illustrated booklet of 1903. These give the main ranges in both earthenwares and stonewares (the latter of course tougher than the earthenwares and gradually in the course of the 19th century displacing it for domestic vessels of heavy use), together with an indication of the various sizes for each shape. The commonest stoneware containers, which can still be found in old tips, cellars, under floors and on demolition sites, are usually those bought on a large scale from the potteries by manufacturers of acid, ginger beer, ink, vinegar and spirits, who usually added their own names on the front of the container. Into this category also belong water filters, once a common household and railway carriage item, often elaborately marked with the manufacturer's name. Domestic wares in both earthenware and stoneware had a more restricted distribution; they included table wares and teapots, kitchen storage, cooking and dairying utensils, bathroom bowls, ewers, footwarmers and chamber pots, flower vases, garden urns and flower pots. Already it seems clear in N.S.W. at least that lead-glazed and red earthenwares for ordinary table use were not produced much after about 1850.

One category of pottery continues to pose problems - that is the blue-and-white china so common in the earlier part of the 19th century and decorated with transfer printing (including willow pattern designs) or feather edging, later produced in green, red and brown as well as blue. It is as yet not clear how much of this was produced in N.S.W., or how soon it became a commercial proposition. The Irrawang pottery attempted it, apparently without great success. Our knowledge from other states is even less.

The Lithgow catalogue of 1889 lists the five glazes made (Bristol, Cane, Majolica, Rockingham, Salt) and the 67 items of household use for sale. In the kitchen wares there are four styles of store jar - the squat, straight and globe covered forms, and the bung jar (with cork or bung) - and three types of stoppered bottle, the bottle, demijohn and screw-top. More specialised vessels include bread crocks, butter pots, cream pans, milk pans and churns, and for cooking, pie dishes, pudding basins, baking dishes, patty pans, pipkins and Dutch jars, as well as the miscellaneous items like butter coolers, safe stands and jelly moulds. In table ware there is a good range of Rockingham and Majolica teapots and pitchers, including Toby jugs, carafes (monkeys), mugs, jam pots and cheese covers. As well as these we find spittoons, spirit and tobacco barrels, bread plates, bedpans, footwarmers, footbaths, and a variety of flower pots, fern pots, seed pans and vases for cut flowers together with four varieties of bird water fountain.

The Fowler catalogue of 1903 shows a slightly different range with less domestic varieties since all were salt-glazed. Ginger beers, bung jars, spirit bottles, acid and vinegar bottles, screwtops and bread crocks are all illustrated. By 1932 when the next catalogue is available, several of the traditional forms are no longer being made.

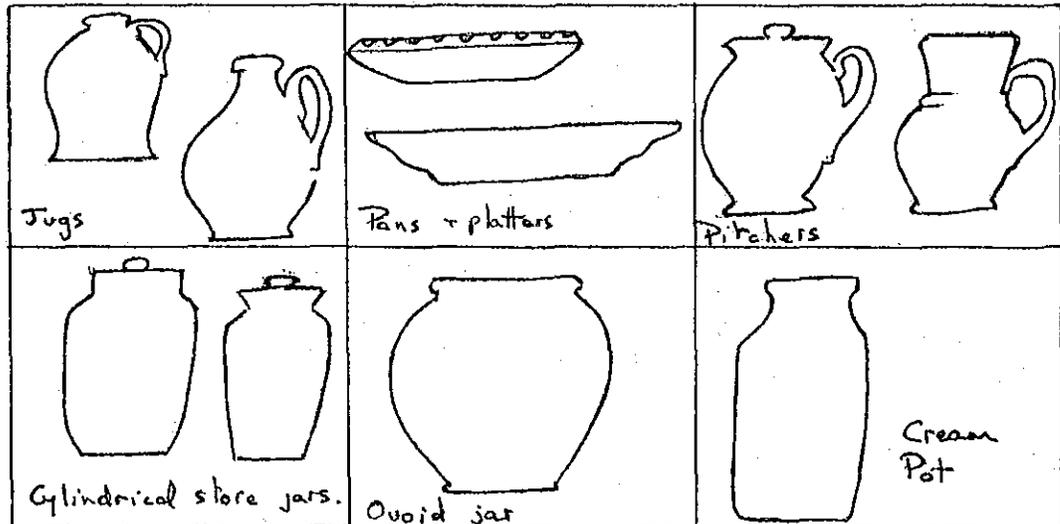
The repertoire so far available from the Irrawang site of James King's pottery is of course earlier yet than Lithgow. King's own records of his range are not extensive, although he mentions ewers, wine coolers, water monkeys, wash basins, filters, mugs, pickle and preserve jars, milk pans etc. (1844 Maitland Mercury) in advertisements. Some whole pots still exist - wine jars, monkeys and ginger beers, and the shapes of many more can be reconstructed from fragments found around one of his kilns: pie dishes, pudding basins, dinner plates, cups, saucers, bread and milk pans, chamber pots, Toby jugs, and a variety of salt-glazed store jars.

Another point of interest is the very close correspondence between Australian and Eastern U.S.A. earthen and stoneware ranges in the 19th century (cf. Watkins, Early New England Potters and their Wares, Harvard Uni. Press, 1950)

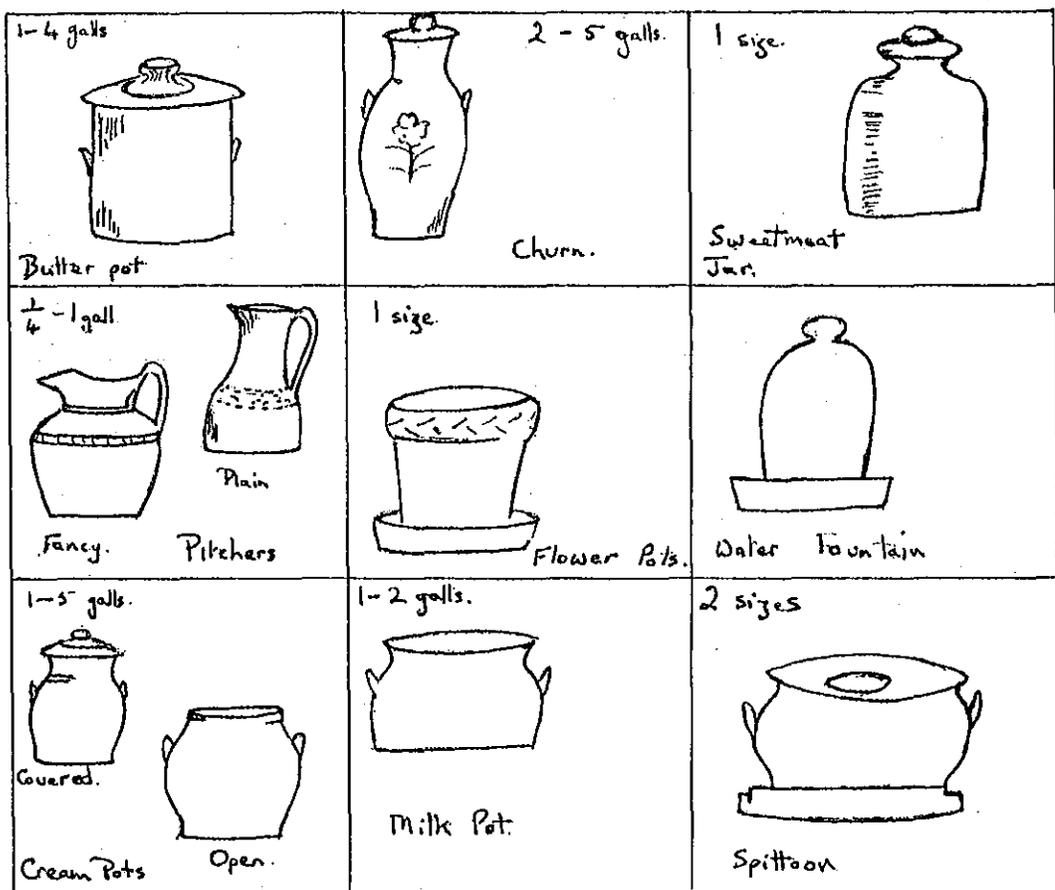
Further information about Australian pottery can be found in several issues of Pottery in Australia, e.g. 4.1 on Lithgow, the Australasian Antique Collector 3, 1967, and two articles in the J.R.A.H.S., 1971.

American East Coast shapes and wares

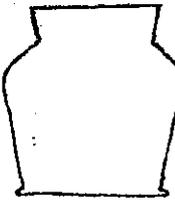
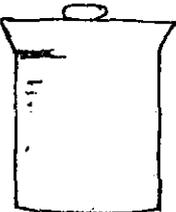
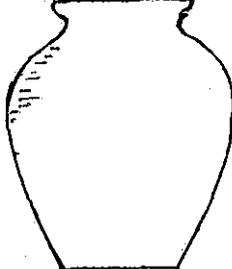
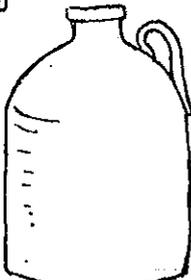
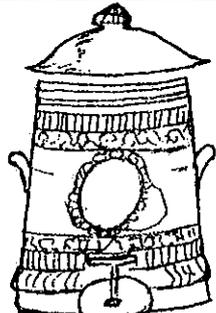
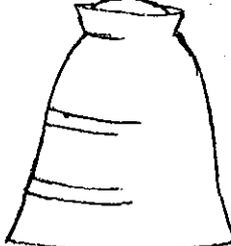
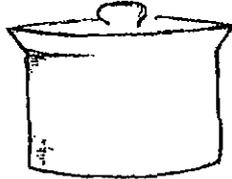
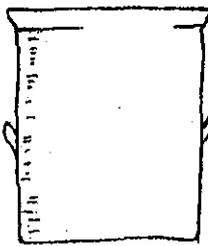
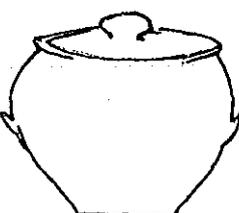
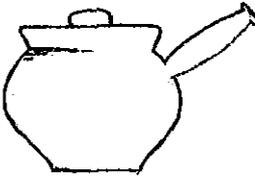
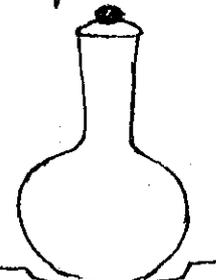
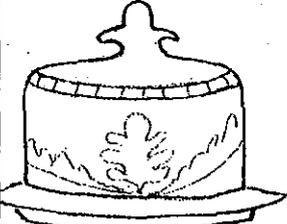
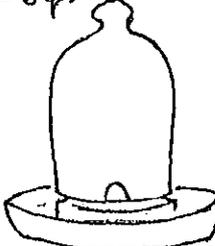
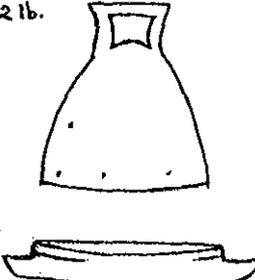
The main redware (earthenware) shapes by the mid and late 19th century in the eastern states were as follows:



Bills from Ashfield, Mass. (1848), Fairfax, Vt., (1840) and Bannington Vt., (1856) confirm that the stoneware range was very comparable to that of Lithgow, with a variety of specialised kitchen pots together with beers and ginger beers, inkstands, water fountains, spittoons and water kegs.



LITHGOW POTTERY.....Catalogue 1889.

1 pt - 12 qts.  Squat covered jar.	1 - 12 qts.  Globe covered jar.	1 - 6 qts.  Cylindrical covered jar.	1 - 12 qts.  Dung jar.
1 qt - 2 galls.  Bottle	2 gall.  Screwtopped.	1 - 2 galls.  Demijohn.	 Filter.
2 - 6 gall.  Churn.	16" - 22"  Milk pan	1 - 8 lbs.  Butter Pot	2 - 6 galls.  Cream jar.
1 pt - 3 qts.  Dutch pot	1 - 2 pts  Pipkin	1 - 2 qts.  Monkey (carafe)	1 size only  Cheese cover
1 - 6 qts.  Water fountain	2 lb.  Butter cooler	 Safe stand	 4"x12" Terracotta vase



## DECORATIVE CAST IRON.

Kevin Fahy.

It has not proved possible to update this paper apart from the addition of two references. The first, written before this article was published but unknown to the author, is Houghton's unpublished 4th year Architecture thesis, Cast Iron in Victorian Sydney (University of New South Wales, 1969, ARCT 624.1821/10 (2) ). The second, John Gay, Cast Iron (John Murray, London, 1986), is very recent.

March, 1987.

Cast iron was widely used as an architectural decoration on buildings in Australia throughout the second half of the nineteenth century. Foundries were established not only in the main cities such as Melbourne and Sydney, but in many country centres. In N.S.W., Bathurst, Goulburn, Newcastle and Maitland foundries produced castings of columns, pilasters, posts and gates etc. on which the names of the various makers can often be found.

While early examples of cast iron decoration were imported from England, most were certainly produced locally. There is no evidence for the belief that the importation of the fragile iron castings as ballast in the wool clippers on the trip out to Australia was widespread. This has arisen largely from the fact that even after iron ore was discovered and smelted locally by the middle of the nineteenth century, the bulk of the pig iron used in Australia was imported from England up to the end of the century.

The first iron foundry in Australia was established by Mr. Dawson in Sydney in the course of 1833. The fluted Ionic columns in the Pitt Street Congregational Church - which was opened in 1846 - were from this foundry. (This church, still standing, is now the Uniting Church) Recently a small door porter (or door stop) was seen with the impressed mark 'Blanche' on the reverse. James Blanch's Sydney Foundry was established about 1832, and on the death of its owner in 1841 the business was sold to P.N. Russell, who had arrived in Sydney from Van Diemen's Land three years earlier. This item is probably the earliest known example of a local casting.

Iron ore had been discovered near Mittagong in 1833. In 1848 a small blast furnace was erected to smelt the ore. The Sydney Morning Herald commented on the success of the venture, and noted that specimens of manufactured articles were being sent to Sydney. In 1851 several castings of a lion restant were produced to commemorate the visit to the mine of Governor FitzRoy.

Sydney Lace, Victorian Heritage, and Ornamental Cast Iron in Melbourne by Dr. E. Graeme Robertson of Melbourne are three important studies on cast iron in Australia, and contain numerous photographs and details of patterns found in N.S.W. and Victoria.

The Society is anxious to compile a list of those Australian foundries which produced cast iron as a building decoration, and readers or members are asked to provide details of foundries encountered, particularly in country areas. Other information such as design pattern books, whether local or English, and dates of country foundries are also needed.

The material gathered will be of importance in establishing the extent of this manufacture, and serve as a valuable aid in dating buildings of the Victorian period. It would also serve as a basis for further study on the techniques of manufacture and the use of regional types and designs.

## CLAY TOBACCO PIPES.

Judy Birmingham.

The literature on clay pipes has escalated in the intervening years, with a welcome increasing emphasis on the nineteenth century overseas. A major contribution has been the British Archaeological Reports vols. 1 and 111 (P. Davey 1979 and 1980 The Archaeology of the Clay Tobacco Pipe, British Series 78: Oxford), while a large number of sites in standard British, United States and Canadian periodicals and other publications provide comparative material.

In Australia the publication of clay pipes from Port Arthur (Dane A. and Morrison R. 1979, Clay Pipes From Port Arthur 1830-1877, Technical Bulletin NO.2, Department of Prehistory, Research School of Pacific Studies, A.N.U: Canberra presented the largest collection of pipes from any single site until the excavation of Hyde Park Barracks, Sydney in 1980-1. The extensive and important H.P.B. collection as well as those from the First Government House site, Sydney (excavated 1983-4) are likely to be published in the comparatively near future.

JMB March 1987

On present evidence few museums in Australia appear to have large collections of 18th-19th century clay pipes and fragments, although all indications from both archaeological excavations and from city and country dumps are that they are as numerous here as in both the U.K. and the U.S.A. Presumably they have not yet attracted much attention - a pity, since they have much information to yield on trade patterns and social fashions.

The first clay pipes were introduced in England in the 16th century, and lasted until the early 20th when they gradually disappeared (It is still possible to buy clay pipes at least in Sydney). To begin with they were small since tobacco was difficult to get, and were carefully hand made by individual journeymen with apprentices organised into guilds. Such pipes during the 16th-earlier 18th centuries were often stamped with initials or registered symbols to identify maker and product. The north of England (Brosely), Bristol, Plymouth and London were major producers, and pipes were also exported from France, Holland and Germany. The identifying stamps are found on bowls, stems and spurs.

By the later 18th century however traditional craft methods together with guild organisation were breaking down, yielding to wholesale production methods and moulds of the Industrial Revolution. Changes appear from about 1780 onwards which are linked to the need for greater speed and lower costs. The individual marks and symbols gradually disappear, and in their place are found the moulded names and mould numbers of big manufacturers from a variety of centres. Decoration

changes in the interests of mass production. It is now usually in relief, incised into a mould. The time necessary to trim off mould marks is grudged, and various devices are employed. Sometimes they are left untrimmed; sometimes turned in a fluted pattern which ingeniously disguises them; and sometimes simply incorporated into the commonest of the 19th century pipe-bowl designs - a line of leaves on either side of the mould junction which thus forms a sort of midrib.

Many of the manufacturers operating throughout the 19th century can be traced in Britain through trade directories, supplemented by excavated dumps of dated material or pits sealed at a known date. Oswald (1) has set out a typology of pipe forms c.1580-1850 based on a combination of these methods, of which the later forms are drawn overleaf. Pipes found in Australia are from the end of the range, and their interest lies as much in their details and place of origin as in their date.

Marked pipes found recently in the Sydney area include the following stamps:

W.White, McDougall, Murray, Davidson, W.P.P., Repeal, Cork, of which the first four are from Glasgow, the last from Ireland, and the other two as yet untraced.

W.White was one of the largest Glasgow firms, although McDougall (founded either 1810 or 1846) was the largest exporter. McDougall stems are also sometimes marked with an 'I' and White stems with '78' or '78C' just before the manufacturer's name. Both can have the letters 'TD' on the bowl, a mark which occurs widely on 19th century pipe bowls and has been much discussed in American publications. Davidson pipes often also bear the name 'Murray'. The Murray company was founded in 1826 in Glasgow and continued until 1861-2 when it became the Davidson Co.

Other pipes recently found, without stamps but with decorated bowls, show wheatsheaves (Flinders Is.), Royal NSW Lancers (Flinders Is.), human heads, flowers on stems (from Hobart, stamped 'Glasgow' on stem), and a possible Britannia figure. These were probably stocked by hotels.

As our knowledge of Australian imports grows, our trade patterns can be compared to the U.S.A. and Canada where 19th century pipes and fragments are more fully studied. At Old Sacramento in California (2), for example, 13-15,000 pipe fragments were found in 1966, 95% of them in a single building destroyed in a fire of 1852. This magnificent collection includes marked examples from France and Holland as well as England and Scotland, and includes several of the companies also exporting to Australia. We may note Dorni, Dumeril (St. Omer), L.Fiolet and Gambier, all of France, A.Coghill, Murray-Davidson (both Glasgow), Jones (Liverpool), McDougall and White (Glasgow), all from Britain, and Dutch 'milkmaid' pipes from Gouda in Holland c.1740-1850, with a simple roulette band close to the rim and the figure of a milkmaid

impressed on the base of each heel. There were bowls from pipes with detachable stems, often with the faces of historical figures moulded on them; a large number of bowls with 13 stars plus leaf decoration and/or the letters 'TD' and 'LF' on them; and there were many bowls with fluted decoration. Less is known of these last three, very large classes, except that like all the rest they must date before, and probably shortly before, 1852.

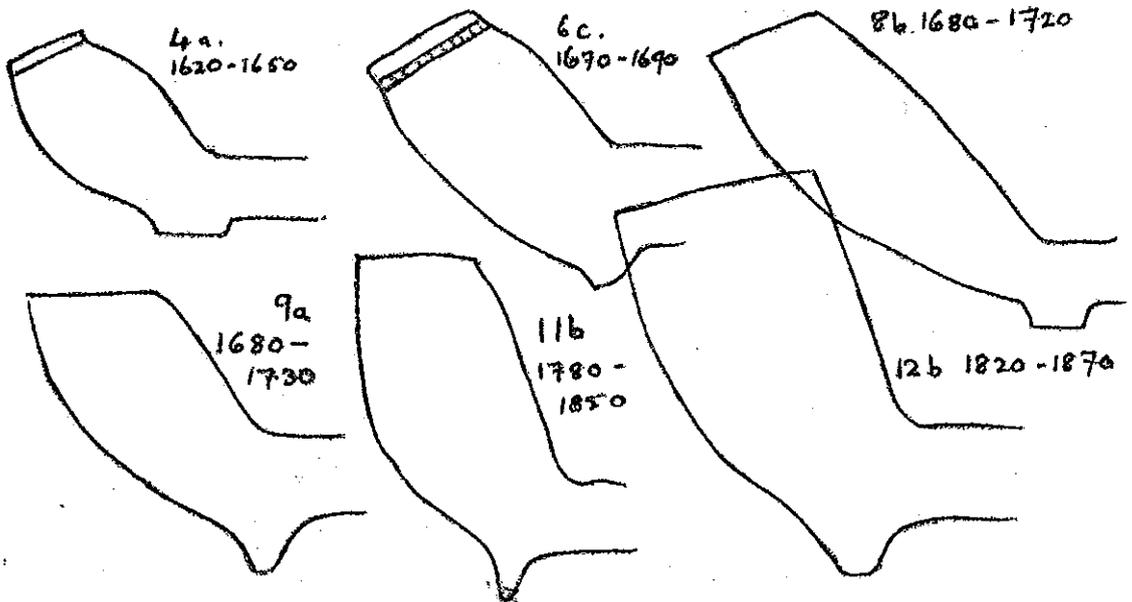
The above method of identification, by stem and bowl marking, falls down of course when a large dump is found which includes quantities of plain bowls and stem fragments. On many American sites statistical methods based on the diameter of the bore hole have been employed for dating purposes, once it was discovered that the size of the bore hole decreased fairly regularly from 1620-1800. However, this regularity appears to break down thereafter and as yet cannot be used for 19th century pipes, in which the hole appears to get larger once again. So far in Australia the numbers found have scarcely justified such methods - 167 bowls and stems from Port Essington, about the same number from Flinders Island, but more are appearing all the time. As usual we would like to hear from anyone who knows of any large collections of clay pipes, either in museums or by collectors, and also of marked and decorated specimens.

- (1) Oswald, A.: The Evolution and Chronology of English Clay Tobacco Pipes, Arch. Newsletter, V 5, No.12, 1955, 243-250.
- (2) Humphrey, R.: Clay Pipes from Old Sacramento, Historical Archaeology 1969, 12-33.

Additional bibliography:

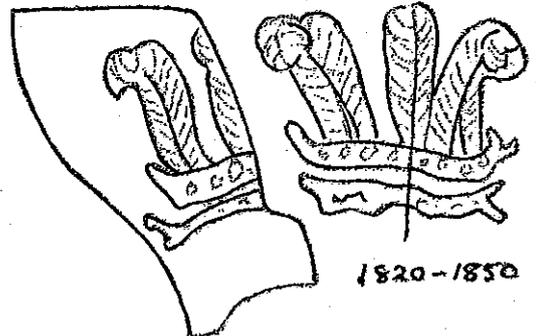
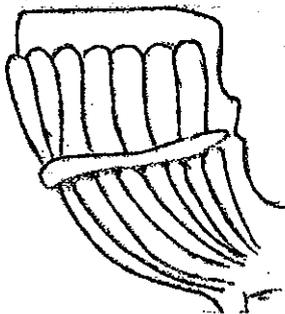
- Allen, J.: Port Essington, Ph.D. thesis, A.N.U., 1969 (unpub.)  
Binford, L.: A New Method of Calculating Date from Kaolin Pipe Stem Samples, S.E.Arch. Conference Newsletter, 9.1, 19-21 (Georgia).  
Dunhill, A.: The Pipe Book, London, 1969.  
Fontana, B. et al.: Johnny Ward's Ranch: a study in Historical Archaeology, The Kiva, 28, 1-2.  
Oswald, A.: Marked Clay Pipes from Plymouth, Devon, Post-Mediaeval Archaeology 3, 122-142.  
Walker, I.C.: Concerning TD Pipes - a preliminary study, Quart. Bull. Arch. Soc. of Virginia 20, 4 June, 1966.  
For a description of the making of clay pipes (illust.) see Fairholt, F.W.: Tobacco, its history and associations, 1859, 176-8.

Forms and dates of English Clay Pipes (Oswald, 1955)



Old Sacramento, California

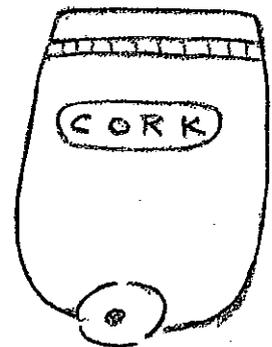
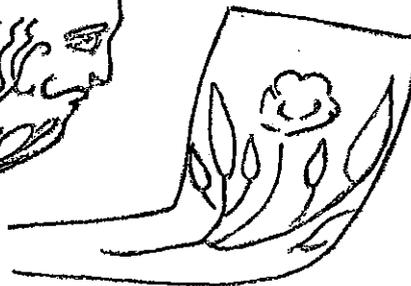
Plymouth, England



Flinders Island, Tas.

Hobart

Sydney



So far only one name of a colonial pipemaker is known, William Cluer of Sydney, about 1808, who exported widely, but whose products have not yet been found.

## BUTTONS.

Judy Birmingham.

Even now not much has been published on Australian buttons, but the increasing intensity of general historical research in preparation for 1988 has resulted in a wealth of books on costume in general, as well as many publications of 19th century photographs which incidentally show contemporary dress and fastenings.

More archaeological lines of research are now in progress in connection with the artefact analysis programmes for the Hyde Park Barracks (1981) and Regentville (1985) excavations. A.S.H.A. Newsletter and Research Bulletin readers will be kept informed. As with many other aspects of historical archaeology much comparative literature from the U.S.A. and Canada is relevant, and useful articles are included in the following list:

Olsen, S.J., 1963, Dating early plain buttons by their form. American Antiquity, 28.4: 551-554

Ripley, H. Buttons Of The British Army 1855-1970. Arms and Armour Press:London.

Scandrett, E. 1978 (repr.1984), Breeches and Bustles: An Illustrated History of Clothes worn in Australia 1788-1914, Pioneer Design Studio, Sydney.

Strong, E. 1975, The Enigma of the Phoenix Button, Historical Archaeology 9.

More comparative information is to be found in the Canada-Parks Research Bulletins and Occasional Papers, as well as in the increasing number of Australian excavations such as Peter Coutts' Captain Mills' Cottage, Port Fairy, Victoria 1984 (Victorian Archaeological Survey).

White,D.P. 1973. The Birmingham Button Industry, Post Mediaeval Archaeology 7: 67-79.

Acknowledgment is here due to the work of Val Attenbrow who devised the initial typology of the Flinders Island buttons, and also researched the basic references noted in the original article.

JMB March 1987

Buttons are of interest to historical archaeologists mainly because, like coins and beads they are small, are usually carried around by people in the course of their daily activities, and are easily dropped and lost. In addition, they are comparatively durable items of dress which nevertheless reflect changing fashions and even social and economic factors quite significantly, and sometimes - as in the case

of uniform and military buttons - can yield documentation of factual information.

In fact, they are commonly picked up on surface sites in Australia - dumps and tips, ruins of old houses as well as in the course of excavation. But like the broken clay pipe fragment, since they are only very occasionally actually of intrinsic interest, they are usually tossed out. We have not yet heard of a collection of 18th-19th century simple trouser or shirt buttons in Australia, and it seems unlikely that we shall; collectors reasonably enough prefer to select buttons attractive in themselves - glass-topped with flowers, painted or papier-mache forms.

Buttons from recent 19th century excavations, however, are already beginning to show that there were steady changes in form in, say, the bone four-holed trouser button and the single-shank flat metal jacket button throughout at least the middle of the 19th century. From the Aboriginal Settlement on Flinders Island of about 1838-40 comes a series of 25 bone buttons of which most are similar four-hole, rimmed forms, and about a dozen plain metal buttons, clearly from pea-jackets. These confirm Robinson's statements that the Tasmanians wore clothes, and suggest a high degree of uniformity in the dress issued to them. A few smaller bone buttons may have been from women's dresses; it is however still conjectural that the four-hole bone buttons are from trousers rather than shirts or even women's dresses. Very few military buttons have been found so far at the Settlement, at least near the aboriginal terrace. There are predictably more from Port Essington (of about the same period).

We are still at the stage of collecting basic information about these, from old mail order catalogues, costume museums and trade circulars and advertisements.

Far more information is now appearing about decorative buttons, on which there have been several recent books.

These are usually concerned with the general history of buttons, from their origins in Bronze Age Europe to the beginnings of the button trade proper in Europe in the 15th and 16th centuries. Their earliest appearances are assumed to have been decorative rather than functional, and most sources date the beginning of the functional button in European dress only to the time of the returning Crusaders from Persia, who brought with them the idea of trousers and tighter-fitting dress in general. Not until the end of the reign of Elizabeth I does the trade become established, and some sources indeed dispute that any buttons were functional before the 18th century.

Thus from being an art only, button-making became a craft, and finally in the 19th century mass-production was needed to meet demands. In general, England had supremacy in the button trade, although in the mid-19th century Paris and Lyons were both great centres, the French speciality being porcelain buttons. Germany produced cheap fancy buttons, the cheapest glass ones coming from Bohemia; while

Vienna at one time had a pearl button output which almost rivalled that of Birmingham.

Birmingham was the real centre of the world button industry in the 19th century, its buckle trade diminishing as its button trade increased. British machinery and processes introduced mass production there.

There are many varieties of decorative button attractive to the collector; sets of 19th century dye-stamped silver and brass buttons showing hunting and sporting scenes; military buttons showing regimental emblems and insignia, which came into use in the 17th century and continued into the 20th; pictorial buttons, popular in the 19th century, showing animals, flowers, fairy and nursery tales; glass-topped buttons, invented about 1775 and fashionable especially at the end of the 18th century; Italian cameo buttons made from laminated shells; Wedgewood jasper ware buttons, and the porcelain and glass buttons from Europe already mentioned.

#### Some references

The Complete Button Book by L.S.Albert and K.Kent, 1949.

Buttons by D.Epstein (Collectors Blue Book), 1968.

The Button Industry by W.Unite Jones, 1924.

The National Button Bulletin of the National Button Society  
(47 Keith Street, Springfield 8, Mass., U.S.A.)



## NINETEENTH CENTURY TOMBSTONES.

Judy Birmingham.

The original references were left off this item, but included Deetz J, and Dethlefsen E.F.1967, 'Death's Head, Cherub, Urn and Willow', most readily accessible in Schuyler R (ed.) 1979, Historical Archaeology: A Guide to Substantive and Theoretical Contributions. In the same volume is Deetz' interesting paper 'A Cognitive Model for American Culture, 1620 - 1835' (1974).

A later paper in this same area is Dethlefsen's 'The Cemetery and Culture Change: Archaeological Focus and Ethnographic Perspective', in Gould R.A. and Schiffer M.B., (eds.) 1980, Modern Material Culture: The Archaeology Of Us, Academic Press, New York.

In New South Wales interest in Victorian and later headstones has continued, although not necessarily in the same direction as my original article. Lionel Gilbert, continuing his early interest (History Around Us, 1974, Hicks Smith and Sons, Sydney) has produced the excellent glossy A Grave Look At History, 1980, John Ferguson, Sydney.

The Historic Houses Trust of N.S.W. produced an excellent and informative catalogue (with bibliography) to their In Memoriam Exhibition in 1981 (J. and J.S.Kerr, Mary Mackay and Maisie Stapleton), and the National Trust of Australia (N.S.W.) Cemeteries Committee in their Cemeteries Policy Paper (1985) propose standardised nomenclature for local headstones (also with bibliography).

Jim Kerr also wrote 'Cemeteries: Their Value, Abuse and Conservation', in Heritage Australia, 2,1,1983:50-57 (reprinted in The Best Of Heritage Australia), and will publish a book on Australian headstones in 1988 from an iconographic and stylistic view point with particular emphasis on the monumental masons. Finally, of course, the Australian Society of Genealogists (Richmond Villa, Kent St., Sydney 2000) continue their excellent work in systematically recording, indexing and publishing inscriptions.

J.M.B. March, 1987.

The study of headstones is both interesting and important from a local historical point of view. Each stone is a piece of dated folk craft, bearing unique historical information about changing family life, occupations, religious beliefs, hopes and fears, and decorated with various ornamental devices which all also change with the passing years.

Moreover, often the stones are not of anonymous manufacture; they are easily traceable to a family of local stone masons, sometimes still working in Australian country towns, about whom they also yield information.

Unfortunately the study of this class of evidence has not anywhere received the attention it deserves until almost too late. In most countries now graveyards are fast disappearing as land values rise. The usual practice is to remove the headstones and level the land. Under a good local authority the area may be grassed over, to become featureless 'open space', with some at least of the stones placed around the perimeter. More often the stones are destroyed and the cemetery disappears without trace.

Britain has a particularly rich series of simple tombstones, mostly from the early 17th century onwards when the practice of erecting monuments spread to farmers, squires, merchants and landowners. Previously only the very wealthy had monuments, and these were inside the church. Those who could afford it copied these 'ledger slabs' - flat slabs on low stone legs - outside, and this was especially common in the days of bodysnatching for medical research since the slabs were too heavy to lift easily. Others had a simple head and foot stone, at first 2-3 feet high, and gradually becoming bigger and more ornate.

In the 17th century, skulls, and epitaphs warning onlookers of their common fate, reflected a forthright, if grim, attitude to death. In the 18th century, at the peak of the fashion for classical Greek and Roman culture, tombs often imitated classical themes - chubby winged cherubs, or stone urns draped as a sign of mourning with a carefully carved stone cloth. Sometimes the eye of God is shown with rays descending, or simple designs like shells reflect work on contemporary furniture. Tools of trade can be shown - shepherd's crook or barber's shears, and, in Victorian times, industrial symbols like a woollen mill or steam engine. More often Victorian symbols are expressions of hope, piety or affection - an open book (the Bible), a wreath of evergreen leaves (always associated with churchyards), a dove, or an anchor (a general expression of security rather than specifically a mariner's grave).

On British headstones also, changes can be traced in both styles of lettering and the nature of the epitaph as time passes. The earliest stones were cut by simple country folk who often made spelling mistakes or used their own variants of letter forms - either in Gothic or Roman script. By the 18th century once again neo-classical influence can be seen in the popularity of good Roman script, while by the middle of the 19th century many headstones show that professional stone engravers were anxious to include as many types of alphabet as possible. 'Sacred' is often written in Gothic (or blackletter), the remaining memorial inscription in Roman variants (Tuscan, with curly ends, sans serif etc.) and the epitaph in cursive copperplate.

Epitaphs - verses written for use on monuments - are very old and very varied. Fashions in them change markedly, from the 'onlooker, beware' approach to the sentimental, funny or sad. By the end of the 18th century death is less often mentioned, and as in headstone decoration, symbols are more common - flowers and buds to denote children, hourglasses,

trumpets, ashes and dust. In the 19th century too there is much mention of suffering, and the need to endure it, with death as a welcome end. Some epitaphs are particularly common by this time, obviously chosen from books of epitaphs which were widespread.

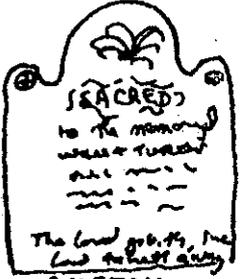
In Britain there are various local styles as well as a general developmental trend throughout the country. One particularly striking group of headstones is that made in slate, partly because of the beauty of the stone and the clarity of its carving, partly because of its resistance to erosion. Workers in this material are in fact known as engravers. The slate comes from the quarries of Leicestershire, and the slate headstones have their distribution throughout the surrounding counties (cf. references at end).

In America there has been more intensive work on headstones in recent years, notably those in New England, so far with a more statistical bias. The New England study by James Deetz involved some 400,000 colonial headstones in a large number of graveyards, and was mainly concerned to document the precise way in which changes in fashion in headstone shapes, decoration, lettering, epitaph form etc. took place in the last two and a half centuries. (cf. references).

Australia has one major disadvantage for this study, in that the heyday of the most attractive early headstone forms was over by about 1800 and the bulk of the available material comprises the more stereotyped late Georgian-Victorian varieties. However, there are early ones to be found, and moreover the 19th century examples are still in reasonable condition and legible (where they have not yet been removed) since Australia did not suffer the intensive air pollution of England before 1955. Equally one of the most interesting aspects of the colonial study is to relate the results back to comparable fashions in England

Local historical or archaeological groups here in Australia could well consider a project on their local older cemeteries for a year's programme, before these finally disappear. Such a project can be an interesting combination of straight-forward historical and more archaeological techniques.

Much of the research is concerned with documentary material related to local families, church and cemetery regulations, and the stone masons involved, and can be found in the usual sources for local history - church records, local government regulations, trade directories and newspaper advertisements. Equally important however is the study of the tombstones themselves, for which the first essential is a careful and accurate copy not only of the inscription on the stone but also its shape, motifs, lettering etc. A small photograph is an excellent addition to this copy, but cannot be substituted for it. Ideally, each tombstone should go on a separate card or page, with drawing, inscription and comments, name of cemetery or churchyard, and contact print attached. Some simple format (cf. overleaf) can be set out for this record.

SITE & LOCATION St Marks (Blanktown)	DENOMINATION Anglican	Recorder's Name and Address
1 SACRED 2 TO THE MEMORY OF 3 WILLIAM TURNER 4 WHO DEPARTED THIS LIFE 5 10 <sup>th</sup> JANUARY 1832 6 AGED 2 YEARS 7 THE LORD GIVETH, THE 8 LORD TAKETH AWAY. INSCRIPTION	1 GOTHIC 2 SANS SERIF 3 TUSCAN 4 COPPERPLATE 5 " 6 SANS SERIF 7 COPPERPLATE 8 COPPERPLATE SCRIPT.	
COMMENTS Legibility excellent	No. of stones in this cemetery:	CONTACT PRINT (25mm x 2 1/4")
SIZE height 1.15m. other dimensions. width 0.55m. thickness 0.15m.	No. of stones recorded:	

SUGGESTED FORMAT FOR TOMBSTONE RECORD CARD (size 1/2 foolscap 5 x 8 inch)

First results will be concerned with the history of specific families, development of church or cemetery regulations, periods of use of different cemeteries, developments among specific religious groups, and location of stone mason families. As more and more cemeteries in the area are recorded, however, and the total number of tombstones reaches 1-200 or more, further points can be demonstrated from the headstone cards themselves - that in one area certain types of shape and/or decoration, or certain forms of epitaph, have specific and limited periods when they were in fashion - sometimes noticeably lingering on in more remote country churchyards when newer forms have displaced them in the big urban centres. Some motifs and inscriptions can be shown to be specifically related to certain denominations regardless of date, while some notable families, and occasionally a particular family of stone masons, can be shown to have a preference for a special design, or ornament, or type of lettering.

Provided that the original cards have a full record of the tombstone including shape, decoration, names, motifs, denomination and date or dates, the information can be sorted to demonstrate a variety of different theories - from fashions in Christian names among different denominations or in different periods to the popularity or otherwise of Gothic script. Because the tombstone record may be incomplete, it should always be supplemented where possible by church or cemetery records. These of course do not include details of headstone style, and hence the need for a complementary field study.

Such results depend for their validity on the accuracy of the original copy, and where surfaces are worn this can present some problems. As in recording rock engravings, side-lighting is useful. The afternoon or evening sun may be sufficient. Several visits back to the stone in different lights are helpful. The date is particularly important, and minute attention must be paid to the forms of numbers used by the engravers, especially 3s and 5s which are easily mistaken. Where the date is dubious even after careful study, it must be recorded as such (whichever figure) and considered as partially or totally unknown in subsequent results.

Presentation of the latter class of results is often most clearly done in tabular form. Tables can be set out either to show different arrangements of results from an individual cemetery, or to show the collation of results over a total area. Changes in shape of headstone, motifs, or classes of epitaph can most readily be plotted against changes in dates, or different religious denominations. Other possibilities will suggest themselves as the study proceeds. Such simple tables, either for area results or individual cemeteries are sketched overleaf.

Some interesting results have already emerged from the Sydney area. In general, the simpler older forms disappear between 1830 and 1840, and new styles in lettering, epigraph and headstone shape are introduced especially between 1835 and 1845. Rural churchyards outside the city are marked by persistent survivals of one form with its own individual stylistic development, while throughout the 19th century there are very marked differences between headstones of different denominations. Some particularly interesting designs and motifs can be found in country areas. The new forms and motifs appearing in the 1840s can incidentally be found also on contemporary buildings - urns, finials, shells, rosettes, wreaths.

The aim of this type of historical study is essentially that of demonstration - the re-presentation of data from individual headstones to demonstrate particular trends or hypotheses. It does incidentally ensure that a full and accurate record is made of a set of fast-disappearing evidence, and any responsible historically-minded group setting about such a programme should also see that this set of records, when completed, is lodged permanently in the local museum or library.

#### References:

Graves and Graveyards, Kenneth Lindley, (Routledge and Kegan Paul) (Local Search Series) 1972.

English Churchyard Memorials, Frederick Burgess, (Lutterworth) 1963.

'Slate Headstones and their Engravers', (The Local Historian, Vol. 8, No. 6, 1969) David Neave and Vanessa Heron (pp.213-217)

'Death's Heads, Cherubs and Willow Trees; experimental

ST MATTHEW ANGLICAN							TOTAL
1790-1809	4	2					6
1810-1819	5	1	1				7
1820-1829	3	4	3	3			13
1830-1839	1	2	1	2	1	1	8
1840-1849					2	2	4
1850-1859					3	4	7

HYPOTHETICAL TABLE OF STYLE CHANGE IN ONE CEMETERY

Blanktown Area 1800 - 1880	URN 	WILLOW 	CROSS 	ANGEL 	SKULL 	TOTAL
PRESBYTERIAN	250	1			1	252
R.C.			57	18		75
ANGLICAN	27	73	9	9	9	127
UNKNOWN	14	8	7	3	2	34
TOTAL.	291	82	73	30	12	688

AREA TABLE - HYPOTHETICAL DISTRIBUTION OF STYLES  
AMONG DENOMINATIONS.

archaeology in colonial cemeteries', E.Dethlefsen and J.Deetz, (American Antiquity, 1966, 31, 4, 502-10)

K. Lindley's book is a handy little beginning to a study of headstones; intended for senior school children and useful for all who plan a project of this kind. Burgess' English Churchyard Memorials is the standard work, with lists of stone masons (in England). The article on slate headstones is a good example of a detailed study of one particular school of craftsmen, while Dethlefsen and Deetz' work is a broader study of many hundreds of headstones in New England which they have treated quantitatively to demonstrate trends in style change.

HISTORICAL ARCHAEOLOGY AND THE RAILWAY AGE.

J.O.Ward - University of Sydney.

Additional Note:

I am not engaged in research into this topic, but two comments seem necessary in view of developments since the preparation of the original article. In the first place, research into the history and archaeology of the light railway has continued its course with some notable publishing achievements, such as Norm Houghton's West Otways Narrow Gauge (Light Railways 45, 1973), R.K.Morgan's Lahey's Canungra Tramway (LR 54, 1975-76), R.Alger's Wooden Rails to Kinglake and Flowerdale (LR 67, 1980), A.P.Winzenried's Britannia Creek (LR 68, 1980) and the rather larger scale Timber and Gold: a history of the sawmills and tramways of the Wombat Forest 1855-1940 (Light Railway Research Society of Australia, Melbourne, 1980) by Norm Houghton, to name but a few examples. For New Zealand one could mention publications such as David Lowe's The Piha Tramway (n.d. published by the Lodestar Press), also for Tasmania, Lou Rae, A History of Railways and Tramways on Tasmania's West Coast (1983) and Lindsay Whitham, In Search of Zeehan Tramways (The Tasmanian Tramp 20 (1972) 99-102). However, more urgent, perhaps, than the steady uncovering of the usually long gone light rail past, is the preservation, excavation (where necessary) and study of the archaeology of the heavy railway. Since the preparation of my original article, the world of heavy railway has, so to speak, collapsed. Aided by so-called 'progressive' governments, the heavy railway systems of all Australian states except Queensland, have been completely made over. The net effect has been the almost total abandonment of country rail services, passenger or freight, and for the few runs that are still left, modern equipment and staffing practices have obliterated most traces of the great railway era of the nineteenth century. These traces had survived more or less into the post second world war era, although the scale of usage declined inevitably. Alongside the dismantling and making over of the government systems we may mention the rapid decline of the private industrial railway in Australia, whether coal-hauling in the Newcastle region, or cane hauling in Queensland, or the Mt. Lyell operations in Queenstown, Tasmania. Rolling stock, fixed facilities such as station buildings and outbuildings, together with a host of lesser items such as water towers, roundhouses, turntables, freight sheds, have been either destroyed and demolished or allowed to decay into ruin. Fires, vandalism and government policy have made inroads into the remains of the nineteenth century within our major cities, whether those portions of the suburban railway stations that survive from the country stations of the nineteenth century, or the few surviving relics, for example, of tramway depots and related structures. In Victoria the survey and conservation impetus is further advanced than in the much larger and potentially richer NSW, and the railway archaeologist of the future will have much to do reconstructing the physical dimensions and antecedent operating practices of our nineteenth and early twentieth century heavy rail systems. This task is rendered more and more difficult, if not impossible, every passing day, as government policy, accident and neglect combine to bury or obliterate the relics of the railway past. The best intentions and most heroic labours of museum societies (which have expanded enormously since my original article) cannot make good the losses of relics and properties

in situ, nor can even such splendid feats of reconstruction as the 'Magic Mortuary Station' near Central Railway, Sydney.

J.O.W. 28 Feb., 1987.

Abbreviations:

- B = Australian Railway Historical Society Bulletin.  
NGR = Narrow Gauge Review, the publication of the Light Railway Research Club of Queensland, founded 1969. Typed and xeroxed. I have seen nos. 1, 2, 5.  
LR = Light Railways, published by the Victorian Light Railway Research Society (later the Light Railway Research Society of Australia). Contains full articles, correspondence, reports, corrections, notes, etc. 'for the serious railway archaeologist'. Typed and duplicated, later offset printed. I have seen 13 (1963) to the latest issue.

The 'Railway and Tramway Age' in Australian transport history has left physical traces in our environment second only in extent and impact to those of the automobile age. Some, perhaps the majority, have become grist for the archaeologist's mill: ancient single-track road-beds can still be glimpsed from today's roads and mainlines; rusting locomotive machinery of the steam era still dots the countryside; an old tram depot, complete with track fan or water tower, survives as a modern trucking depot; miles and miles of tram track lurk beneath our city streets; tramcars themselves moulder away as sheds or sleepouts. Most ephemeral, and possibly most fascinating, are the remains of the 'empire' of narrow-gauge light railways that carried out in an earlier era the job of the modern motor-truck, lugging timber, sugar, shale, sand, firewood, construction materials, military supplies, sewage, the products of numerous mines and quarries, and even passengers, working for concerns as various as the Powelltown Timber industry (which operated 250 miles of tramway in the Upper Yarra area, Victoria), the Port Melbourne Gasworks, or the Heatherton Benevolent Asylum (Victoria). Horses, winches, steam engines, diesel motors, petrol motors, and, if we include what must be Australia's oldest railway, the Port Arthur (Tasmania) human tramway, human beings, provided the motive power on these lines. A tiny fragment of this 'Empire' is still in use (for instance, the Queensland Sugar tramways, the underground electric 'trams' of the Mt. Lyell Co., Queenstown, or the 2 foot gauge, 7 mile long 'Luna River Railway' 65 miles south of Hobart, carrying high-grade limestone for the Australian Commonwealth Carbide Co.), but the greater part of it can only be sampled in the pages of enthusiast magazines, newspapers and archives, or on foot, where careful field-work can still locate traces of road-bed, trestle bridges, rusted rolling stock and locomotive equipment, outbuildings, and the like.

The feel and look of the rolling stock and locomotives of the railway-tramway era have luckily been preserved in some degree by the devoted efforts of groups and institutions like

the Van Diemen Light Railway Society, the Ballarat Tramway Preservation Society, the Tramway Museum Society of Victoria, the Geelong Steam preservation Society, The Railway Transport Museum of N.S.W., the South Pacific Electric Railway Cooperative Society, the N.S.W. (Parramatta Park) Steam Tram Preservation Society, the Marsden Museum of Historic Engines (Goulburn), the Puffing Billy Preservation Society, the Australian Railway Historical Society Museum and others. Too often, however, the modern automobile-oriented citizen sees the equipment carefully restored by the above groups as a 'quaint gimmick of olden times', scarcely appreciating the scope of the job the railway and tramway, and especially the light railway, performed, in its proper industrial and social context. It is important that this impression be dispelled: the technology of the pre-clover-leaf and V8 era is no less blameworthy, from an environmental point of view, than that of the automobile age, but it can offer our own generation ecological lessons of significance: at Hill End, we see in perspective how destructive man really is, without being blinded by the sign 'profits are now being made here'; any country railway line or light railway route shows how simply large volumes of traffic can move through the countryside without destroying its character; an effective tramway system still saves a city thousands of cubic tons of atmospheric gases annually. The labour-intensive nature of earlier technology, whether a Victorian building facade, a Hill End timbered mine-shaft, or a light railway network, suggests some insight into the nature of economic change, whilst the design of an old railway sleeping carriage, or an early tramcar, sheds a tiny beam of light, like the interior of a Victorian house, into the physical world of our ancestors, and the way they liked it.

The historical or industrial archaeology of the railway age in Australia has hitherto been the province of the enthusiast, whose job has offered little in the way of either incentive or reward for his work. The following brief account of the progress made in this field relies entirely upon the work of the enthusiast and is intended simply to give an idea of the kind of use made of what might be termed 'the archaeological approach' in the recording and reconstructing of Australian railway and tramway history.

By 'the archaeological approach' I mean the inspection of the material remains (usually in situ) of the defunct railway or tramway operation under investigation: I am (largely for reasons of space) excluding the reconstruction and restoration of tramway/railway equipment in museum conditions, and my example will be drawn, in the main, from the field of light railway operations: heavy railways are in many places still with us, their past is better documented in the archives (light railways, being ephemeral in nature and usually privately owned did not require authorising acts of Parliament and did not attract the attention of newspapers, diarists and travellers in the way that heavy railways did), and the functions they performed in society were less varied in nature, both geographically and economically than the light railway. To my knowledge, 'archaeological' investigations have played only a marginal role in the recording of heavy railway and urban tramway

history (though the work of the railway and tramway museum has, of course, been made possible by the adequate survival of material remains). With the light railway, the story is somewhat more interesting. Here 'on-site' inspections have on occasions revealed aspects of operations unsuspected in the literary and personal record, and of value for the overall significance of the operation rather than simply for the design details of the rolling stock and locomotive equipment.

This said, however, it must still be admitted that there has not been, to my knowledge, any systematic 'excavation' of a light railway operation to date, and the bulk of 'on site' inspection that has taken place has necessarily been confined to the confirmation and illustration of evidence known to exist, or suspected, from the literary sources or from the personal memories and records of people associated with the operation in some way, or who visited it when still working. In this category are the on-site investigations that have been undertaken into such operations as the Elphinstone Timber Tramway (Victoria, 1924-8), the Lal Lal Iron Tramway (The Lal Lal Blast Furnace is classified by the National Trust; situated above the Moorabool River, Victoria, it represents the state's only pig-iron industry, and was serviced by a network of tramways linking the operation with the V.R. mainline 3½ miles away), the Thomson Valley tramway (near Walhalla, Victoria), the North Mt. Lyell Railway (Tasmania), the Tarrawingee tramway (north from Broken Hill), the Powelltown tramways (Upper Yarra area, Victoria), the Stannary Hills and Irvinebank tramway (a N. Queensland tin-mining two-foot gauge operation), and a host of other lines and systems that could be cited, from the 'sons of Gwalia' firewood tramway in W.A., to tramway operations in the Zeehan area of Tasmania.<sup>1</sup> The secondary importance of 'on-site' material evidence inspections in the vast area of Australian coalfield railways and tramways is clear from the voluminous publications of Clifford Eardley, both in B and in individual books.

In some cases, on-site inspections of long defunct operations have resulted in the extension and correction of information concerning track lay-out at pits or in yards, tramway route location, design and nature of rolling stock, locomotive equipment and other machinery, derived from survey plans, newspapers, archival material, personal memories and other sources.<sup>2</sup> In other cases, on-site inspections have revealed operations or aspects of operations that had not been suspected from the literary material.<sup>3</sup> Amongst the more intriguing examples of this are some aspects of the Port Arthur human tramway system. The following is a report on the incomplete and hence as yet unpublished on-site investigations of Mr. J.W. Wainwright, a Canberra parliamentary draftsman and leading figure in the railway/tramway enthusiast world.

The human tramway, from Taranna, on the W. side of Eaglehawk Neck (between the Forestier and Tasman peninsulas, Tasmania) to an inlet within a short boat trip of Port Arthur, is well known, from both literature and legend. The purpose of the tramway was, it seems, to avoid the hazardous ship passage to Port Arthur around the Tasman Peninsula. (see G. Eardley 'The Convict Tramway of Port Arthur, Tasmania'. B 5 (1954) 37-40). Less well known, however, are the coal mines at the NW tip of

the Tasman peninsula, a little W. of Salt Water River. The mines were worked by convict labour, boasted a shaft, incline railway from hilltop to jetty, jetty and the ruins of a settlement, with underground convict cells. The coal was apparently shipped out from the jetty. In the course of investigating the region, however, Mr. Wainwright discovered near the old Salt Water River P.O. and a 2 cell sandstone block, a lumpy rise in the ground, which turned out to be the top of a set of underground cells. From here to Salt Water River a right-of-way had clearly been hacked out of the ground to the remains of a causeway of tree trunks which once led across the Salt Water River inlet: on the Taranna side of the inlet, an embankment clearly led into the bush towards Eaglehawk neck. Literary sources refer to a 'bridle path' at this point, but the underground cells suggest to Mr. Wainwright an additional 'motive power' depot for a human tramway, possibly between the coal mines and a timber source for pit props, or even Taranna itself. The additional convicts might have been necessary for assisting trams up the grade from Salt Water River. At Premaydena, another inlet between Salt Water River and Taranna (along the N. coast of the Tasman peninsula), Mr. Wainwright discovered further traces of a tramway. He discerned a causeway around the E. shore of the inlet, ending up on a point, leading through a cutting to a jetty. At the southern tip of the inlet, the tramway passed the remains of very old, high, masonry retaining walls, at Premaydena, and then disappeared southwards over paddocks leading ultimately to orchards and wooded hills. Traces of sleepers seemed visible. Subsequent study of aerial photographs (c.1947) confirmed that the formation was that of a tramway, probably in connection with a sawmill or quarry.

These investigations are at present only tentative, but they raise the possibility of tramways west of the 'main line' and thus suggest that the early Australian investment in the Tasman peninsula was more complex than has hitherto been suspected. For our present purposes they present a situation in which the 'archaeological' evidence provides the first and most extensive clue to a possible operation.

In conclusion it might be observed that material remains in situ of railway/tramway operations are less substantial in nature than those of other archaeological sites and hence more subject to dislocation caused by time, neglect or subsequent over-building. In addition, most light railway managements, on liquidation, have found it profitable to sell off track and other equipment, thus reducing the material evidence for the historian. Furthermore, the type of information which 'archaeological' investigations may yield does not substantially increase our understanding of the socio-economic complexity of the operation in question. The case is quite otherwise, for instance, with an abandoned pottery works, or settlement, where an extensive range of operations, activities and products might be revealed by careful archaeological investigation. The archaeological investigation of railway/tramway operations is likely to be confined to the physical details of the system (trackage, motive power, rolling-stock, per way works, yard lay-outs etc.), and here the archaeological record, in so far as it may be available, will be valuable in inverse proportion

to the availability of other forms of evidence. Ultimately, however, the historian will seek to concern himself with the socio-economic dimensions of the railway/tramway system, its impact on standards of living, and the economy as a whole.<sup>4</sup>

(Note: Only a fraction of the available enthusiast literature on light railways has been cited in this account. The compilation of the article would not have been possible without the assistance of Mr. J.W.Wainwright).

Notes:

1. On these see respectively: LR 27 (1969) 15; 34 (1970) 5-25; 38 (1971) 13-21; 39 (1972); 32 (1970) 24; 29 (1969) 22; 31 (1970) 19-23; 39 (1972) 32-3; 31 (1970) 20 (on an inspection trip to the remains of Cuming Smith's wood distillation works and other Upper Yarra sites); 30 (1969) 11-14 (and B 13 (1962) 190-7); B 15 (1964) 106-112; L.Whitham, The Railways and Tramways of Zeehan, Tasmanian Historical Research Association 1970, p.(15) 'present usage'. One could contrast light railway investigations that have been conducted solely from literary sources: the tramway built for Mr Gullard at Tivoli (NGR issue no.1), the Tolmie District Railway (LR 14 (1963) pp.4ff.), or the tramways (proposed and actual) of the Land Boom era in Victoria (1887-90), on which see the researches of the late John Alfred, LR 25 (1968) 14-16 and elsewhere (for a projected, but never completed book on the subject). It is an interesting and sometimes even challenging pastime to 'walk the route' of a closed heavy railway branch. Success will depend now and then on the ability to detect the former line of railway in the changes of soil or crop coloration in a ploughed field, and the rewards will be substantial evidence of former operations in the form of derelict platforms, locomotive turning tables, ash-pits and so forth. However, it cannot be claimed that such on-site researches advance our knowledge of the railway in question beyond the area of finer detail location. The old Red Hill Railway (Mornington Peninsula, Victoria), (see Green over Red 4 (1969) p.10) is a good illustration of my point. In the Journal of Australian Tramway Museums, Trolley Wire, June 1972 p.19, appeared an illustration of the operations manager of the Illawarra Light Railway Museum Society, starting excavations at the Corrimal incline on the 3-foot gauge side tip wagon, captioned "Industrial Archaeologist at work". It seems, however, that the "dig" was confined to the clearing of equipment still in evidence from the Corrimal Colliery light railway network, which included a 2' gauge cable incline, for a projected industrial light railway museum for the Illawarra region. For further report see Trolley Wire Feb., 1973, pp.10-11.

2. See, for instance: NGR issue no.1 on the tramways of the W.Moreton coalfield (Queensland); B 20 (1969) 194, 197 on the firewood tramway near Cobar N.S.W. (operating in connection with the copper mines of the region); B 2 (1951) 42, on the Cobdogla to Loveday Light Railway (S.A.); B 13 (1962) 4-10, on the shale tramways of Katoomba, where inspections provided a more accurate understanding of the aerial ropeway that once operated from near the present-day summit of the scenic railway. Survey maps in particular need to be checked against the

material evidence: where a tramway follows a road formation, maps frequently omit any indication of the fact. Thus two 'separate' tramways, on a map, both leading to a road formation may well turn out to be the same tramway.

3. LR 35 (1971) 16, an unsuspected 2-foot gauge railway at Wensleydale, Vic.; LR 37 (1971) 22-3, a wooden tramway put down to a stand of sassafras from which the pioneer Woodware Co. of New Norfolk made pegs; B 16 (1965) 171 where, apparently, the location and identification of the 2½ mile contractor's tramway from the Old Brick wharf on the Hawkesbury to the Woy Woy tunnel resulted from extensive on-site researches. C.W. Jessup, in an article on 'Aerial Photography as an aid to Tramway Research' (LR 31 (1970) pp.4-5) claims to have detected from photographs, formations and indications that could prove to be hitherto unsuspected tramways. See also the report on the Cattai Creek tramway elsewhere in this Newsletter. In the case of a large number of ephemeral operations, the archaeological record must surely be the only record. I think here of the horse or hand tramway that used to carry passengers' baggage and freight from the Stony Point railway platform to the jetty and Cowes ferry (Victoria). Shed and track vestiges are still in evidence. Pier tramways in general would be in this class.

4. LR 28 (1969) p.20 carries a plea for National Trust classification of tramway relics.

#### HAWKESBURY REGION TIMBER TRAMWAYS.

The following is a short report on an informal inspection by J.O.Ward and R.I.Jack (with impedimenta) of the remains of a timber tramway in the Hawkesbury region, N.S.W. The operation is rather like that of the Cressbrook tramway (near Esh, see LR 41 (1972) 28-9) where a similar combination of horse power and a winding engine for an incline (in this case a balanced load system, full trucks coming down, hauling empties up) is found. The contents of the report were sent some time ago to the Editors of LR, but it seems that little is known of the operation and its probable peers. In making public the report, we hope to solicit further information on the subject of logging in the Hawkesbury region.

On the Army Ordinance map, 1" to the mile, of the Windsor region, N.S.W. there is marked a 'disused tramway', extending from Cattai Creek to Tommy's Gully. This appears to have been the situation in 1925 when the map was first printed. It turns out that the line was timber sleeper and rails, of uncertain gauge, probably around 2' and, according to a Mr. Brown, an old-timer of the region, ceased operation around 1923. It was the only such line in the region and was owned by the Hardwood Timber Co. The logs were hauled up the wooden tracks by a steam driven winch from Tommy's Gully, and the line then crossed the present road from Herbert to Cattai. Horses completed the haulage to Cattai Creek, where there was a mill from which the timber was shipped to the Hawkesbury and thence to the wider world. The roadbed and sleepers (with occasional lengths of rail) are clearly visible steeply

descending from the Herbert road to Tommy's Gully. Apparently another winch was situated part of the way down, handling the lower section of the gully haulage. The line of track peters out at the Herbert road in a private garden, but the well for the steam winch is still visible in front of this property on the Herbert road. The roadbed can be picked up again at the corner of another property located a few hundred yards down a side road branching west off the Herbert road, less than half a mile from Herbert, south of the well property. This portion of the track, horse haulage, has had most of the sleepers removed and is only rarely built on a rockpile base, as is the descent into Tommy's Gully. It makes a pleasant meander through the white gum trees. We did not walk right to Cattai Creek, but apparently the electricity commission has demolished the mill site (and wharf?). There are also bullock roads out of Tommy's Gully.

## AUSTRALIAN RAILWAY DEVELOPMENT: ORIGINALITY OR ADAPTATION?

James Walker.

Before giving this lecture, I think it advisable to say a few words on the subject concerned. Research and writing in railway history has been bedevilled by a large following of enthusiasts, producing a large volume of "fannia". Much of it has ignored scholarly standards and techniques, and legend has often the place of fact, i.e. George Stephenson and the "Rocket". Should any of you wish to pursue this subject further, you would be advised to be careful in your reading.

Transport history is of great importance for any country, and in Australia from the 1850s to World War I, railway history is transport history to an extent equalled in few other places. There were few viable inland alternatives. I shall concentrate on N.S.W. with a number of glances at Victoria as those states are the best illustration of the problem.

The first factor which we might consider is that of time. The first railway, as we understand the term, was opened in N.S.W. in September, 1855. Railways were by then well established overseas, and the idea was hardly new even in Australia. In 1836 a convict powered wooden railway had been used across the Tasman Peninsula (Tasmania). In May 1854, South Australia had opened a 7 mile horse line, and in September of that year, Victoria had opened a 2½ mile steam hauled line. This incidentally, had opened with a locally built locomotive which failed, and which had to be replaced with a contractor's engine until the motive power ordered from Britain had arrived.

When the Parramatta line was opened, the Stockton and Darlington line was 30 years old, the Liverpool and Manchester was 25, most of Britain's main trunk routes had been completed, the Great Northern 2 years earlier, and in the United States, the Baltimore and Ohio was 28 years old. Railways had spread overseas:

first lines: France 1832 (1827 horse hauled)  
Germany and Belgium 1835  
Russia 1836  
Austria 1838  
Italy 1839  
Denmark and Switzerland 1847  
Spain 1848  
Sweden 1849  
India 1853  
Norway 1854

Portugal and Egypt would open their first lines in 1856, Finland in 1860, Bulgaria in 1866, and Rumania and Greece in 1869. Already in 1850, Britain had built 6,084 miles of line, the U.S.A. 9,021, Russia 108, Canada 66, France 1,852 and Germany 3,735. By 1860, these totals would be respectively, 9,069 - 30,626 - 669 - 2,065 - 5,847 - 7,182, while India would have 838 miles.

The first travelling post office was in 1838.

The first use of semaphore signals was in 1839, and the first interlocking of signals about 1840, of signals and points in 1856, and of full interlocking in 1860. The electric telegraph was first used in 1839, and the first two needle telegraph in 1841.

Britain's first electric locomotive, albeit a fairly ineffective one, was in 1842.

You will see from this that when the Sydney-Parramatta line opened, railways were not only an accomplished fact, but were already assuming the form and content of a mature industry.

Secondly, it should be noted that Australian railway experience was unique in none of its features. Similar conditions to those overseas brought similar results. Australia's gauge problem mirrored that of Britain, the U.S.A. and Canada. In Britain, the Great Western Railway was initially built to a gauge of seven feet, and the Eastern Counties to a gauge of five feet. Some early Scottish lines used five feet six inches. In the U.S.A. the Erie railroad was built to a gauge of five feet. The lines from New York to Buffalo which were combined to form the N.Y.C.H.R.R. had gauges of four feet eight and a half and four feet nine. In 1860, 92% of the Canadian railways were built to a gauge of five feet six, the rest being four feet eight and a half, and it was 1870 before steps were taken to correct this.

Australia's wheat networks were similar to those of Kansas and Southern Manitoba.

Government intervention/ownership followed much the same lines as in New Zealand, India, most of Europe, and, later on, Canada. Australia's problems were much the same as elsewhere, and produced similar, though not identical results. The methods of obtaining those results tended to be those of Britain and her dependencies rather than those of the U.S.A. or Europe, while Canada and New Zealand had a larger American content in their admixtures, and the question is why? and why did a slight change occur later? Comparison could be made with the Argentine, whose railways were even more British.

First there was the matter of personalities. A high proportion of the population was British born and the social structure was largely that of the United Kingdom. The population still looked on "British" and "civilized" as the same thing. Many of the politicians, and most of the officials, from the Governor down, were likewise British born and trained. To them, British ways were natural ways. What is more, the engineers, artisans, and operating staff were British trained and experienced, unless they had no training or experience at all. When the Parramatta line opened, the only stationmaster with any experience came from the Eastern Counties Railway in England. The man who created most of N.S.W.'s 19th century network, John Whitton, was an already experienced engineer from England. Each colony also had a consulting engineer, always a Britisher. That for N.S.W. was the famous Sir John

Fowler, whose office was in London, and who, no doubt quite incidentally, was Whitton's father-in-law.

Then there was the matter of initial equipment. This had come from Britain, and all later equipment had to be compatible with it. (It can be noted at this stage, that America did not become a major exporter of railway equipment until the 1870s.) In the earlier period of expansion, it was, for shipping reasons amongst others, easier to import from Britain than elsewhere. Once a railway system is established, it can afford to experiment, but till then, it must use well tried equipment designs, and it is on these bases that development must be made.

It might now be appropriate to discuss the differences in the railway philosophies of the U.K. and the U.S.A. These differences were economic and operational. Mechanically, the Americans built cheaply, and accepted rapid replacement, while the British built to last. Their idea was high capital expenditure and high capital return. The results were probably about the same in the long run. Examples of the differences were plate versus bar frames, and inside versus outside cylinders. There was less difference in civil engineering between the two countries. Much depended on the engineer, and there were great differences within each country. Later lines were constructed more cheaply than earlier ones in both. There were particular attitudes - Britain would not use suspension bridges for railways. Signalling was basically the same, except for the American train order system. Broadly - British built solidly with little further work, - Americans built cheaply and replaced or improved - but there were numerous exceptions in both countries - i.e. the Erie Railroad.

South-eastern Australia followed the pattern set elsewhere. Early lines were between centres of population. As in the U.K. and the U.S.A., the densest areas received the earliest lines, and these lines were the most intensively constructed i.e. Sydney to Parramatta, Penrith and Bathurst, Liverpool, Campbelltown and Goulburn - but keep in mind the extensive deviations and regradings later - and Melbourne to the goldfields. This meant trunk lines with trunk line standards. One may take as examples the original Iron Cove viaduct, the zig-zag viaducts and those out of Lithgow, the bridge at Menangle (though this had timber approaches), and the beautiful stonework on the Geelong-Ballarat line. However, tunnels were avoided. The first one in N.S.W. was not till 1866 at Picton. Victoria in 1862 drove two at Elphinstone and Ravenswood.

As the main trunk lines were completed, three conflicting needs arose. Increasing traffic required development work on the trunk lines, while feeder branches and cross-country lines were demanded by country areas. There was also a growing demand for suburban services. The impetus given to the first was economic and operating, that given to the second from the Crown Lands Act of 1861, and that of the third was the growing centralisation which characterises this country. However, by this time a certain amount of standardisation was taking place. The use of standard designs helped to decrease the cost of larger engineering items. You might care to look at the

original bridge at Como and compare then with those at Kelso, Cowra and a number of other minor crossings. All were built within a period of 20 years, and consist of single track lattice spans on circular iron cylinders. The components were all standard, with the cylinders coming from Britain.

Stations, too, were of standard designs for the most part. Size might vary, but the basics remained the same. Compare Cowra and Carcoar, or from a later period the western suburbs, the Newcastle area and the Blue Mountains. Later country stations were considerably simplified.

Standardisation was the aim of most administrations everywhere, but because Australian systems were not the result of amalgamations, they were often more successful than in the U.K. or U.S.A.

Signalling was already well developed when construction commenced in this country, and the techniques used were basically British. The Americans copied the semaphore from the U.K. and frequently copied other developments. The British, around the turn of the century started introducing many American techniques. Australia largely copied the U.K., Victoria with somersault signals, N.S.W. with standard commercial parts. There was a later introduction of upper quadrant and colour light signals, as in the U.K. The large scale use of the triangle marker appears however to have been restricted to Australia.

No railway system can be operated without facilities for the maintenance and repair of rolling stock. The major problem is that of servicing motive power. Two types of facility are needed, heavy workshops for major work, and "running sheds" for day to day operations. Because of their distance from the main source of locomotives, Australian railway systems quickly developed major workshops, and at an early date, Victorian and N.S.W. railways attempted building their own engines. Towards the turn of the century, building of locomotives by the railways themselves became reasonably common - this was a British habit, most American systems did not normally construct their own motive power - an indication of the extent and capacity of the workshops.

Two types of running sheds developed overseas - rectangular and roundhouse. In spite of popular belief, both types were common in both the U.K. and the U.S.A. Different administration tended to favour one or the other, but most had both types. Australia followed suit. N.S.W. tended to use rectangular for large and small sheds, and roundhouses for medium depots, but there were many exceptions. Still existing large roundhouses are Enfield and Broadmeadow, small ones are at Valley Heights and Cowra. Everleigh running sheds no longer exist, but numerous photos are available. The largest rectangular depot left is Bathurst. Other rectangular sheds, large and small, are at Albury, Mudgee, Dubbo, Gurabegah and Cootamundra.

The Redfern carriage shops and the Clyburn wagon shops show the extent of facilities needed for rolling stock.

The first locomotive used in Australia was the contractor's used on the Port Melbourne line. Locomotives to operate the line had been ordered from Britain, but when it became obvious that they would not arrive in time for the opening of the line, one was constructed locally, being the first steam locomotive constructed in Australia. The machine, however, was a failure, and the contractor's engine had to take over until the British engines arrived.

In N.S.W., the contractor used the first running locomotive to arrive. This was one of four built by Robt. Stephenson & Co., which were a mixed traffic version of the L.N.W.R. standard goods engine. Other British manufacturers were also represented in early locomotive contracts, but Boyer Peacock became the major suppliers, and became responsible for much of the detail designing.

N.S.W. designed and built its first engine in 1870, fifteen years after the opening of its first line. This engine was built largely as a "public relations" gimmick to advertise the progress of the colony. Unfortunately, neither of the original Australian built engines survive - the N.S.W. one was condemned in 1892.

The first American locomotive in service in N.S.W. was in 1877. This was a 4-4-0 and was rather a failure. The next class, introduced in 1879, a heavy freight locomotive was a success. It might be noted at this point that Victoria was a trifle charier of trying American locomotives, but a shade readier to employ American style carriages. During the first fifty years, N.S.W. tried six classes of American locomotives totalling sixty-five machines. As with the British engines, some were successful, some were failures. There is some reason to believe that, in one case, this was deliberate. It seems possible that a class may have been built to specifications deliberately designed to ensure failure, as a matter of inter-departmental politics. All this class had been scrapped by 1928. None of the 19th century American designed and built locomotives lasted long enough to be preserved, but the 304 class was so successful that an order was placed on Dubs & Co. of Scotland using the same specifications and generally adhering to the original design, though some modifications were introduced. These engines were called the "Scotch Yankees".

It would seem that for N.S.W., British motive power had a slight edge. For political reasons, and in the hope of increased efficiency, American engines were tried six times. Half were successful. The other three classes were flops. The problem appears to have been that though suited to our geographic conditions, they were not suited to our operating conditions generally. The Americans were especially useful in the Blue Mountains. Australia could not, however, support the economic conditions which the American railroad philosophy presupposed.

What is interesting is the long time it took N.S.W. to do its own detail designing. It would appear that the C34 class was the first class of passenger engine for which detail

designing took place in N.S.W. although extremely detailed specifications had previously been issued for the C32, D50 and C30 classes.

N.S.W. is famous overseas for two locomotive classes, the C32 and the C38, of which only the former concerns us here. Introduced in 1882, they were Thow's first major design for the colony, and they introduced a house style which continued till the end of steam. Nevertheless it is remarkable how alike they are to the Jones designed "big goods" and "Castle" class locomotives of the Highland Railway of 1894 and 1900, and to the Scandinavian engines of the same period by the same designer. Jones had connections with Berger-Peacock, and it seems reasonably apparent that he was consulted, at least, in the design of the C32 class. This class was very successful. A total of 191 was built and the class saw steam out. Later steam locomotive development till the end of World War II was a logical follow on.

Early carriage stock was standard British equipment. There were three classes. First had roofs and windows, Second had roofs but no glass windows, and Third had roofs but no sides above. All often were four wheelers, although the six wheeler was already starting to spread in Britain. Australia followed Britain in using the six wheeler, and, as in the U.K., by the 1880s most new construction was eight wheeled. Generally speaking, however, Australia was unsuited to the rigid or radical eight wheelers, (there were a few) and went straight to the bogie coach. The first eight wheelers in N.S.W. were imported from Britain in 1869, and the first bogie coaches from America in 1877. No further rigid axle passenger stock was constructed for the colony after the mid 1880s.

Lighting followed British standards. Gas was first introduced in 1878, and electricity in 1904.

Braking lagged a little, a very little, behind the U.K. which was behind the U.S.A. In N.S.W., the non-automatic Westinghouse was introduced for some stock in 1877, and the automatic version in 1879. The decision to standardise the latter was made in 1890.

The first sleeping car was imported from the U.S.A. in 1877, four years after the first sleeper in Britain, but considerably later than those in the U.S.A.

Britain never built bogie goods vehicles in large numbers, and here Australia initially followed suit, and it was not until recently that bogie stock outnumbered four wheeled. There was a good reason for this. Train distances here, while longer than in the U.K., were shorter than in the U.S.A., towns were smaller, and businessmen followed the British practice of keeping small stocks and ordering frequently. Nevertheless, some bogie stock was introduced quite early, if infrequently. Some N.S.W. bogie sheep vans were in use in 1885.

As in Britain, most of the minerals were transported in the wagons of the mineowners, and the same problems, too small

wagons, found in Britain, applied here. See Eardly's books published by the A.R.H.S.

Railway expansion in N.S.W. was bedevilled by politics. Many secondary lines were built too soon, before there was an adequate population to support them, and before there were adequate funds to build them to a sufficiently high standard to be operated efficiently. The results were a chronic lack of capital, unnecessarily high overheads, and an inability to rationalise services, and these effects were cumulative. Because early locomotive classes tended to be small, greater amounts of spares had to be carried. Forward planning was extremely difficult, and it was impossible to budget for more than a couple of years in advance. Demands for upgrading of services were continuous. The result was that the Midland Railway's policy of short, light and frequent, as opposed to the American ideal of long, heavy and less frequent, was the rule. The fourth cornerstone of the Midland's policy, speed, was not, however, observed. There just was not enough money, and the track would not stand it.\*

The Blue Mountains caused havoc. The Zig-Zags were difficult and expensive to work, and formed a bottleneck.

There was the suburban problem, as bad then as it is now, and steam hauled.

Yet the railways remained economically viable till World War I. Until then, passenger traffic was profitable. If the trains were light, they were usually full, and at night carried large quantities of mail and parcels. Interstate travel was mostly by rail.

There was a steady flow of coal and a growing traffic in wheat and wool, both bulk commodities well suited to rail transport, and in livestock. There were very few branches which did not pay the running expenses. The trouble was in meeting the interest payments.

It seems that the British, rather than the American, practices were more suited to Australian conditions. But they were practices which had been modified greatly. The approach was more casual. With lighter traffic, time was of less importance than convenience. Other than in matters concerning safety, sales could be bent a little more in the interests of individuals. There was a certain amount of local flexibility. This seems to have been so from early on, and only began to change with increased traffic and dieselisation.

\* \* \* \* \*

\* In the 1880s and 1890s there was a major spread of minor lines partly as a result of political logrolling. Less capital expenditure was needed, as happened overseas, but even less was provided. Cheeseparing was the order of the day - severe gradients, sharp curves, light wooden trestle bridges, minimum station facilities, unmanned crossings etc. - in order to build as many lines as possible.

The cost of transport is not purely economic, nor are the benefits, a point which seems to escape economists, but was realised by both railway staff and railway users in the early period.

## THE PHOENIX FOUNDRY, URALLA.

Margaret Simpson.

The Phoenix Iron Foundry is a jobbing foundry in the small New England town of Uralla, 20 kilometres south west of Armidale.

The story of the foundry begins in Wurttemberg, Germany, in 1858, with the birth of Christopher Andrew Young (Zung). His family migrated to Australia and Christopher spent his early years in Queensland. Later he moved to Tamworth, N.S.W., where he learnt a blacksmiths' trade from the firm of Lancasters and in 1888 moved to Uralla and purchased B.J. Smith's blacksmith's shop in Bridge Street (Main Street). His business thrived on the patronage of the Cobb & Co. line of mail coaches, so much so, that he purchased the plant and equipment of Henry Goddard and Ormond's New England Foundry in Uralla. This foundry opened in 1872 and thrived during the gold rush days serving the nearby Rocky River diggings. In 1898, Christopher Young moved the foundry from its location on the northern side of Uralla, where the Bakery now stands to a new site in East Street, Uralla, where it remains today.

Christopher learnt the foundry trade from an English craftsman by the name of Fred Berry. C.A.Young & Co. was at one time the only foundry between Newcastle and Toowoomba in Queensland. They undertook machinery repairs and were kept busy during the Hillgrove mining period of the 1890s. At one stage the foundry employed six men and made up special orders of cast iron and wrought iron and steel. Almost all the buildings in Uralla and Armidale feature 'Sydney lace' cast at the Phoenix foundry. As well as this a small amount of bronze casting was also undertaken at the foundry.

Christopher Young died in 1928 and his family survived the Great Depression by erecting a sawmill behind the foundry.

Today, the only one of Christopher's nine sons to carry on the foundry business, Les, born in 1895, lives in his father's cottage next to the foundry and sleeps in the room he was born in.

The foundry remains a model foundry with all the original blacksmith's tools and foundry equipment predating 1900, all laid out in place, ready to be used again.

### A DESCRIPTION OF THE PHOENIX FOUNDRY AND THE PROCESSES UNDERTAKEN THEREIN

- The foundry can be divided into four main work areas namely:
- a) The Moulding Shop, where pig iron is melted in a furnace and cast into the desired shapes.

- b) The Blacksmith's Shop, where pieces of steel and wrought iron are heated in the forge and punched and hammered into the desired shape.
- c) The Machine Shop, where the finishing of the wrought work and steel is undertaken with drilling machines, grinders and lathes.
- d) The Bronze Casting Shop, where bronze is melted in a furnace and cast in moulds of the desired pattern

a) THE MOULDING SHOP

Preparing the Furnace:

The first process in making cast iron is to prepare the furnace or cupola for melting the pig iron (Inset A Fig 1). (Pig iron is initially made in a blast furnace and can not be used in engineering without being further refined or remelted in a furnace).

Layers of foundry coal (as opposed to gas coal which does not burn hot enough) pig iron and some limestone are loaded into the furnace through the top charging door (Fig 2). A hundredweight of coal is required to melt 400 lbs of pig iron. The correct ratio is necessary to produce a fine stream of molten iron. Consequently, before charging, the pig iron is weighed and hoisted up to a landing around the top of the furnace with a crane. (Fig 2). Air is pumped from a blower (Fig 4) in the Machine Shop, through underground pipes to nozzles called tuyeres (pronounced 'tweers') towards the base of the furnace (Fig 1). As the iron melts it runs downwards and forms a pool in the bottom of the furnace. When the iron is ready to run the metal is 'tapped' and drawn off through the tap hole. The molten metal is then poured out into the ladle (Fig 3). A large ladle is used for heavy jobs and holds 400 lbs of molten iron. This ladle is lifted to the mould by a pulley. For smaller jobs, two-man hand ladles are used (Fig 5). The iron is poured into the mould by two men, while a third man skims the top of the liquid to prevent dirt from flowing into the mould (Fig 6). The flow of molten iron from the furnace is stopped with a clay bung or ~~dob~~ (or tamper) which is rammed into the tap hole and the residue iron is cleared from the tap hole with a clearer. Finally, the furnace is cleared from the bottom door (Fig 1) with a rake and the fire put out with water.

The Process of Casting a Mould

A wooden pattern or model of the desired shape is first made in either pine or hard box. This is used to make a cavity in moulding sand.

At the Phoenix foundry some of the patterns were made on the premises. Patterns for the cast iron "Sydney lace" were often copied from English designs. The moulding sand is prepared with a mixture of loam, black lead (or graphite), plumbago and Newcastle coal dust (for aeration). This mixture is finely sieved and ground

in the coal grinder (Fig 7) patented by J.A. Haywood Jr, Engineer, Phoenix Foundry, Derby. It is necessary for the mixture to be finely textured so that a "light" iron can be produced. The moulding sand is then dampened so that it is just solid, but still porous. The wooden pattern is placed in a metal moulding box (Fig 10) and the moulding sand is rammed all around the pattern with a variety of rammers (Fig 8a). The moulding box is then opened and the pattern taken out. Following this, the sand mould is repaired with moulder's tools (Fig 9) and the moulding box is then closed again in the exact position and secured with sliding bolts. Lastly, wooden boards are placed on top and the moulding box is held down with weights or clamps (Fig 6). These are necessary as the molten iron could lift three times its own weight during pouring.

A channel or runner (Fig 8c) is cut in the sand so the molten iron can be poured into the cavity. For long pieces of cast iron lace the runner may have multiple ends to ensure the molten iron is spread throughout the mould.

After cooling there is a delay of about one day before the mould is opened. Wire brushes on long bars (Fig 8b) and hand bellows (Fig 11) clean the sand from the cast iron and the runner is broken off.

#### The Process of Making Castings Which Require A Core

Before an item with an internal cavity such as a pipe can be cast, the centre part or core has to be made. This consists of a mixture of moulding sand, core gum (which comes ready made up) and a little flour. The mixture is pressed into a wooden mould and a small hole is made through the middle by running a piece of wire along its length to prevent exploding in the oven (Inset A Fig 15). The core is removed from the mould and dried in the core oven for about a day. At the Phoenix foundry Les Young built his own core ovens, a large one (Fig 13) about eight feet high which is charged with wood or gas coke through a small door on a landing outside the foundry building (Fig 14) and a small core oven about five feet high (Fig 15).

The process of casting iron pipes or anything else requiring a cavity is the same as for other cast iron pieces except that after the wooden pattern of the pipe is removed the core is placed inside the mould to make the hollow section.

The type of items cast at the foundry include fancy work with intricate patterns such the "Sydney lace", pipes, fire-bars, grates and plates (Fig 16).

#### b) THE BLACKSMITH'S SHOP

It is in the Blacksmith's Shop that bars of iron or steel are heated red hot in the forge (Fig 17) to make them soft and pliable, then belted, hammered and punched into the desired shapes. First of all, however, a fire is made in the forge and air is pumped by a hand lever to work the bellows. The leather bellows in the

foundry are over 100 years old yet remain very soft due, Les Young considers, to the quality of the tanning at the time, done with bark rather than the chemicals of today.

An interesting part of the forge is the water tue iron (Fig 18) located between the forge and the bellows (Inset A Fig 18). This acts as a funnel directing air into the forge. A small pipe is connected to a barrel of water and another pipe is suspended above the barrel. When the tue iron heats up water flows up the tube into the barrel, thereby acting as a cooling agent.

Once the iron or steel is heated red hot in the forge it is taken to the anvil (Fig 19a) where various tools such as swages and punches are hit by a hammer to make the required indentations. Alternatively, the hot iron is taken to the swage block (Fig 19b) where it is bent from blows with a hammer.

Another machine in the Blacksmith's Shop is the roller (Fig 21) which evenly bends pieces of iron to make such things as chimney pipes. It is turned by hand and rolls the iron in a similar fashion as the wringer on a washing machine.

Wrought iron, therefore, can be forged hot and bent when cold without cracking. Its toughness, resistance to shock and corrosion made it suitable for pipes, chains, nails, hinges, bolts, nuts and horseshoes.

### c) THE MACHINE SHOP

This is where the pieces of wrought iron and steel are precision finished by cutting, drilling and grinding to the exact size. Most of the machines were purchased from Henry Goddard and Ormond's New England Foundry and include:

- Two lathes, one for surfacing and one for turning
- Shaping machine
- Double ended emery grinder
- Power hacksaw
- Drilling machine (light type)
- Heavy drilling machine
- Portable grinder
- Surface grinder

These machines were all run via leather belts, copper sewn for extra strength and durability, and attached to an overhead drive shaft (Fig 22). This was originally steam powered but today is run by a  $7\frac{1}{2}$  h.p. electric motor.

Other instruments used in the Machine Shop include inside and outside calipers and a micrometer (Fig 23).

d) THE BRONZE CASTING SHOP.

A small part of the foundry work is devoted to the casting of small bronze items of up to 100 lbs in weight. These include engine bearings and occasionally plaques. The bronze is placed in a graphite crucible and lowered into the furnace with a pair of long tongs (Fig 24). When the bronze is molten, it is lifted out and poured into moulds. The casting procedure is the same as for casting iron, complete with the initial wooden pattern, moulding sand and moulding box.

The Phoenix Foundry at Uralla today remains a neat time capsule illustrating the traditional technology of iron working all under one roof (Fig 25).

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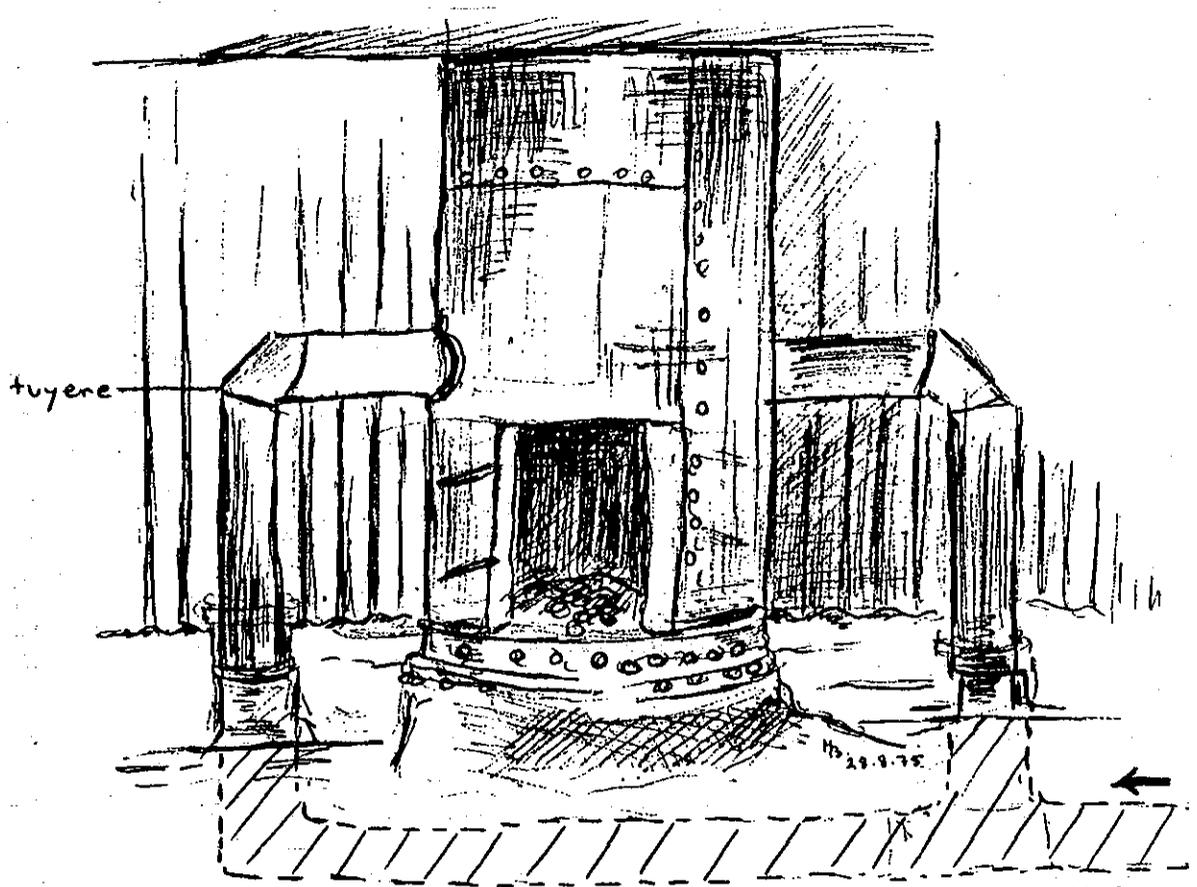
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POSTSCRIPT

Since this article was first published in 1975, it is understood that Les Young sold the foundry to Peter Wright and retired to Tumut where he died two years later.

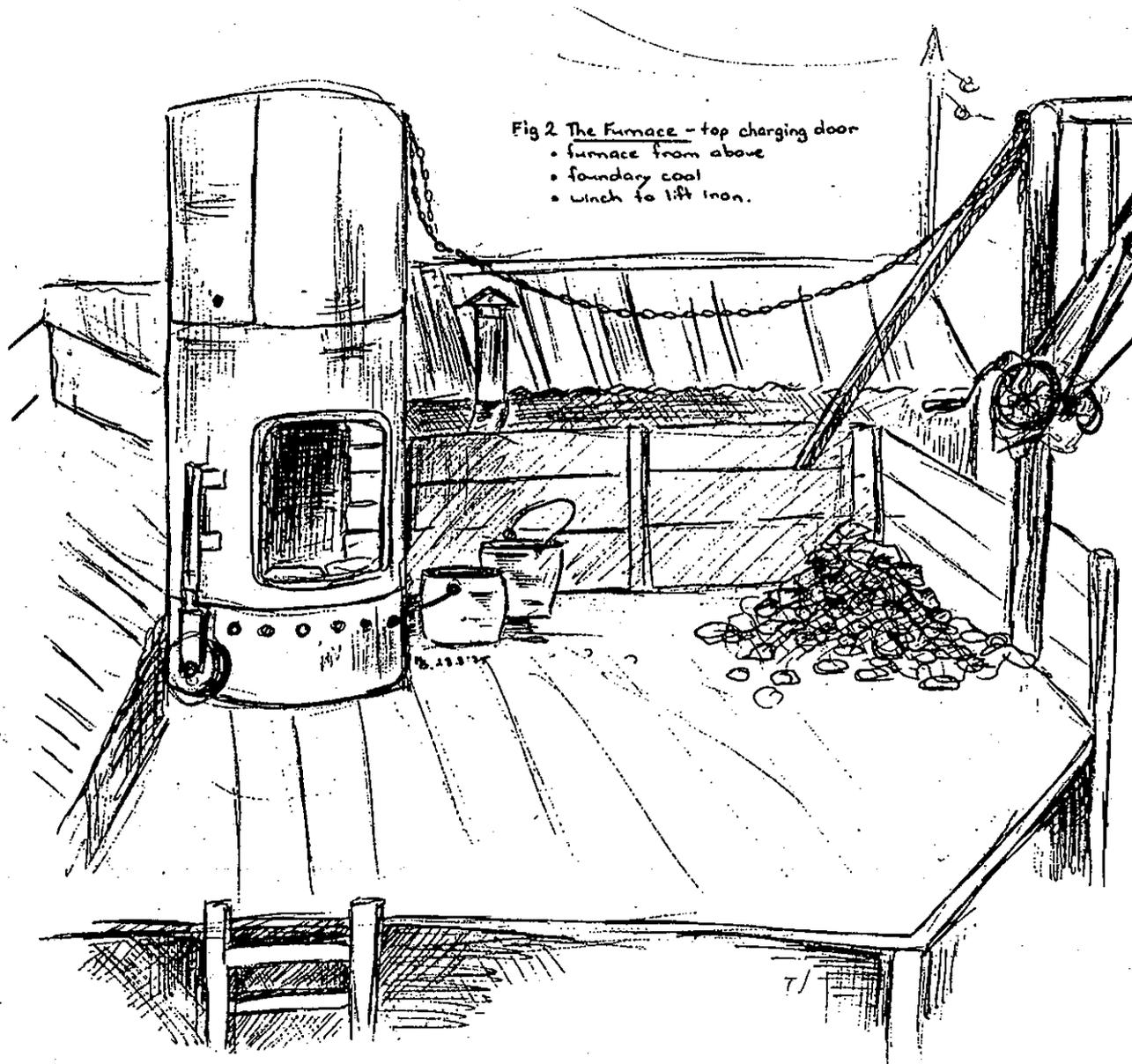


Air is pumped from a blower

Fig 1. The Furnace - bottom door

- furnace from below - fire removal door.
- dotted pipes - underground.
- Inset A - Entire furnace with 2 changing doors.





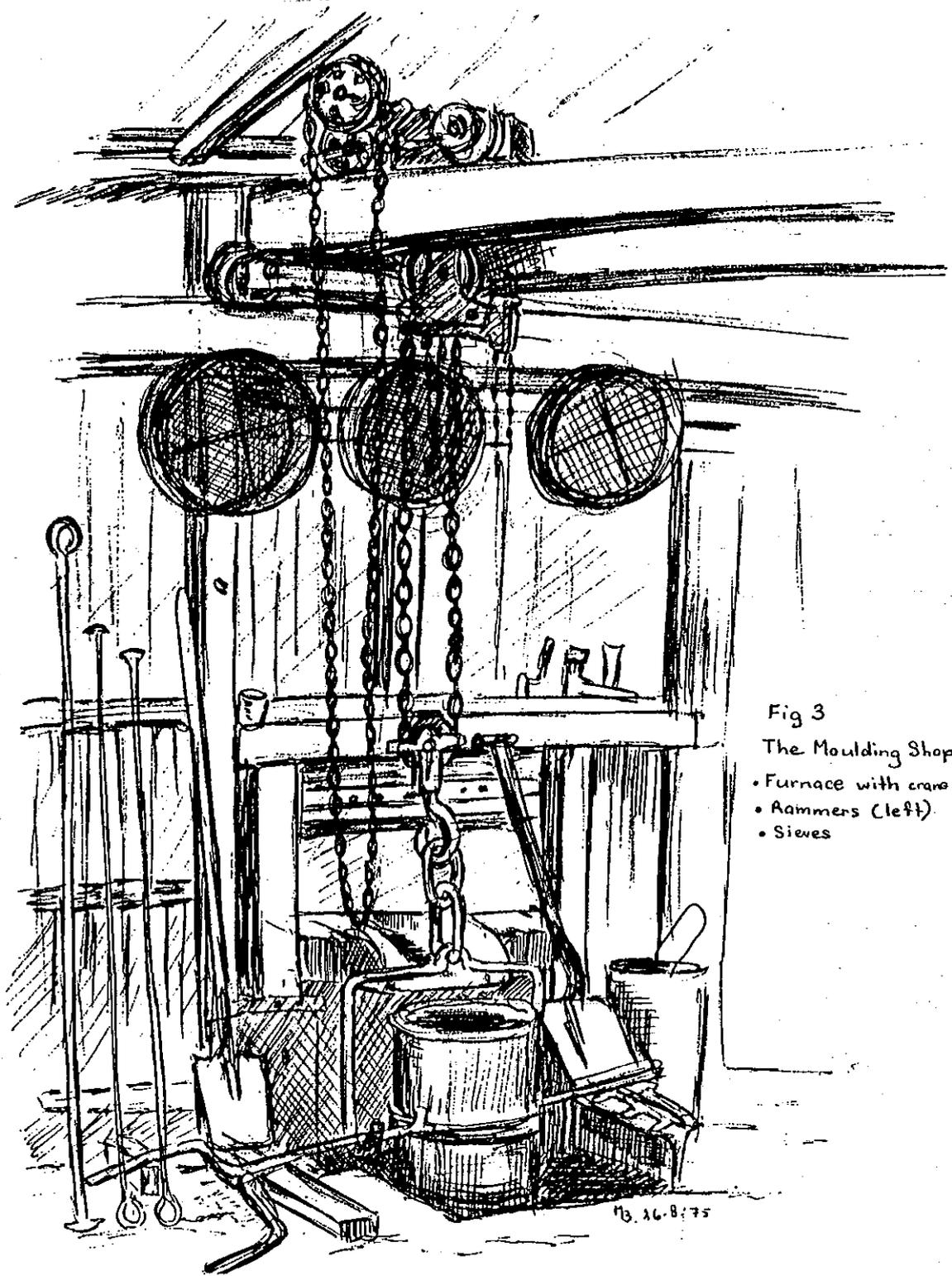


Fig 3  
The Moulding Shop

- Furnace with crane
- Hammers (left)
- Sieves

Fig 4 The Furnace. Blower

• which sends  
air through pipes, to the  
tuyeres and into the  
furnace.

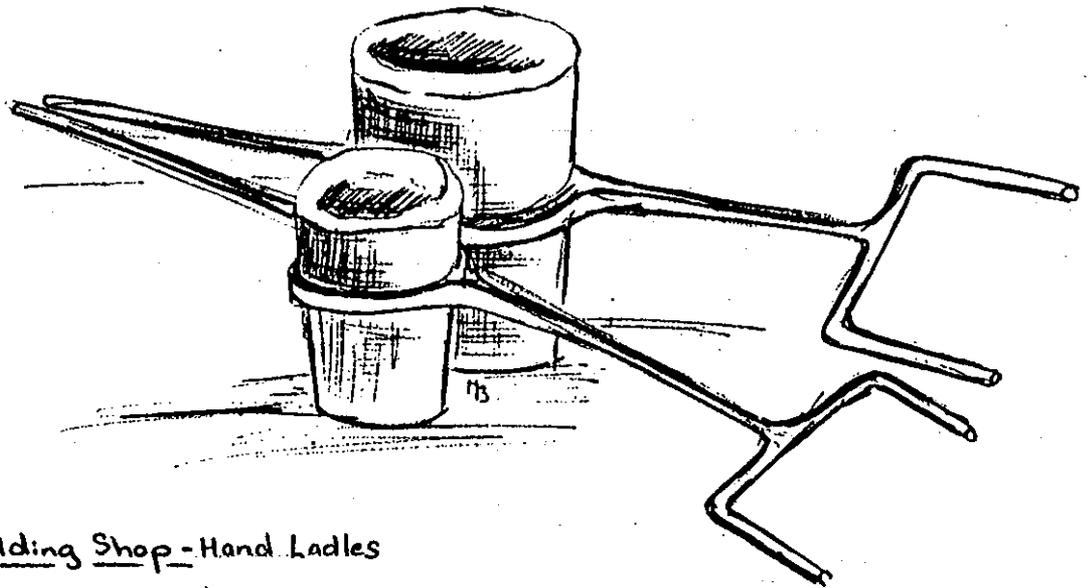
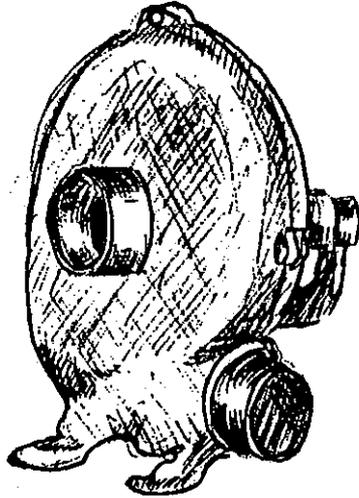
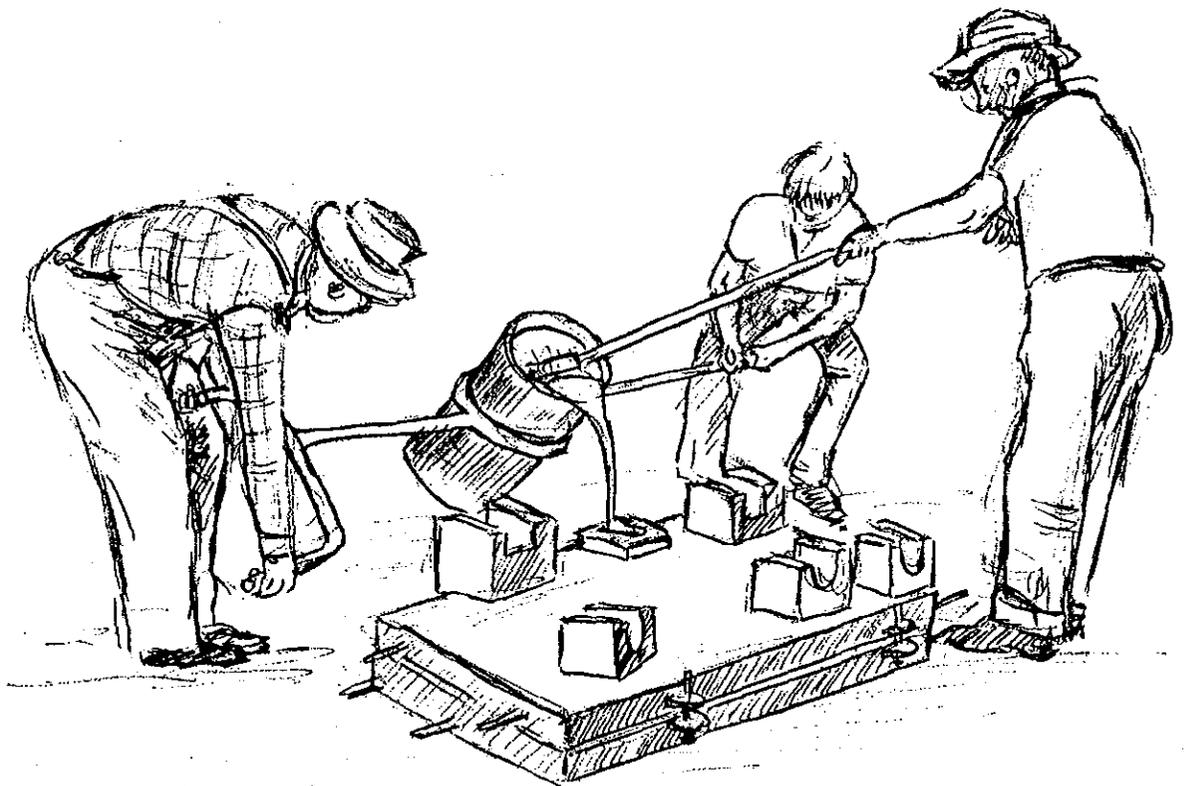


Fig 5 Moulding Shop - Hand Ladles  
2 man hand lad

Fig 6 Pouring the molten iron  
into the mould, from the 2 man ladle.

- The weights holding down the mould.
- A third man skims dross from the surface so as not to allow dross into the mould.



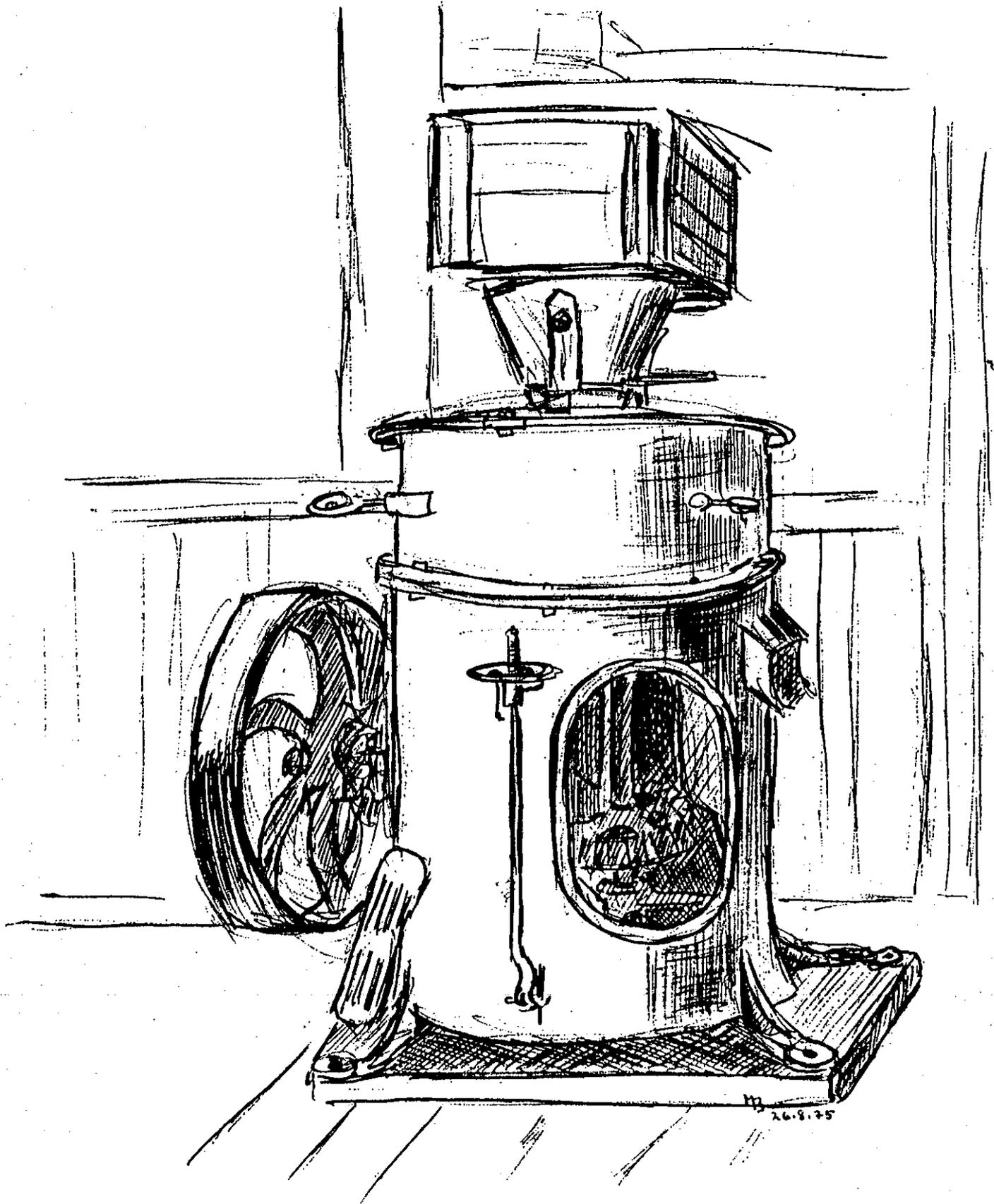


Fig 7 Coal Grinder

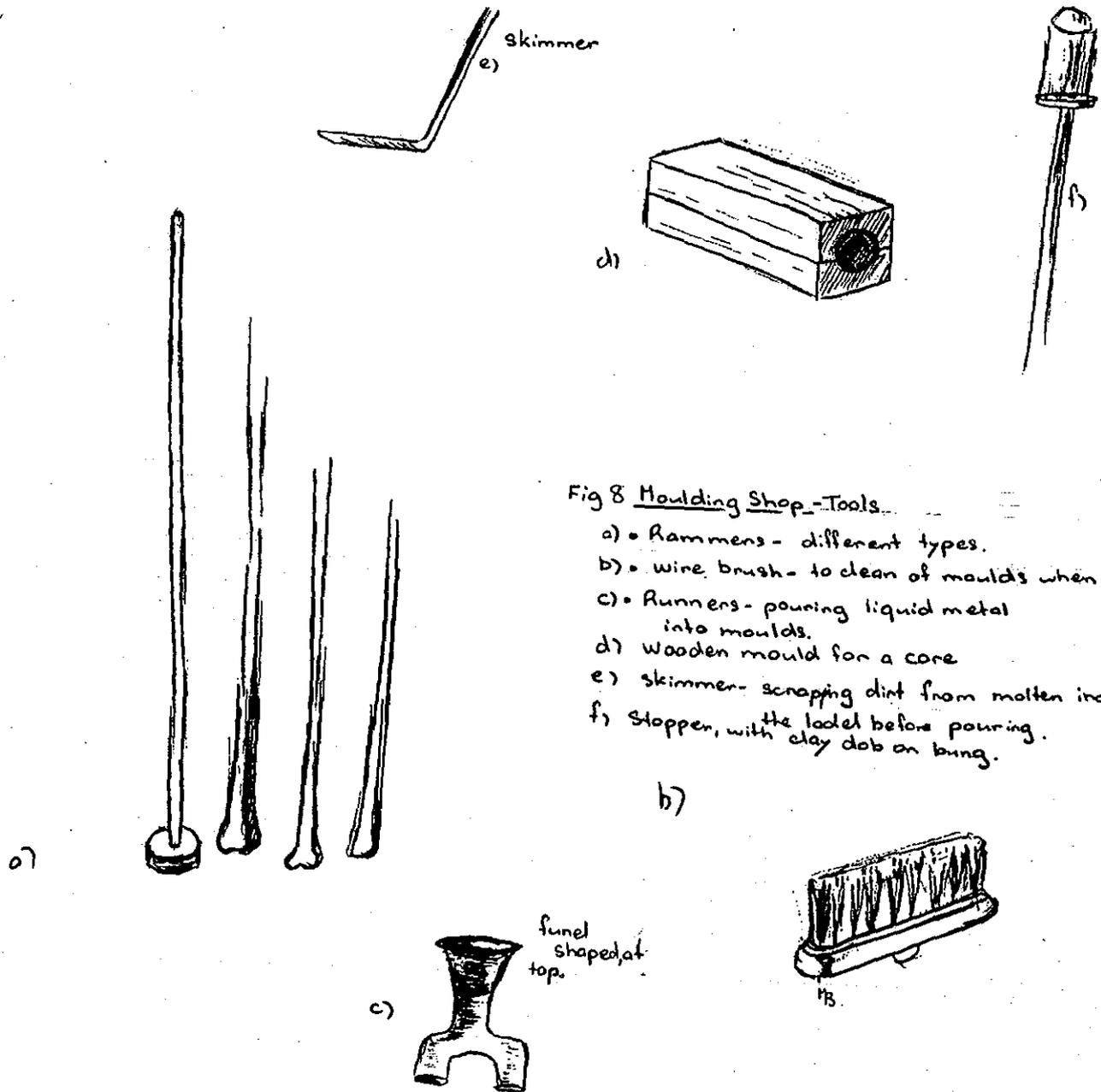
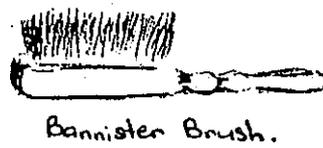
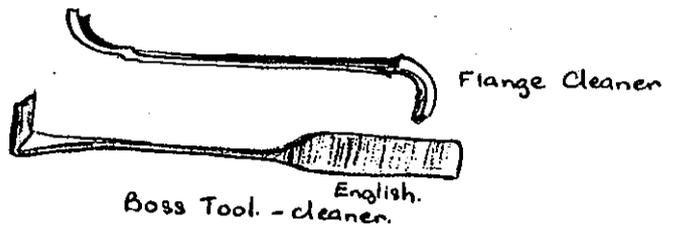
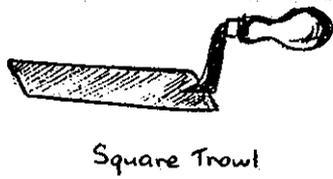
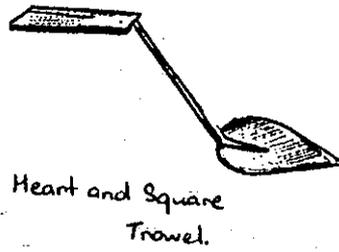
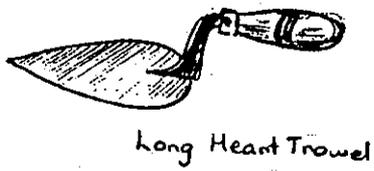
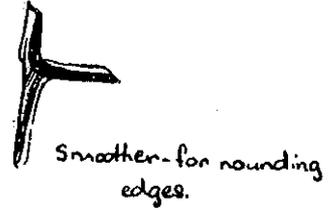
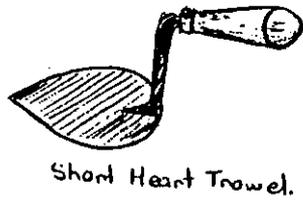


Fig 8 Moulding Shop-Tools

- a) • Rammers - different types.
- b) • wire brush - to clean of moulds when cool.
- c) • Runners - pouring liquid metal into moulds.
- d) • wooden mould for a core
- e) • skimmer - scraping dirt from molten iron in the ladle before pouring.
- f) • stopper, with clay dab on bung.

Fig 9 Moulder's Tools.

To Repair sand moulds  
before casting.



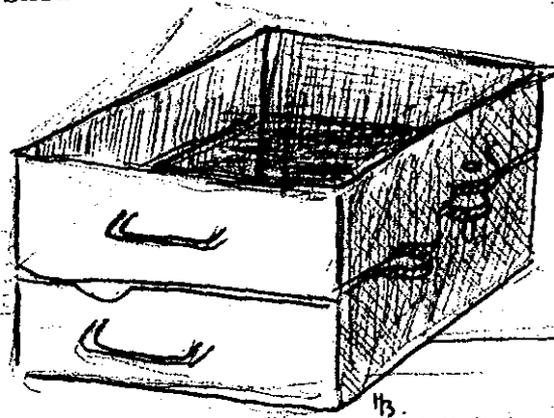


Fig 10 • Metal Moulding Boxes.

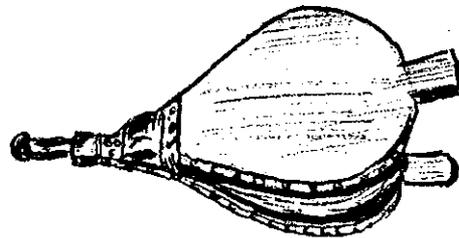


Fig 11 Moulder's Hand Bellows.

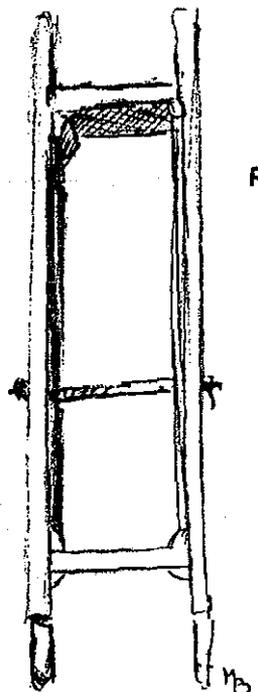


Fig 12 Wooden moulding boxes, for making fire bars.

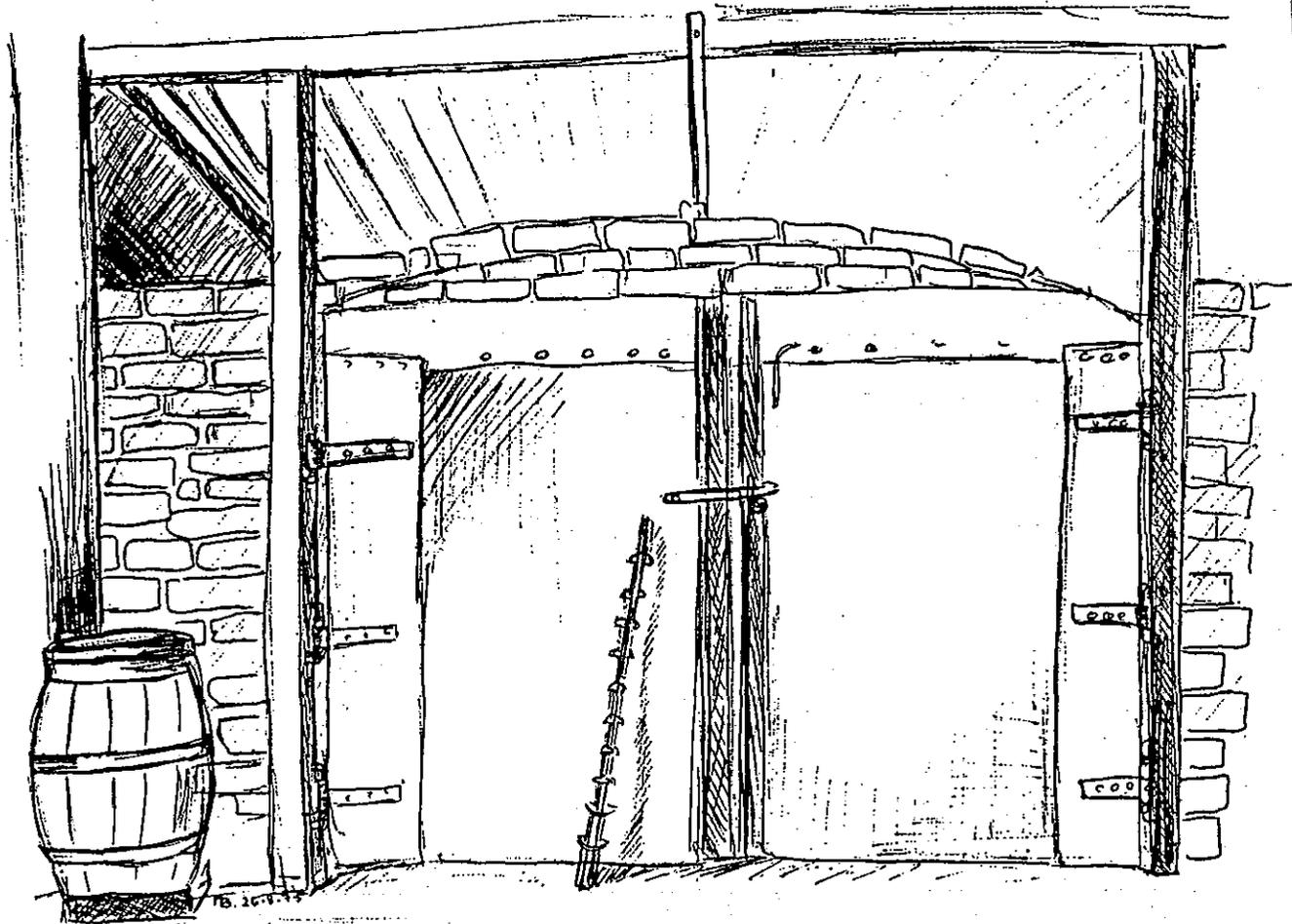
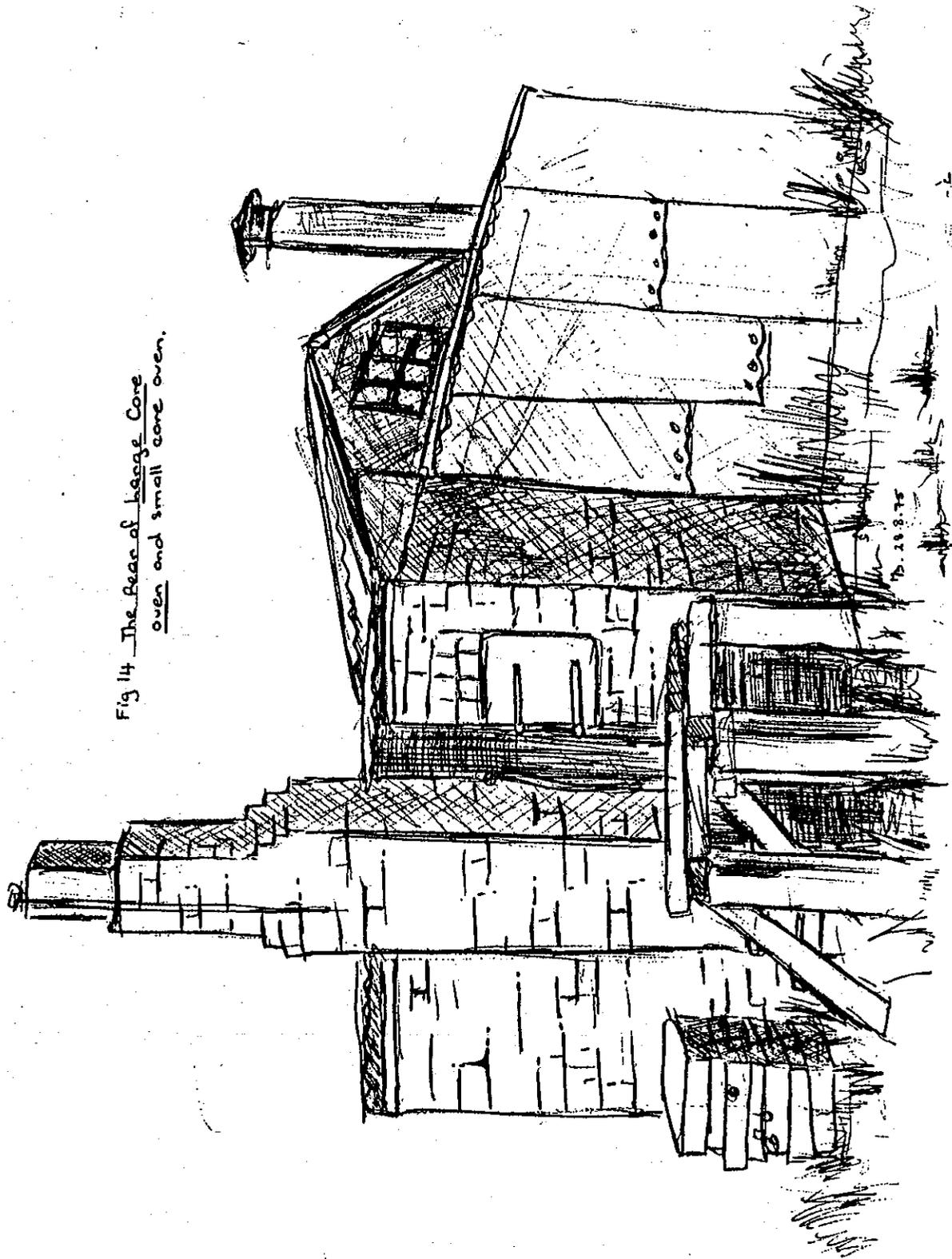


Fig 13 Large Core Oven - for drying cores. (in the Moulding Shop)  
• A Core iron (leaning against door).  
• Barrel of Core Gum - holds the sand together

Fig 14 The Bear of beage Cove  
oven and small cove oven.



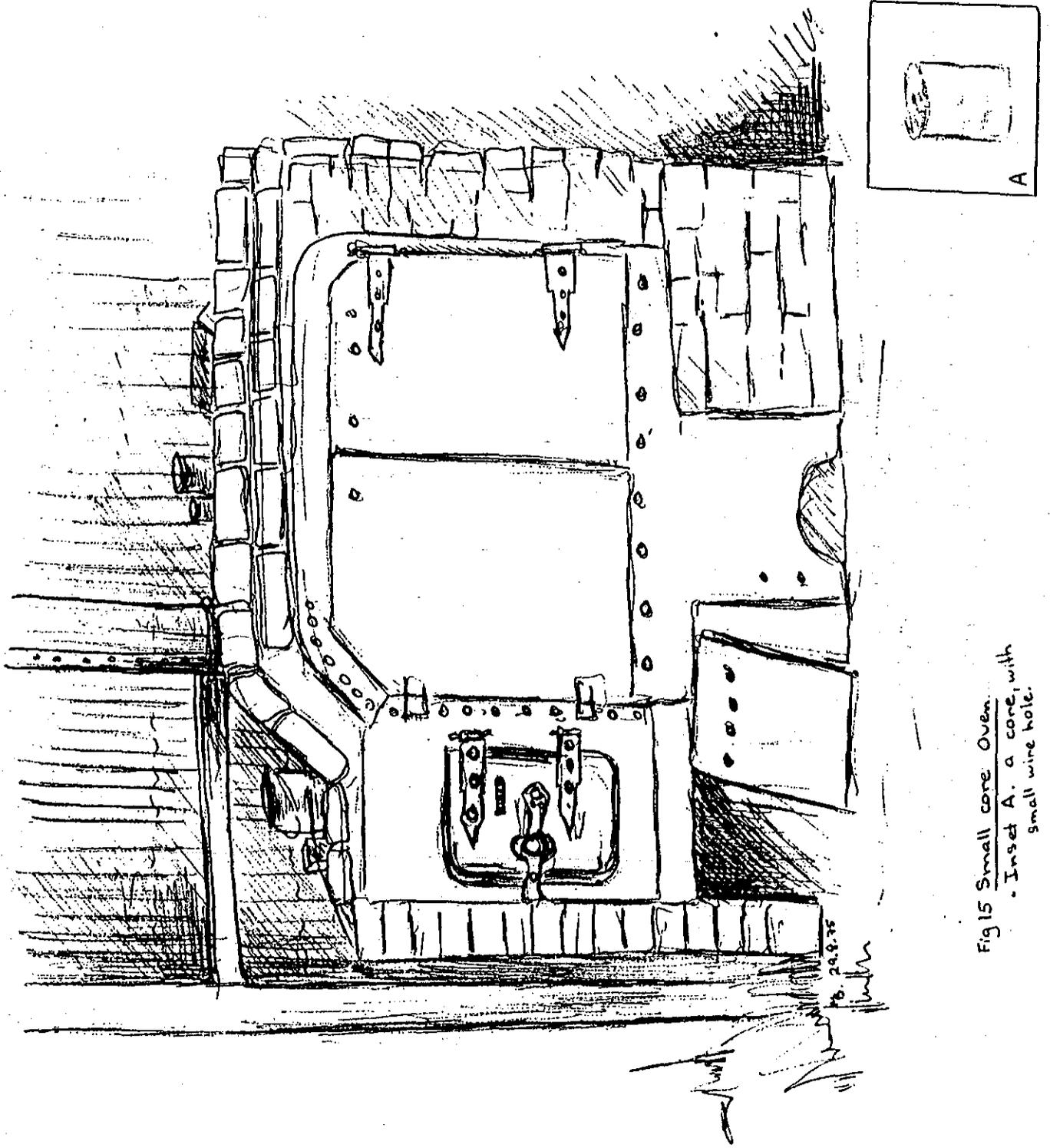
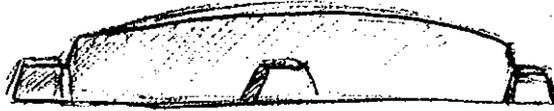
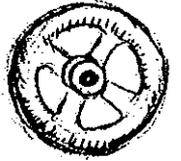


Fig 15 Small core Oven.  
Inset A. a core, with  
small wire hole.

Fig 16 Finnished Cast Iron  
Pieces from Phoenix Foundry.



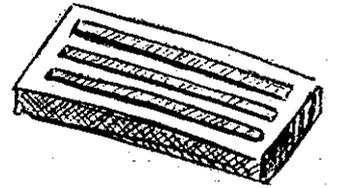
A fine bar  
- many of which were  
used in boilers.



Wheels.



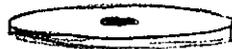
"Sydney" lace  
- from the Imperial Hotel  
Ammidate, cast at the  
Phoenix Foundry



Cast Iron  
Grate.



Cast Iron. Pipe.



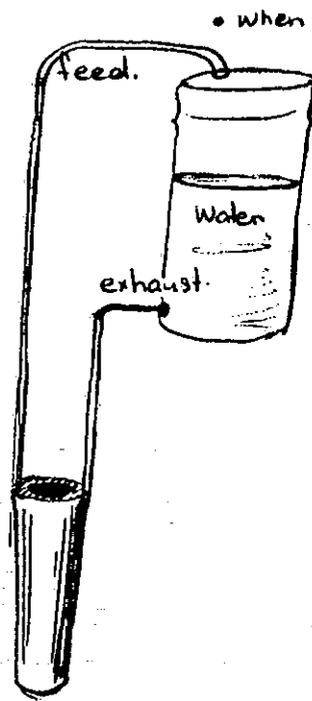
plates.



Fig 17. Blacksmith's Shop.

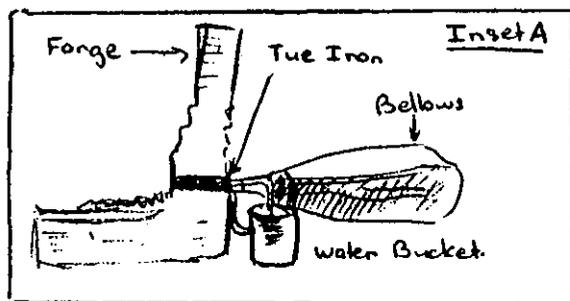
- Forge
- Bellows
- Swagers
- Tongs.
- Punchers
- Ladels

Fig 18 • Water Tue Iron .



- when water boils comes up tube - through feed, and more goes down through the exhaust
- Acts as a cooling agent so as the iron doesn't become too hot.

Position of Tue Iron in the forge.



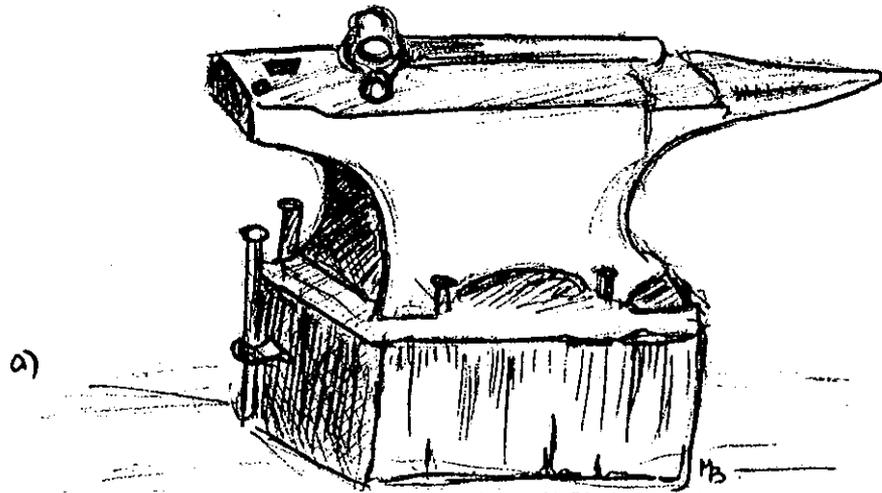


Fig 19 a) Anvil with hammer

b) Swage Block with hand hammer and sledge hammer

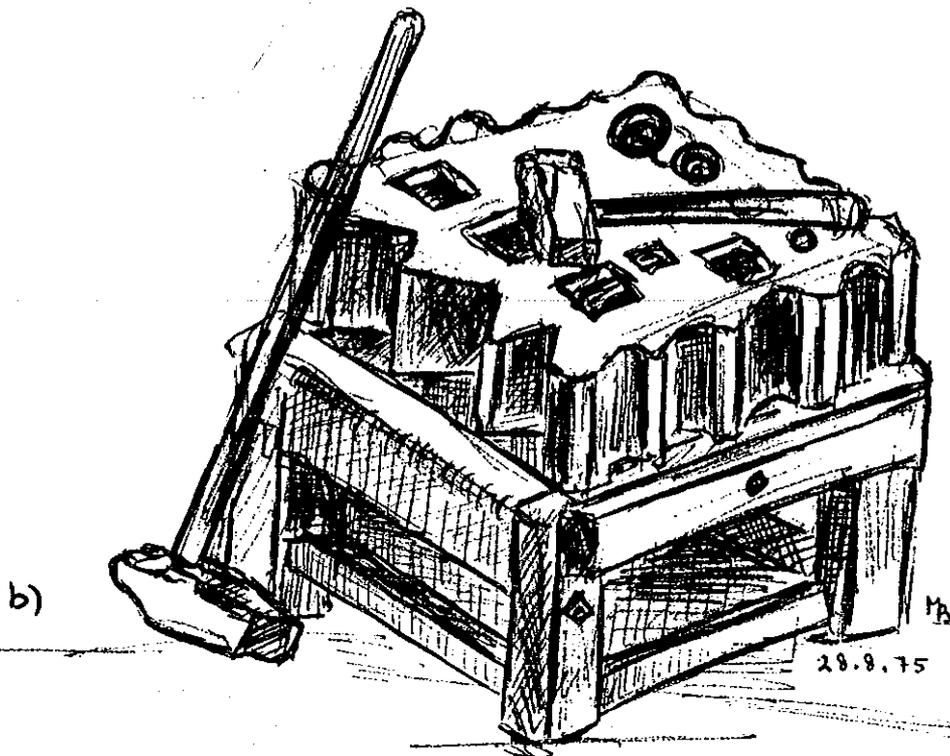


Fig 20 Blacksmith's Tools

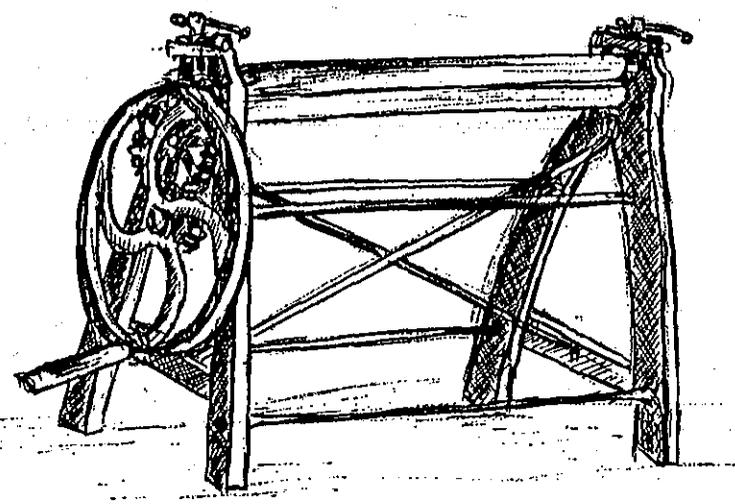
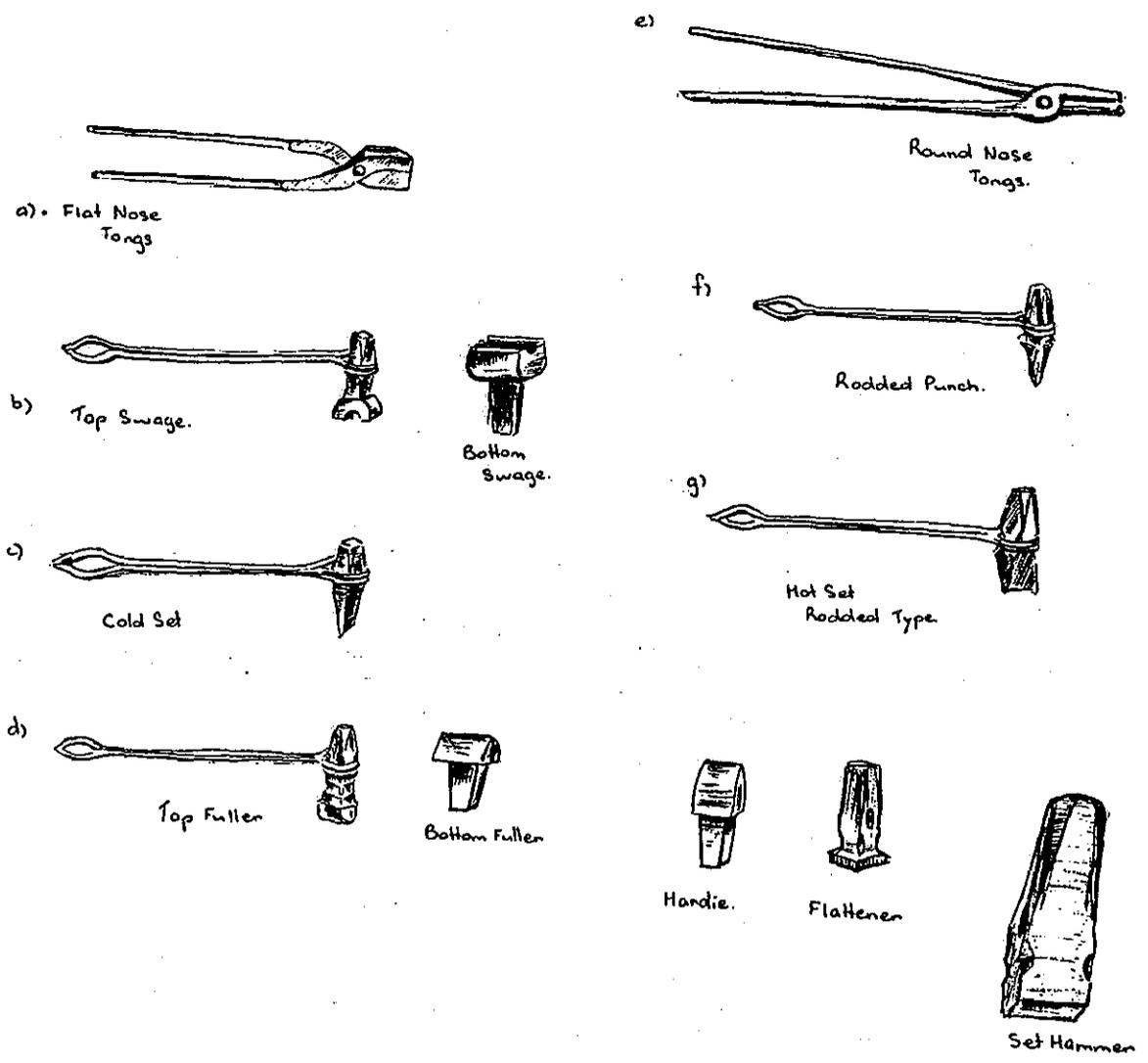


Fig 21. Roller for bending chimney pipes etc.

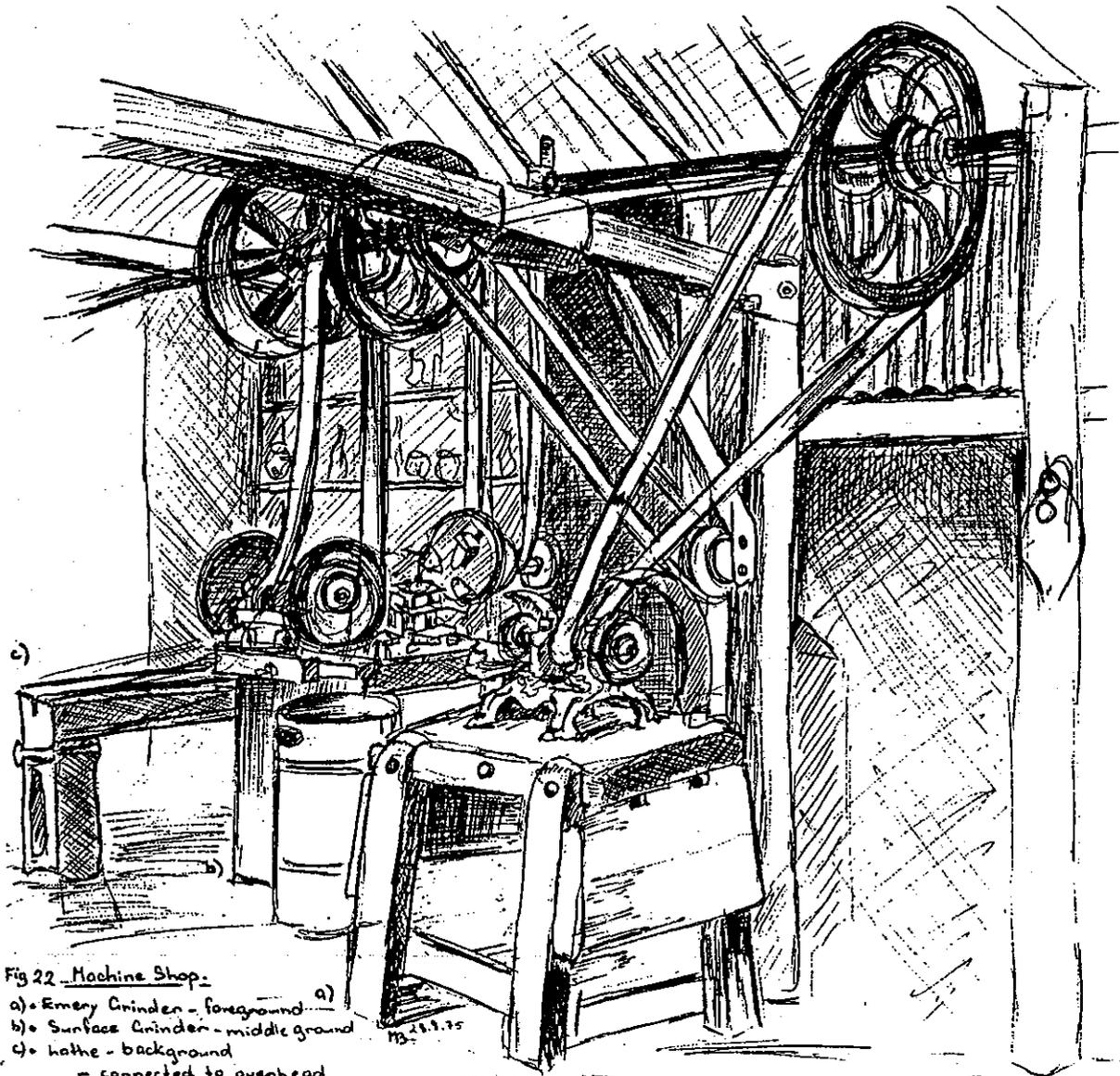
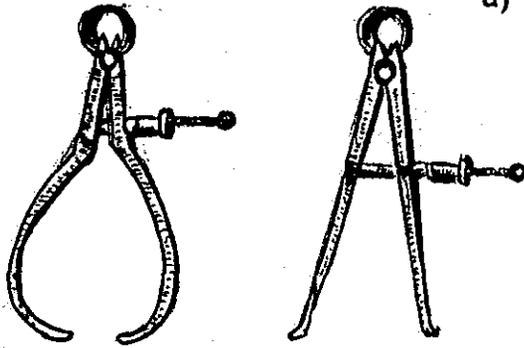


Fig 22 - Machine Shop:  
a) Emery Grinder - foreground  
b) Surface Grinder - middle ground  
c) lathe - background  
- connected to overhead  
drive shaft.

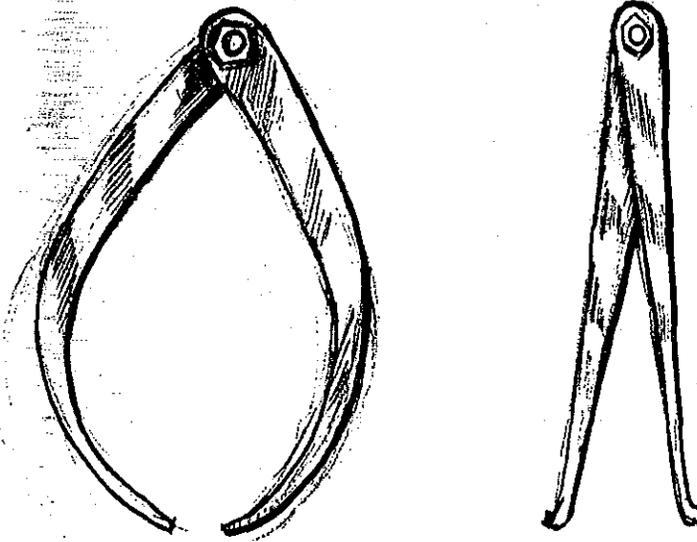
Fig 23 Machine Shop Tools

• Precision and Measuring Instruments.

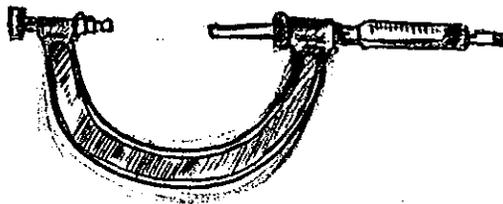
a) Outside and Inside Calipers



b) Firm Joint Inside and Outside Calipers



c) Micrometer



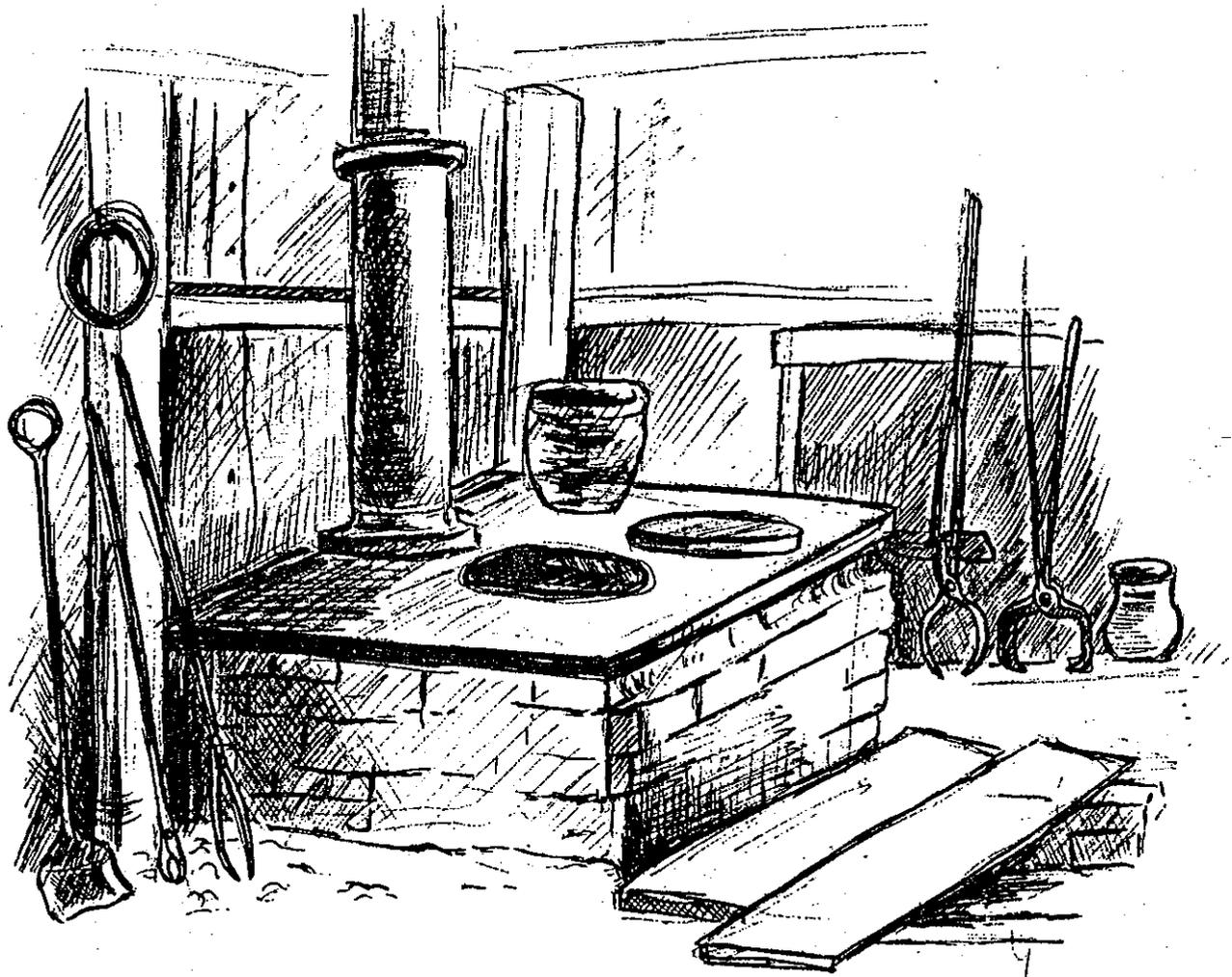
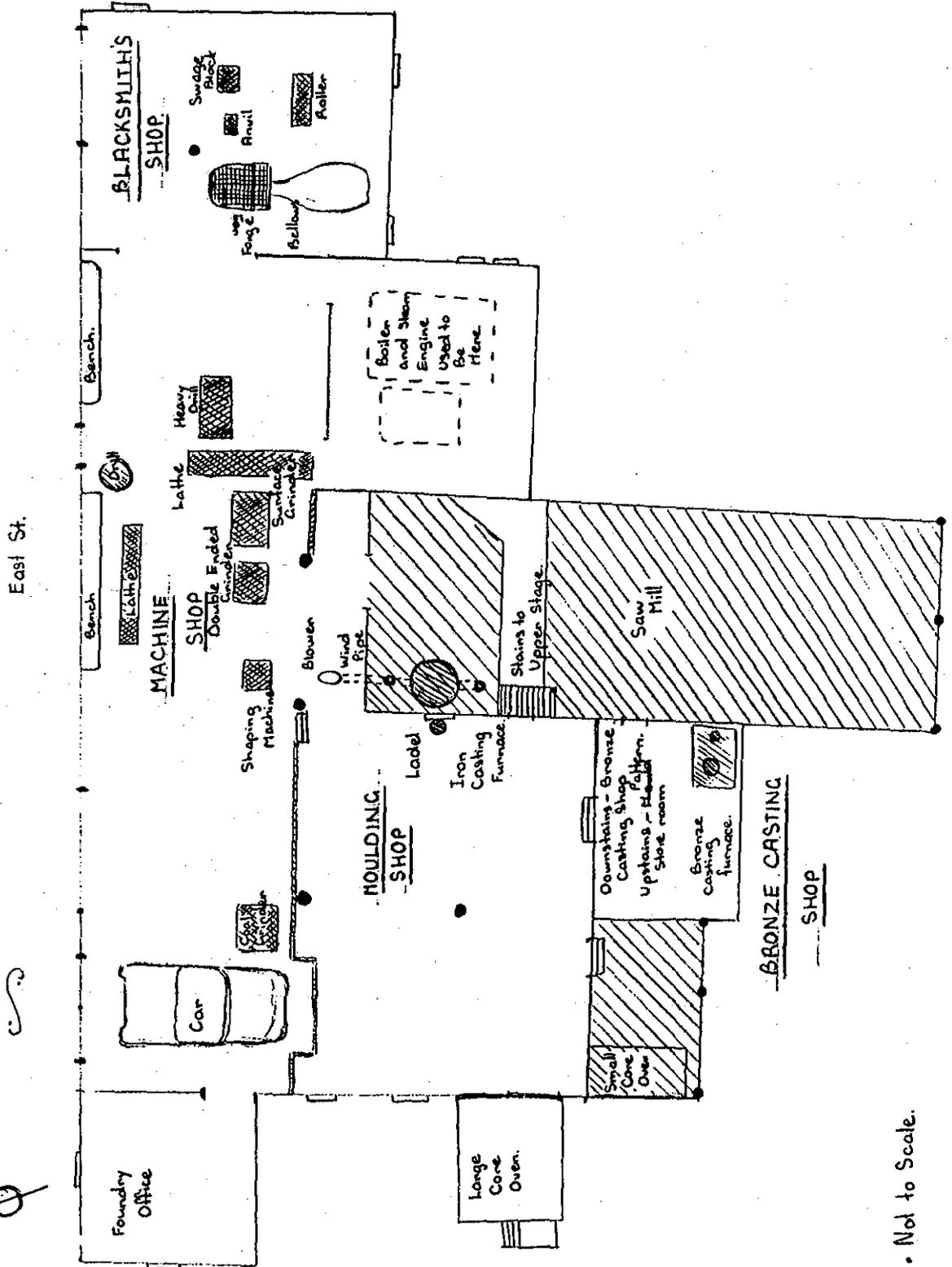


Fig 24 Bronze Casting Shop.

- fine
- graphite crucible
- various tongs. (long type)

Fig 25 Phoenix Foundry -  
plan



• Not to Scale.

## THE MASHMAN BROS. POTTERY.

Ernest Ungar.

The firm of Mashman Bros. was founded in 1885 at North Willoughby, New South Wales on a site bounded by Victoria Avenue and Jacques Street in what is now called Chatswood. Behind this development lies the story, skill and enterprise of two London potters.

William and Henry Mashman were the sons of James Mashman who was born in London in 1824. (1) At an early age he was apprenticed to Sir Henry Doulton the head of the renowned Doulton Pottery at Lambeth, where he became skilled in the potters art and continued his association with that company after he had served his time. In due course, as was common practice in those days, James Mashman had his sons William and Henry and later John also apprenticed to the Lambeth Pottery where they each learned to be skilled in different aspects of the craft. William became a small ware thrower, Henry a fancy thrower, and John an expert at turning and sticking. (2)

After the death of their father at Tooting in 1876 the Mashman family moved to Leigh on Sea where the brothers were able to find employment at the Regal Pottery where a relative, George Day, was already employed as a mould maker. (3)

Hearing of the opportunities available in Australia for artisans, William and Henry decided to emigrate leaving John behind to look after their mother and the rest of the family until such time as they could be sent for.

The brothers arrived in Sydney on the steamship "Windsor Castle" (4) in 1885 and looked carefully around for a suitable area in which to set up in business. The East and South side of the Harbour seemed to have enough potteries to cater for the needs of the inhabitants but on the North side of the Harbour there was only one small pottery owned by John Boyd situated in Fullers Road, North Willoughby. (5) The brothers decided to inspect this district and were pleased with what they saw. There were plenty of good red clay deposits of excellent quality, virtually no competition and this was an area which seemed poised for a building boom to house the families who were already looking for land away from the bustle of the big City.

They were fortunate to find a site which was ideal for their purpose, the land consisted of three small allotments 50' x 2000' and already had erected upon it a small 8' updraught kiln and a workshed of 30' x 30' which contained two potters hand wheels. (6)

This site had originally been used in 1882 by William and Bradley Willoughby who were brickmakers who remained in business until 1884 (7) when the site was taken over by the potters William and Robert Abbott. (8) They failed to make the business profitable and in 1885 sold the site to a Mr. Alexander Dodds (9) who in turn leased the land to James Sandison a potter who built a house called 'Fern-tree Cottage' (10) on the Victoria Avenue frontage and lived in it.

William and Henry Mashman entered into partnership with Sandison and in July 1885 the firm of Mashman and Sandison came into being. (11)

The first output of the new company consisted of Ginger Beer bottles, Bread Pans, Squat Jars and various other kinds of small hand made household utilities, all of which were saltglazed, the clay being dug out of the pottery site. (12) These items were eagerly sought after by the local inhabitants and the Company, having virtually no competition soon began to flourish.

To meet a new demand by drainers and builders who were increasing their activities in conjunction with the settlement expansion on the North Shore the company purchased a small pipe machine driven by horse power, the pipe being flanged by hand. Mosman and Neutral Bay contains many hundreds of thousands of feet of those pipes made long ago, and still as good today as when they were manufactured. (13)

The firm soon increased its land holdings and the Sandison and Mashman Bros. horse drawn drays loaded to the brim with clay were a familiar sight trundling to and from the new clay pits located in what is now called East Roseville. (14)

In response to a request from his now successful brothers in Australia, John Mashman together with his mother arrived in Willoughby in 1888, and took up residence in a second house which had been erected on the Jacques Avenue frontage to the pottery site. (15)

With John Mashman's skill in turning and sticking to aid them, the business expanded at a rapid rate and by 1890 Steam Power was added in order to drive a more sophisticated pipe machine which was imported from England and manufactured by Pullman and Mann which made a pipe complete with the flange in one operation.

In the same year, John Mashman opened a branch manufactory at Auburn, and took over an already established small pipe and red ware works owned by Alfred Poulton, situated along the Parramatta Road near Short Street. (17)

In 1892 James Sandison was induced to sell his share of the Pottery to John Mashman and the name of the Company was changed to Mashman Bros. Victoria Pottery, the brothers having an equal third share of the enterprise. (18)

By a stroke of good fortune a copy of the catalogue issued by the company about this time has survived, and by painstaking inquiries families have been located who still have some of the items illustrated in their possession. (19) In 1895 George Day who had worked with the brothers at Leigh on Sea together with his brother William (who was married to Harriette Elizabeth Mashman) arrived in Australia with Charles Mashman and they all settled in homes around the pottery. (20) George Day worked as a moulder, William Day became a carrier and Charles Mashman became a clergyman although he also at times worked in the family business. (21)

Flushed with their success the Mashman Brothers brought out from England Mr. Thomas Stevens, an artist potter who was employed at the Doultons Lambeth Manufactory where the Mashmans had served their apprenticeship. (22) Stevens created some beautiful artistic stoneware. Amongst his favourite designs were ornamentations executed with gum leaves which were applied to the items before glazing and which left a reddish colour in the shape of a gum leaf under the final glaze. A few rare examples of Stevens' art have been located, together with a beautiful example of a jug

appliqued with rural scenes after the Fulham ware style. Mr. Stevens' creations were very successful but the time was not ripe and the work abandoned. (23)

Gradually many of the utility items manufactured were dropped because of the increased demand for drain and agricultural pipes and for a time the pottery became solely a pipe works.

By the turn of the century all the Mashman family had ceased to live on the pottery site. Henry and William lived in Roseville, (24) John and the Rev. George Mashman (C of E) lived at Auburn, (25) and Charles had moved to Enfield where he went into business on his own account and opened a pottery in Water Street in 1904. (26)

The Mashman Pottery was a major employer of people in the Chatswood area for many years and one photograph taken about 1906 shows 29 employees outside one of the work sheds. (27)

William Mashman died in 1912 and his son Frederick Albert Mashman left the family business to found his own pottery at Kingsgrove and later Sutherland. John Mashman died in 1918 but the Auburn plant still remained under family control, and Henry Mashman died in 1922 with his son Ernest J. Theodore Mashman becoming chairman and managing director of the company. (28)

Gradually over the years new lines were introduced. 1932 saw the commencement of "Regal Art" ware which was designed to cater for the middle income people who were becoming 'house proud' and wanting low cost vases and ornaments etc., with which to decorate their homes. A Catalogue of this era has also survived and most of the lines manufactured have been traced and the names of the present owners recorded. (29) 1932 also saw the production of "Bristol Gloss" ware, the white clay necessary for this product being brought from clay pits in Orange and Gulgong. Items made from this ware included Acid Jars and W.C. Sanitary ware items for which there was a considerable demand. (30)

In 1935 Mr. Frank Mills, who had learned the trade with Fowlers at their Marrickville Pottery, joined Mashman Bros. He introduced the mass production methods so necessary for a modern factory to survive and virtually changed what was an improved cottage industry production, into a modern factory. He was frequently sent overseas to study the latest technical processes and developments and to buy, and bring back, machines which would increase the efficiency of the pottery. (31)

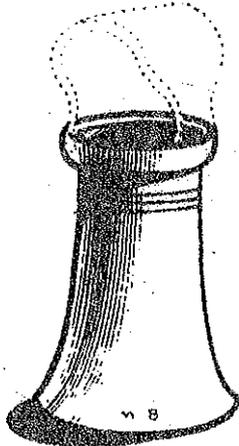
In 1957 the Royal Doulton Co. of England decided to open a vitreous china pottery in Australia and sent out a Mr. C. J. Brookes a director, to arrange details of a merger with Mashman Bros. His negotiations were successful and a company known as Doulton Mashman Pty. Ltd. was formed, 1959 saw the complete take over of the Pottery which became The Royal Doulton Chatswood Pottery. (32)

Theodore Mashman died in 1964 and Mr. Frank Mills became the managing director. Shortly afterwards he moved from Chatswood and Royal Doulton to continue in business at the Auburn works with Bill Mashman who was the son of John, one of the original founders.

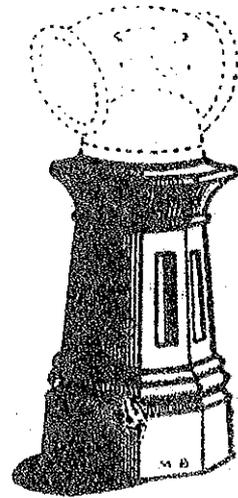
1. Info, G. Mashman. Document written by his father, Rev. G. Mashman.
2. *ibid.*
3. Details supplied by Mrs. Day
4. Photo in possession of F. Mills, Auburn Pottery.
5. Sands Dir. 1884 p.250 Called Blue Gum Creek in those days.
6. Document in possession of G. Mashman.
7. Sands dir. 1882 p. 236
8. Rate Book Nth. Willoughby 1884 Folio 137 p.22
9. Rate Book Nth. Willoughby 1885 Folio 190 p.12.
10. Sands Dir. 1886 p.276
11. Document in possession of G. Mashman (Also Sands Dir. 1886 p. 276)
12. *ibid.*
13. *ibid.*
14. Information supplied by Mr. Ronson.
15. Rate Book Nth. Willoughby 1888 Folio 906 p.56
16. Information supplied by F. Mills
17. Sands Dir. 1889 p.148
18. Document in possession G. Mashman
19. Orig. cat. in possession of F. Mills
20. Sands Dir. 1895 p.451
21. Info. G. Mashman
22. *ibid.*
23. Examples owned by G. Mashman, E. Hewson.
24. Sands Dir. 1902 p.1282
25. Sands Dir. 1904 p. 981
26. *ibid.*
27. Photo F. Mills
28. Information from Mrs. C. Whitehead
29. In possession of F. Mills
30. Information from G. Mashman
31. Information F. Mills
32. S.M.H. 12.5.1959 p.20

# MASHMAN BROTHERS,

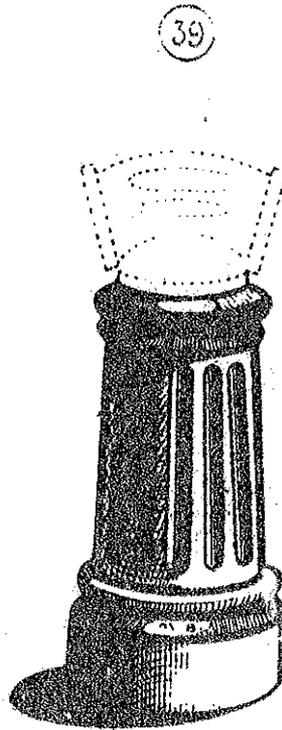
## Stoneware Chimney Pots, &c.



37

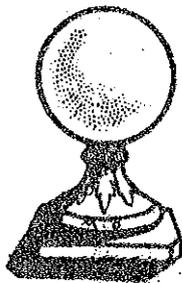


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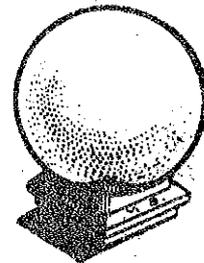


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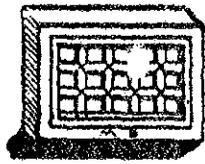


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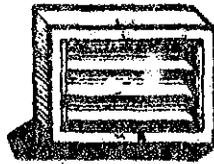


Victoria Pottery, Willoughby. Carrington Pottery, Auburn.

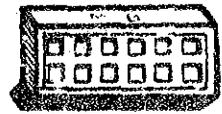
# MASHMAN BROTHERS.



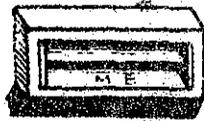
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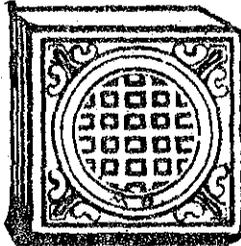
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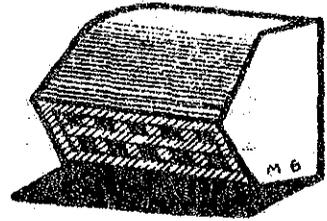
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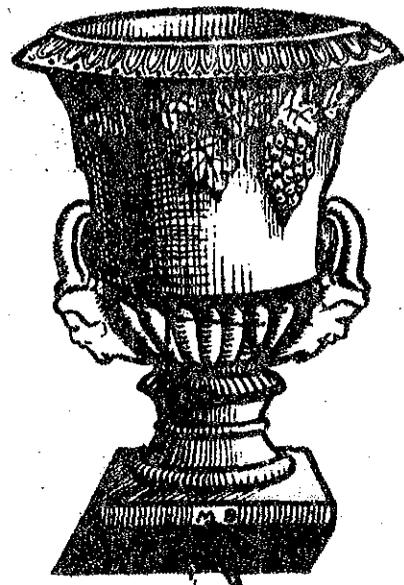


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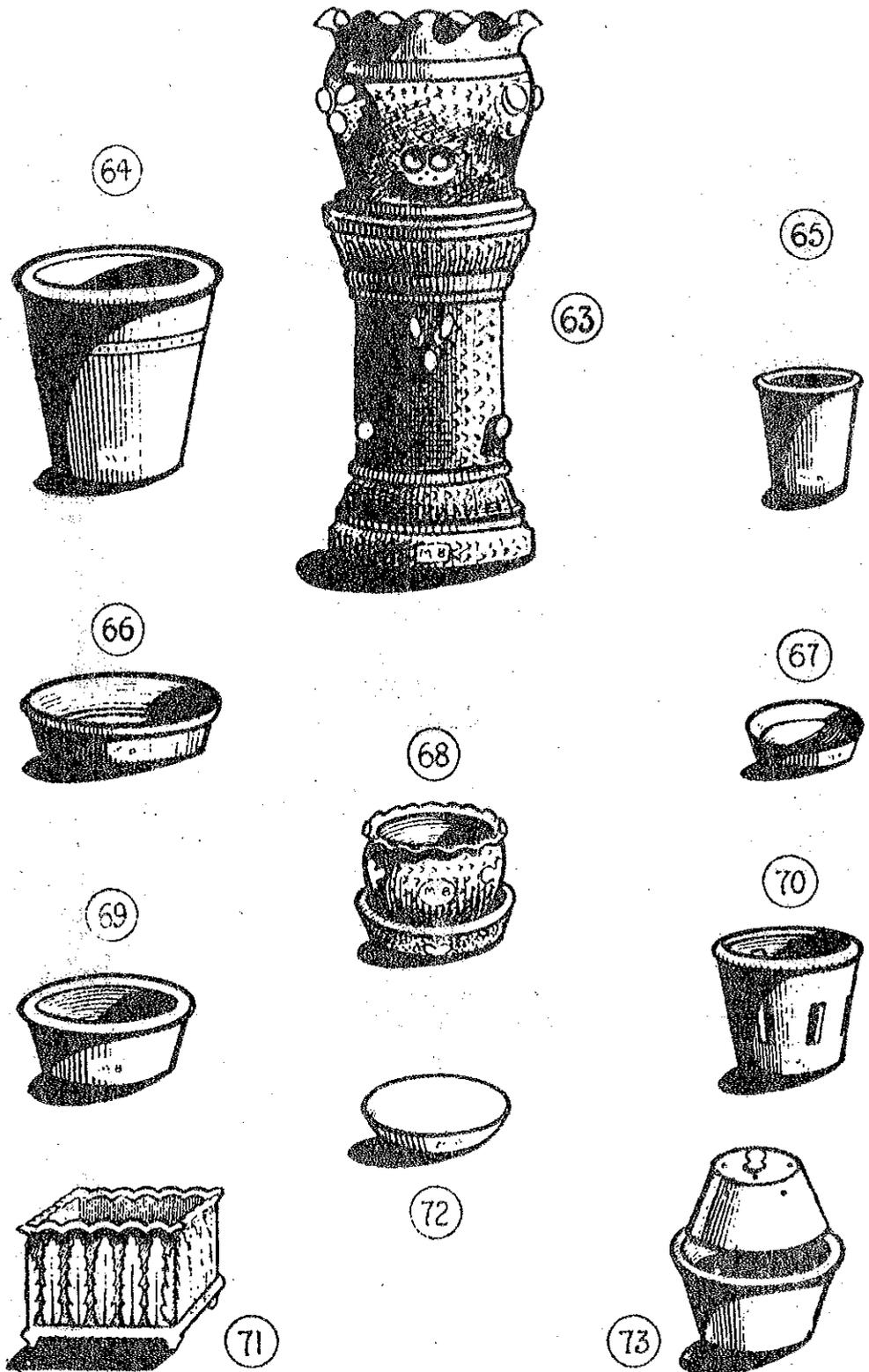


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Victoria Pottery, Willoughby. Carrington Pottery, Auburn.

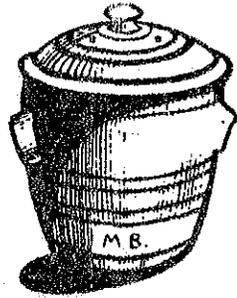
# MASHMAN BROTHERS.



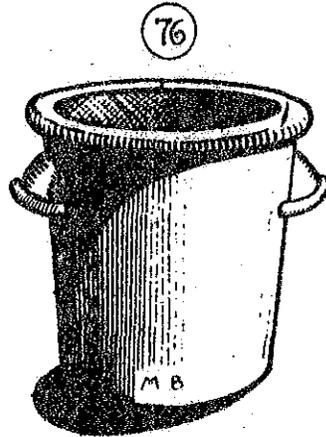
Victoria Pottery, Willoughby. Carrington Pottery, Auburn.

# MASHMAN BROTHERS.

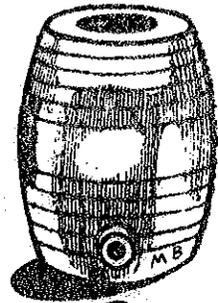
## Bread Pans, Jars, &c.



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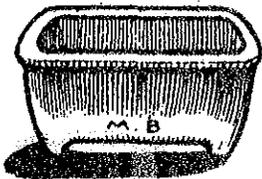
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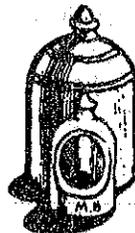
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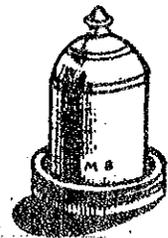
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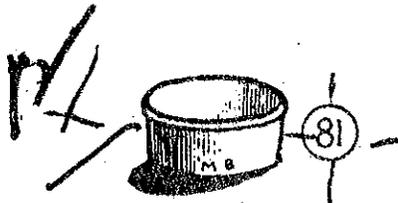
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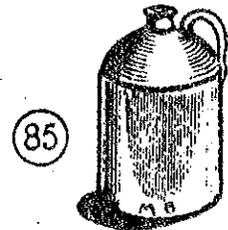
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85

Victoria Pottery, Willoughby. Carrington Pottery, Auburn.

## EUCALYPTUS DISTILLERIES.

Judy Birmingham.

Little new work has been published on this technology from an archaeological viewpoint, but Dr. Michael Pearson (Australian Heritage Commission) is currently working on these sites probably for publication in A.J.H.A. 1988, and Kirsty Altenburg (Postgraduate, Historical Archaeology, University of Sydney) is collecting oral history connected with this industry.

Field sketch and photograph, with captions, appeared in Birmingham, Jack, Jeans 1979: 188.

J.M.B. March, 1987.

Among the more picturesque survivals of an earlier technology are the eucalyptus distilleries still to be found in parts of western Victoria and New South Wales. One which still operates commercially and is also open to the public (on Sundays) is the Hartland distillery a few miles north of Bendigo, the area in which several of those still surviving are to be found.

The Hartland distillery was begun in 1890 by Albert Hartland and Matthew Hodgson, and is still operated by Mr. O.W. Hartland, son of the founder. One process only appears to have changed very recently. The underground vat in which distilling used to take place, twelve feet deep, eight feet in diameter and lined with a double row of bricks is now no longer used. Its heavy iron cover, and the five chained bundles of leaf which were packed in and out of it for each distillation were moved by a small crane turned by hand. This labour intensive process has now been replaced by using the truck which collects the leaf as a mobile vat. It is driven under a lean-to roof, and a tight-fitting cover fits over the back of the truck. Steam is piped into this from below, just as in the brick-lined vat, from an old Cornish boiler superannuated from the gold-fields and fuelled by the dried residue of leaf after distillation.

An outlet pipe from the upper part of the vat (or truck) leads via the adjacent dam into a small receiving shed. The dam acts as a cooler, and the condensed steam and oil vapour flow out into an oil can sunk into the ground.

The leaf used in this distillery is the blue mallee, a leaf of moderate oil yield but of high medicinal value. The yield is 20lb. of oil per 1,000 lb. of leaf, but the percentage of cineole, the camphorous pharmaceutically-valued component, is 80%. Other varieties distilled in this area are the red mallee and the blue gum.

The economics of the process are interesting. The Hartland distillery has its own blue mallee lands extending some 12-14

miles, which it systematically harvests by mechanical means. About five acres is stripped at a time to yield a truckload of leaf, which can then be distilled in about four hours, the whole process taking a day. One truckload yields from ten to thirty gallons of oil according to quality and the current price is \$21.60 per gallon.

The blue mallee can only be stripped once every two years or it will die. The mechanical strippers now used are heavy duty cutters; previously hand cutters were used.

The distilling process is considered completed when the flow of oil and water in the receiving shed changes from about 80% oil (which floats on top) to about 10% or less.

That the 'mobile vat' system of the truck distillery is gaining ground is clear. A similar example can be seen at Inglewood (north west of Bendigo). Equally it seems likely that the brick-lined subterranean vat of considerable size (holding 1-2 tons of leaf producing 80-100 lb. of eucalyptus oil each load) was common in the same area earlier.

Another smaller scale of distillation is mentioned as being common in 1911.\* Two 400 gallon iron ship's tanks were coupled together, each holding about 800-1,000 lb. of leaf. Eighty gallons of water was placed in each tank, a grid being raised about 12" above the bottom. A fire was then lit directly beneath and the vapour let off as described above through an iron pipe and condensed. Distillation time for this process varied from 3 to 18 hours. These tanks were small enough to be mobile, following supplies of leaf; the larger fixed tanks seem to have come into wider use about 1911 when eucalyptus oil began to be used for the flotation process of mineral separation in Broken Hill and elsewhere. One of these for example was the iron still of Mr. Burgess in Kangaroo Island which held 5,000 lb. of green leaf. Using *E. cneorifolia*, a slightly higher-yielding leaf than *E. polybractea* also used for medicinal purposes, Mr. Burgess was able to distil 100 lbs. of oil in favourable conditions from each distillation.

It seems likely that Burgess' still on Kangaroo Island still exists if indeed not actually working. At least three are still operating in the Bendigo-Wedderburn-Inglewood region of Victoria, another in the environs of Melbourne, another in Gippsland, and at least one more near West Wyalong in south east New South Wales. Not all these distilled blue mallee; the New South Wales varieties are mainly the industrially useful *E. dives* and *E. phellandra* rich in phellandrene (used in disinfectant), thymol and menthol apart from West Wyalong where blue mallee is abundant.

Anyone who can should attempt to record such distilleries in detail - full ground plan of lay-out, plus photographs and/or drawings of each item of equipment or machinery; then a simple flow chart of the processes involved, plus an account of the sources of leaf, methods of collection, frequency of operations, transport of product, and capacities and yields of all

containers. Note fuel and recycling of waste, and the variation in economic viability.

\* Smith, H.G.: Present State of Eucalyptus Oil Industry, Techn. Gaz. of N.S.W., August 1911, p.20-22.



## WHALING AND WHALING SITES: SOME ARCHAEOLOGICAL ASPECTS.

Judy Birmingham.

Some additional references on this paper are given here. They reflect the growing interest in locating whaling sites, in the technology of whaling, and especially the activity of the Department of Maritime Archaeology of the Western Australian Museum.

Coutts, P.J.F. 1985. Towards the development of colonial archaeology in New Zealand. Part 2: Early settlement patterns in southern New Zealand. A.J.H.A. 3: 31-42.

Pearson M. 1983. The Technology of Whaling in Australian waters in the 19th century. A.J.H.A. 1, 40 - 54.

" " 1985. Shore-based whaling at Twofold Bay: one hundred years of enterprise. J.R.A.H.S. 71 (1):3 - 27.

Stanbury M. 1983. Norwegian Bay Whaling Station: an Archaeological Report Department of Maritime Archaeology, W.A. Museum.

J.M.B. March, 1987.

Stranded whales must have been exploited by early man from the moment when primitive cutting tools could pierce their thick skins. Primitive methods of hunting whales by driving them ashore in small boats may equally date back to an early period, surviving into the 19th century in Shetland Orkney and Faroes, and possibly practised on Atlantic shores. In the 18th Century AD however came the growing mastery of systematic whaling, first by putting out in small boats from land whenever a whale was sighted, harpooning and killing it, and towing it back to shore for cutting up and boiling down (trying out) which was known as shore whaling, then as whales became scarcer in a given locality by deep sea whaling i.e. a similar operation using a parent ship as base, the whale carcasses being secured alongside for cutting, and the trying out carried out on deck in iron trypots heated over brick hearths.

Greenland was the first locality for more distant whaling operations, where the Greenland 'right' whale proved particularly susceptible, being a slow swimmer, particularly rich in oil, and also one of the varieties of whale which did not sink when killed. Spitzbergen was a main centre, and blubber was either tried out on the spot, or casked and sent back to British and European ports for processing. Whales became scarce in the Arctic by mid 19th century, and emphasis had long since shifted to the coasts of New England and Connecticut. Nantucket was one of the main centres, and between 1800 and 1850 the Nantucketers built up an unparalleled reputation for mastery in the whaling business. The American Civil War (1861-5) brought a sharp decline to Yankee whaling since many boats were sunk. Moreover, the development of the petroleum industry from 1850 on, with its associated product kerosene, meant a growing challenge to whale-oil as the primary lighting fuel. Only the continuing demands of the 'whalebone' industry, particularly for corsets and crinoline stiffeners, carried the whalers through the last quarter of the 19th century, and with the demise of the crinoline

whaling virtually ended about 1910.

In addition to the plankton-eating class of whales to which the Greenland right whales belonged, characterised by their colder and shallower habitats as well as the presence of whalebone or baleen in their throats, the early whalers also soon discovered the deep-sea sperm whale, carnivorous and toothed, capable of existing at great depths under enormous pressure, and found in temperate and tropical waters. The sperm whale had the attraction for the early whalers of considerable quantities of very high grade oil, as well as a substance called spermaceti in its head, which cooled to a white wax suitable for extremely smoothly and brightly burning candles. The sperm whale also floated when killed.

Until 1860 the right whales and the sperm whales remained the normal catch. Then Sven Foyn a Norwegian revolutionised whaling by a new method of killing and towing on the one hand (a heavy charge fired from a swivel mounted cannon in the bows of a steamship fast enough to chase the speedier whales, attached to a very strong rope suitable for towing) and the use of compressed air pumped into the dead whale on the other to raise it to the surface. Thus many more varieties of plankton-eating whales were accessible - finbacks, humpbacks and others, the humpback especially rich in oil, both to bay whalers and deep sea whalers in the 70s and 80s. One earlier improvement in whaling technology - the shoulder-held or swivel-mounted bomb lance which projected an explosive dart of 1850 - was not particularly successful.

Meanwhile the early and mid 19th century had seen the expansion of the industry well beyond the Arctic and subarctic shores of Greenland and New England. The comparable situation in the southern seas was soon recognised by early explorers in the Pacific, but trade and navigation, including whaling were much inhibited in the 18th century by the East India Company's monopoly in the Indian and Pacific oceans. 1788 saw the first British whaler in the Pacific via Cape Horn (the Emilia) bound for rich whaling grounds off Chile and Peru, and nothing could stop the accelerating exploitation thereafter. Trade restrictions were successively withdrawn, and Australasian waters were freed in 1801. In fact whaling began off Port Jackson in 1791 and the end of the 90s saw the benefits of whaling off the new colony recognised by many - one of them being whale oil as a return cargo for convict ships, and conversely convicts as an outward cargo for whalers bound for the Chilean grounds.

Australian waters saw the annual migration movements of the southern right whale as the approaching Antarctic winter sent them north to breeding grounds either along the east coast of Tasmania and NSW as far as about Townsville, or west along the coast of Tasmania across to Western Victoria about Portland, along South Australia past Encounter Bay (Victor Harbour) or around Kangaroo Island, across to Western Australia near Albany, and north to Carnarvon, Dampier and Derby. At first the whaling remained the province of the roving deep sea whalers who first began to fish Australian waters; then from about 1806 the potential of bay whaling became apparent, and the coasts of NSW, then Western Victoria and SA became dotted with small whaling operations. Above all the headlands and bays of Tasmania were alive with action, while Hobart and Sydney both became headquarters for both local and deep sea whaling operations, with the development of skilled whaleboat builders and ships services.

### Tasmania

The earliest major centre of whaling was Tasmania, and it would seem likely that many sites must have survived intact. From Hobart, bay whaling began from its founding in 1803, when the Derwent River itself was found to be a feeding ground for immense numbers of the southern right whale. The first tryworks was established in Ralph's Bay at a site still called Trywork Point, and there are innumerable suggestive names and likely sheltered coves to be examined from the southernmost point of South East cape on entry to the d'Entrecasteaux channel, suggestively called Whale Head, with Second and First Lookout Points, around the coasts of Bruny Island up to Whalers Cove (and later Haunted Bay) on Maria Island.

Wherever a good lookout point can be associated with a sheltered cove with shallow sloping beach there may be signs of footings for an old capstan, a capstan tree, iron rings in the rocks, even brick foundations and whitened whale bones. There may be remains of old iron oil store tanks and try pots.

Such relics are unique; if you are the first to find them after 160 odd years, don't disturb them in any way, and don't let dogs or children idly play with them. Enjoy your own unique experience without disturbance, and then report them on your return to your local State Museum or National Parks and Wildlife Service.

Such early whaling sites continue all the way up the east coast of Tasmania (Bicheno, Falmouth, probably St Helens) in all of which it should be possible to find traces of this early activity once one is attuned to the signs. Occasional whalers' coves must also exist along the less hospitable west coast, since the whale migration route passed that way.

The heyday of bay whaling from Tasmanian shores was about 1806 until the early 1840s; in 1836, 2291 tons of oil and 117 ton of whalebone were corrected, a high point.

Meanwhile the deep sea whaling of the sperm whale had begun as early as 1829 with the sailing of the brig Caroline and by the 1840s some 45 deep sea whalers were owned by Hobart men. In addition large numbers of foreign boats - Nantucketers, but also Norwegian, Dutch, British-used the port, sailing both south to the Antarctic but also north even as far as Alaska.

The early fifties marked the peak; new fuels first kerosene then electricity, as well as economic depression of 1858-72 ended the dominance of whale oil for domestic lighting.

(W. Lawson, Blue Gum Clippers and Whale Ships of Tasmania, Melbourne 1949; H. O'May, Wooden Hookers of Hobart Town and Whalers out of Van Diemen's Land, Hobart, 1957; J.E. Philp, Whaling Ways of Hobart Town, Hobart, 1936; acknowledgment, Whaling out of Hobart Town, Information leaflet, Tasmanian Museum and Art Gallery; Max Cowall, Whaling around Australia).

### Victoria, South Australia and Western Australia

Detailed knowledge of the existence or otherwise of whaling remains in the Portland area is so far unknown. An interesting discussion of whaling activities in Encounter Bay, SA, by the South Australian Whaling Co., and

also less significantly on Kangaroo Island (Destrees Bay especially) is given in J. Cumpston's Kangaroo Island 1800-1836 (2nd ed. 1974). The Whalers Haven Museum has been set up in Rosetta Harbour (just west of Victor Harbour) on Encounter Bay on the site of the old whaling station (established 1837). The nearby jetty was built by the SA Government for the use of whaling vessels in 1854. About 1850 there were some dozen buildings at the whaling station - stables, sleeping berths, boat sheds and workshops. Numbers of whale bones were strewn about the area. (M. Grose & M. Sando, Discovering the Fleurieu Peninsula with the National Trust (S.A.)). Very slight traces of old whaling structures and relics can still be found on Kangaroo Island - including the sadly cement-embedded trypot at Kingscote, and a small stone hut, now a garage, on descrees beach with foundations observable in the ground nearby.

In Western Australia there are a scatter of shore whaling sites from Albany in the south, operative from the early 19th century to Dampier in the north, some of them with particularly interesting surface remains. It is also reported that a recent wreck reported to the WA museum is possibly that of a whaler. We hope very much to present a special account of whaling sites in WA - and perhaps also Victoria and western South Australia in a later Newsletter.

#### New South Wales

By far the best known whaling locality in NSW is that of Twofold Bay near Eden, where whaling continue from about 1828 until the 1930s.

Benjamin Boyd, quite the best-known of the three families who operated there lasted essentially only some five years (1843-8) and as with all his enterprises it is never quite clear how much was actually accomplished, Three generations of Davidsons however survived a very challenging mode of livelihood, and most of what remains to be seen around Eden of whaling days is theirs.

John Raine (1828-32) and the three Imlay brothers (beginning in 1833) both operated from Snug Cove, adjacent to the present day Eden wharf, and it is difficult so far to identify earlier traces, if any survive. Boyd however, selected the southern end of Twofold Bay both for his township of Boydtown and for his tryworks and station. A number of interested people have visited the site in recent years - Bob Irving with architectural students from NSW to look at Boyd's beautiful and unfinished church, Ms. Barbara Little, whose paper on early whaling is cited below, Mike Pearson of the National Parks and Wildlife Service, which happily plans a full coverage of the area's history and topography in relation to its Boyd National Park, and students from Sydney University's Historical Archaeology course, quoted below.

In fact difficulty of terrain and access to sites (by sea only) makes such flying visits unprofitable, while the knowledgeable local historian H.P. Wellings is alas not topographically oriented; there are no maps or plans in his otherwise admirable Benjamin Boyd in Australia (1842-1849) available from the Eden Historical Museum. In fact it becomes clear, from a study of the 1:25,000 topographical map plus the relevant parish maps that Boyd's whaling station was most probably located in East Boyd Bay either on the Boyd block bordering Fishery Creek on the west bank (now very swampy), or at about the site of Edrom Lodge on Boyd's more easterly land. Either are

plausible on prima facie grounds - the first has water, a good beach, and is at a distance from a possible residence (necessary in view of the noxious nature of whale processing: the latter is on firmer ground, and may well have been a first choice if there was no real question of a residence. Either site incidentally makes good sense of a previous Boydian crux... the Boyd tower on Red Point, with its elaborate landing stages internally, would have been an essential lookout link to a secondary beacon, the Round Tower, on Torarago Point halfway to Boydtown. The first Boyd tower was not in view of East Boyd Bay; it could however certainly have signalled to the Round Tower, which was.

The fact remains that the re-identification of the Boyd whaling ruins remains a challenging task, essential to the proper telling of the story of Ben Boyd and Eden.

Again, should you find such ruins - note, describe, photograph, and inform (the NSW Heritage Council, Sydney 237 9111); don't disturb in any way. There will not after all be anything of interest except information and disturbance will destroy it irrevocably.

Two brief field investigations in this region have recently been carried out and are included here for interest. Damaris Lord and Wendy Thorp investigated the old Davidson site at Twofold Bay, and Mike Pearson recently issued a report on the Bittangabee site for the National Parks & Wildlife Service. The first is a typical example of gathering on-site data - the informant stage. The second is an interesting example of archaeological inference (especially in the light of K.G. McIntyre's recent book).

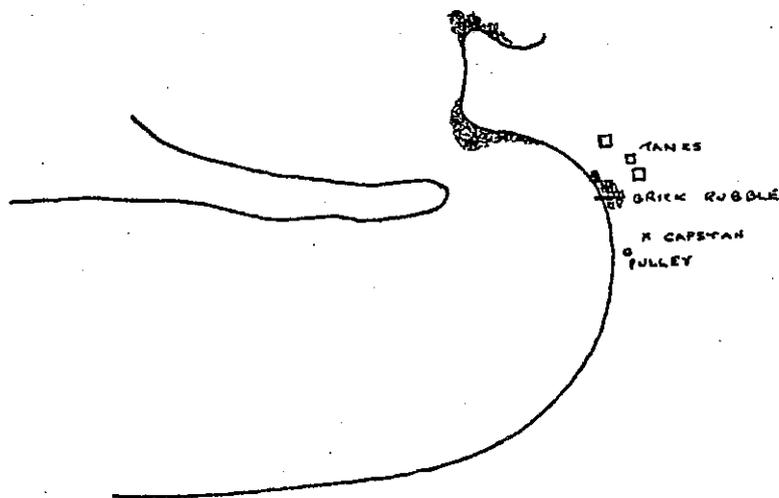
#### The site of Davidson's Whaling Station, Twofold Bay

Alexander Davidson was a latecomer to whaling in Twofold Bay. He seems to have worked for Boyd in the 1840s and in the 1860s bought land at the mouth of the Kiah (now Towamba) river. Here he established a bay whaling station which was continued by his son, John and grandson, George and ceased operations only in the 1930s. There is still a Mr. Davidson in the Eden area.

The property is now owned by Mrs. Boyd (no relation to Benjamin). With her we inspected what was left of the whaling operations. The site is typical of early shore whaling stations, occupying the south-east of a sheltered, shallow cove. Whales were winched up the gentle slope to the shore by means of a hoist in a tree and a hand operated capstan set on heavy timber blocks embedded in the slope above the beach. Mrs Boyd said that George Davidson's son had removed the hoist, upon which the tree collapsed and that she had removed the capstan to protect it from the ravages of bottle hunters and sent it to Eden where it now rots outside the museum.

All that is left on the shore are three square, iron tanks, some collapsed brick and timber beams. Although on the present shoreline and not much above high water mark, the fact that the brickwork is closer to the tanks than to the hoist suggests fireplaces rather than a timber ramp sometimes shown in illustrations allegedly of Davidson's station. There is nothing to indicate a ramp and one of the criticisms of Twofold Bay

whale oil in the last century was that it contained sand. However there was a timber structure on these brick foundations, part of which was standing when Mrs Boyd came to East Boyd some twenty years ago. Local information is that the shoreline of Twofold Bay changes constantly, especially at the mouths of the rivers where floodwaters meet heavy tides and storms. Mrs Boyd said that each major storm meant a bit more of the brickwork slid into the bay.



The kitchen and dining-room of Davidson's house remain, not the original house but what seems to have been the second. Much of the kitchen fireplace still stands, hooks for smoking suspended on chains in the chimney. Two blubber scoops and a flensing knife are kept here, and a whale vertebra, someone's souvenir of the past.

In the garden around the house are three trypots. They are about the same size, 15-18 gallons, squat with a flared lip, but are slightly different in detail. One has a knob on either side, presumably to fit a stand and allow the pot to be tipped. The second has a square-sectioned spout. The third has no additions apart from the manufacturer's name, 'R. Dawson Sydney'. Davidson seems to have acquired some of his equipment from the Imlay brothers. It is not known if these could be part of that equipment.

D.L.

Bittangabee Ruins, Ben Boyd National Park

Theories relating to possible pre-Cook landings on the eastern coast of Australia by Spanish or Portuguese ships have appeared from time to time since the late nineteenth century. For example, Lawrence Hargrave, the noted aeronautical pioneer, presented a detailed argument in support of a claim that Lope de Vega, a Spaniard, discovered the east coast in the late 1500's. This work, done in collaboration with Norman Lindsay, was published early this century. (Royal Society of N.S.W. Journal Vol 43, 1909). However, to date, none of these theories have been supported by any concrete evidence.

The theory of a Spanish/Portuguese settlement at Bittangabee Bay seems to have been generated during the last two decades, no earlier reference to it having been found. Mr Rex Gilroy has published articles expounding the theory in local newspapers.

The evidence used to support the Spanish/Portuguese theory consists of two jars and a figurine recovered in trawling nets off Twofold Bay. The two jars are common Mediterranean ware, still made today in Mediterranean countries, and they have never been identified or analysed to establish their age. The figurine has disappeared and can no longer be studied, even in photographs.

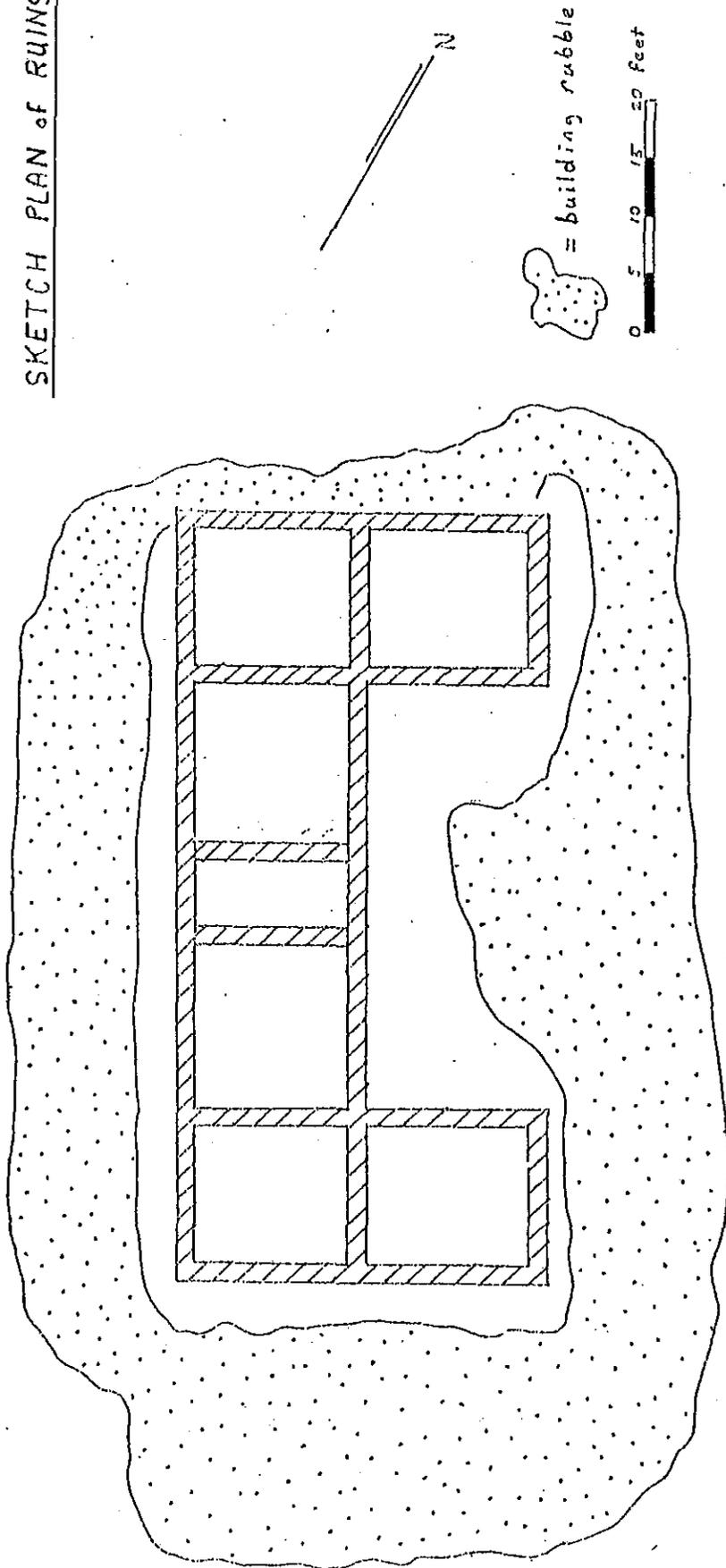
Recently K.G. McIntyre forwarded a Portuguese origin for the Bittangabee ruins in the book "The Secret Discovery of Australia" (Souvenir Press, 1977). In this book many mistakes are made concerning the ruins size, construction, and a non-existent date. Mistakes are also made regarding the architectural styles at nearby Boyd Town.

If the Spanish or Portuguese did land at Bittangabee one must explain why the large stone building (the ruins), was commenced. The work was obviously done by skilled masons, and ship-wrecked or visiting parties are not likely to go to the trouble of quarrying stone, cutting it, and burning lime in order to build what was to have been a large imposing building. The building was obviously meant to be permanent, not a survival shelter. It had been suggested that it was a fortress to give protection from marauding Aborigines. This is not likely, as the building was shaped like a squat "U" in plan, not at all suited to defense during attack and it is not situated in an easily defended position.

The construction technique used is still a common one in masonry, being rubble filling between two coursed and shaped outer layers. A derelict Nineteenth century building in Eden shows just this building system.

The mortar used in the structure was local sea shell, burnt about 200 metres from the ruin. Shell was also burnt for lime at Boyd Town, where piles of shall (not Aboriginal middens) are still found close to the wharf and brick pits. The well preserved condition of this mortar suggests an age considerably younger than the 300 or 400 years required by the Portuguese theory.

SKETCH PLAN of RUINS



The Bittangabee building was never completed. Evidence for this is the existence of a clear working space between the existing foundations and the surrounding stone rubble. This space is commonly seen in buildings under construction, where it represents the standing room required by the masons constructing the walls. If the walls had collapsed, the rubble would be in a continuous heap extending from the wall's base. The remaining standing masonry are sub-floor foundations, which measure 68ft x 33ft maximum dimensions. These foundations rest on the ground, not on a masonry platform as suggested by Mr McIntyre.

It would appear that without other evidence the theory of a Spanish/Portuguese origin of the Bittangabee ruins stands on shaky grounds.

#### The Ben Boyd Evidence:

The proximity of the ruins to the area of Ben Boyd's activities led to an investigation of manuscripts in the Mitchell Library to establish whether anybody connected with Boyd refers to the ruins or to the building of substantial structures in the Bittangabee area.

The papers and diaries of Oswald Brierly, manager for Boyd at Twofold Bay for most of the Boyd era (1842-9) were most enlightening.

Brierly refers to "Bataneby" and "Bat-angaby" as early as 1842-3. In 1844 Brierly indicates that Bittangabee and Mowarry were pastoral properties and whaling lookout points for the Imlay brothers, Boyd's main rivals. By 1847 Boyd was grazing his own stock on Bittangabee and Mowarry, and late in 1847 he acquired the leases for these properties from the Imlays, and stationed his own men on-site.

Up until early in 1848 Brierly visited Bittangabee several times, but made no mention of any buildings or ruins at the site. If the legend that the Imlay brothers discovered the ruins were true, Brierly, an artist, would almost certainly have made reference to them, or even painted them. Brierly left Boyd's employ, and the district, soon after Boyd acquired the Bittangabee Run License.

It was not unlike Boyd to plan and commence a building with the style exhibited by the Bittangabee ruins, to service his newly acquired pastoral properties and whaling outstations. Boyd's flamboyant use of stone and brick on a large scale was shown in many buildings around Boyd Town, compared with which projects the Bittangabee ruins were quite small.

Oswald Brierly never mentioned any building activities at Bittangabee, but he left Boyd's employ early in 1848 to join the "Rattlesnake" expedition, and may have been gone by the time the project commenced. Boyd had imported highly skilled stone masons to work on the Boyd Town buildings, especially the lighthouse, which was completed in October 1847. It is probable that Boyd put these masons to work on the Bittangabee outstation, which would explain the high standard of workmanship at the ruins. The fact that the building was never completed is easily explained by the sudden collapse of Boyd's financial empire early in 1849. Any works in progress, like the Boyd Town Church, were just abandoned. It is this sudden abandonment of the Bittangabee ruins that had confused local historians for years, but if it is seen as a Boyd building this "mystery" ceases to be so mysterious.

Conclusion:

There is no evidence, as yet located, either at the ruins site or in the literature, to suggest that the Spanish or Portuguese landed at Bittangabee Bay. There is, however, internal evidence in the building technique used, style of construction, and location, as well as in the documentary evidence of Oswald Brierly, to strongly suggest that the structure originated as one of Ben Boyd's enterprises, as the base station for his pastoral empire and as a whaling outpost.

Protection of the ruins:

The Bittangabee Ruins are located within the Ben Boyd National Park, and are protected under the National Parks and Wildlife Act, 1974. The National Parks Service is currently trying to preserve the ruins and interpret them to the public. To this end over-growing vegetation has been removed from the site and the area generally cleaned up, allowing the ruins to be seen in total for the first time in many years. Methods of stabilizing the walls are being investigated. Rather than surround the site with a fence, educational signs are being erected to inform the public of the history and legends of the site, and to encourage visitors not to vandalize the site by pulling down walls or digging holes. Visitors are gently reminded that any activities which damage the site, or which remove material from the site, are offences punishable by fine. It is hoped that such a program of education will ensure the protection of the site and at the same time increase the enjoyment and awareness of the visitor.

M.P.

## Addendum.

Since the section of the preceding article which deals with the Bittangabee Ruin was issued by NPWS in 1978 there has been more evidence found which leads to a reinterpretation of the origin of the ruin. A new report, part of which is reproduced below, was issued by NPWS in 1980. This presented the case suggesting that the Imlay brothers, and not Ben Boyd, were responsible for the Bittangabee works. This interpretation has been reinforced by subsequent work by myself, and in particular by Sandra Blair while working on a conservation plan for the ruins and for the new Davidson Whaling Station Historic Site for NPWS. A brief history of Whaling at Twofold Bay, written by myself, was published in the Journal of the RAHS, Vol.71(1), 1985.

### THE IMLAY BROTHERS

The Imlay brothers, George, Alexander and Peter, built up a considerable pastoral holding in the Twofold Bay - Bega area during the 1830s and 40s. Bittangabee run was added to these holdings sometime before 1844, and a whaling outstation was established there, which operated for at least two seasons. (for more information on the Imlays, see Wellings W.H.: The Brothers Imlay)

In 1844 the Protector of Aborigines for the Port Phillip District, George Augustus Robinson, travelled to Twofold Bay. Robinson visited Bittangabee ("Pertungerbe" to Robinson) and described it as a "pretty little bay" where the Imlays had a boat station. More importantly, Robinson states that the "stone foundations for a house" had been begun. (G.A.Robinson's Journal 1 July, 28 Sept 1844, Mitchell Library, especially 13 and 17 July).

The only stone foundations in Bittangabee Bay, apart from a lighthouse storeshed built in the 1880s, belong to the Bittangabee ruin. Robinson refers to the foundation variously as being for a "house" and "storehouse", with bark huts and a garden nearby, and the dimensions of the Bittangabee ruin would be well suited for a storehouse with some accommodation space. That the building was designed as a storehouse would be suggested also by the absence of chimney foundations in the ruin.

If the Imlays built the Bittangabee ruin, the non-completion of the project is easily explained. The Imlays, who had built up extensive holdings of pastoral land, were faced with financial troubles as a result of the general decline in stock values and trade in 1843-4. As a result, several properties were sold to the Walker brothers, and the Imlays generally reduced their activities. (see Wellings The Brother Imlay p.6) One of the first projects dropped would have been the expensive building at Bittangabee Bay. Work may well have ceased by the time Robinson arrived, as he does not refer to active building activity, just to the fact that foundations had been begun. The Imlays' withdrawal from their activities at Twofold Bay continued, and after the death of George Imlay in 1846, and Alexander Imlay in 1847, the family concerns were withdrawn entirely to Bega and New Zealand.

The direct reference to stone building foundations by G.A.Robinson is the most concrete evidence yet presented to explain the origin of the Bittangabee ruin, and this evidence, and the consistency of the Imlay story, would suggest most strongly that the Imlays were responsible for constructing the Bittangabee ruin.

M. Pearson, March, 1987



## EXCAVATIONS IN MARY ANN STREET, ULTIMO, N.S.W.

John Wade.

Digging of the foundations and drainage lines for the new Conservation Laboratory for the Museum of Applied Arts and Sciences during late October and November 1978 became interesting archaeologically when old bottle and tableware fragments began to turn up.

The site of the digging, which was not controlled, is located in the eastern end of Mary Ann Street, north of Systrum Street, in the forecourt of the Former Ultimo Tram Depot. The things were dug up by the building contractor's workmen, who were able to keep the best things for themselves. I came upon the site after the digging was well under way; fragments from the spoil dumps were collected on several occasions, and taken back to the Museum for analysis.

At first it was thought that the diggers had encountered a small rubbish pit, such as was commonly used to dispose of household rubbish in the Victorian period. However the extent was shown to be wider than this by the digging of a long trench for drainage pipes, which extended some 15 metres in a roughly north-south direction from the rear of the new building. Inspection of the sections in the trench showed the rubbish to consist of several lines, each about 20cm thick, of tightly compacted broken glass bottles, stoneware bottles and earthenware, separated by layers of clayey fill; such a filling could result from the tipping of many dray loads of refuse. There was a heavy iron content in the soil, due to the decay of iron objects in the rubbish, which included pieces of corrugated iron sheet, which had stained much of the earthenware brown. There was also some organic material, notably cloth, leather boots, and scraps of leather from a shoemaker's, out of which heels and soles had been cut. Trenches to the east of the Laboratory were less rich in finds, for these did not have the compacted layers of broken ceramics and glass. The whole deposit had been very clearly sealed by a layer of stone ballast, into which the sleepers for the tram tracks were set. Since we know the Ultimo Tram Depot was constructed in 1899, we have a neat *terminus ante quem* for the whole deposit.

The nature of the material is either domestic or the detritus from small business, such as the shoemaker, or from retailers such as hotels and small shops. Most of the land was still undeveloped in 1870, and Surgeon John Harris' original land grant of the Ultimo Estate remained mostly intact. In the decade after 1870, there was development on the eastern side of Harris Street (the Duke of Cornwall Hotel is listed in Sands' *Directory* from 1877) while the western side remained in the hands of John and George Harris; Ultimo House and its grounds eventually became the site of the Sydney Technical College in the late 1880s. The present building of the Museum of Applied Arts and Sciences was erected here, to the design of William Kemp, in 1891. Further east nearer Darling Harbour was the railway spur goods line which took agricultural products to the wharves. The character of the area was that of a working class waterfront. The naming of Systrum Street is a fair indication of what the neighbourhood was like, since it would appear to be an abstruse joke based on the ancient Greek *σίστρον* (Latin *sistrum*), meaning a metallic rattle used in the worship of Isis, or a brothel.

Unlike the deposit found in Water Board operations outside the Duke of Cornwall Hotel in Harris Street, Ultimo last year (see the brief note in *ASHA Newsletter* 1977, vol.7, no.3 p. 13), which comprised almost entirely saltglazed stoneware ginger beer bottles, this deposit included as well glass bottles and fragments of household ceramics, which give a fuller picture of life in Ultimo during the late 19th century.

The dating of the tip on archaeological grounds can be made quite precise. We have the *terminus ante quem* of the construction of the Tram Depot in 1899. The significant items from the fill and their dates of production are as follows:

Stoneware bottles, <i>T. Field and Sons</i> (B1, B3-B7)	1873 - 1887
Stoneware bottle, <i>H. Kennedy, Glasgow</i> (W1)	1866 - 1929
Stoneware bottles, <i>Port Dundas, Glasgow</i> (W2-W3)	mid C19 - 1932
Stoneware bottle, <i>W.F. Murray, Glasgow</i> (W5)	1870 - 1898
Glass Bottle, <i>Rowlands, Ballarat &amp; Melbourne</i> (G2)	- 1884

The Field & Sons bottles give us a *terminus post quem* of 1873, so the burial of the deposit must date between 1873 and 1899. However, the absence of any Field bottles with earlier marks suggests a slightly later date; since the company went out of business in 1887, it would be unlikely to be so heavily represented in such a deposit after this date, although some bottles may have continued in use after the pottery closed in 1887. I think it would be fair to surmise the company was still thriving and maintaining a strong market position locally when the bottles were buried (they may even have been kiln wasters dumped here by the proprietors, who certainly owned a dray which could have brought them down from George Street). So we can narrow the dates to c. 1875 to c. 1887. The Rowlands bottle can narrow it further, since his business expanded to Sydney in 1884, whereupon his new bottles were embossed with the word "Sydney" as well. This is certainly one of his older bottles, but is unlikely to have arrived here until Rowlands began in Sydney in 1884. With the Field and Rowland evidence, we can narrow the dates to c. 1884 to c. 1887; a date of c. 1885 is a reasonable guess.

The finds from the excavation are briefly catalogued here under five groupings: brown stoneware, white stoneware, glass bottles, household ceramics and miscellaneous, each of which will be discussed in turn. The last two categories will appear in the next issue, in Part 11 of this report.

#### A. Brown stoneware

Twelve of the thirteen specimens recovered are stoneware bottles. Eleven are of similar shape, the standard form of "ginger beer" bottle which is about 17cm (6<sup>3</sup>/<sub>4</sub> inches) high and 7.0 to 7.5cm (2<sup>3</sup>/<sub>4</sub> to 3 inches) in diameter, with a cylindrical body, concave shoulder, blob top, and thick walls to withstand the pressure of the aerated contents. One bottle is rather less in diameter (B12; diameter 5.9cm or 2<sup>1</sup>/<sub>4</sub> inches); this and its thinner walls suggest another function, perhaps a blacking or ink container. The other example in stoneware is a "penny" inkwell (B13). All are saltglazed.

The capacity of the nearly complete ginger beer bottle is about 320ml, and if we allow for an air space this would leave about 290ml, or ten fluid ounces, for the contents. Six of the eleven specimens are marked, all with the impressed oval stamp of Thomas Field and Sons. The founder of the pottery had been a potter by trade in Hertfordshire before he migrated to Australia when he was in his mid-twenties. He announced the commencement

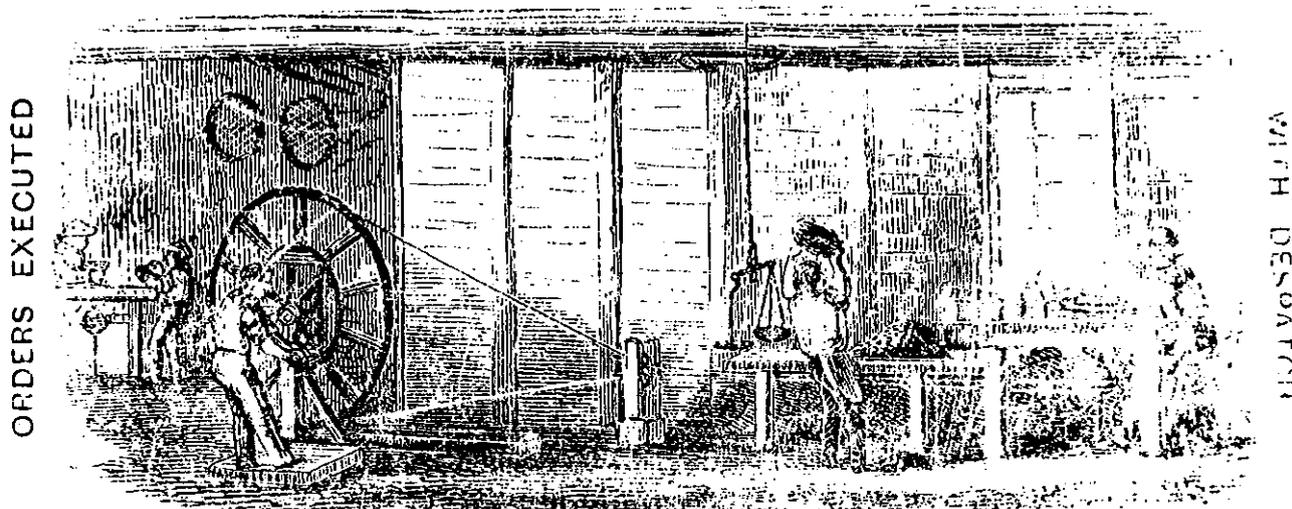
of his business in the *SMH* of 1st April, 1843, and the business is listed in Sands' Directories from 1847 to 1871. From 1873 until 1887 Sands' Directories show that the firm was styled Thomas Field and Sons. Field himself died in 1880, aged 64, leaving his sons to carry on the trade until rising property values in George Street South, and perhaps the working out of clay deposits there, resulted in the closing of the business.

The oval stamp *T. Field & Sons Potters Sydney* is a much more professional device, no doubt produced by a brass stamp, than some of Field's earlier marks, such as that on three lines T. FIELD / POTTER / SYDNEY and the later oval mark with the same wording. Field had at least two stamps with the latter oval design, since two sizes of the mark of known.

The mark which includes the names of the sons in the business was probably introduced around 1873, when the business name is changed to include them in the Sands' Directory. The descendants of the family still have a copy of Field's business card, which we have reproduced here with their permission.

The Field bottles, which were also found in great numbers in the November 1977 Water Board excavations outside the Duke of Cornwall Hotel are characterised by the chamfered base up to a height of about 0.5cm, and on this basis it is perhaps justified to attribute one of the unmarked bottles from this deposit (B8) to Fields. However, as some other manufacturers also chamfered the bases of their bottles, I do not wish to press the argument.

## T. FIELD,



ORDERS EXECUTED

WITH DESPATCH

MANUFACTURER OF

Singer Beer Bottles, Stone Piping, and all kinds of Pottery &c.

GEORGE STREET SOUTH, SYDNEY.

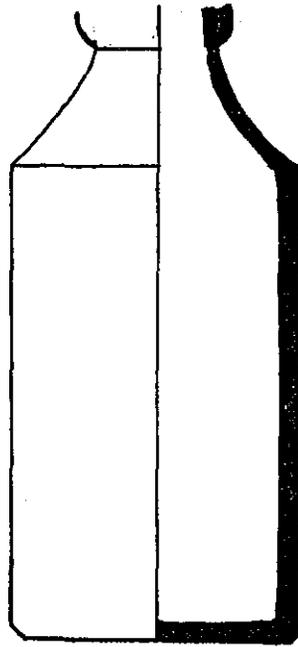
## Catalogue of Brown Stoneware

- B 1 Brown stoneware ginger beer bottle, complete except for the top, saltglazed outside, chamfered base. Impressed oval mark T. FIELD & SONS POTTERS SYDNEY. H pres. 16.2, D 7.3cm, total capacity approximately 320 ml.
- B 2 Brown stoneware ginger beer bottle, top, shoulder and upper wall fr., saltglazed outside. No mark. H pres. 12.6, D 7.5, top D 3.6, I.D. 1.6cm (minimum).
- B 3 Brown stoneware ginger beer bottle, base and lower wall fr., saltglazed outside, chamfered base. Impressed oval mark as for B1. H pres. 9.9, D 7.7cm.
- B 4 Brown stoneware ginger beer bottle, base, wall and shoulder fr., saltglazed outside, chamfered base. Impressed oval mark as for B1. H pres. 13.3, D 7.5cm.
- B 5 Brown stoneware ginger beer bottle, base and lower wall fr., saltglazed on outside, chamfered base. Impressed oval mark T. FIELD & SONS POTTERS SYDNEY. H pres. 6.7, D c. 7.5cm.
- B 6 Brown stoneware ginger beer bottle, base and lower wall fr., saltglazed on outside, chamfered base. Impressed oval mark T.(FIELD) & SONS POTTERS SYDNEY. H pres. 5.7, D 7.4cm.
- B 7 Brown stoneware ginger beer bottle, base and lower wall fr., saltglazed on outside, chamfered base. Impressed oval mark T.(FIELD & SONS) POTTERS SYDNEY. H pres. 3.6, D 7.1cm
- B 8 Brown stoneware ginger beer bottle, base and lower wall fr., saltglazed on outside, chamfered base. Unmarked. H pres. 10.5, D 7.4cm
- The chamfered base suggests this is also a Field bottle.
- B 9 Brown stoneware ginger beer bottle, top, shoulder and upper wall fr., saltglazed outside. No mark. H pres. 8.5, D 7.4, top D 3.9, I.D. 1.6cm (min).
- B10 Brown stoneware ginger beer bottle, top, shoulder and upper wall fr., saltglazed outside. No mark. H pres. 5.9, D > 7.0, top D 3.6, I.D. 1.6cm (min.)
- B11 Brown stoneware ginger beer bottle, complete except for top, saltglazed outside, unmarked. H pres. 14.5, D. 7.1cm
- B12 Brown saltglazed stoneware ginger beer bottle, base and lower wall fr., saltglazed outside, very slightly chamfered base. No mark. H pres. 9.3, D 5.9cm
- B13 Brown stoneware "penny" inkwell, intact but for chip to rim, saltglazed outside, unmarked. H pres. 5.3, D 4.8cm

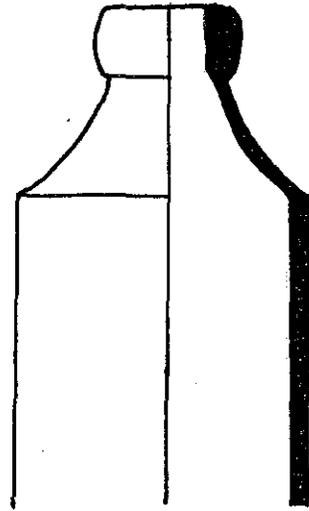
## B. White Stoneware

Of the 18 pieces recovered, 16 were bottles of the "porter" type, with a cylindrical body, long sloping shoulder, and generally a collar rim with ring below. None was complete, but six were marked, all made in Glasgow, Scotland. At least three makers are represented:

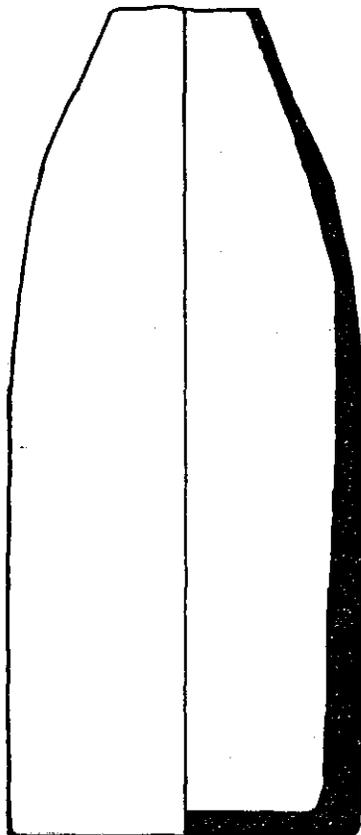
- i. H. Kennedy, Barrowfield Pottery, Glasgow.  
Listed in G.A. Godden, *Encyclopaedia of British Pottery and Porcelain Marks*, as operating between 1866-1929;
- ii. Port Dundas Pottery Coy Ltd, Bishop Street, Port Dundas, Glasgow.  
Listed by Godden from mid 19th century to 1932.
- iii. W.F. Murray & Co. Ltd, Caledonian Pottery, Rutherglen, Glasgow.  
Listed by Godden as working 1870-1898.



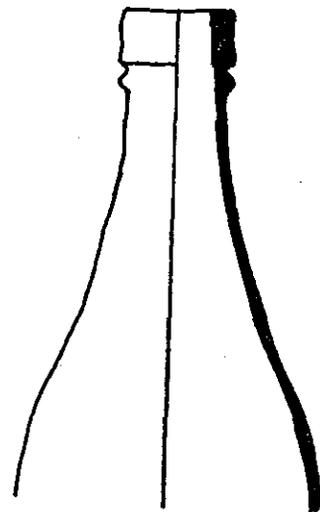
B 1



B 2



W 2



W 15

Three sizes of bottle are represented in this group, their diameters respectively c. 9.1, 7.5 and 5.8cm. The Murray bottle gives the closest date for the group, which we can refine with other information. These Scottish bottles are of superior quality to the local stoneware bottles, being of fine texture and lead-glazed inside and out; they are often thought to have been used for porter or stout, but as these bear no indication of the contents, we cannot be certain.

The other two fragments are a bottle and a jar, both with clear lead glaze inside and out, with the tops dipped in a honey-brown glaze. These are clearly imported.

### Catalogue of White Stoneware

- W 1 White stoneware bottle, base and lower wall fr., lead glazed inside and out, smears of glaze under base. Mark impressed on side in oval, H. KENNEDY (BARROWFIE) LD POTTERY @GLASGOW around a number, probably 29. H pres. 13.0, D 9.1cm.
- W 2 White stoneware bottle, base, wall and shoulder fr., lead glazed inside and out except for the base. Mark impressed on side in oval, upside down (POR)T-DUND(AS POTTERY COY GL)ASGO(W), the rest of the mark illegible. H pres. 21.6, D 9.1cm.
- W 3 White stoneware bottle, base and lower wall fr., lead glazed inside and out except for the base. Mark impressed on side in oval PORT-DUNDAS P(OTTERY COY) GLASGOW. H pres. 13.0, D 9.1cm.
- W 4 White stoneware bottle, base and lower wall fr., lead glazed inside and out except for the base. Mark impressed on side in oval (G)LASGOW, the rest illegible. H pres. 10.6, D 7.5cm.
- W 5 White stoneware bottle, base and lower wall fr., lead glazed inside and out except for the base. Mark impressed on side MURRAY GLASGOW. H pres. 11.0, D 7.6cm.
- W 6 White stoneware bottle, base and lower wall fr., lead glazed inside and out except for the base. Mark impressed on side in oval GLASGOW, the rest illegible. H pres. 12.0, D 7.7cm.
- W 7 White stoneware bottle, base and lower wall fr., lead glazed inside and out except for the base. No mark. H pres. 13.0, D 7.5cm.
- W 8 White stoneware bottle, base and lower wall fr., lead glazed inside and out except for the base. No mark. H pres. 11.3, D 7.7cm.
- W 9 White stoneware bottle, base and lower wall fr., lead glazed inside and out except for the base. No mark. H pres. 5.7, D 5.8cm.
- W10 White stoneware bottle, neck and rim fr., lead glazed inside and out. No mark. H pres. 10.2, rim D 3.0, inside D 1.7cm.
- W11 Ditto. H pres. 5.3, rim D 2.8, I.D. 1.6cm.
- W12 Ditto. H pres. 8.0, rim D 2.7, I.D. 1.6cm.
- W13 Ditto. H pres. 5.5, rim D 2.7, I.D. 1.7cm.
- W14 Ditto. H pres. 12.9, rim D 2.7, I.D. 1.7cm.
- W15 Ditto. H pres. 12.5, rim D 2.7, I.D. 1.7cm.
- W16 Ditto. H pres. 13.9, rim D 2.6, I.D. 1.6cm not glazed inside.
- W17 White stoneware bottle, fr., preserving rim to upper wall, lead glazed inside and out. H pres. 14.6, D 7.8, D rim 3.2, I.D. 1.7cm.

- W18 White stoneware bottle, neck and rim fr., lead glazed outside, collar rim. H pres. 9.7, rim D 4.0, I.D. 1.9cm
- W19 White stoneware bottle, neck and upper body fr., with concave shoulder and cylindrical body, collar rim with ring below, the top of the bottle dipped in honey-brown glaze, the rest clear glazed. No mark. H pres. 11.8, D 8.0, rim D c.2.5, I.D. 1.5cm.
- W20 White stoneware "meat paste" jar, neck and upper body fr., with bands on the neck, the top of the bottle dipped in honey-brown glaze, the rest clear glazed. No mark. H pres. 7.2.  
D c.10, D.rim c.5cm

### C. Glass

The glass finds are a group about which at this stage it is difficult to say much, most of them being unmarked, and with few distinguishing characteristics.

The Hamilton bottles (G1-3), of a type invented by William Hamilton in 1814 to lie on their sides and so circumvent the problem of corks drying out, would have contained aerated water. The Evan Rowlands bottle mentioned above is of particular interest in suggesting a date for the deposit.

A pharmaceutical use is most probable for the large blue bottle (G4), and the small clear bottle (G32) would have served for pills or patent medicine. Salad oil was sold in bottles with fancy ribbing (G23) and salad oil or vinegar would have come in a bottle of which a neck fragment with three rings (G31) is preserved. The others would all have contained spirits, wine or beer.

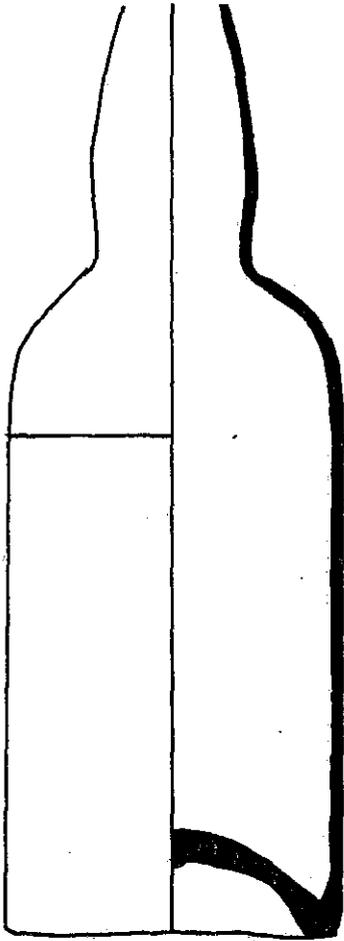
All the bottles are mould made, generally in a three piece mould - one for the base and two for the sides. There is considerable variation in diameter, height of the kick-up, and the thickness of the base (probably due to irregularities in the amount of glass introduced into the mould).

Three kinds of lip finish are represented - the collar rim found on modern wine bottles, the blob top also found on the stoneware ginger beer bottles, and the thickened collar rim with a ring below a recess used for wiring on the cork. In one or two examples the original cork is still there; before the invention of the Crown Seal in 1892, and introduced by Australian manufacturers some fifteen years later, even beer bottles had a cork which had to be withdrawn by means of a corkscrew.

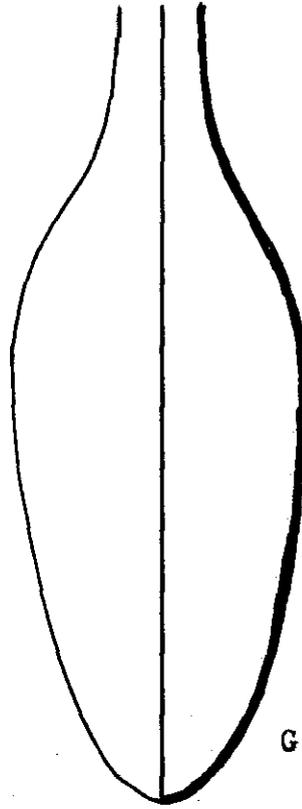
### Catalogue of Glass

- G 1 Pale green round-bottomed Hamilton bottle, neck and rim missing, blown in a two-piece mould, iridescent surface. H pres. 21.2, D 7.5cm.
- G 2 Pale green round-bottomed Hamilton bottle, base and neck missing, blown in a two-piece mould, embossed lettering ROWLANDS/LATE ROWLAND(S)/ AND LEWIS/BALLARAT/ AND/ MELBOURNE.

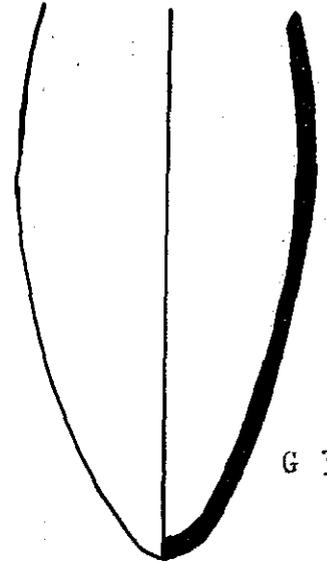
According to Sieling, *Australia Aerated Waters* p.4, Evan Rowlands expanded his business to Sydney in 1884, introducing bottles embossed "E. Rowlands Ballarat Melbourne and Sydney"; stoneware bottles are known with "Newcastle" added as well (J. Lerk, *Bottles in Collection* p.40, nos. 1 & 2). This bottle must date from before the expansion to N.S.W. but may have been used here before new bottles were introduced; it is tempting to date its burial around 1885. A complete bottle of this type is illustrated by Sieling, p.29 no.3.



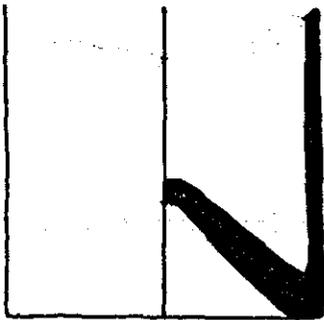
G 5



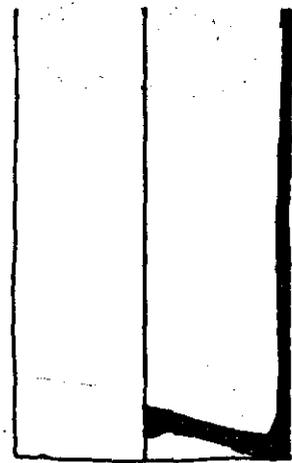
G 1



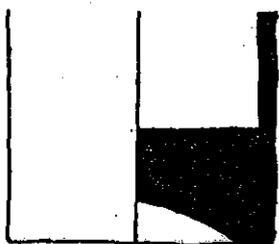
G 3



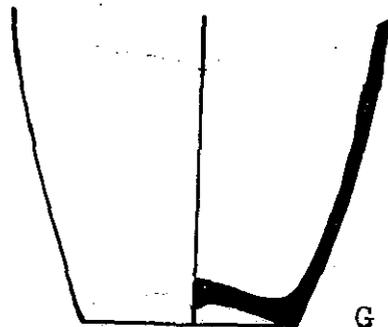
G 10



G 14



G 15



G 19

- G 3 Pale green base fr., of a round bottomed Hamilton bottle, slightly oval in section, blown in a two-piece mould. H pres. 14.0, D 7.5cm.
- G 4 Cobalt blue base fr., probably of a pharmaceutical bottle, low kick-up with small central nipple. H pres. 6.1, D 12.4cm.
- G 5 Green "whisky" bottle, rim missing, with cylindrical sides, curved shoulder, nearly cylindrical neck, semi-circular kick-up with central nipple and embossed "II", blown in a three piece mould. H pres, 24.5, D 9.1cm.
- G 6 Dark olive green bottle base and lower wall fr., cylindrical sides, thick base, low kick-up with small central nipple. H pres. 8.8, D 8.7cm.
- G 7 Dark olive green bottle: base and lower wall fr., cylindrical sides, thick base, low kick-up with small central nipple. Moulded reverse "N" under base. H pres. 6.1, D 8.5cm.
- G 8 Green bottle base and lower wall fr., cylindrical sides, low kick-up with small central nipple, moulded "5" under base, mould seam around foot ring. H pres. 9.0, D 8.0cm.
- G 9 Black bottle base and lower wall fr., cylindrical sides, conical kick-up, thick base. H pres. 7.3, D 8.8cm
- G10 Black bottle base and lower wall fr., cylindrical sides, conical kick-up, thick base. H pres 8.4, D 8.0cm.
- G11 Black bottle base and lower wall fr., cylindrical sides, kick-up with small central nipple and embossed "S", thick base. H pres. 12.3, D 7.7cm.
- G12 Green bottle base and lower wall fr., cylindrical sides, low kick-up with small central nipple and embossed "2" and letter "C". H pres. 6.2, D. 8.7cm.
- G13 Olive green bottle base and lower wall fr., cylindrical sides, very high kick-up (>6cm). H pres. 5.9, D c. 10cm.
- G14 Green beer bottle base and lower wall fr., cylindrical sides, low kick-up with small central nipple, thick uneven base. H pres. 11.5, D 6.8cm.
- G15 Black bottle base and lower wall fr., cylindrical sides, kick-up, thick base. H pres. 5.6, D 7.0cm.
- G16 Green bottle base and lower wall fr., cylindrical sides, kick-up, iridescent surface. H pres. 8.0, D c.7 cm.

Numbers G17-22 are all base and lower wall frr. of dark olive green bottles with flaring sides, perhaps of "ten pin" shape, having a moulded recessed base with clearly defined small central nipple. The seams of the mould around the base and up the sides of the bottle are clearly visible.

G17 H pres. 10.1, D base 5.5cm

G18 Ditto 8.3, Ditto 5.5cm

G19 Ditto 8.5, Ditto 5.5cm

G20 Ditto 8.9, Ditto 5.5cm

G21 Ditto 7.8, Ditto 5.5cm

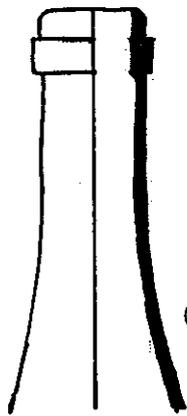
G22 Ditto 9.1, Ditto 5.5cm

G23 Pale green salad oil bottle, upper neck and rim missing, with moulded vertical panels of oblique ribs alternating with plain, iridescent. H pres. 18.0, D 5.1cm.

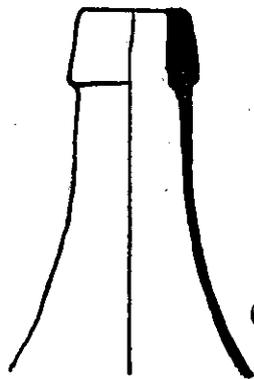
Cp. J.A. Lerk, *Bottles in Collection* p.46 no.4

G24 Green bottle neck fr., with chamfered lip and applied ring collar below rim. H pres. 10.2, D rim 2.9, l.D. 1.8cm

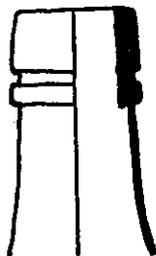
- G25 Green bottle neck fr., with uneven lip and applied ring collar below rim. H pres. 6.5, D rim 2.8, I.D. 1.7cm.
- G26 Olive green neck fr., with flaring shoulder, tall applied collar rim. H pres. 9.3, D rim 2.6, I.D. 1.8cm.
- G27 Olive green neck fr., tall applied collar rim. H pres. 9.4, D rim 2.8, I.D. 1.8cm.
- G28 Dark olive green neck fr., applied collar rim with smaller collar below channel for cork fastener. H pres. 6.6, rim D 2.8, I.D. 2.1cm.
- G29 Green neck fr., applied collar rim with smaller collar below channel for cork fastener. H pres. 7.1, rim D 2.7, I.D. 1.9cm.
- G30 Dark olive green neck fr., applied blob rim with smaller, irregular collar below channel for cork fastener. H pres. 4.6, D 3.6, I.D. 1.7cm.
- G31 Very pale green neck fr., of a salad oil or vinegar bottle, blown in a mould with three rings on the neck. H pres. 9.7, D 2.5cm.  
Cp. J.A. Lerk, *Bottles in Collection*, p.47 no.10
- G32 Clear small medicine bottle, intact, oval in section, with short cylindrical neck, blown in a three-piece mould. H 10.7, W 4.7, T 2.3cm.



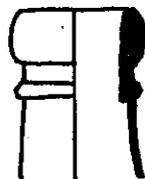
G 24



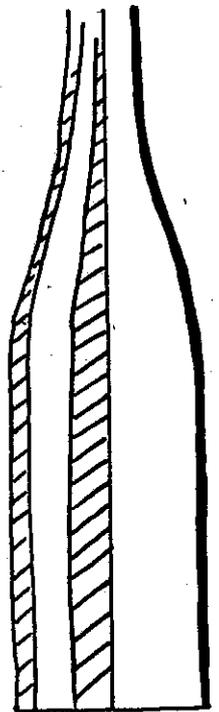
G 26



G 28



G 30



G 2

## AUSTRALIA'S TECHNOLOGICAL HISTORY IS WORTH PRESERVING.

P. H. Sydenham.

Engineering and technological achievement reveals itself as unique man-made rearrangements of naturally available resources. This creative effort seldom reproduces Nature, the end product of it being civil works, structures and machines which have been executed to fulfil a given task at a given time by ways not existing naturally.

The design and implementation of these works are always compromises made to suit the times. As abilities improve, as new materials become available and as more knowledge is discovered, the means to fulfil a stated aim change. Technology has a great social impact on the society of the time.

History of technology and engineering is the discipline that delves into these processes, a discipline that also enhances national pride and assists proper understanding of the place of technology in the scheme of things.

In general the Australian attitude to objects and works no longer useful is that they are of nuisance value only and must be removed from existence as soon as possible, a process enhanced if a financial return is offered for the scrapping process.

Occasionally a class of object from the past captures the imagination and interest of the public and its history and preservation is then provided for. Early transportation is the obvious example of historic artefacts (the Institution uses the term 'Relics') being preserved.

The historic value of plant, equipment and civil works is too often not recognised. An important pumping station in the outskirts of Newcastle recently lost its pump to the scrap merchant; a nineteenth century dividing engine in Melbourne went the same way.

The current apathetic mood toward historical engineering relics probably can be traced to the fact that Australian technology has always been largely of a derivative kind. The tendency has been to buy in know-how and ready-made products from other Nations; little national attachment develops for products made elsewhere.

But to believe we have been a totally derivative technological culture is untrue. Throughout all of our history many notable world inventions have originated in Australia. Here are a few -

Ridley/Bull stripper	1843
Harrison commercial, mechanical refrigeration	1851
Bland 'Atomic' steam-driven airship (model)	1852

Higham/Gwynne/Wolseley mechanical shears	1869-1877
Smith stump-jump plough	1876
McKay stripper-harvester	1884
Hargraves discovery of the principles of flight, radial engine	1890s
Potter, Delprat, de Bavey flotation processes	prior 1910
Taylor header harvester	1913
Rocla concrete pipes	c 1920
Hastings Favelle high-rise tower crane	c 1950-60

No doubt research will uncover many more as we learn of achievements long forgotten.

Another reason for recognizing that early Australian technology is important and interesting is realised when we remember that Australia was a work-place for real application of many new requirements made possible by the 19th century Industrial Revolution - gold and winning of other minerals used the latest Northern Hemisphere technology. Communications also made use of the most modern techniques available at any time. In most cases new technology in Europe found application in Australia within a very short time indeed. Here is an ad hoc list of some first uses of technology in Australia.

Locally built ship, 10 tonne	1789
Magnetic observatory, Rosssbank, Hobart	1840
Weather observatory, Williamstown, Victoria	1853
Telegraph link, Melbourne to Williams- town	1854
Government owned railway (first in British Commonwealth) NSW	1855
Domestic underwater cable telegraph link, Tasmania	1859
Engineering course, Melbourne University	1860
International submarine cable link, Java to Port Darwin	1871
Telephone link, Yanga Station, NSW	c 1877
Telephone exchange, Melbourne	1880
Gas engines and electric generators, South Head Lighthouse, NSW	1883
Telephone trunk line, Tasmania	1888
Steam car built in Australia by Thompson, Victoria	1896
X-ray in medical use at Newcastle Hospital	1896 (?)
Radio-telephone link to England	1930

With a little delving it is clear we possess an interesting technological heritage, especially if we add in several globally important relics which have been brought into Australia by enlightened persons in earlier years. The Boulton and Watt beam steam engine in the Sydney Museum of Applied Arts and Sciences (it is a joy to behold!) is probably one of the oldest intact commercially useful steam engines in existence (manufactured in 1785 and acquired for Australia in 1880); the Holmes magneto-

electric generator stored at ETSA in South Australia is one of two of the first generators to be used in lighthouses - it dates from 1867 (acquired around 1956).

Engineering relics are as important a part of our heritage as the early buildings that are now accepted as worth preserving. Already, of course, many important relics may have gone. What happened to Shearer's 1896 steam waggon that plied from Mannum to Adelaide? Where is the second de Mentla's 1883 magneto-electric generator from the Macquarie Lighthouse? Does the second Thompson 1896 steam car that went to Tamworth Shire Council around 1901 still exist? Where is the Watt grass-hopper beam engine that Ridley brought to Australia for his own use in the 1830s?

The engineering profession is built upon its past achievements and experiences. It is, therefore, proper to research its foundations, to display its works of the past and to document its existence. Overseas museums of technology are as popular as art galleries!

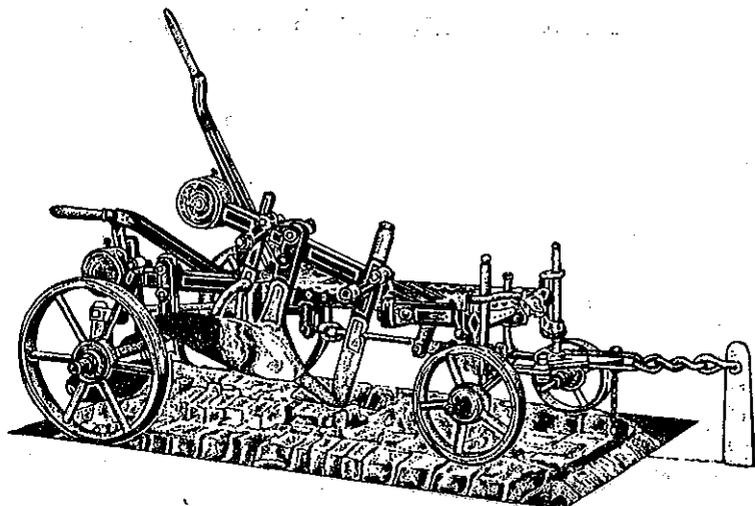
\* \* \* \*

Fortunately there is some interest in our past technology and a little more progress has been made since 1974 to update this article. Shearer's steam car has been reconstructed and normally is on show at the Birdwood Mill Museum, Birdwood, South Australia. The Holmes magneto-electric generator has been faithfully restored and now sits in a place of pride in the foyer of the Sir Charles Todd Building of the Schools of Electronic and Electrical Engineering, The Levels Campus, South Australian Institute of Technology.

Peter Sydenham, now at the South Australian Institute of Technology, reports that Denis McCullum, University of Adelaide, has taken up the banner for technological history releasing, in recent years, a biography of South Australia's past engineers and their works.

Finally a National Committee now exists within the Institution of Engineers, Australia.

Stump-jump Plough.





## THE NAIL AS A CRITERION FOR THE DATING OF BUILDING AND BUILDING SITES (LATE 18TH CENTURY TO 1900)

Robert V.J. Varman.

What is emerging in the examination of many building materials as dating criteria is that machine made or mass produced objects provide us with much better subjects for dating than those produced by hand. This is because machine made objects require a specific invention which is then patented and production begins subsequently. The object has a specific production life span and shelf life (i.e., how long it takes to sell existing stock). For all of this documentation may be found; the name of the inventor, the date of invention, the date of the patent, the commencement of production, clues to distribution including export, the rise and fall of popularity and finally the cessation of production.

Unfortunately there have been so many nail patents taken out since the 18th century and nearly all of them ambiguously worded that only broad statements can be made at present.

Over the last two hundred years there have existed four basic methods of manufacturing nails; these have resulted in the following types: wrought or forged nails, cut nails, cast or moulded nails and the wire nail. Within these types based on manufacturing technique there are sorts with specific names based on their particular function. Tomlinson's Cyclopaedia of Useful Arts, popular during the mid 19th century, exaggerates perhaps a little when it states that there are 'probably over 300 (sorts), with at least ten different sizes for each sort, so that there are upwards of 3,000 nails with different names, all of which are perfectly understood by the persons who manufacture them or use them' (p.308, under Nails). There are, for practical purposes, about ten sorts (see ill.A). These sorts could be bought according to their length and number to the pound using a system of penny names (see ill.B). These were further divided according to their thickness, viz., fine, bastard and strong. Nails of over 5 or 6 inches in length were called 'spikes'. The system of penny names varied much from place to place and also over time. I have found that in Australia nail sorts were rarely used according to their text book function; this I think relates to their scarcity especially up to about 1870.

### WROUGHT OR FORGED NAILS

Until 1792 nails manufactured in England were forged. Even up to that time progress had been made in the mechanization of some aspects of nail production. Forged or wrought nails were cut from rods of iron which originally had to be laboriously hammered out from a lump of iron. In later times a bore was used to shape the head. This was a strong piece of iron about 10 to 12 inches long and was bored to fit the shaft of the forged nail, the forged nail was placed

within using a pair of pliers, and the head was brought to shape by the hammer. The next step was to introduce a bore with another piece which when hammered on the head of the nail would produce a neat form. By using different bores various forms of head could be produced. The ease of producing wrought nails was much facilitated by the production of ready-made nail rods. English patents were taken out in 1606 and 1618 for cutting iron into nail rods but they were never put to practical use. Sweden was the first nation to develop machinery which successfully split rods for nail making. This invention was 'borrowed' by a man called Faley of Stourbridge and the practice spread rapidly.

The first nails used in the colony in 1788 were brought out with the First Fleeters from England. These nails would have been manufactured out of ready made rod iron and hammered at the forge for pointing. At this time in England the nail was probably placed in the bore and the nail headed fairly crudely with a hammer into the 'rose' shape (see ill. C). In most cases the head would tend to be quite flat and the four facets or sections of the head of unequal area. This type of primitive head may still be found in buildings of the 1820s.

Blacksmiths were too valuable to the early colony to spend time in the making of nails. Nails were not made locally to any large degree until about 1818 though a few instances are recorded between 1800 and that time. These nails were made from nail rod iron imported from England.

Many patents improved methods of manufacture over the first half of the 19th century. Wedge pointed nails became more common in the late Macquarie period (see ill.F), these early ones have rose heads and unlike the later ones have very sharp edges along the shaft. The wedge pointed nails have only two sides of the shaft which taper (see ill. F and G). As a result of machines invented in the U.S.A. and developed in England (there was much exchanging of nail making inventions between England and the U.S.A. during the first half of the 19th century), systems were developed where wrought nails were cut from the rod, headed and pointed in the same operation. A sophisticated nail was developed with a wedge point which became known as the Eubank's patent (see ill.G). This nail almost appears moulded, which is due to the pressers or hammers of the machine which formed the shafts and the operation of the dies which formed the heads by compression. This nail is most commonly found in Australian buildings of the late 1840s to about 1870 when it was replaced by the iron nail.

### THE CUT NAIL

This type of nail required long thin iron plates (or ribbons of iron) instead of rods of iron as the 'raw material'. The nail plate or ribbon was taken to the nail plate shears which sheared off pieces the length of the nail required (see ill. Ha). From these nail plate strips nails could be made from one inch to six inches plus in length. In the case of tacks or brads (the simplest form of cut nail), the nail

plate strips were fed into a machine with a shear blade set at a small angle. After each cut the nail plate was turned over and the shear blade cut a series of tapering nails resulting in a nail or tack indicated in ill. Hd. In the case of the sort of nails indicated in ill. Hb and C, the nails were formed by a cutting punch which punched the nail out of the nail plate strip. (The nail plate strip was turned over after each punch as in the case of the tack or simple nail.)

The history of the cut nail takes us back no further than about 1775 when Jeremiah Wilkinson of Cumberland, R.I., (U.S.A.) cut tacks from plates of sheet metal. He later extended his invention to nails and spikes and formed the heads of these nails in a vice. Another American, Ezekial Reed of Bridgewater, Mass., invented a machine for cutting nails from plate iron in 1786. Inventions at this time took little time to travel across the Atlantic. Thomas Clifford, in England, patented a machine in December of 1790 which cut nails from nail plates using a punch. Cut nails on the Clifford principle were being produced at French's factory at Wineburn, Staffordshire, England, in 1792. Machines producing nails as illustrated in ill. Hb and c were probably not produced in England until about 1800 and we can expect them to have turned up in Australia a few years later.

They appear to have been used as housebuilding nails up to the mid 1820s and are used on a minor scale as tacks for about another fifteen years after which they are used almost exclusively as horse shoe nails (see ill.A, Nos 9 and 10).

It should be noted that some nails are difficult to categorize as strictly cut or wrought as some cut nails (especially ones produced as illustrated in ill. Hd) were put through a secondary process. In the case where a cut nail undergoes a repointing and heading under heat and pressure I prefer to classify them as 'wrought' because in their gross characteristics they are virtually indistinguishable from the wholly wrought product.

#### CAST OR MOULDED NAILS

This nail is rarely found in excavations of old buildings. I have not come across any in Australia except in the form of horse shoe nails (fairly recent in date). They have turned up in excavations in the U.S.A., the earliest example being found at Fort Montgomery, New York, dating 1776, 1777. They are thought to have had a very specialized function, probably decorative. They are primarily characterized by their smooth surface and lack of sharp cutting edges and on the top of the head appears a small knob as a result of the casting process.

The earliest patent for them is an English one granted to Joseph Ashton of Birmingham dated 1769. The reason of manufacture was to make 'Coffin nails and tacks': these nails were also tinned. Technical manuals of the 19th century mention their use as garden nails; 'a cast nail with a pyramidal head, used for nailing up climbing plants, vines, and wall fruit trees to brick walls'.

## WIRE NAILS

This type of nail, as its name suggests, is manufactured from drawn wire and is intimately connected with the mature development of machine wire drawing. Many machines had already been developed to cut nail rods, head and point the nail in one operation. It now required an inventor to use wire as the 'raw material' instead of nail rods to produce a new type of nail. The first recorded wire nail making machine was developed by Adolph Feliz Brown of New York in 1851 and the production of the wire nail commenced both in the U.S.A. and Great Britain in that decade.

Although coils of wire of various diameters were readily available weighing from 15 to 20 lbs in the 1830s, there was no great demand for wire until the advent of the telegraph. Its sudden demand made improvements to its manufacture in bulk imperative. In 1862 George Benson invented and patented a continuous rolling-train for the production of wire in quantity. Machinery of this patent was installed in the works of Johnson Bros. at Manchester. This invention resulted in the first quantity production of steel wire. Further improvements occurred in England and the U.S.A. in the 1880s.

The first wire nails were imported into Australia late in 1853 but as in most building circles in the U.S.A. and Britain they were viewed with suspicion. The first wire nails were not especially cheap and they were not fully accepted amongst builders in Australia until about the mid 1860s. By about 1870 as a result of the improved methods of wire manufacture they became both cheap and plentiful and replaced the wrought nail. Well dated buildings of the 1850s in Australia, for example those at Beechworth, Victoria, employ wrought nails of the sort illustrated in ill.G. Buildings of the mid 1860s sometimes use both wrought and wire nails.

Common house wire nails up to the 1870s tend to be thicker than those of later times. A nail of two inches in length in 1870 may be  $9/64$ th of an inch in diameter whereas a nail of the same length in the 1890s may be  $7/64$ th of an inch in diameter. Thinner nails were available in 1870, however, these were used for very fine wood work only.

The square shafted wrought nail continued to be popular in England long after they ceased to be popularly used in the Australian colonies; the British referred to the wire nail as 'French' nails because of their popularity in France. Although the wire nail was produced in England the main producers of them were the U.S.A. and Continental manufacturers. I have not found any successful manufacturers of the wire nail in 19th century Australia.

To establish a dating system within the order of wire nails is fraught with problems. Patent records, as mentioned before, are generally vague; advertisements in trade journals and newspapers rarely if ever illustrate nail products. The type of nail available is usually offered under ambiguous

trade names such as 'Eubank's' (which from 1840 to 1900 may represent a score of different varieties) or they may be simply called 'best imported'.

By examining nails from the original fabric of firmly dated structures a system of dating may be established. A rough picture has emerged which with the co-operation of public institutions and individuals involved in restoring buildings may in time be reasonably perfected.

The parts of a typical wire nail are as shown in ill.I. There were two basic sorts used for common building purposes in the second half on the 19th century; the rose headed nail (see ill. K and A), and the rhomboid headed nail (see ill. M and N). The following is a rough chronological outline of the two sorts:

### ROSE HEAD

The rose head is the earliest type of wire nail to be used on a large scale. The shape of its head is an adaption of the earlier rose headed wrought nail but it is more compact and well defined in shape. I have divided the rose headed nail into two types on the basis of brackets which appear under the head (see ill.J).

The earliest form of the rose nail is type Ia and b (ill.K); the head is large and in some cases primitive looking, the body is thick and the point of the nail has only two facets or divisions. This type is common until about 1870. After this date these nails have four facets at the point. Type Ic appears often in the 1870s.

The rose nail of type II (with the brackets occurring at the corners of the nail head) appear in much the same form as type Ia to c in the 1870s but are comparatively rare. Type II is more common during the 1880s in the form of b and c (see ill.L); these seem to disappear at about the time of the 1893 depression.

### RHOMBOID HEAD

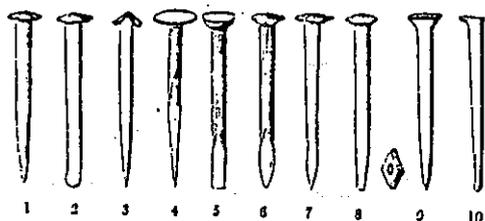
These are quite distinct from the rose headed nail as the profile of the head is much more block-like, except in the case of a transitional variety Type IIa (ill.N). The rhomboid nail has eight facets or divisions on the head excluding the apex (see ill. M and N). The facets are divided into major and minor facets (see the breakdown of parts in ill.I). The rhomboid nail is divided into two types based on the same system as in the rose nail.

Type IIa appears to be one of the earliest types and first appears in the 1880s. Type Ia (ill.M) appears in the 1890s. Types Ib and IIb and c have only two sets of ribs instead of four (type IIc has only two brackets instead of four). These latter sorts appear in the late 1890s and some survive on the market well into the 20th century.

\* \* \* \* \*

I have presented the above material not as a definitive guide to dating nails but more in the hope of creating an awareness of the possibility of their potential in dating. I wish to encourage people in the position of restoring our public and private buildings to take samples of nails from the original fabric and place these samples in envelopes noting the location of the building and the exact part of the building from which they were taken. Perhaps a public repository could be created to receive dated and properly located building materials for the benefit of future research.

R.V.J.V.

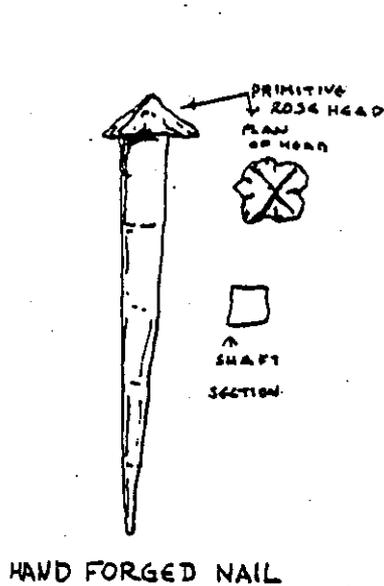


(A) (Tomlinson's Cyclopaedia)

1. Rose nail, sharp pointed. Used traditionally for hard woods.
2. Rose nail, chisel pointed. Used in timbers which split easily.
3. Clasp headed nail. The head is driven below the surface of the wood to give an even plane.
4. Clout headed nail. Used to nail iron sheeting, leather, etc. to wood.
5. Counter clout nail (has a countersink under the head). Used by wheelwrights and smiths.
6. Dog nail. Used for nailing stout iron work.
7. Kent hurdle nail. Used for nailing and clenching the oaken bars of hurdles together, also used as gate nails.
8. Rose clench nail with 'washer'. Used in ship and boat building.
9. Horse shoe nail.
10. Brad.

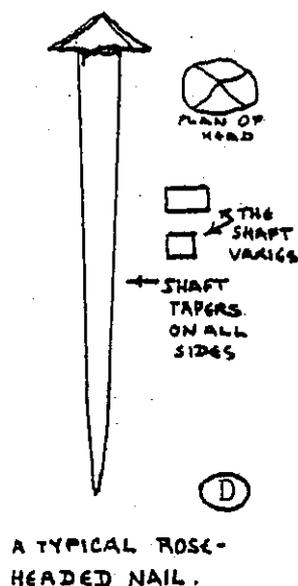
(B)

	Inches long	No. to the pound
2d fine.....	1.....	880
3d fine.....	1½.....	665
3d common.....	1¾.....	400
4d .....	1½.....	280
5d .....	1 ¾.....	195
6d common.....	2.....	155
6d fencing.....	2.....	80
7d common.....	2¼.....	120
7d fencing.....	2¼.....	65
8d common.....	2½.....	90
8d fencing.....	2½.....	50
9d common.....	2 ¾.....	70
9d fencing.....	2 ¾.....	40
10d common.....	3.....	55
10d fencing.....	3.....	30
12d .....	3¼.....	45
16d .....	3½.....	28
20d .....	4.....	20
30d .....	4½.....	16



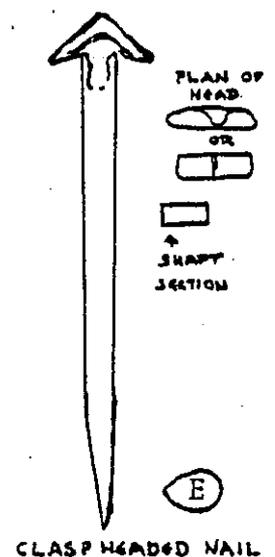
HAND FORGED NAIL

(C)



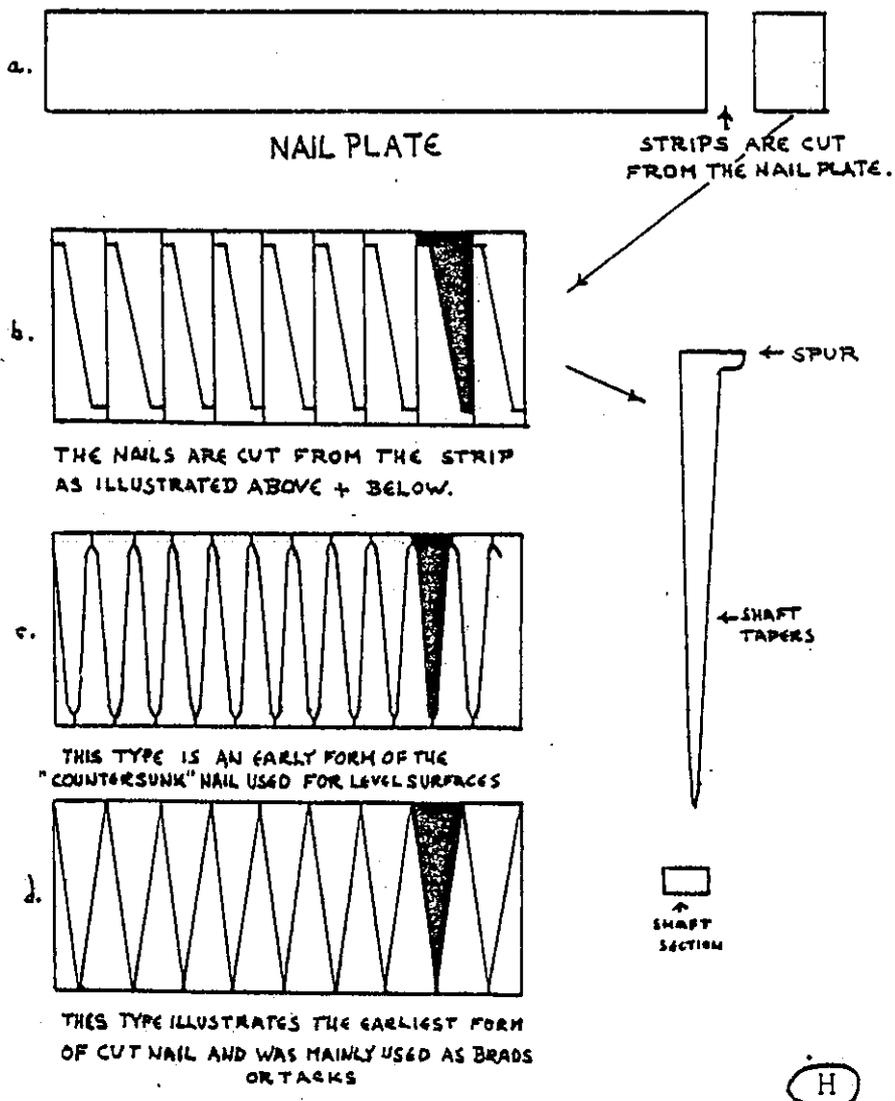
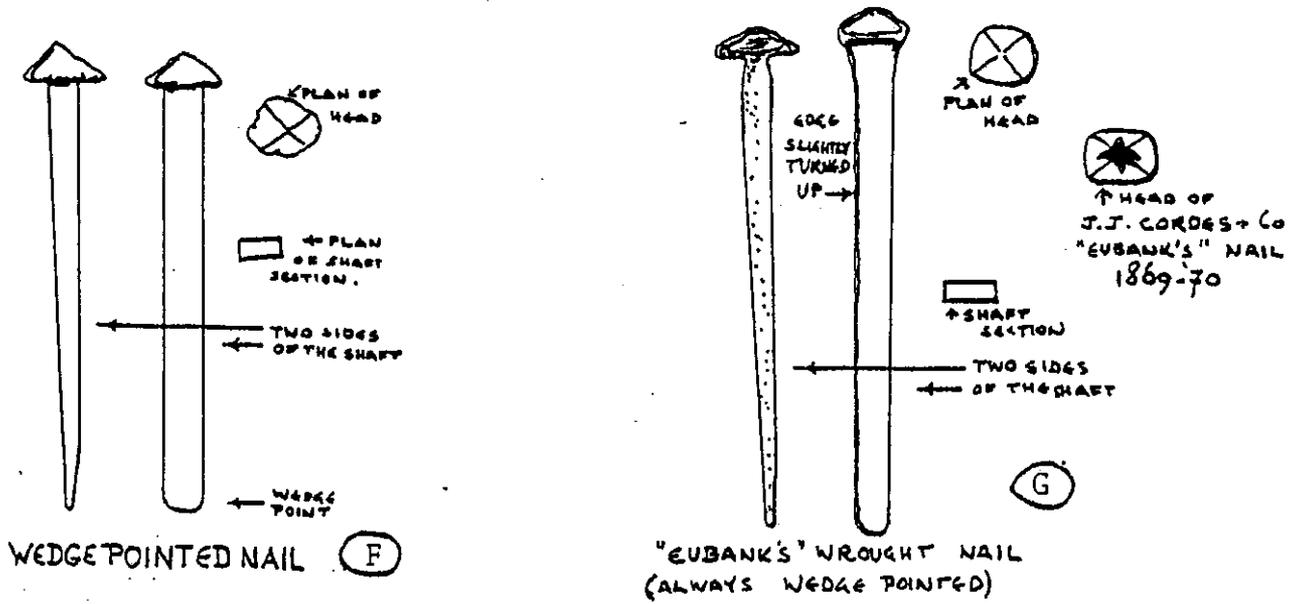
A TYPICAL ROSE-HEADED NAIL.

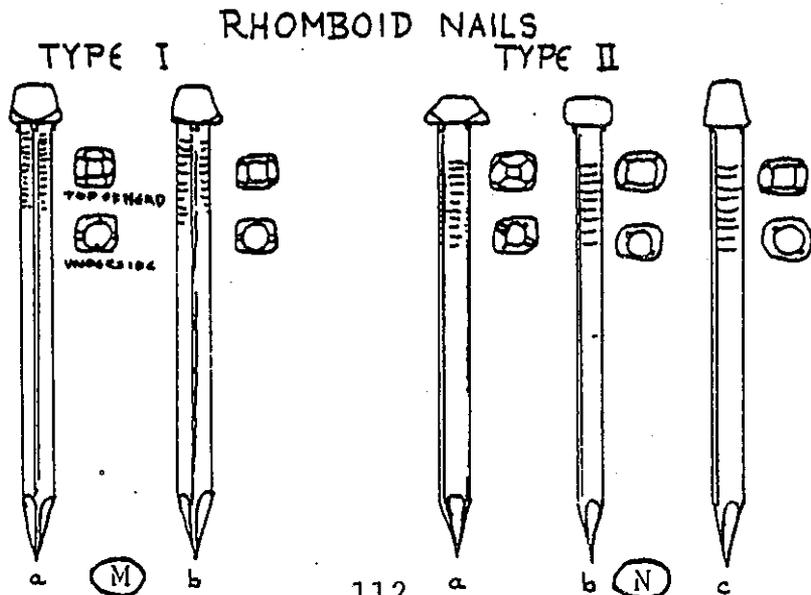
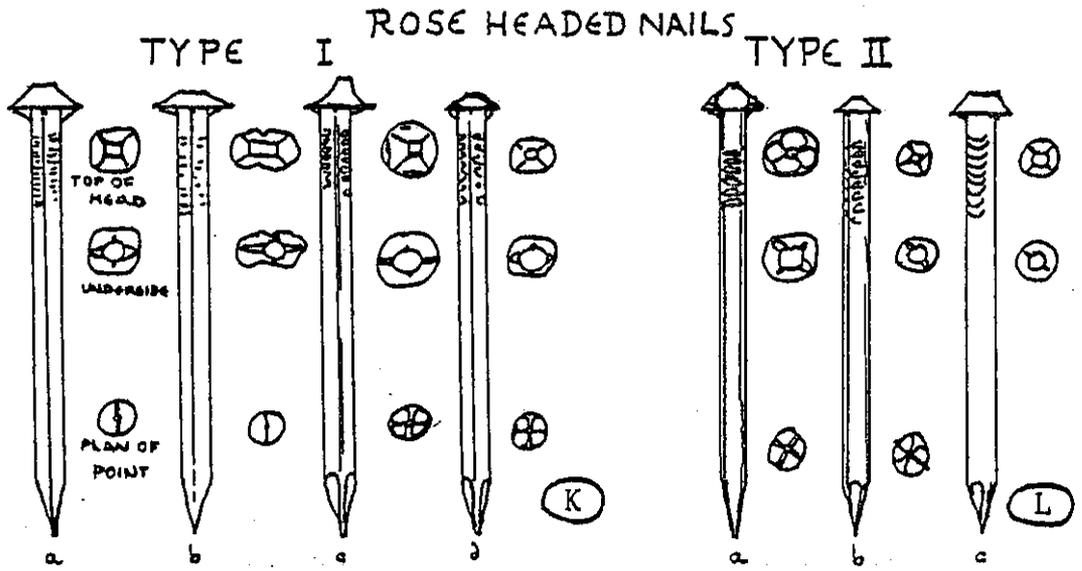
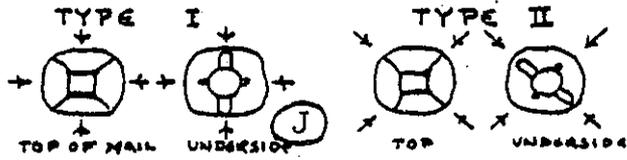
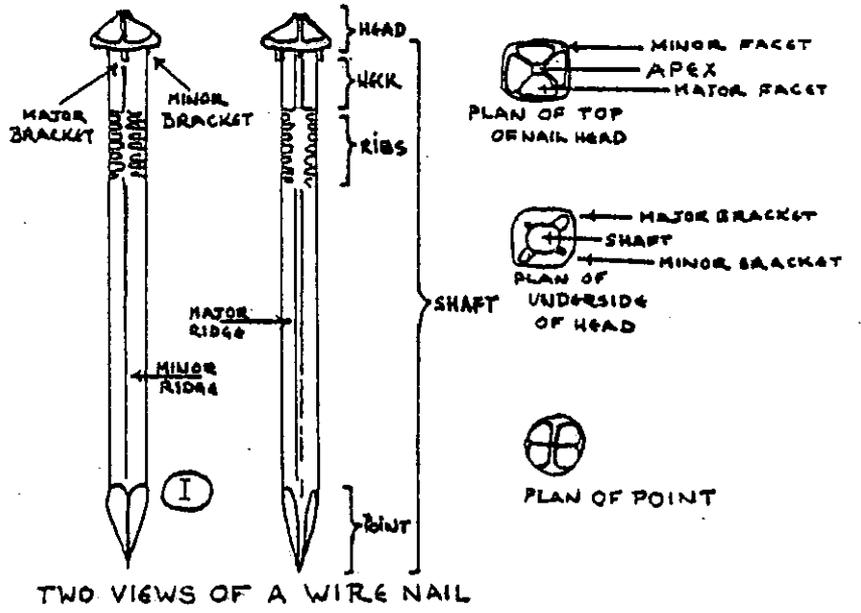
(D)



CLASP HEADED NAIL

(E)







THE WUNDERLICH PROJECT - AN EXERCISE IN INDUSTRIAL ARCHAEOLOGY.

Susan Bures and Barry Groom.

"No firm is better known in Australia than that of Wunderlich Ltd."

"It is safe to say that Wunderlich Ltd. has done more than any other firm or organisation to improve and beautify Australian architecture, whether of a public or a private character. The roofs of our houses would be duller and drabber if there were no Wunderlich materials; the interior construction of the average Australian home would be a clumsier and less attractive thing."

(*The Clay Products Journal*, 1938, 39)

The story of the Wunderlich industries is one of the great success stories of Australian industrial enterprise. From small beginnings at the end of the 19th century, by the early 1960s it was a public company employing 2,000 people with a subscribed capital of nearly two million pounds and assets of over five million pounds. Through the greater part of this century, Wunderlich was a household name throughout Australia.

It all began in 1885 when Ernest Henry Charles Wunderlich arrived in Australia from England, with the agencies for several lines of European manufactured goods, and high expectations. Born in London and educated at Vevey in Switzerland, his business career to date had not been particularly successful -- indeed an earlier attempt to sell pianos in Africa was a notable failure.

Undaunted however, he settled in Sydney as a manufacturer's agent. A builder friend noticed, in Ernest's house, a discarded catalogue for stamped zinc mansard windows. He insisted they were just what he needed for some houses he was building at Rushcutters Bay, and Ernest agreed to supply them. And so, almost by accident, the saga of the Wunderlich industries began.

In 1887 Ernest was joined in Sydney by his youngest brother, Alfred, and the following year Ernest took out a patent for stamped zinc as applied to ceilings. The Wunderlichs' first major ceiling contract was for the Town Hall:

"The present Town Hall, at first named the Centennial Hall, was completed about 1889. It was never designed as a concert hall and the immense organ must have been an afterthought, because the architects had specified an elaborate plaster ceiling, with console and pedentives, that certainly would have fallen on the audience as soon as the 64 ft. lower C pipe sounded. After a long canvass of mayor and aldermen, I induced the City Council to substitute stamped zinc for the ceiling and all its decorations. This ceiling is intact after half a century. I merely mention this, as it is not my intention to dilate on my business achievements, which are well known."

(Ernest Wunderlich, *All My Yesterdays - a Mosaic of Music and Manufacturing*, 1931)

The business of the Wunderlich brothers expanded, and they won many contracts for both ceilings and various types of metal roofing. In 1890 they established a factory at Baptist Street, Redfern, for the manufacture of stamped zinc and other metal products. They were, of course, in competition with the makers of fibrous plaster ceilings, which had become very popular over the previous decade. We found in the *Building and Engineering Journal* of May 1889 this letter from Ernest Wunderlich to the Editor:

"Dear Sir,

It may interest your readers to learn that the plaster ceiling of Aaron's Exchange Dining Hall has quite recently come down in

a lump. I have been instructed by Mr Pritchard on behalf of Aaron's Exchange Co. Ltd to supply and fix a zinc ceiling, which I hope to be able to complete within five months from this date. In the meantime all the paster has had to be removed, and a canvas vellum has been drawn across the ceiling.

I remain, Dear Sir, yours faithfully,

E. Wunderlich"

Over the next few years the picture becomes murky. Ernest says in his own publications that he went to Melbourne to establish the metal working branch of W.H. Rocke and Co. and stayed there for three years as manager. Our researches indicate that, in fact, the Wunderlichs sold their patent to Rockes, probably after an unsuccessful business deal had left them in an unstable financial position. Both brothers were then employed as managers for Rockes, Ernest in Melbourne and Alfred in Sydney. However, in a curious reversal of fortune, Rockes themselves ran into financial difficulties during the great depression of 1892/93, and the Wunderlichs bought back the patent, operating under the name of the Wunderlich Patent Ceiling and Roofing Company Ltd.

After 1892 the Wunderlich brothers, by another happy accident, entered the terracotta roofing tile importing business. A large shipment of tiles from Marseilles to Sydney could not, for some reason, be handled by the original consignee -- it was possibly the same Rocke and Co. whose Sydney branch had become insolvent that year. The Wunderlichs were asked to sell the cargo, beginning a fruitful partnership with the United Tileries of Marseille, which lasted until World War I.

In 1900 the third brother, Dr Otto Wunderlich, arrived in Sydney and was responsible for re-organising the business along modern accounting principles.

In 1908 Wunderlichs finally absorbed their old rivals, Rocke and Co., and the business was formed into a public company under the name of Wunderlich Limited. In this year a new administration block was build at Redfern which housed the offices of the Sydney branch and the head offices for all the Wunderlich enterprises.

The outbreak of World War I proved the foundation for future Wunderlich growth. Metal for the ceilings (now steel rather than the more expensive zinc) could no longer be imported from England and there were no ships free to bring in the cargoes of roofing tiles. Wunderlichs established their own tilerly at Rosehill, near Sydney, and by 1916 were manufacturing terracotta tiles in large quantities. They also established a plant at Cabarita to manufacture asbestos cement sheets, under the brand name of Durabestos.

Through a lack of sheet metal, the Redfern plant was forced to turn to other materials:

"In the matter of ceilings, things were not so easy. It was the potency of the name that stood the Company in good stead in those trying times. Clients permitted contracts to be executed in almost any materials - plaster, wood, cardboard, etc. - as long as Wunderlichs gave their imprimatur to the work. In this way the Redfern factory was practically transformed into a plasterer's shop during the latter period of the war, and for some time after."

*(Forty Years of Wunderlich Industry, 1927)*

The period between the wars was a time of great expansion for Wunderlich Ltd. Factories for the manufacture of metal products, Durabestos and clay products were established in every state, and a new industry -- manufacturing architectural terracotta -- was founded, with the main factory at Rosehill.

The depression years shook Wunderlichs, but they survived. During World War II the entire Redfern plant was turned over to wartime manufacture. Production lines included aircraft parts, lockers, and metal coffins for the American armed forces.

It was during the immediate postwar years and through the early fifties that Wunderlichs reached their highest production peaks. A massive shortage of materials in the housing and construction industry meant the Durabestos and roofing tile factories could sell whatever they produced. In 1957 Wunderlichs established an aluminium window manufacturing plant at Villawood, and even diversified into plastics in the early sixties.

Yet some cracks began to appear in the fabric of their success. In a remarkable piece of misjudgement, Wunderlichs refused to go into the manufacture of cement roof tiles, fabricating instead metal roofing panels which imitated terracotta tiles. Today, cement tiles represent 80% of the roofing tile market.

A disastrous venture into the production of asbestos cement pipes and a significant over-capitalisation in factory real estate, buildings and plant, left the company in a fragile financial position.

In October 1969 Wunderlichs were taken over by CSR, a company that had substantially diversified into building materials. The tilery at Rosehill, the aluminium plant at Villawood and the plastics factory were retained and integrated into the CSR company structure, while the asbestos cement industry was sold off to another company.

The Redfern plant, however, devoted since 1890 to metal working and fabrication, was found to be hopelessly outdated, inefficient, labour intensive and uneconomic. It had been kept going out of sentiment, but CSR inevitably had to make the decision to close it down. Little by little the site was abandoned, machinery and people moved to other factories and some senior management people shifted to CSR's head office in the city. The site was finally sold for a supermarket development and the demolishers were ready to move in.

Just about this time the Museum of Applied Arts and Sciences was made aware of the factory. The director, Dr Lindsay Sharp, realised its importance in the record of Sydney's industrial development and approached CSR for a grant. They responded with a donation of \$20,000 for the recording of the site and the preservation of certain items.

The Museum then appointed Senior Curator John Wade to head the project, assisted by the Curator of Transport and Engineering, Norm Harwood and his assistant, George Imashev. We were appointed as consultant industrial archaeologists directly responsible for the Project.

By the time we began, demolishers were already at work on the site razing the buildings. Thus, our work was in essence a rescue operation although on a massive scale.

We decided to treat the factory on a number of levels. First, there were items to be preserved for re-erection in the new Powerhouse Museum. These included an old stamping machine, the 1908 boardroom, and part of the magnificent Art Deco showroom. Then came those items to be preserved for archival purposes. As the pressed metal ceilings for which Wunderlichs were famous were so much a part of the Australian scene until World War II, it was decided to preserve and store at least two examples of every panel type found in the factory. Generally, we treated the factory as an archaeological site. Complete plans were drawn with the industrial features indicated, and an industrial flow chart is being prepared to show the workings of the plant through its history. Everything that could illuminate the life and times of the plant has been preserved for analysis and documentation -- including a detailed examination of the Marseille tiles, which

Wunderlichs imported in vast quantities, that were used to roof the factory buildings.

Finally, but by no means the least important, a complete social history of the factory and its people is being prepared, by contacting former employees and collecting as much written, oral and pictorial material as possible. One additional task, which proved of vital importance, was to attract as much public attention to the project as possible, with the aim of stimulating interest in the preservation and recording of valuable buildings and material. We found that, after each newspaper item, radio or television spot appeared, we received several phone calls from people offering us books, letters and other memorabilia of Wunderlichs. The final product of our work is to be a book summarising all that has been done and discovered in the course of the Project.

The impending destruction of the buildings naturally dictated the order of work. We began working carefully with old photographs and we are painstakingly reconstructing the different factory areas, their machinery and their usage. Although almost all the machinery had gone, there were some diagnostic features we could work with -- for example, an acid treatment bath which was used in an enamelling process for various ornamental metal works.

The whole area was carefully measured and drawn, and we are taking sketch plans with us when we visit former employees, asking them to point out on the plans what they remember of the processes that occurred in different areas. Our longest employed informant began work at Redfern in the late thirties and, as we have a fairly complete photographic record of the factory processes in the late twenties, we are able to build up a picture of the industrial development that took place at the Redfern site.

The factory once had eleven drop hammer stamping machines at the height of pressed metal panel production, which apparently peaked in 1914. There were only two left when we came to the factory and one was earmarked for preservation and re-erection in the new Museum. This machine was carefully photographed and will be measured and drawn with its original steam-powered workings reconstructed.

The sequence of pressed metal panel production began with designs carefully drawn by skilled draftsmen. In the modeller's studio, the designs were modelled in clay and plaster moulds taken. There were then cast in zinc at the foundry and taken to the press area where zinc matrices were prepared. The drop hammers then stamped out the design on sheet metal, guillotines trimmed the panels to shape and other machinery, like toggle presses, were employed for processes like blanking and forming. The panels were then stored in the warehouse until despatched.

Pressed metal panels were not, of course, the only thing manufactured at Redfern and, indeed, after the Second World War, they went completely out of fashion. The factory produced everything in its time from mudguards for the Australian Six motorcar, memorial tablets in metal doors and stainless steel sinks to beautifully crafted metal letters and ornamental metal work such as the metal griffins holding the globes atop the Grace Bros building on Broadway. "Indifferent work is never Wunderlichs" was an early slogan of the company, and indeed it was their superior craftsmanship that virtually put the Redfern branch out of business. In this era of mass production and assembly line manufacture, there is not much of a market for hand-crafted, or rather hand-finished products.

The administration building and showroom area were measured and carefully drawn up. In certain areas we discovered traces of the original external walls of the building behind the later additions and were able to correlate these findings with our knowledge of the site's development.

The next area on which we concentrated was the boardroom, designed when the administration building was erected in 1908. When the Museum first saw it the

furniture was all gone, and only the bare bones left. It was decided to preserve the fireplace, ceilings and wall panels, if possible completely. This proved an impossibility. The wall panels were completely removed but the ceiling was firmly fixed, with no access through the rafters to enable the panels to be knocked down. For this part of the project we employed five stalwart young men (Warren Wickman, Peter Kelley, Michael Lorimer, Martin Davies and Graham Wilson) and we all worked at prising off panels, which were then all stacked and labelled. It was necessary to invent new techniques as we went along for removing these panels. Finally, it was decided to take a range of samples of all parts of the ceiling pattern, with the rest of the ceiling to be reproduced in fibreglass.

We are trying to trace the furniture and other fittings from the boardroom. So far we have located the table and several other pieces. The boardroom housed a large library of technical and other publications, a list of which we discovered among the Wunderlich papers in the Mitchell Library, and we are endeavouring to recover as many as possible.

Our next major job was the showroom, which the Museum intends to reconstruct in the new Powerhouse Museum as a display hall for its own collection of Art Deco. Begun in 1928 and completed the following year, it was designed as both a social hall and showroom and was furnished with magnificent bronze and glass hanging lights, and a grand piano. The ceiling was of pressed metal and the structural columns were tiled in glazed terracotta, capped with foliate bronze capitals. Around the sides of the showroom were lower ceilings illustrating the history of design in pressed metal, and tiled pilasters were set against the walls. Gradually, the area lost its social function and was used just as a showroom. In the late fifties or very early sixties the whole area was renovated when extensions were added to the administration building. The columns were encased in caneite and a false ceiling of acoustic panels slung below the original ceiling, obscuring it completely. Even the pilasters had been covered. Only the floor was still visible. Thanks to the quick eyes of Peter Lesslie and Csaba Kollanyi of the Government Architects' branch of the Public Works Department, the original showroom was uncovered. Through the acoustic ceiling we could see the ornate pressed metal ceiling, the Art Deco windows, the bronze capitals and the tops of the columns. The exterior of the showroom had been obscured with a display of Wunderlich roofing tiles. When these were removed, the facade was photographed and the terracotta medallions removed, although vandals damaged two soon after.

It then became a matter of taking the showroom to pieces. The columns were removed by artisans from the Public Works Department, not before, unfortunately, three of the bronze capitals were stolen. We were left with the task of removing the windows and ceiling. First, the copper surrounds had to be removed from the windows; it was impossible to unscrew the windows from their frame so the wooden surrounds of each window had to be destroyed to get them out.

Again the ceiling could not be saved in its entirety. Two-thirds of all the panels had been damaged when the acoustic ceiling was hung, and it was decided to get down representative samples of each portion for future reproduction, after detailed drawings and plans had been made. As the panels could not easily be removed from their frame, we had to get into the loft above the ceiling and lower the panels on their frames by rope.

As a follow-up, we are also trying to locate the fittings from the showroom. We have traced the dome which was in one corner, and were given three ornate copper panels that framed an archway. We have also tracked down a bronze and stained glass War Memorial that stood in a small bay to one side.

As we stated earlier, one of our functions was to record and, wherever possible, preserve samples of the pressed metal panels that were everywhere scattered throughout the factory and the administration building. In the main

factory area, we had some difficulty in persuading the demolishers to take care in bringing them down. We were not always successful, and the demolishers ripped down with a crane one area of panels marked for preservation.

As we have been fortunate enough to locate a large number of old catalogues for the pressed metal panels, we will prepare a complete typology of designs which could then be used diagnostically to date certain buildings. At the very least, it could provide a *terminus post quem* if no firmer information was available.

Incidentally, in the early days Wunderlich had several competitors in the pressed metal ceiling field as we discovered from this delightful quote from an 1895 catalogue:

"Everything of sterling merit is subject to imitation and the zinc ceiling is no exception to this universal rule. The success of our works in every colony of the Australasian group has naturally stimulated the parasitic, not to say piratic, habit in the incompetent mimic and the cheap copyist, who have entered the field with plagiarisms of our very designs and who seek to force an entry into the market with common travesties of our original and perfected work. Against these inferior imitators we intend in no wise to compete."

Part of our work at Redfern was to analyse the Marseille tiles which had been imported to Australia in such great numbers by Wunderlichs between 1892 and 1914. Seventy-five million tiles were brought in through this period, enough to roof 40,000 Australian homes. Large areas of the factory were still roofed with these tiles which thus provided a unique opportunity to study them in quantity. We were delighted to discover ten separate types including one that came not from Marseille but from Voghera in Italy, near the port city of Genoa. Each was identified by a characteristic mark:

Cock:	SAUMATI FRERES, Marseille, St. Henri
Horse:	LES FILS DE JULES BONNET, La Viste, Marseille
Bee:	GUICHARD CARVIN ET CIE, Marseille, St. André
Lion:	GUICHARD FRERES, Seon, St. Henri, Marseille
Star:	PIERRE SACOMAN, St. Henri, Marseille
Spade:	PIERRE AMEEDÉ, St. Henri, Marseille
Anchor:	ANTOINE SACOMAN, Usine La Plata, St. Henri, Marseille
Maltese Cross:	ARNAUD ETIENNE ET CIE, St. Henri, Marseille
Turtle:	TUILERIES DE LA MEDITERRANNEE, Siège Social, Marseille
Horned Head: )	
Entwined Anchor:)	GUSTAVO CAVOTTI, Lungavilla, Voghera.

Wunderlichs themselves used a waratah mark on their locally produced tiles.

We titled this paper "The Wunderlich Project, an Exercise in Industrial Archaeology". Industrial archaeology is a relatively new field in Australia and a relatively new concept in archaeology. The Wunderlich site is probably the largest industrial site to have been tackled as an archaeological project and, although we intended to work within the bounds of traditional archaeological theory, we found ourselves constantly formulating new approaches to problems.

There were, for example, few material remains at the site -- the machinery had gone, the records dispersed. The few pieces of machinery of plant remaining were either stripped or in isolation, with nothing of their industrial context evident.

We had to turn elsewhere for our information, and found it in the Wunderlich publications, in the memories of former employees, in old photographs and relevant printed material, acquired through the generosity of former Wunderlich employees and of CSR management.

12 RAGLAN STREET, DARLINGTON.

Damaris Bairstow.

This catalogue was compiled as an undergraduate exercise at a time when little archaeological work on bottle fragments had been published and nothing was available from overseas. Since that time important work has been published. First and foremost is Parks Canada's GLASS GLOSSARY (1985), a definitive work on the classification and cataloguing of glass. Within Australia, Peter Coutts, in his report on Captain Mills Cottage, Port Fairy, Victoria (Victoria Archaeological Survey, 1984, Appendices 3 - 6) produced not only a classification of the bottles recovered but also details for dating bottles from 1840 on.

None the less, the Raglan Street catalogue may still prove useful. The material, mainly black bottle of two sizes (small and large) was deposited, according to the evidence from historic documents and from the bottles themselves, over a short period just prior to 1867. Thus the catalogue may assist in dating similar material.

In terms of social history, these bottles stand as material witness to the validity of those who, in the 1860s, declaimed against the then prevailing habit among underprivileged 'boozers' of creating a public nuisance by carousing all night in any available open allotment.

The material, the subject of the following catalogue, was unearthed by Bob Holmes under a terraced house shortly before its demolition by the University of Sydney. The catalogue was compiled early in 1978 but publication abandoned as better artifacts seemed to be appearing from sites of greater interest. The Raglan Street finds, however, are a homogeneous collection, possibly the result of a single dumping, are limited almost entirely to black bottles and case gins and have a definite ceiling date. As such, they are of considerable interest.

The first mention of Raglan Street in Sands' Directory was in 1867. Eight householders are mentioned, a number neatly commensurate with a terrace of eight houses on the north side of the street between Darlington Road and (former) Alma Street, considered by Mr Holmes the oldest there, of which No.12 is one. The glass fragments were found with but a shallow cover of earth and household dirt beneath the floor boards which were seemingly the original. This gives a terminus ante quem of 1867, a date borne out by the material. One of the two case gin lips is of the bulbous kind common until 1870 but not later.

The following abbreviations have been used:

H. : Height of basal kick.

L. : Height of lip.

M. : Diameter of mouth.

W. : Diameter of base. All measurements are in centimetres.

CATALOGUE OF FINDS.

Glass

Olive

Black Bottles:

These bottles, whilst in the main a homogeneous group, can be subdivided according to their bases, lips and necks as follows :-

Bases:

- Type 1 : 9.0-9.5 cm. base diam.; domed basal kick with central nipple. G1-10; G13-19.
- Type 2 : 8.6-9.3 cm. base diam.; conical basal kick. G11-12; G20-37.
- Type 3 : 7.8-8.0 cm. base diam.; conical basal kick. G38-39.

Lips & Necks:

- Type 1 : Convex in profile; down-tooled neck & string rim. G41-45 & G66-67.
- Type 2 : Convex in profile; bulbous lip over down-tooled string rim. G46-G54.
- Type 3 : Convex in profile; vertical lip over down-tooled string rim. G55-G57, G65, G68.
- Type 4 : Tapered to down-tooled string rim. G58-60.
- Type 5 : Pinched below trailed string rim. G61.
- Type 6 : Convex in profile; vertical lip; no string rim. G63-G64, G69-G70.

Bases

- G.1 W.9.0 Domed basal kick & moulded 'P'.  
H.2.0
- G.2 As above.
- G.3 W.9.0 Domed basal kick with moulded 'P'.  
H.2.4
- G.4 W.9.2 Domed basal kick with moulded 'P'.  
H.2.2

- G.5 W.9.0 Domed basal kick with moulded 'P'.  
H.2.1
- G.6 Fig. 1 W.9.0 Domed basal kick with moulded 'P'.  
H.2.3
- G.7 W.9.0 Domed basal kick with moulded 'P'.  
H.2.2
- G.8 W.9.2 Domed basal kick with moulded 'P'.  
H.2.3

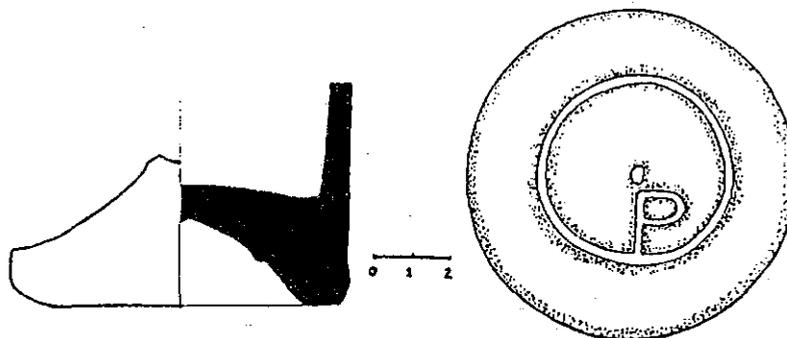


FIG. 1 G6

- G.9 W.9.0 Base fragment. Domed basal kick with moulded 'P'.  
H.2.3
- G.10 Fig. 2 W.9.5 Shallow domed basal kick with moulded 'D'.  
H.1.5

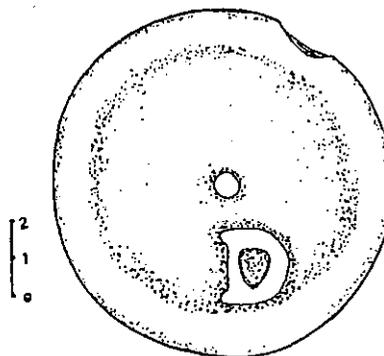


FIG. 2 G10

- G.11 W.9.0 Conical basal kick. Wall transfer-marked  
H.2.8 (Sto)u(t) - se labelled bottles man(ufactured)  
only by J.E. Lampard & Co. Lond(on).
- G.12 Fragment. Conical basal kick. Wall transfer-  
marked S(tou)t - se labelled bottles manufact(ured)  
only by J.E. Lamp(pa)rd & Co. Lon(don).

- G.13 W.9.1 Domed basal kick with irregular mould marks.  
H.2.0
- G.14 W.9.0 Domed basal kick with irregular mould marks.  
H.2.3
- G.15 W.9.0 Shallow domed basal kick.  
H.1.6
- G.16 W.9.0 Slightly ovoid; irregular domed basal kick.  
H.2.0
- G.17 Fig. 3 W.9.0 Slightly ovoid; irregular domed basal kick.  
H.2.0

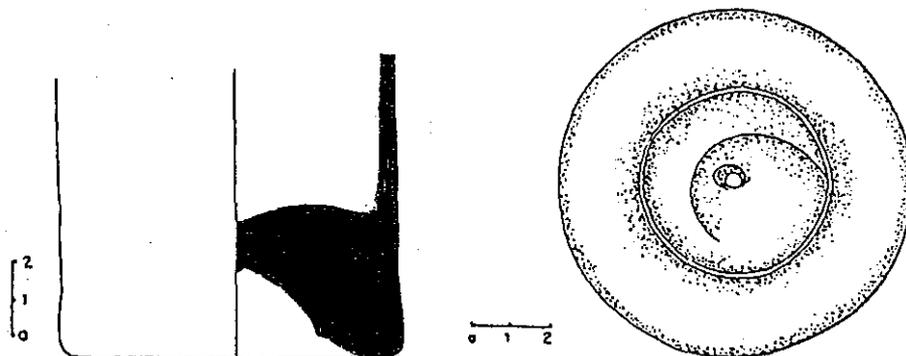


FIG. 3 G17

- G.18 W.9.0 Irregular domed basal kick with nipple in a  
H.2.4 small moulded star.
- G.19 W.9.0 Slightly ovoid; irregular domed basal kick with  
H.1.9 irregular mould marks.
- G.20 W.8.6 Conical basal kick.  
H.2.5
- G.21 W.9.0 Conical basal kick.  
H.2.5
- G.22 As above.
- G.23 W.8.9 Diam. 8.9 cm; conical basal kick without central  
H.2.0 indentation.
- G.24 W.8.9 Fragment. Conical basal kick.  
H.3.1
- G.25 W.8.9 Fragment. Conical basal kick.  
H.2.9
- G.26 W.8.9 Turn moulded. Conical basal kick without central  
H.3.1 indentation.
- G.27 W.8.9 Conical basal kick.  
H.3.1
- G.28 W.9.2 Conical basal kick without central indentation.  
H.3.3
- G.29 W.9.3 Conical basal kick slightly off-centre.  
H.3.7
- G.30 H.3.2 Fragment. Conical basal kick with mould marks.  
Mould mark on wall.

- G.31 W.8.9 Fragment. Conical basal kick.  
H.3.2
- G.32 Conical basal kick.
- G.33 W.8.9 Conical basal kick with mould marks.  
H.3.3
- G.34 Fig. 4 W.9.3 Irregular conical basal kick.  
H.3.2

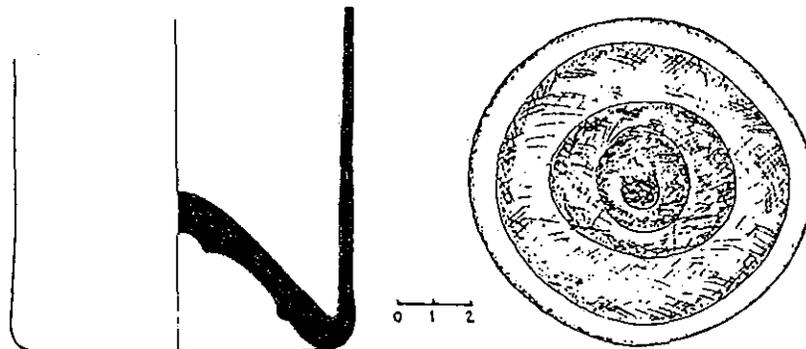


FIG. 4 G34

- G.35 Fig. 5 W.9.0 Conical basal kick without central indentation.  
H.3.0
- G.36 W.8.8 Conical basal kick.  
H.2.8
- G.37 H.2.5 Fragment. Conical basal kick with mould marks.
- G.38 W.7.8 Conical basal kick  
H.3.0 with mould marks.
- G.39 W.8.0 Conical basal kick.  
H.2.5
- G.40 18 assorted fragments.

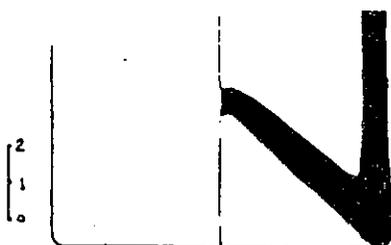


FIG. 5 G35

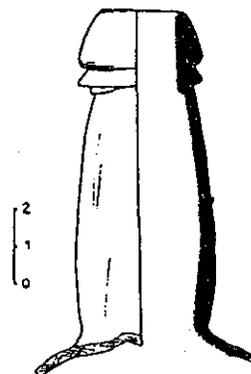


FIG. 6 G41

Necks and lips

G.41 Fig. 6 M.2.2 Neck. Convex in profile. Lip thickened and L.2.0 down-tooled string rim.

G.42 As above.

G.43 Mouth and string rim as above.

G.44 M.2.1 Neck. Slightly convex L.2.3 in profile. Lip thickened and slightly down-tooled over down-tooled string rim.

G.45 M.2.1 Neck. Slightly convex L.2.0 in profile. Lip thickened and down-tooled over down-tooled string rim.

G.46 Fig. 7 M.2.3 Neck. Convex in profile. L.2.3 Lip roughly tickened and bulbous. Down-tooled string rim.

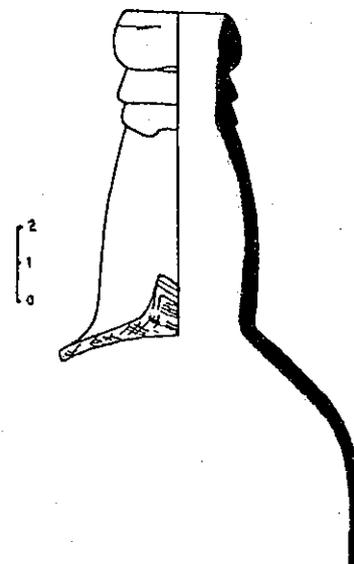


FIG. 7 G46

G.47 M.2.2 Neck. Pinched below string-rim. Lip roughly L.2.3 thickened & bulbous; Down-tooled string rim;

G.48 M.2.1 Neck. Pinched below string rim. Lip thickened & bulbous. Down-tooled string rim.

G.49 M.2.0 Neck. Pinched below string-rim. Lip roughly L.2.4 thickened & bulbous. Down-tooled string rim.

G.50 M.2.0 Neck. Convex in profile. Lip thickened & L.2.3 bulbous. Down-tooled string rim.

G.51 M.2.2 Neck. Pinched below string-rim. Lip roughly L.2.5 thickened & bulbous. Down-tooled string rim.

G.52 M.2.0 Neck. Pinched below string-rim. Lip thickened L.2.3 & bulbous with horizontal striations. Down-tooled string rim.

G.53 Fragment. Otherwise as above.

G.54 As above.

- G.55 Fig. 8 M.2.2 Neck. Convex in profile.  
L.2.3. Vertical lip thickened with horizontal striations. Down-tooled string rim.
- G.56 M.2.2 Neck. Pinched below L.2.1 string rim; roughly applied lip vertical in profile with horizontal striations. Down-tooled string rim.
- G.57 L.2.5 Fragment. Mouth as above. Down-tooled string rim.
- G.58 Fig. 9 M.2.2 Neck. Vertical L.2.2 striations. Tapered to string rim. Down-tooled string rim. Iron wire for cork in position between string rim & lip.
- G.59 Fig. 10 M.2.2 Neck. Some vertical striations. Tapered to L.2.7 string rim. Lip with some horizontal striations. Down-tooled string rim.
- G.60 M.2.2 Neck. Vertical striations. Tapered to string L.2.0 rim. Roughly applied lip with some horizontal striations. Roughly applied, down-tooled string rim.
- G.61 Fig. 11 M.2.2 Neck pinched below string rim. Lip with horizontal L.2.1 striations. Roughly trailed string rim extending beyond lip.
- G.62 Neck fragment. Convex in profile.
- G.63 Fig. 12 M.2.5 Neck. Convex in profile. Vertical sided lip L.1.2 horizontal striations. No string rim.
- G.64 Neck. Tapering to lip. Vertical sided lip with horizontal striations.
- G.65 Fig. 13 M.2.0 Neck. Convex in profile. Some vertical striations L.2.2 and long, vertical bubble. Lip thickened and vertical sided with horizontal striations. Down-tooled string rim.
- G.66 M.2.2 Neck. Vertical striations & bubbles tapered to L.2.0 string rim. Lip slightly down-tooled over down-tooled string rim.
- G.67 M.2.2 Neck. Convex in profile. Lip slightly down-tooled L.2.0 over down-tooled string rim; iron wire in position below string rim; strong shoulder.
- G.68 M.2.2 Neck. Slightly convex in profile tapered to L.2.1 down-tooled string rim. Vertical striations. Lip vertical in profile with some horizontal striations. Iron wire in position between string rim & lip; strong shoulder..

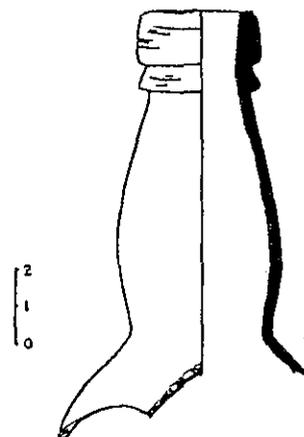


FIG. 8 G55



FIG. 9 G58



FIG. 10 G59



FIG. 11 G61



FIG. 12 G63

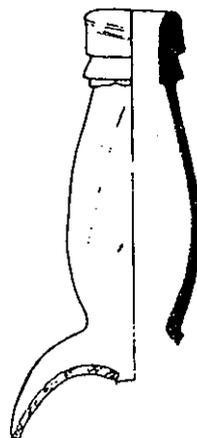


FIG. 13 G65

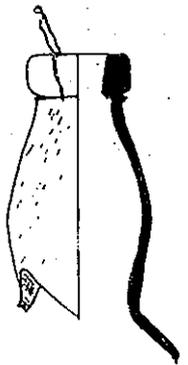


FIG. 14 G69

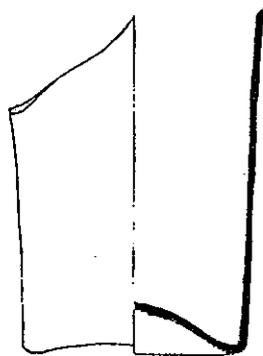


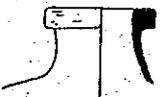
FIG. 15 G85



FIG. 16 G89

0 1 5

FIG. 17 G90



- G.69 Fig.14 M.1.9 Neck. Convex in profile with vertical striations  
L.1.2 & bubbles. Lip heavily thickened in part and  
vertical in section; copper wire in position  
below lip. No string rim.
- G.70 M.2.0 Fragment. Neck tapering to applied lip with  
horizontal striations. Lip vertical in profile.

Assorted Fragments

- G.71 24 lip and neck fragments.
- G.72 60 neck fragments.
- G.73 76 neck and shoulder fragments.
- G.74 271 shoulder fragments.
- G.75 94 shoulder fragments with single mould line.
- G.76 9 shoulder fragments with horizontal & vertical  
mould lines.
- G.77 19 base fragments.
- G.78 100 body fragments (assorted).
- G.79 500 body fragments (assorted) with packet  
miscellaneous tiny fragments.
- G.80 7 shoulder fragments with "sandblasted" line.

Labelled fragments

- G.81 15 fragments from 3-4 bottles Barclay's Stout with  
parts silk screen label.
- G.82 14 fragments amber bottle with part silk screen  
label " - ewans India".
- G.83 Fragment with illegible pink & yellow silk screen  
label.
- G.84 Fragment with illegible pink & white silk screen  
label.

Case Bottles

Bases

- G.85 Fig.15 W.6.8 Base & part body.  
H.1.5
- G.86 W.5.2 Base and part body. Brown metal mottled slightly  
H.0.6 from contact with mould.
- G.87 W.7.1 Base & part body. Shallow indentations in corners  
of base. Heavy metal.
- G.88 Base Fragment.

Necks and Lips

- G.89 Fig.16 M.1.8 Neck rising to roughly applied spreading lip convex in profile.
- G.90 Fig.17 Neck rising to roughly applied spreading lip vertical in profile. Brown metal.

Body fragments

- G.91 Shoulder and part body.
- G.92 Shoulder and part body. Brown metal.
- G.93 Shoulder and part body. Brown metal.
- G.94 8 green shoulder fragments.
- G.95 2 brown shoulder fragments.
- G.96 14 green side corner fragments.
- G.97 2 brown side corner fragments.
- G.98 68 green body fragments.
- G.99 23 brown body fragments.

Brown

See Case gins G.86, G.90, G.92, G.93, G.95, G.97, G.99.

Blue

- G.100 Fig. 18 Base fragment. Round, vertical-sided blue castor oil bottle. Shallow basal kick with central nipple and moulded '51'.

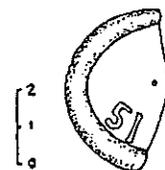


FIG.18 G100

Pottery

- P.1 (Incomplete) Neck & rim of buff glazed stoneware bottle; neck tapered to 'trailed' string rim below vertical lip.

Miscellaneous

- X.1 4 small corks, one impregnated with red material, one stamped 'Lampar(dLo)ndon'.

## A BRIEF ACCOUNT OF THE DEVELOPMENT OF FENCING IN AUSTRALIA DURING THE NINETEENTH CENTURY.

James Semple Kerr.

All early settlement plans and drawings emphasize the significance of fencing in the settled landscape. Its main function was to help protect gardens and cultivation from theft and straying stock. In purely 'urban' areas its purposes were as disparate as simple boundary delineation and the protection of human corpses from rooting swine.

The 1796 plan of Sydney, Norfolk Island, shows a variety of enclosures for allotments and gardens for the 'Governor', (1) officers, overseers and men. In addition, there was an extensive area for swine and an enclosure for cattle. Illustrations contemporary with the early settlement of the Sydneys, both at Norfolk Island and on the mainland, Parramatta, Newcastle and later Adelaide all show post and rail fencing with close set or open pales or pickets as the predominant type. Sophia Campbell's painstaking representations of such fencing at Newcastle (Fig.1) and at Five Islands in the Illawarra area about 1817 are good examples.

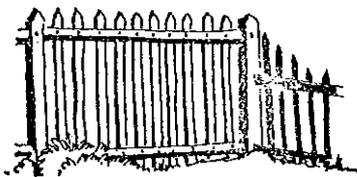


Fig. 1 Detail from Sophia Campbell's sketch book, ca. 1817, of Newcastle, N.S.W.  
A.N.L. Pictorial Section

Such picket or paled fencing remained common for homestead or garden enclosures right

through the nineteenth century, however, it was the post and two, three and four rail fence that became the dominant feature in rural landscapes. Lionel Gilbert mentions (2) that J.W. Lancashire depicted a two-rail fence in 1803 and on November 26, 1814, William Cox recorded in his diary that he was enclosing the famous road down the Mt. York escarpment in the same way (3). A watercolour of 1815 attributed to J.W.Lewin and now in the Mitchell Library, shows it clearly.

About the same time, Macquarie had ordered that cropped or cultivated land be enclosed with 'a good sufficient fence equal to a three rail mortice fence, or one composed of two rails and a ditch' (4). However it was only settlers with substantial resources and establishments such as the Government farm at Emu Plains that were able to comply.

The best account of post and rail fencing was given by James Atkinson in his Account of the State of Agriculture and Grazing in N.S.W. published in London in 1826. It is worth quoting at some length.

Fencing and enclosing land, is the greatest and most important improvement that can be effected upon it; to the acquiring a proper knowledge on this subject the attention of the new Settler should be early and closely devoted, since, without doubt, it is the foundation and basis of every other improvement to be afterwards expected. Enclosing with post and rail fence of split wood, has been brought to a very considerable degree of perfection in this Colony; and is executed

in a style of great neatness and stability. This work is usually performed by free men, who have acquired the knowledge of this branch of rural labour since their arrival in the country; very few common labourers from any part of the kingdom being at all acquainted with it. The prices at which it is generally performed are:

four-railed, 3s and 6d per rod  
three-railed, 2s6d  
and two-railed, 1s9d.

The best woods for the purpose are the blue gum, iron-bark, stringy-bark, and box trees. The tools used in splitting are a cross-cut saw, scoring axe, set of 7 wedges, and two mauls or beetles. In cutting out the mortices, a very singular tool, called a morticing axe, is used; it has a short handle, large eye, head about a foot deep or long, and with an edge about an inch and a half wide; some use them double-headed, shaped like an adze on one side, and an axe on the other, and this perhaps is the best construction. In setting up, a common spade, and a post-hole spade are requisites for digging the holes; and if there are many stones, a small crow-bar or pick-axe will be useful in loosening them; an adze or broad axe are used for trimming and fitting the rails for the mortice.

Posts are cut five feet six inches, and rails nine feet long. The mortices are cut quite through the posts, about four inches long, and two inches wide; the ends of the rails are sometimes placed one over the other in the mortice, and sometimes one by the side of the other; which last is much the neatest plan. The ends are trimmed away so as to overlap each other, and project through the mortice on both sides; two panels are invariably put up to a rod, and the posts are always sunk two feet in the ground, which allows the fence to be three feet six inches high. In enclosing lands

for cultivation, four rails are made use of; the three lower ones being placed pretty close to each other, completely exclude pigs or other small stock. Lands for grazing, are generally enclosed with three rails, but large enclosures intended for horned cattle or horses, and especially where timber is scarce, are frequently enclosed with two rails only.

Atkinson noted that drop (slip) rails are usual and that gates hung on hinges are seldom met with (5), a fact confirmed by Louisa Meredith who described the practice as a universal inconvenience and very tedious (6). Their popularity was due to their cheapness and ease of repair, unlike gates which were difficult to maintain.

Atkinson pointed out that (before 1826) there had been few attempts to grow live fences (hedges) (7).. The main factors were the time needed to establish them, the necessity for regular and skilled maintenance and the fact that the most popular English hedges such as the Whitethorne (Hawthorne) needed careful attention if they were not to become too straggly.

However the large estates, particularly in the colder parts of the colony, did establish fine hedging throughout the nineteenth century. In Tasmania, Gorse, Broom and Hawthorne were introduced and flourished. Sarah Ann Fogg depicted a variety of hedging in her view of Quamby Bluff from Westbury about 1860 (8) and fine hedges survive in the vicinity of Westbury (Gorse) and Hagley and in N.S.W. at Dangarsleigh, (Hawthorne) today. In bleak and exposed areas such as the Western Districts of Victoria, more substantial trees were planted on field boundaries to create windbreaks.

Several exotic hedges left to themselves in a congenial

environment without maintenance became pests and occupied the paddocks they were intended to protect. Gorse, Hawthorne, Privet and Lantana have all got out of hand in areas from Tasmania to Queensland, but the classic case of a live fence out of control is the Prickly Pear.

In 1826 Atkinson knew of no example of dry-stone walling having been erected in the colony(9). However, in subsequent years when settlers or squatters had the resources and stone was easily obtained locally, such walling was erected in a number of areas. Large parts of England have a long tradition of fine stone fencing, and the techniques were imported direct with varying success.

Fences of stone that does not split easily are usually constructed with a pyramid section containing bonding or through stones where available. On completion it looks like this Wensleydale example (Fig.2). Similar erections have survived near Robertson in N.S.W.

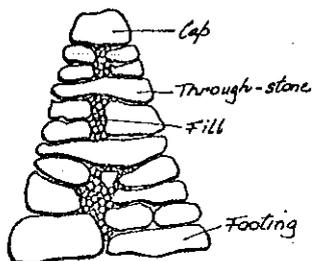


Fig. 2 Section through pyramid shaped dry-stone wall near Aysgarth, Wensleydale, U.K. showing bonding of irregular stones with 'through' stones

Where the stone splits easily along its bed as in this field

fence near Huddersfield, Yorkshire (Fig.3), the fence is given vertical sides with appropriate capping. The coral rock wall at Kingston, Norfolk Island is a fine surviving Australian example (Fig.4).

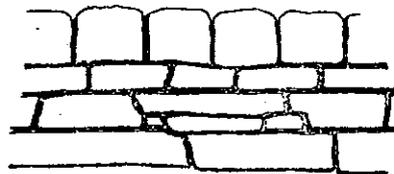


Fig. 3 Part of wall face including capping near Huddersfield, U.K.



Fig. 4 Part of coral rock wall face behind the surgeon's quarters at Kingston, Norfolk Island

Neither type of construction was in widespread use in the colonies and fences of the more intractable materials were often a rough piling of stones in an approximation of a rubble wall construction, often adopted because it was necessary to clear an area of stone to bring it into agricultural production. The tufa walling erected by Scottish artisans on the Stoney Rises north-west of Pirron Yallock in the Western Districts of Victoria were a skillful exception. The better stone fencing later in the century sometimes appears as a result

of ornamental or symbolic requirements for garden or burial ground protection as on the Ryan's property at Galong (NSW) or in the ha-ha at Werribee Park (Vic).

By the 1840s and 50s the combinations and permutations of fencing techniques in the Australian colonies were astonishing and included:

- .all types of morticed post and rail (Figs. 5 and 6)
- .post and rail with picket and pale (Figs. 7 and 8)(some with rails superimposed in the mortice(Fig. 7) but most with rails side by side)

- .clasping posts and log(Fig.11)
- .chock log (Fig.10)
- .zig zag or crinkle crankle (Fig. 9)
- .stakes lashed or clasped (Fig. 12)
- .basket or woven (Fig. 13)

and among many others the ubiquitous and loosely termed 'cockatoo'. Lionel Gilbert quotes Thomas Tourle saying in 1840 'our fencing is what is termed Cockatoo, i.e. trees felled and rolled into line'(10). Mrs. John Mitchell depicted the same technique in her pencil sketches near Lisdillon (Tas.) in the 1850s(11). However the term is also applied by a number of other nineteenth century commentators to a wide range of makeshift fencing made from felled trees or scrub. Mrs. Mitchell's drawings provide a rare and remarkable record of a range of bough, log, brush, felled or deadwood fencing. Unfortunately they are faint and almost impossible to reproduce. As the century progressed 'cockatoo' became an increasingly disparaging appellation and this I suspect reflected something of the attitude of the squatter for the small farmer, selector or 'cockatoo' as he became known

(12). Lack of resources made him the usual creator of such make-shift fencing.

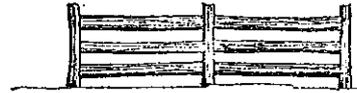


Fig. 5 Morticed post and three rail



Fig. 6 Morticed post and two rail

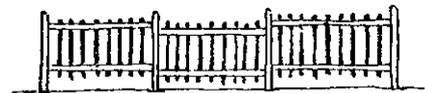


Fig. 7 Sapling picket with rails superimposed in the mortice. Based on Watercolour in C.F.L. Allport's sketchbook c. 1885 (Allport Collec.)



Fig. 8 Post with two rails clad with pales and finished

with top plate. Homestead enclosure, Fysh River, NSW

The fate of cockatoo fencing was destruction by fire and frequently sooner than later. Some members may recall the conflagration of a magnificent cockatoo fence in the original film version of 'On Our Selection'.

The great variety and combination of fencing types arose as much from material shortages and a consequent need to use what was procurable as from a desire to improve the utility and durability of fencing. An article of 1827 in The Australian on the Bathurst area (and attributed by Malcolm Ellis to William Dumaesq) illustrates the point.

'From the great scarcity of timber, fencing is a very expensive improvement, and is only to be seen on the farms of the richest settlers, the want of paddocks is very general - what fences there are are bad, generally made of stringy bark, of a very inferior quality to the tree found nearer the coast, and as for iron bark there is none. What little fencing timber there is, is found on the ridge .....The smaller settlers content themselves with a 2 rail fence, and half the space underneath the lower rail is filled up with turf pared from the most tenacious part of the soil, and makes an excellent fence'. (13)

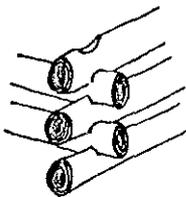


Fig. 9 Construction used for wooden 'zig-zag' fences

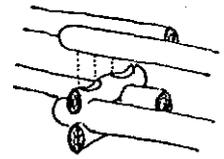


Fig. 10 Construction used for 'chock-log' fences

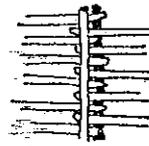


Fig. 11 Construction used for clasping post or stakes. Coolamine Hut stockyards NSW



Fig. 12 Lashed stakes with post and top-rail system for sheepyards, Pyramul, NSW and Jondaryan, QLD.



Fig. 13 Woven fence of split saplings

During the early 1850s squatters were carrying out a variety of experiments. John Learmouth and his neighbour William Lewis of 'Terinallum' in the Western Districts of Victoria erected a boundary fence in which the lowest rail was replaced by a stone dyke(14). At the same time, George Russell, who superintended the Clyde Company's operations in Victoria, wrote to Lewis from Scotland suggesting a turf bank two feet high or upwards with wooden stakes driven into the bank ten feet apart and two wires stapled to the stakes 9" and 1'9" above the bank(15). Both were built. This tradition continues in the Western Districts and may also be seen at Coswell, near Swansea, in Tasmania where rock-pile walls or dykes form the base storey for both post and wire (Fig.14) and modified cockatoo fencing.

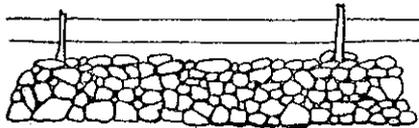


Fig. 14 Stone dyke with post and wire at Cosworth, near Swansea, Tasmania

From 1852 to 1855, the Clyde Company tried a variety of 'iron wire hurdles' from C.D.Young of Edinburgh and a Glasgow firm (16) as well as both iron and wire fencing from a variety of sources (17). Quite large quantities were purchased and improvements evolved. This early wire was mostly soft black bull wire, though at least by 1857 galvanized wire was available (18).

The fencing of sheep properties in the Western Districts was given impetus in 1854 by the outbreak of scab(19). Elsewhere pleuro pneumonia was to impress Riverina cattlemen in the 1860s with the need to isolate their properties from travelling or straying stock, or even to go over to sheep. Changing to sheep usually meant converting existing post and two rail cattle fencing by adding wire.

However, it should be emphasised that until the 1860s, extensive fencing of properties was the exception rather than the rule. The first boundary fence in the Barrabool Hills of Victoria had been erected by Williamson in 1854(20), and fencing gathered momentum after the mid 1850s.

In the Riverina, the change from post and rail for cattle to post and wire for sheep got underway in the 1860s and intensified during the 1870s and 80s. During the period 1861 to 1891, flocks increased from 1 to 13 million(21) and six and seven wire fences became usual.

At the beginning of the period a pastoral layout would probably include the following fencing:

- .paled fence for homestead and vegetable garden
- .post and rail stockyard
- .folds throughout the run for each flock attended by a shepherd - usually of a temporary nature (brush or hurdle) though sometimes of a more permanent wooden construction (fold at Wambo, Warkworth) (Fig.15).

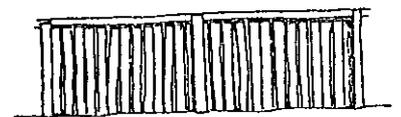


Fig. 15 Sturdy fold fence at

Wambo, NSW, with post and top-rail holding heavy split timber stakes.  
Taken from photograph, plate 4, Cox and Freeland, Rude Timber Buildings, London, T & H, 1969

Fencing would be progressively added to enclose:

- .grass paddocks to conserve feed for summer
- .small horse paddocks to facilitate catching the beasts
- .cultivation paddocks
- .stock paddocks to permit the separation of bulls, stallions and rams to permit selective breeding.

At some stage, a boundary fence would be built.

An important consequence of the completion of boundary fences was the enclosure of stock-routes. By the 1880s this had created intense problems for travelling stock in dry seasons and virtually closed a number of routes(22). The process was accelerated by a requirement under the N.S.W. Crown Lands Act 1884, for selectors to enclose their land with a substantial fence within two years of conditional purchase (23).

By the 1880s, rabbits spreading north from Victoria had crossed the Murray into the western Riverina and by 1886 had reached southern Queensland(24). This resulted in the erection of netting fences. The 1891 Act (NSW) defined as rabbit proof, a 'substantial fence hung with galvanized-iron wire netting of maximum mesh of 1 5/8 inches, minimum width 36 inches, with wire minimum gauge of 17... furnished with suitable gates' (25). On Willurah Station such netting cost £23 per mile and was erected for £45 per mile.

Another development in wire fencing was the introduction of barbed wire during the 1880s. The Tamworth Historical Society

Museum (NSW) has samples of 21 types of barbed wire mostly found in the Tamworth area. An interesting early sample is that called 'Buckthorne' patented in the U.S.A. on July 26, 1881 and found on Bective Station. It is a single wire with a double flange or keel, one of which is set with regular cut-out points. The whole is then twisted and the thorns point every which way. The effect is very much that of an imitation of nature (Fig.16).

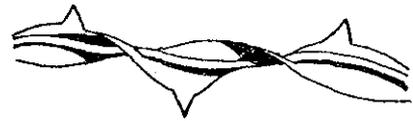


Fig. 16 'Buckthorne' barbed wire, patented in the U.S.A. July 26, 1881, Tamworth Historical Society Museum display

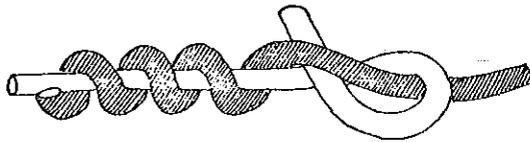
By the turn of the century, the N.S.W. Intelligence Department noted (26) that the following were the most common fences:

- .for cattle - post and barbed wire, though post and two rail was still preferred if timber was available
  - .for sheep - post and six wires, the posts were spread 12 feet and the wires stapled midway on spreaders or battens.
- The Department also noted the continued use of:
- .post, top rail and 4 to 6 wires
  - .post, 2 rail and 2 to 4 wires
  - .cockatoo fencing
  - .chock and log fencing.

On the western slopes and Northern and Southern Tablelands, the wire fences had an optional

cladding of rabbit-proof netting.

The almost complete abandonment of rail fencing and the general use of wire has made fencing a much less dominant feature in the twentieth century landscape. As the new century progressed, slim steel posts, high tensile wire and the use of multiple steel droppers have continued the trend. Older fencing forms are now used for ornamental effect or in some cases to reinforce the historic significance of a remarkably intact property.



The 'bull-wire' knot

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Figs. All figures are sketches prepared by the author from photographs in his collection except where otherwise acknowledged.

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3. Mackaness, Ed., Fourteen Journeys over the Blue Mountains..., Sydney, 1950, p.59
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6. Meredith, L. A., Notes and Sketches of N.S.W..., London, 1844, p.130
7. Atkinson, Agriculture in N.S.W. p.93-4
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18. Clyde Company Papers, Vol. VI p.481
19. Clyde Company Papers, Vol. VI p.21-2.
20. Clyde Company Papers, Vol. IV p.114
21. Buxton, p.246
22. Buxtob, p.250
23. Coghlan, Wealth and Progress of N.S.W., p.200.
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## RECENT MARITIME ARCHAEOLOGICAL INVESTIGATIONS IN N.S.W.

Michael Lorimer.

In the last year, a number of wreck sites have been investigated by the authors under the auspices of the Maritime Archaeological Association of New South Wales. These are part of an ongoing programme of wreck inspection. Two sites have been completed (Alexander Berry and Rose of Australia) and two more are still in progress (Royal Shepherd and Catherine Adamson).

ROYAL SHEPHERD: (wrecked 13th July, 1890)

### History

In 1853 Messrs. Blackwood and Gordon of Paisley on the Clyde in Scotland built two ships for the Launceston and Melbourne Steam Navigation Company for operations in Bass Strait. One of these was the Royal Shepherd (O/No. 31714) and the other, the Black Swan (O/No. 32181).

The Royal Shepherd ran on the Launceston-Melbourne run averaging up to 48 hours. In 1865, the Tasmanian Steam Navigation Company took over the Launceston-Melbourne Steam Navigation Company together with its ships including the Royal Shepherd. Sometime between 1865 and 1876 she was sold to a nine man syndicate trading in the Spencer's Gulf. In 1876 this syndicate became known as the Spencer's Gulf Steamship Company Limited. This Company traded until 15th December, 1882 when it amalgamated with the Adelaide Steamship Company. However, the new Company could not keep all their ships in full employment and at various times in 1884 and 1885 instructed Eldred, a Sydney shipbroker, to sell the Royal Shepherd for £2,800. He was only able to get £800 for her. She was sold to Joseph Mitchell who, on the 29th October, 1885, raised a £901.16.1 mortgage from the Adelaide Steamship Company. This mortgage was discharged on the 11th October, 1886. Prior to this in June, 1886, J. J. Cattnach trading as the Cattnach Chemical Co. bought her and used her for carrying refuse and sewage from Sydney to outside the Heads for dumping. Then, in August, Cattnach took out a £3,000 mortgage from William Alexander Manning who immediately transferred the mortgage to the Mercantile Bank of Sydney. The mortgage lapsed in October, 1889 'due to unfortunate circumstances' as reported in the press<sup>1</sup>, forcing the Mercantile Bank to sell the Royal Shepherd of 31st October to Charles George Warburton. He used her in the coal trade until January, 1890 when she was sold to W. A. Firth. Under this ownership, she was used to bring coal from South Bulli and Bellambi to Sydney<sup>2</sup>.

### The Wrecking

The Royal Shepherd was outbound from Sydney for South Bulli and Bellambi on the on the 13th July, 1886, with the schooner Countess of Errol in tow. Between 11pm and 12 midnight, the crew sighted the steamer Hesketh approaching. Shortly after the Hesketh struck the Royal Shepherd on the port side amidships. The Royal Shepherd began to sink immediately so her crew went aboard the Hesketh while the ships were locked together. Ten minutes later the Royal Shepherd sank<sup>3</sup>.

### Technical Details

s.s. Royal Shepherd

76/1885 Sydney Register  
previously  
1/1865 Port Adelaide

139.9' x 19.8' x 10.5' engine room 31. 6'

Tonnage:-

Underdeck tonnage deck

233.63

Poop

35.64

elongation of poop

61.38

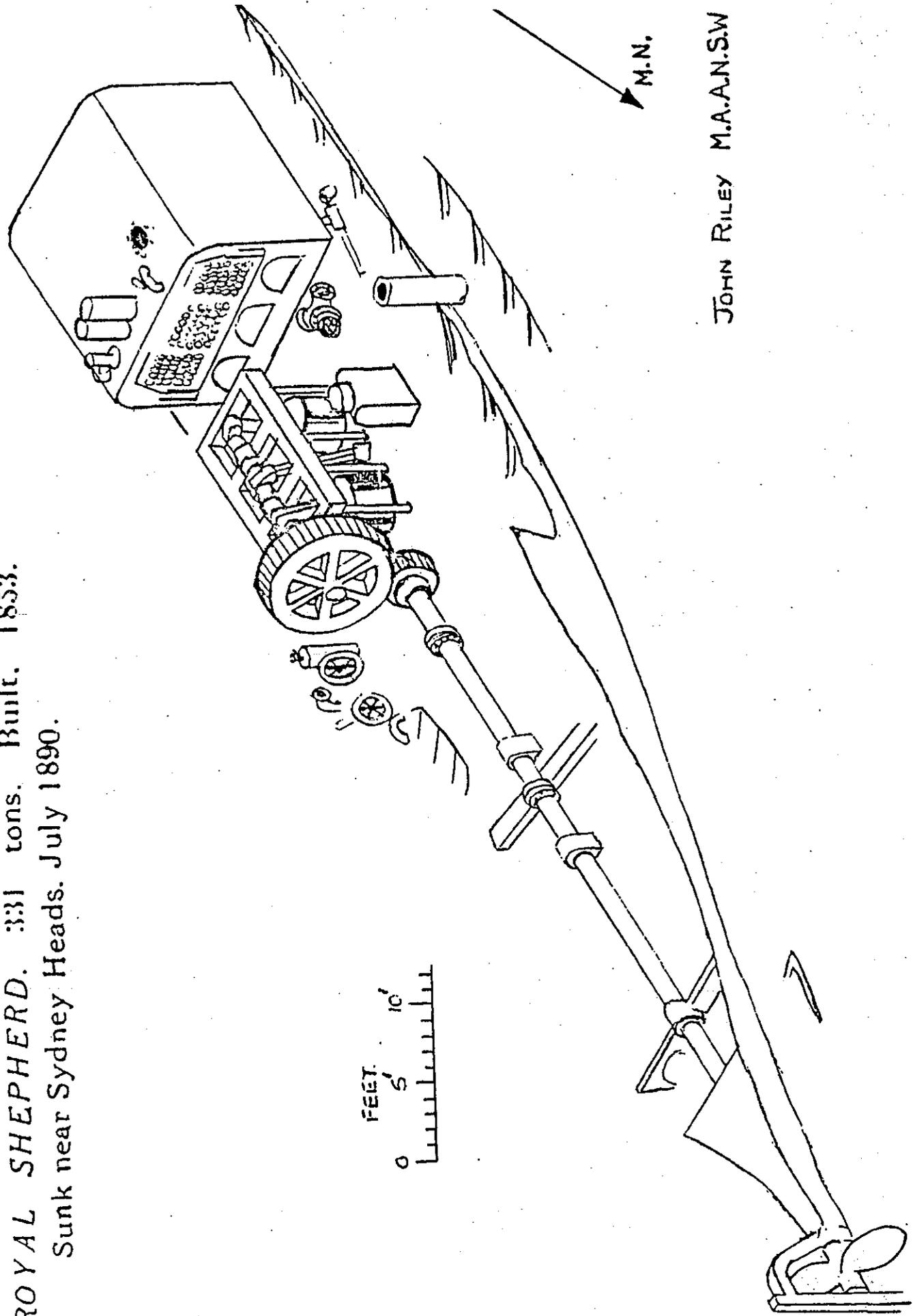
358.61

Deductions (propeller space, and crew)

104.03

226.58

S.S. ROYAL SHEPHERD. 331 tons. Built. 1853.  
Sunk near Sydney Heads. July 1890.



JOHN RILEY M.A.A.N.S.W

Steam Screw built at Paisely, County of Renfrew in 1853 by Blackwood and Gordon.  
1 deck and poop  
2 masts, schooner rigged  
square stern  
iron clench built on iron framework  
female bust head  
two engines oscillating by Blackwood and Gordon  
diameter of cylinders 38' h.p. 60 nominal  
Speed 10 knots on 22 tons (coal) per day  
Could carry up to 50 passengers

#### Significance of Vessel

The Royal Shepherd was a fairly typical small iron coaster of the middle of the 19th century. She reliably served many owners in diverse places and trades for nearly 40 years, descending from passenger and general cargo to tramping, cattle boat and garbage scow. Her last employment was as a collier - a familiar story to aging ships overtaken by technology. She will provide much information on mid-19th century marine engineering which is, as yet, poorly understood as little in the way of plans, diagrams and records have survived, especially of the smaller ships. Little archaeological work has been done on this type of vessel, yet these vessels are almost as poorly documented as the 17th century Dutch sailing vessels.

#### The Site

The site lies in 27 metres of water off South Head Port Jackson, and as such poses a number of technical problems. For reasons of safety, considering that none of our divers are professional divers, we decided not to allow dives which require decompression, so bottom time has been limited to 20 minutes per diver per day. So far only 8 days have been spent diving.

The Royal Shepherd is lying on sand at an almost even keel. The length of the site is 42 metres, however little is visible above the sand. At the south end of the site is a winch which was originally near the bow. Further north and working aft on the wreck is the boiler (box type), then there is a twin oscillating engine with gearing to increase the number of revolutions. The propeller shaft plus propeller are, at times, visible. Around the propeller there are the stern and rudder posts. Remains of the hull can be seen from the stern to the boiler. A small pump and other machinery lie to the port of the engine. A hot well and large steam valve are to starboard.

Our work until now has been concentrated on recording the details of the machinery as these are at risk from divers acquiring souvenirs. It is well known and a popular dive spot. The isometric drawing has been produced from the measurements so far made. Photographic recording is also under way but, due to the wreck's location near the Heads, visibility is usually very poor - often less than one metre<sup>4</sup>. So far, only the oilers and some details of the boiler have been photographed; we are waiting for a good day to produce a photomosaic.

In the near future, a more accurate ground plan will be produced in preparation for the laying of a grid for recording artifacts which are appearing from the sand.

CATHERINE ADAMSON: (wrecked 24th October, 1857)

#### History

She was a ship rigged clipper built in 1855 at Aberdeen for H. Adamson, for use on the Britain-Australia run<sup>5</sup>.

#### Wrecking

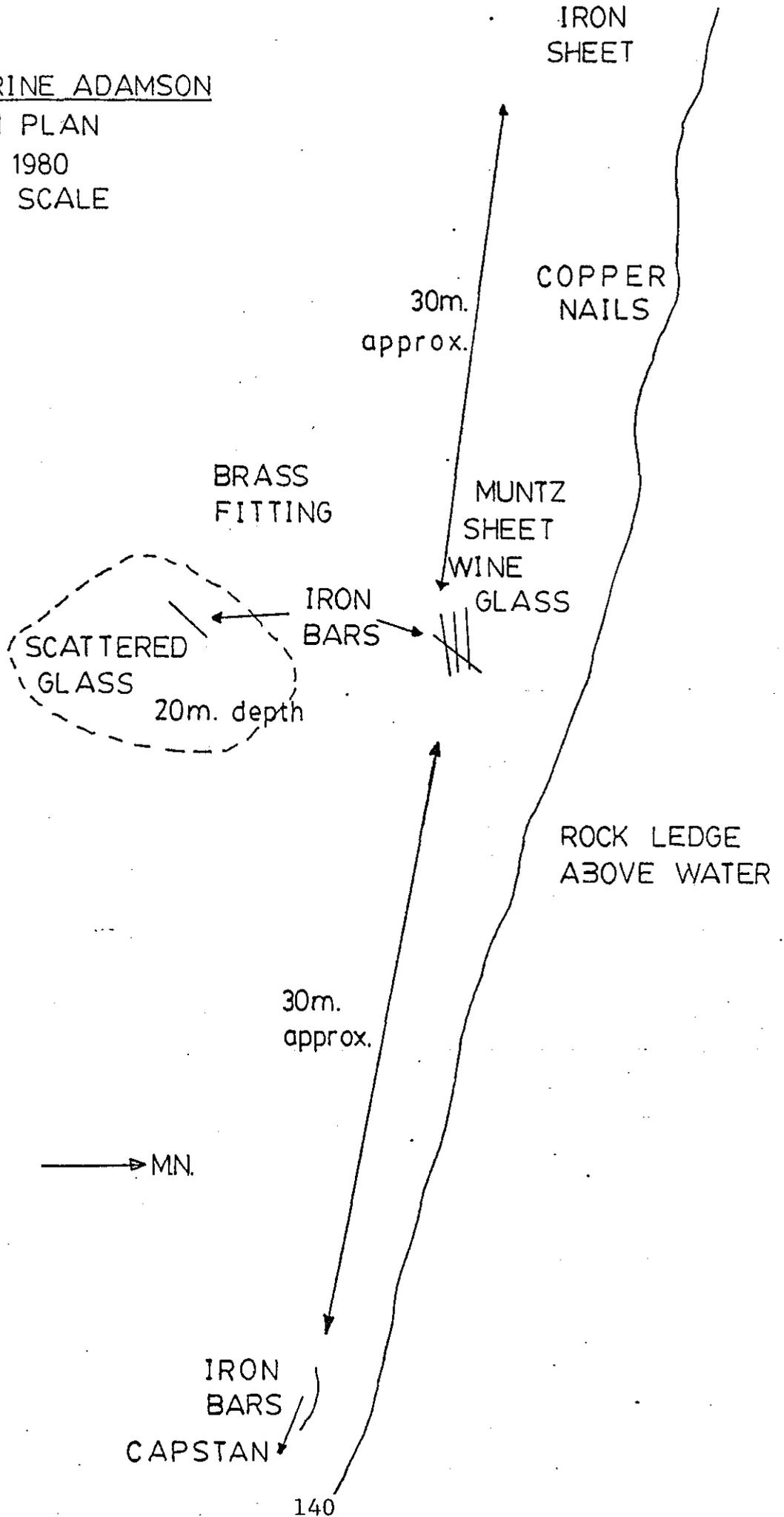
At 9pm on 23rd October, 1857, she entered the Heads of Port Jackson with Pilot Hawkes in control. Due to the strong S.W. breeze she had double reefed topsails, courses jib and spinnaker. She made several tacks across the Heads. But after going about on the port tack was struck by a heavy squall forcing the crew to reef the mainsail and foresail. This tack had her heading for North Harbour. The wind began to moderate forcing the crew to reset the foresail to keep way on,

CATHERINE ADAMSON

SKETCH PLAN

MARCH 1980

NOT TO SCALE



however, in the process the foresheet carried away. It was not possible to set the mainsail so the ship had insufficient steerage and started to drift rapidly to leeward. Both anchors were then dropped, all sails were clewed up and furled. The crew, at this stage, thought the ship was safe. When the steamer Williams under Captain Creagh entered the Heads, the Catherine Adamson burnt blue lights and sent up rockets as signs of distress.

The Williams managed to get a hawser aboard the Catherine Adamson twice but the first broke and the second had to be shipped. About 3am on the 24th heavy rollers began to come from the Heads and the ship's stern swung very close to the rocks. At approximately 3.30am the ship's keel hit the rocks several times. The crew began to transfer passengers to the Williams. The Captain of the Catherine Adamson then went aboard the Williams in the life boat. Immediately after this, the boats were swamped and destroyed, leaving a number of people aboard the Catherine Adamson. She soon went to pieces and 21 lives were lost including passengers and the pilot<sup>6</sup>.

### Salvage

Almost immediately salvaging began on the wreck. The cargo included bales of cottons, woollens, worsteds, flannel, muslins, umbrellas, parasols, hats, counterpanes, clothing, agricultural implements, machinery, 9,876 gallons of rum, 4,376 gallons of brandy, 1,873 gallons of white wine, 74 barrels of bulk beer<sup>7</sup>. Parts of the cargo and the ship were scattered throughout the bays of Port Jackson. A number of people were prosecuted for failing to hand in articles they had found. Divers were quick onto the scene and brawls developed between competing divers, but eventually most of the cargo was salvaged.

She was then forgotten until the mid 1960s when she appeared in the headlines again. Sometime in 1964, two local divers found the wreck and tried to keep its location a secret. Then in May, 1965, Ben Cropp found the wreck and he began to salvage the remains<sup>8</sup>. Since then, the Catherine Adamson has become a popular dive spot among Sydney divers.

### Significance

The Catherine Adamson is an example of the type of ship which maintained the lines of communication of the Colony with the centre of the Empire during the gold rush period. In the 1850s sail still predominated on all international Australian routes. The clippers were the prestige craft of the '50s carrying both passengers and cargo. In the 1850s, the exports of England to Australia quadrupled<sup>9</sup> and the cargo of the Catherine Adamson is typical of the range of goods being imported into New South Wales at the time. This typicality along with its position near to Sydney which meant that it was at risk, decided us to make an inspection to record what had been left after many years of gradual destruction by both sea and man.

### The Site

The site lies in water ranging from 2 metres to 20 metres off the locality known as Old Man's Hat on North Head, Port Jackson. So far only two dives have been made involving approximately 10 divers. The visibility is usually no more than 4 metres with a continual strong surge buffetting the divers. The bottom consists of large boulders with twisting gullies and holes. There is no sign of the hull structure remaining and on the scale Muckelroy developed for wreck sites in British waters, based on topography (% of bottom sedimentary deposits), deposit (range of sediments), slope (average over the whole site), sea horizon (sector of open water for 10+ km.) and fetch (maximum offshore distance),<sup>10</sup> the Catherine Adamson would be a Class 4 site in a scale of 1 to 5. Class 4 is described as more than 10% of bottom being sedimentary deposits; range of sediments being boulders to sand. Slope average being less than 8% (this is not strictly correct in the Catherine Adamson as the slope becomes quite steep at approximately 10 metres), the sea horizon ie. the sector of open water for 10+ km. being more than 30° and the fetch or offshore maximum distance more than 250km.

A sketch plan has been made and is continually being added to as the bottom sediments move. In the conditions prevailing it is practically impossible to make an accurate survey of the area nor is it at present warranted.<sup>11</sup> Artifacts are found in holes, sand catchment areas and in any place where the surge is minimised by the shape of boulders.

The major problem with the site is that, not only the Catherine Adamson was wrecked in the area but that a number of other ships have been wrecked in the general region, for example the Annie, a 470 ton barge on 29th June, 1858; the Emily Horst, a sailing vessel on 12th October, 1861; the William Hill, a 109 ton brig on 28th November, 1865, and the Julia, a 60 ton schooner on 11th August, 1873. None of these wrecks has been located and the possibility exists that part, at least, of their remains are mixed in with those of the Catherine Adamson.

Future work will consist of more mapping, limited artifact recovery and more attempts at photography. Unfortunately, conditions so far have not been conducive to successful photography. The only significant artifact recovered so far is a sheet of Muntz metal. Muntz metal was a patent alloy developed for sheathing wooden hulls to protect them from the various marine organisms, such as toredo, which attack wood. This piece has regular nail/tack holes showing how it was attached to the hull. Lloyd's register for 1856 indicates that the Catherine Adamson was sheathed in yellow metal, i.e. Muntz metal on top of felt. Other artifacts recovered have been wine glass bases, nails and tacks. Significantly, glass is not very common on the site. It is worth quoting a newspaper report of 25th May, 1965, describing what Ben Cropp found when he started diving on this site. 'They swam around the wreck for hours and recovered pewter mugs, coins, a sextant, a cannon, brass bells, cutlery and broken pottery'.<sup>12</sup> After 15 years of diving on the site it is a very different story.

ROSE OF AUSTRALIA: (wrecked 22nd January, 1874)

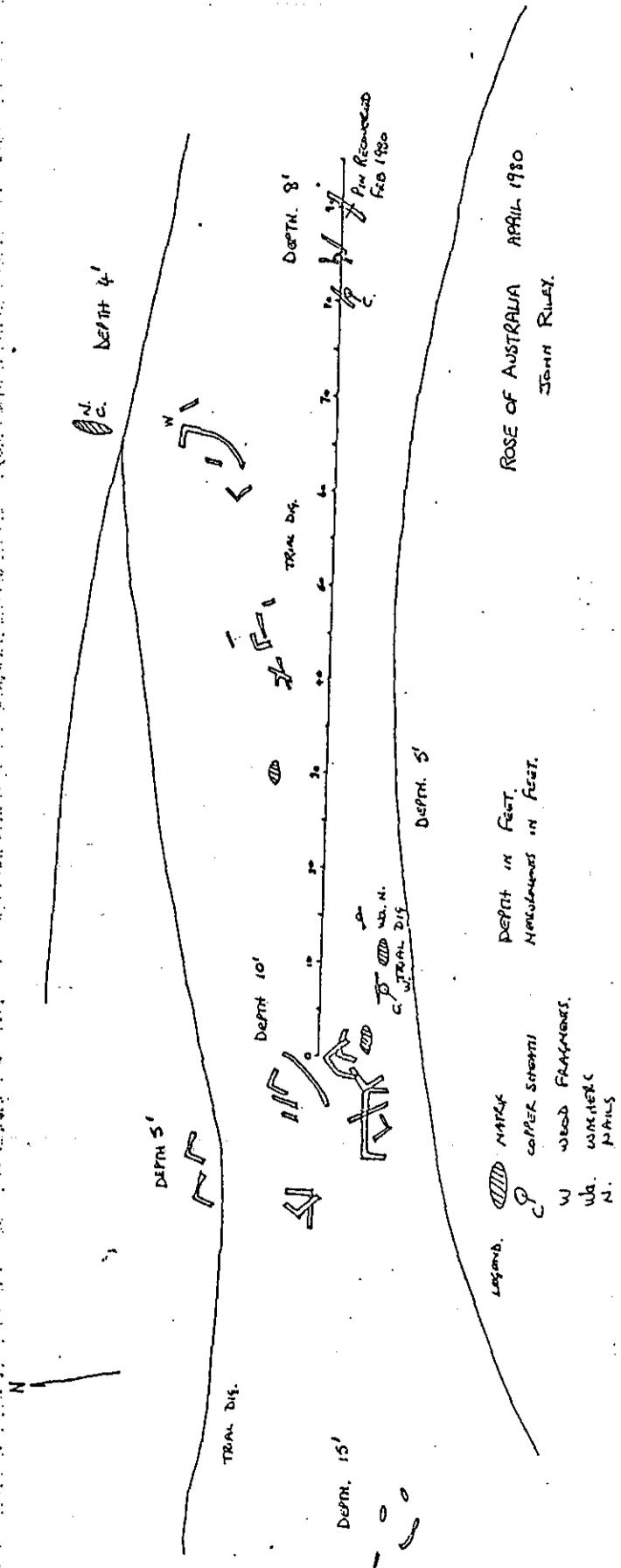
### History

The Rose of Australia was a wooden brig of 261.72 tons 98.9' x 26.2' x 16.2' built at Gateshead, County Durham, England in 1862. She was first registered in Australia in 1864 at Newcastle, N.S.W. when her owner was William O'Hagen, master mariner; in July, 1864 he took as a partner R.R.S. Bowker of Newcastle. Then in June, 1867 William O'Hagen sold 16 of his 32 shares to James Munro. Bowker bought Munro's 16 shares in February, 1868. The final share arrangement was reached in March, 1869 when Charles B. Desborough has 21 shares and R.R.S. Bowker 43.<sup>13</sup> Charles Desborough was the master of the vessel when she was wrecked and a George Desborough (relationship not traced - brother?) was Second Mate. The Rose of Australia made a number of trips between Melbourne, Sydney and Newcastle and prior to the wreck had been to Foo Chow.<sup>14</sup>

### The Wrecking

She was sailing from Melbourne to Sydney in ballast, leaving Melbourne on 15th January, 1874. The last land they saw was, according to the Master, Point Perpendicular. This was on 21st January, 1874. On being asked why they had been wrecked in Wreck Bay some 9 miles south of Point Perpendicular the Second Mate, George Desborough, blamed a particularly strong current which took them south whilst the ship was sailing north at 7 knots.<sup>15</sup>

On the 22nd there was a strong gale from the SSW with short squalls - 'thick dark, rainy weather'.<sup>16</sup> The Second Mate was on watch when the crew reported land ahead but he thought it was cloud. Later he changed his mind and called the Captain who came on deck. Captain Desborough was also not certain whether it was land or cloud and gave the order to wear ship. Unfortunately he picked the wrong tack and almost immediately she went ashore. Erik Olsen was at the helm at the time of wrecking and states that the officers did not know where they were when she went ashore.<sup>17</sup> No one was killed as everyone got ashore by a plank. The vessel was insured for £2,600 with the Sydney Marine Office.<sup>18</sup>



A letter written by the local Sub-Collector of Customs reports that the crew was beginning to salvage gear.<sup>19</sup>

### Significance

The Rose of Australia is typical of the craft which made up the bulk of the coastal fleets which ran between the capital cities of the Australian Colonies. As the history of this vessel shows these craft would also make the occasional run to ports throughout the Pacific. They were the general workhorses of the internal maritime trade of Eastern Australia.

### The Site

In February, 1980 the site was located by the authors using directions from a letter concerned with the Marine Board of Inquiry and information from a local abalone fisherman.

The wreckage lies in a shallow gully beside a small island and is strewn in general East-West direction. Nothing indicating bow or stern has been found but working from the wreck reports it is assumed that the bow is in the east. The gully is rock with a covering of natural stones mixed with small, smooth pebbles used as ballast and shellgrit. Iron knees and other pieces of iron lie over the area. pieces of copper sheath, nails, washers and small fragments of wood and pottery were also found in the sediment overlay.

The absence of fittings, anchors, rudder pintles and gudgeons suggests that the wreck was dismantled after going ashore as it would have been easily accessible in calm weather.

At Easter 1980 a site plan was produced and photographs of all the iron fittings were taken (see diagram). Although the site would classify as Class 2 on Muckelroy's scale from environmental attributes, it is very disappointing from an archaeological point of view. It has clearly been very thoroughly salvaged.

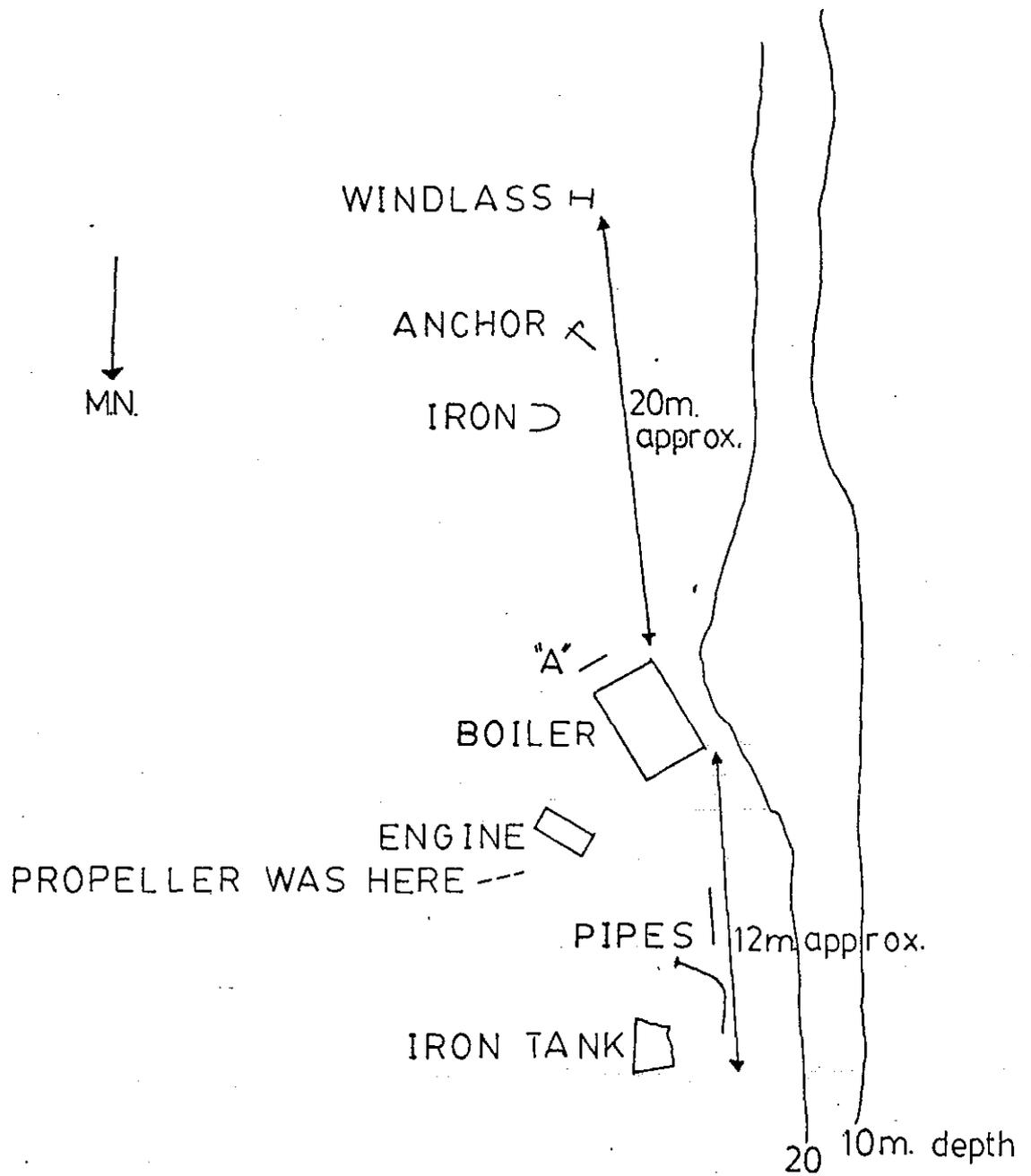
ALEXANDER BERRY: (wrecked 1st June, 1901)

### History

The Alexander Berry (O/No. 69740) was a steam drogher built in 1873 at Pymont by James Bower & Co. for the Illawarra Steam Navigation Company. She was named for a director of the company who had died in 1870. She was 42.36 net tons, 80.6' x 15.4' x 5.2' wood with an elliptic stern, billet head, two masts, schooner rigged. The engines were two direct acting high pressure cylinders with diameters of 9 inches and a stroke of 10 inches with a rating of 20 h.p. James Bower not only fitted the engines but built them.<sup>20</sup> She was used on the Shoalhaven River running from Nowra to Greenwell Point.<sup>21</sup> A late photograph (date unknown) taken at Nowra Wharf shows that she was at some stage cut down from a schooner.<sup>22</sup> It also shows her function very well. The main vessels of the I.S.N. Co. would unload at Nowra either onto the wharf or directly onto the droghers which would then distribute the cargo up the river. They were not intended for coastal work although they would often be forced to make coastal passages from one river to another. She remained in this company's hands right up to her wrecking in 1901. In 1898 she had had some £700 spent on making her seaworthy.<sup>23</sup>

### The Wrecking

She left Shoalhaven on the 30th June, 1901 for Merimbula. Heavy weather forced her to take shelter at Abraham's Bosom about eight miles south of Gerringong. There she anchored but at half past nine the anchor cable parted and the gale drove her out to sea. At midnight the rudder head broke leaving the vessel without steerage. The crew used the booms from the mast in an attempt to steer her by dragging them astern, however this failed. The seas were continually sweeping the vessel, carrying away anything loose. She eventually drifted onto the rocks at the extreme end of Long (or



ALEXANDER BERRY  
SKETCH PLAN  
APRIL 12, 1980  
NOT TO SCALE

Bass) Point. The seas lifted her clean over the rocks and deposited her in a small bay on the other side of the Point where she went to pieces and sank. There were only five men on board, namely Captain Marshall, the engineer Mr A.J. Bartlett, the fireman Mr Walter Pearce and two able seamen Mr John Pratt and Mr John Jansen. Only Mr Pratt survived.<sup>24</sup>

#### The Site

The wreck was discovered by two local divers Mr Ludvic Lieske and Mr Ray Pike. After seeing a poster advertising the Maritime Archaeological Association of N.S.W. they contacted John Riley requesting information as to what they should do with the wreck. So on 12th April 1980 a group of divers from the Association went to Wollongong to investigate the wreck and advise the finders as to correct procedures. The finders had already raised the propeller, stern tube and the bronze shoe of the stern of the keel. The site is lying in 23 metres of water off the North side of Bass Point. The bottom is rock over which there is a continually moving shell grit, sand and pebble sediment. During the four dives made at the site, on only the first was there sufficient exposed to record any details of the engine boiler and winch.

From the sketch plan it is clear that the hull had broken apart before settling on the bottom. It would appear that the vessel struck the rock cliff to the west of the site before being carried over the first rocks she had struck and then broke up scattering the machinery and fittings in a disjointed pattern.

#### The Artifacts

There are a number of significant artifacts, some of which have been raised, others are still in situ. These show the type and standard of machinery fitted to the river droghers. The boiler is oval with a single stoke hole. The engine has twin high pressure cylinders of 9" diameter (note the specifications of the register list 9" cylinders - a good identification feature.) The propeller and stern gland plus shaft is 9.1' long and shows a very rough and ready design typical of the small local engineering workshops. Note in particular the unsophisticated design of the propeller. Also raised was a bronze shoe 3.8' long which fitted around the stern end of the keel. The purpose of this was to protect the propeller blades when the vessel grounded - a frequent occurrence with the river droghers. On a later dive fitting 'A' was raised. This was found on the first inspection dive and was at risk. Its function is provisionally suggested as a pivot shoe for a derrick or crane.

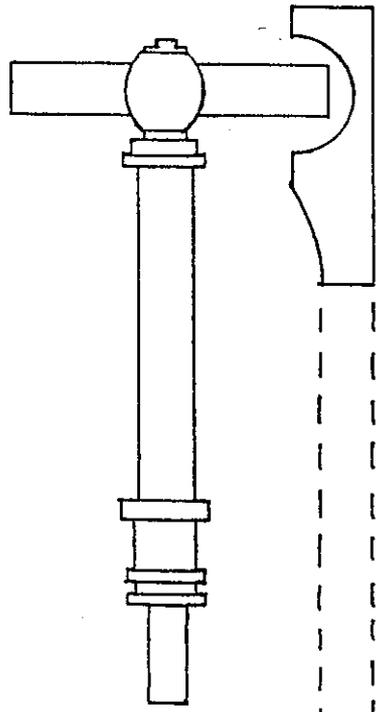
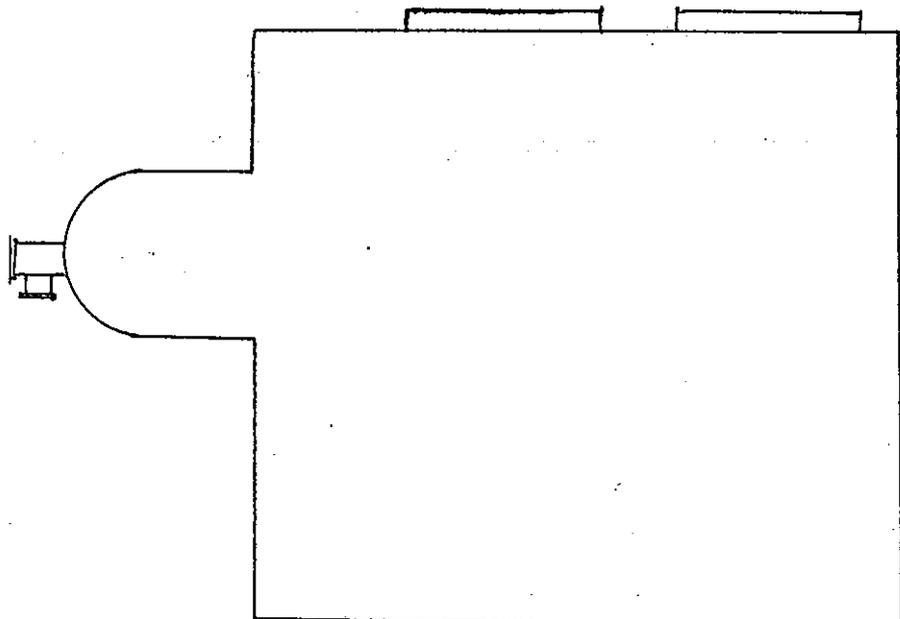
No further work is intended for this site at present. It is quite important as one of the best examples of river droghers machinery known and as such should be protected. Fortunately the finders took a very responsible attitude to this wreck and so prevented an archaeological disaster so common in diving history e.g. the Dunbar.

#### Conclusions

The preceding reports show a large part of the range of material available along the New South Wales coast. The Maritime Archaeological Association intends continuing this programme. Expeditions are planned to the Maitland wrecked at Maitland Bay, the Wauhope II at Port Stephens. It will also respond to any reports of wrecks and requests for advice.

As yet no intact wooden hulls have been inspected but it is anticipated that in the near future two sites will be recorded. These sites show the value of wreck inspection which is the most fruitful area of research for bodies with little or no funding. It also has great value in extending diver's recording skills.

ALEXANDER BERRY  
RECONSTRUCTION  
SCALE: 3/8"=1'



Notes

1. Sydney Morning Herald, 14th July, 1890.
2. History based on M. Page, Fitted for the Voyage, D. Gregory, Steamships Past and Present, Register of British Shipping at Sydney, Folio 76/1885. Sydney Morning Herald, 14th July, 1890.
3. Sydney Morning Herald, 14th July, 1890.
4. Being a non-funded body we are not able to afford the expensive underwater photographic equipment which would allow us to work in these conditions, e.g. a Nikonos with a 15mm uw-Nikkor lens, the cost of which is approximately \$2,000 a unit.
5. Lloyd's Register of British and Foreign Shipping, 1856.
6. Sydney Morning Herald, 26th October, 1857, 28th October, 1857, 30th October, 1857 and 4th November, 1857.
7. Daily Mirror, 24th May, 1965, Australian, 25th May, 1965.
8. Ibid.
9. J.S. Bach, A Maritime History of Australia, p. 94. A.G.L. Shaw, The Economic Development of Australia, p. 78.
10. K. Muckelroy, Maritime Archaeology, p. 164.
11. P. Baker & G. Henderson, 'James Matthew Excavation', International Journal of Nautical Archaeology, 1979, Vol. 8:3, p. 229, for discussion on the degree of accuracy required.
12. The Australian, 25th May, 1965.
13. Register of British Shipping at Newcastle, Folio 7/1864.
14. Sydney Morning Herald, 24th January, 1874.
15. Court of Marine Inquiry, Evidence of George Desborough, 1874.
16. Court of Marine Inquiry, Evidence of Captain G.B. Desborough, 1874.
17. Court of Marine Inquiry, Evidence of Erik Olsen, 1874.
18. Desborough, op. cit.
19. Letter of Sub-Collector of Customs, Shoalhaven to the Collector of Customs, Sydney, dated 26th January, 1874.
20. Register of British Shipping at Sydney, Folio 6/1874.
21. Illawarra Mercury, 11th July, 1901.
22. Held by Nowra Historical Museum.
23. Illawarra Mercury, 11th July, 1901.
24. Ibid. 4th July, 1901.  
Kiama Independent, 2nd July, 1901.

RECORDING OF ENGINEERING AND INDUSTRIAL HERITAGE SITES,  
ADAPTED FROM FIELD INSTRUCTIONS OF THE HISTORIC AMERICAN  
ENGINEERING RECORD (HAER).

D.A.Cumming.

1.0 Introduction

The essential aim of the work is to document important engineering and industrial sites and structures effectively. It is done by a team which normally consists of an engineer, a historian, and an architect who possess different backgrounds, interests and expertise. The work will only be successful when their skills are applied to the task so that each complements the others; cooperation and sharing information is essential if success is to be achieved. On arrival at the site, the team will often encounter a number of mysteries or puzzles: the function of a particular structure or artifact may not be easily recognized. It may not be known why it is there, when it was made, or what it did. Alternatively a missing object may be the mystery, what fitted into the empty room, or on to the remains of a foundation. What was there? What did it do? Unknowns must not be ignored; they are often very important.

The process of recording a site has much in common with good practice in acquisition and preserving objects for a museum. Artifacts are three dimensional objects which after proper examination can tell us much about the people who made or used them; they can tell us how people spent their time, performed tasks, earned their living, used materials, and shaped and worked the finished articles.

Occasionally sites can be preserved by a current compatible and sympathetic use, sometimes as a museum, occasionally as ruins. Most will probably be completely destroyed and their information lost unless they have been adequately recorded; this is in many ways, the functional equivalent of physical protection. Reports, photographs and drawings, like artifacts in a museum, store information on past human behaviour.

Provided the right questions are asked and answered; documentation has some advantages over physical preservation: the site and its function can be explained; documents are the results and summary of research. They have definite limitations; texture, heat light, colour and sounds are hard to record on paper.

1.1 Documenting technological sites and structures

There is no set formula for each site differs and requires its own specific treatment. The basic questions are usually:-

What was there?  
Why was it there?  
How did it work?  
Why did it take the shape it did?  
Who did the work?  
How did the site change through time?

Finding answers requires good detective work: the following advice is usually helpful when time is short:-

- (i) Decide on the questions which seem most applicable; establish an historical point of view; develop a strategy or plan of attack.
- (ii) There are often a number of sources of data: but start with the site itself. What questions does it raise? Then examine manuscripts, published materials, historic graphics and knowledgeable local people

who worked on or at the site.

- (iii) Adapt to the available data: if information in one area is scarce, turn to another.
- (iv) Record information by the best means available; recognizing that written reports, drawings and photographs have both strengths and weaknesses. A written report explains best why a site was chosen, a drawing describes more precisely its situation: photographs show clearly durability, texture and workmanship. In general historians (and engineers) should use graphics extensively; architects should use script as well as lines on their drawings.
- (v) The report concerns a particular site; it must at all times feature in the foreground: regional or national developments may be relevant, but are essentially background supporting material.

### 1.2 Analysis and description of location

A site, situated on property with real boundaries, may be analysed in terms of:-

- (i) Topography
- (ii) Geology including foundation problems
- (iii) Climate
- (iv) Resources including minerals, building materials and supplies of water, power, fuel etc.
- (v) Natural or man-made barriers
- (vi) Transportation systems
- (vii) Utilities such as water, electricity, drainage
- (viii) Land values
- (ix) Markets and capital
- (x) Labor
- (xi) Zoning ordinances, regulations, taxes
- (xii) Community and business services

### 1.3 Analyses of contents

A site may contain one or many structures; some may already have been demolished; some may be important because of what they are, or what they did, because of rarity or alternatively because they are typical examples of a once common structure. Their importance may be in who built it, used it, or what it looks like. Significant questions include:

- What is it?
- What was its function?
- When was it built, manufactured, destroyed?
- Who designed it, engineered it, built it?
- How much did it cost?
- Of what materials was it made and why?
- How was it made?
- How did its form relate to its function?
- What machinery or process did it house?
- How many people worked on it or in it?
- What products were made?
- What processes were carried out?
- How long did it remain in service?
- Is it rare or unusual?
- Is it typical of an important but now scarce type?
- Is it associated with significant individuals, inventions or events?

How much did the individual item contribute to the economics or technology of the site, structure or process.

#### 1.4 Analysis of a work place

Some of the questions to be asked are:

What machines or tools are or were present in the structure?  
Who manufactured the equipment and when?  
How much skill was required to operate the machinery?  
What was the source of power for the machinery?  
How was this power transmitted through the site or buildings?  
What tasks were performed?  
What were the products?  
What materials and resources were used?  
How were they processed or shaped?  
What were the working conditions, e.g. heat, light, ventilation, fire prevention, air pollution, noise?  
What was the size of the labour force?  
What different occupations and trades were involved?  
Where did the labour force come from?  
What was their composition ethnically or by sex and age?  
Were children employed?  
Was the labour force exploited?  
Was the venture profitable?  
How were the profits and rewards distributed or shared?  
Whenever a site is complex and an assemblage of work-places, investigate their inter-relations and inter-dependencies.

#### 1.5 Temporal and Technological Changes

The site, especially when used for a long time, will have survived many changes, and much wear and tear. An enterprise may be successful for a time, it grows, changes its machinery and processes. Competition forces it to change.

Not all changes are equally important; select the most important which are generally;

the initial development  
the zenith of its development  
the final period of collapse.

Look for changes in ownership or internal organisation, the arrival of innovative people, changes in the local and national economy, changes in markets, the growth or decay of competitors, fires, explosions, strikes. Try to find out -- who instigated or resisted changes and why? Did the changes come from inside or outside? What new machinery or processes were required?

#### 1.6 Impacts

A site was often part of a larger community; What effects did the site have on this community? Did the goods or services provided have regional or national significance? Were new products or technologies developed at the site and subsequently adopted by others? What effect did the site have on the environment and "quality of life", locally and regionally?

#### 1.7 Intangibles

Human actions are not always logical and rational: cultural values and

personal quirks can be significant: these should be considered and evaluated where possible.

#### 1.8 Conclusion

These areas of enquiry do not constitute a formula for evaluating sites. Use this list to generate an appropriate strategy for the particular site and set of resource materials under consideration.

## IDENTIFYING BOTTLES.

David Hutchison.

### Introduction

About 8 years ago, when plagued by numerous inquiries about the dating of bottles, I devised a "provisional field guide" based on a number of references (at that time principally American), some personal observation of bottles recovered from sites in W.A., and on information derived from correspondence with several people, Ivor Noel Hume of Colonial Williamsburg particularly.

The resulting key has proved useful as far as it goes. It could be improved by providing much more detail which I have not had time nor opportunity to do.

This key must, of course, be used only to obtain a first approximation to a date. We still know too little about the dates of adoption of new technologies in different factories and in different countries. A new technological development might have been adopted much earlier in America, say, than in Australia - or much earlier in one American factory than in another. There is no substitute for a critical analysis of an assemblage of artefacts from a particular site.

REFERENCES: Derry, T.K. and Williams, T.L. A Short History of Technology (Oxford U.P.)  
Kendrick, Grace, The Mouth-Blown Bottle  
(Pub. by the author, U.S.A.)  
Wyatt, Victor, From Sand-core to Automation  
(Glass Manufacturers' Federation, England)

### General Notes

Free-blown bottles were first produced about 2,000 years ago. At first they were 'free-blown' but were later mouth-blown in moulds. In 1903 the first successful machinery for blowing bottles was manufactured. Free-blown bottles are still used for special uses or for aesthetic purposes.

After about 1917 machinery became almost universal in bottle manufacture.

Free-blown bottles were most common until the mid 1850's. Moulded bottles were reintroduced about 1800. (There were some moulded bottles quite early but moulding was not used much between then and 1800).

### Ingredients

Sand - ideally 99.9% pure silica.

Flux - to enable melting of the sand at a lower temperature (about 2000°F).

Two fluxes are used principally:

. potash - which causes the glass to be more difficult to blow,  
. soda - which produces a softer glass.

Lime - to stabilize the glass. A sand/soda glass is unstable and tends to dissolve. ("Soda-lime" glass now forms about 90% of total production).

Cullet - about one - to three-quarters of a mix would be old glass.

Crystal glass - made of refined ingredients with about 25% to 50% lead oxide.

## Colouring

Colour depends upon the amount of metallic oxide present, the temperature of the melt and upon reheating at certain stages of manufacture. Glass tends to be green to blue because of iron impurities. Colourless glass is bleached by adding manganese or selenium. Too much oxide gives a 'black' glass. A cheap 'black' glass was made by adding iron filings.

[See 'colour change' in the following key.]

Colour	Oxide of the following metal used
. Blue	cobalt or copper
. Yellow	chromium, sulphur, silver, charred horn
. Purple or brown	nickel
. 'opal' ('milk')	tin, zinc
. Ruby red	gold (metal)
. Red	copper
. Emerald	copper or iron filings
. Purple (or colourless)	manganese
. Yellow, pink (or colourless)	selenium
. Common brown	carbon
. 'Prismatic surface'	reheating when copper present
. Surface colour similar to oil slick on water	probably due to thin film of glass on surface being dissolved on exposure.

## THE KEY

### PRINCIPAL HEADINGS:

(A) Surface	(B) Shape	(C) Seams
(D) Lip and Stopper	(E) 'Kick up'	(F) Lettering
(G) Pontil marks	(H) Colour changes	(I) Seals
(J) Vent marks	(K) Some defects	(L) Fruit jars.

### (A) Surface

A.1 - a very smooth surface without seams.

A.1.1 Free-blown bottle: no seams, lack of exact symmetry, high lustre surface  
- most common until c.1850's.

A.1.2 Turn-moulded: (bottle turned in mould to obliterate seams). no seams, smooth surface, but more precise symmetry. May be rings due to impurities or imperfections of mould during turning. These can be seen by looking along surface of the bottle.  
- mainly just before or just after 1900.

A.2 - Seams present:

a moulded bottle  
- after c.1800 (see C)

A.3 - Whittle marks:

('hammered appearance' of surface produced when iron mould is cold. Tended to occur in first

- A.3 bottles produced in a day. In later years all iron moulds were pre-heated)  
- iron mould, after c.1860.

(some bottles are given artificial whittle marks, but experience may help to detect this)

- N.B. Condition of surface is not a reliable indicator of age, although it helps. A bottle in dry conditions, if sheltered from sand-blast, will keep a shiny surface far longer than one in moist conditions. Experienced observers may use surface erosion as another indicator of age.

(B) Shape

(principally refers to general evolution of shape of cylindrical bottle, with two special shapes)

B.1 Evolution of cylindrical bottle:

- B.1.1 longer neck  
- before about 1675.
- B.1.2 neck shortened, shoulder more angular  
- c.1675/1680.
- B.1.3 neck shortened further, body more dome-shaped, 'kick up' wider and higher. Body rather tapered.  
- c.1680-1715.
- B.1.4 cylindrical bottle similar to modern port bottle - body sides nearly vertical  
- c.1750.

B.2 Free moulded bottles in general:

A blown bottle tends to be spherical unless moulded. Flat bottoms and sides may be formed by placing on 'marver' (flat plate) or by shaping with paddle-like tools, or by slapping down on marver.  
- most common before c.1800.

B.3 Special wine bottles:

- B.3.1 slender green moselle
- B.3.2 slender amber hock
- B.3.3 pot-bellied burgundy
- B.3.4 'robust' champagne  
- c.1800 (U.K.) a bit earlier on Continent'

B.4 Egg-shaped aerated water bottles:

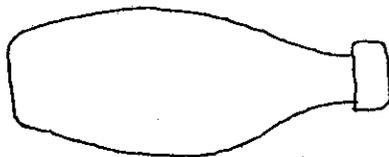
(early aerated water bottles were corked and the bottle had to lie on side to keep cork moist and prevent loss of gas, hence rounded bottom)

- B.4.1 Original egg-shape



- later 19th C. to c.1907.

- B.4.2 Flat bottom egg-shape .  
(with introduction of crown-seal bottle could stand up, partly egg-shape preserved for tradition)



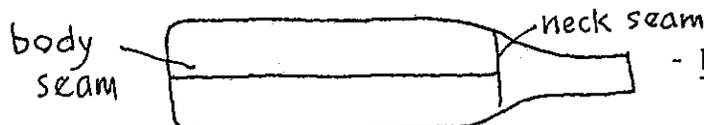
- c.1907 to c.1919.

(C) Seams

General: Moulds became common after c.1800. Mainly wooden moulds were used until c.1860. Principally iron moulds after c.1880. Experience may help to detect surface differences and general appearance of seams. Seams of iron moulded bottles tend to be finer than for wooden and become finer still as better iron moulds are produced.

C.1 Seam on body, not on neck:

- C.1.1 2 piece mould for body and shoulders, neck and lip drawn out and formed by hand.

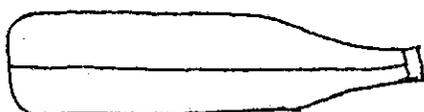


- before c.1860.

- C.1.2 later bottles have higher neck-seams.

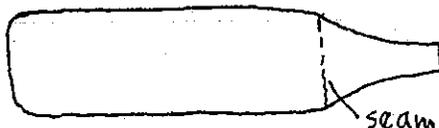
- after c.1860.

- C.1.3 neck seam only about 3mm below crest.



- c.1900.

- C.2 No seam on body, neck formed separately.  
(some bottles were formed with a one piece mould for the body, with neck moulded separately)



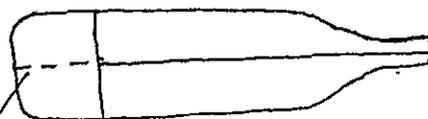
- early 19th C.

C.3 Seam continuous to crest of lip:

- 2 piece mould, machine made bottle - 1903 or later.



C.4 Three piece mould:



- mid 1800's.

Sometimes seam on bottom part (4-piece mould)

(D) Lip ("Finish") & Stopper

The lip was formed last with a mouth-blown bottle, hence the term "finish" - which is still used although the lip is formed first on a modern bottle. From c.1600 to c.1870 bottles were mostly corked.

D.1 Sheared or rolled lip:

(Lip cut off with shears and smoothed by tool or melting, or lip rolled back causing bulge on inside or outside)

- before c.1840.

D.2 Laid-on ring:

(introduced for effervescent liquids to enable wiring on of cork)

thread of glass laid on a round neck about 6mm from crest

- after 1840.

Note: In c.1850 a 'lipping tool' was introduced to form the lip. This may leave scratches and/or rings circumscribing the neck near the lip.

D.3 Codd's glass marble stopper:

- 1873 and later.

D.4 Rubber gasket inside bottle controlled by wire loop through neck: (Hutchinson's patent)

- c.1873 and later.

D.5 'Lightning' stopper:

rubber or porcelain plug clamped down or released with click of wire bale

- mid 1880's to c.1920.

D.6 Crown seal:

- 1892 and since

(-not general in Australian manufacture until c.1907)

D.7 Inside screw closure:

(especially whiskey bottles and English pottery bottles)

- c.1900.

D.8 Outside screw closure:

(used earlier on 'specialty bottles' such as reusable whiskey flasks but not common until thread standardised in 1920)

- c.1920 and since.

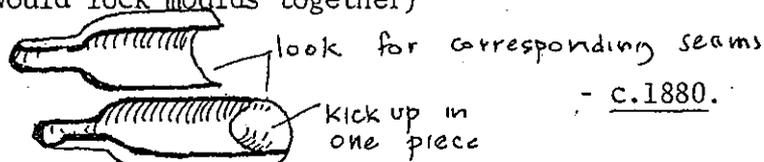
(E) 'Kick Up' (Concave base)

E.1 Very exaggerated:



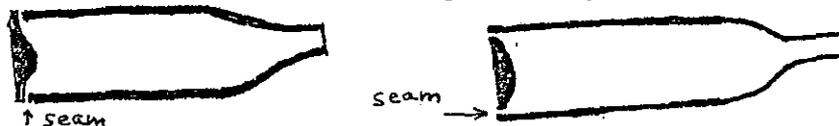
- 18th C. & early 19th C.

E.2 Moulded kick-up:  
(Conventional 2 piece mould could not be used as kick-up would lock moulds together)



- c.1880.

E.3 Separate base-plate and 2 piece body mould:



(F) Lettering

F.1 Principally introduced after 1860 with iron moulds, but could occur on bottles before this. Does it appear moulded, if so

- after c.1860  
(roughly)

F.2 Slug plates:

introduced in late 19th C. These were thin metal sheets with embossed lettering which fitted into a sunken panel in the mould. Plates could be changed to use the same mould for different customers' bottles. (A seam might show around edge of panel).

- late 19th C.

F.3 Lettering on bases:

F.3.1 1 or 2 digit number. Cavity number. A sequence of moulds of same design.

F.3.2 3, 4 or 5 digit number, with perhaps 1 or 2 letters. Mould design number.

F.3.3 Symbol, monogram, few letters. Trademark.

F.3.4 Word. Name of product or customer.

(G) Pontil Marks (or Scars)

(these appear on the centre of the base of the bottle)

G.1 Pontil mark:

rough ring or disc. Made when bottle held by 'pontil' during forming of lip. All bottles before 1860 with few exceptions. Most of exceptions would have a cold finished lip in which case grinding should be obvious.

- generally before 1860

G.2 Improved pontil mark:

round or squarish. May appear to be ground in. Partly or wholly metallic surface.

- after 1840

G.3 No pontil mark:

if a mouth-blown bottle

- c.1860 to c.1903

(H) Colour Change

H.1 Manganese used to produce clear glass. Very apt to 'solarize' to amethyst colour.

- c.1890-c.1916

H.2 Selenium became most popular 'discolourizer'. May also change to a 'ripened wheat' or 'honey' colour.

- after c.1916

NOTE: Clear glass containing Manganese may be coloured more quickly by exposure to more intense ultraviolet radiation. Glass may also be dyed. If dyed scratching will show that colour is only near surface.

(I) Seals

commonly on shoulder, often with lettering or mark.

- introduced c.1650

(J) Vent Marks

As iron moulds improved the complete neck and lip were formed with the body mould. Moulds were also locked together more securely. Air could not escape from between glass and mould so small vent holes were drilled - usually in shoulders or base. They left a pinhead size pointed mound of glass, usually placed where they might appear decorative. E.g. - quite common on whiskey bottles at shoulders in c.1900. Now often incorporated in raised lettering or drilled within joints and not noticeable.

If vent marks are detectable - probably later 19th C. to early 20th C.

(K) Defects

(just a few more obvious ones. These are not much use in identification).

- . Stones: fragments broken off when poor clay used in melting pots. Wrinkles in glass may cause 'tails' or 'insects'.
- . Seeds: myriad small bubbles formed if mix fired too slowly.
- . Cloudy or bubbly glass: usually cheap bottles due to 'gall' not being removed from surface of melt.

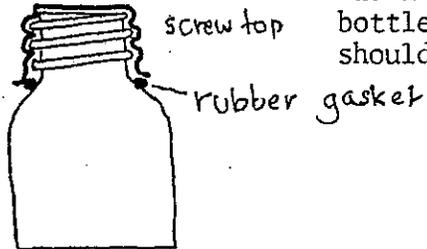
(L) Fruit Jars

L.1 Wide mouth bottles:

- before c.1850

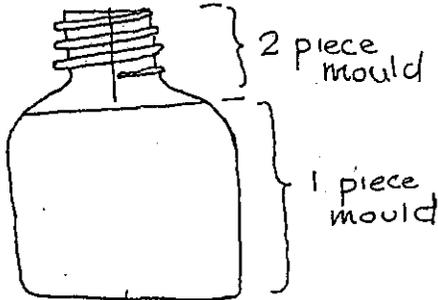
L.2 Mason screw topped fruit jar:

(John L. Mason. Body mould included threaded mouth - which did not appear until later on necked bottles. Rubber gasket for sealing at shoulder).



- c.1858 and since

L.3 Jars made by 'press and blow' machine



- c.1882 and since

## NOTES ON THE EARLY HISTORY OF SMELTING COPPER ORES IN SOUTH AUSTRALIA.

D. A. Cumming.

By the end of 1845 about 900 tons of copper ore had been carried to Port Adelaide and exported to Swansea in Wales where it brought about twenty pounds per ton. It was obvious that much higher prices could be obtained if the ore was smelted to copper before export and the consequent cost, which was on a per ton basis, of shipment to England reduced.

Many people, including Edward Davy, physician, chemist and journalist who had earlier invented a telegraphic relay, experimented with smelting copper ores at Port Adelaide using charcoal (Blainey 1963, 110). Penney and Owen arranged a private act of the Legislative Council to safeguard their rights to one smelting process (Linge 1979, 144). The Burra company engaged Germans to build them a smelter, but abandoned the venture.

Late in 1847 the brothers Thomas who had previously operated a smelter in Chile, established the Bremer smelting works which started operations in August 1848 (S.An. 26/8/48) using charcoal and poor quality ores.

In 1848 Penney and Owen erected a smelter at Apoinga 25 miles north of Kapunda to smelt ore from the Burra mine: the first metal reached Adelaide in 1849. The proprietors of the Kapunda mine set up a smelter which started production in December of the same year.

The Adelaide Smelting Company which was formed in December 1847 with a capital of 20,000 pounds built a smelter at Yatala east of Port Adelaide, started operating in February 1849 and by mid-December had produced 140 tons of copper worth 12,000 pounds using imported coal and coke for the hot blast machinery (Linge 1979, p.145) and often as fuel for the furnaces when charcoal was not available (S.A.Register 1/12/45, 29/8/46, 15/9/46. 29 April, 4 October and 15 December 1849 and 2/10/50).

The Burra company which had earlier backed experiments in smelting with charcoal, called tenders in 1845 for the construction of a smelter. In 1846 they stated that they had 1460 tons of ore ready, and attempted to raise capital for a smelting company.

The Patent Copper Company which was already established in New South Wales started construction of a smelter costing over 60,000 pounds at Burra in December 1848. The first furnace started production in March 1849: three more followed in June and two more in October.

A generalised flow diagram of the grading of copper ores and their subsequent processing in about 1890 is given in fig.1. The flow diagram given by Hopkins of the smelting processes used in Wales in the early 1800s is given in fig.2.

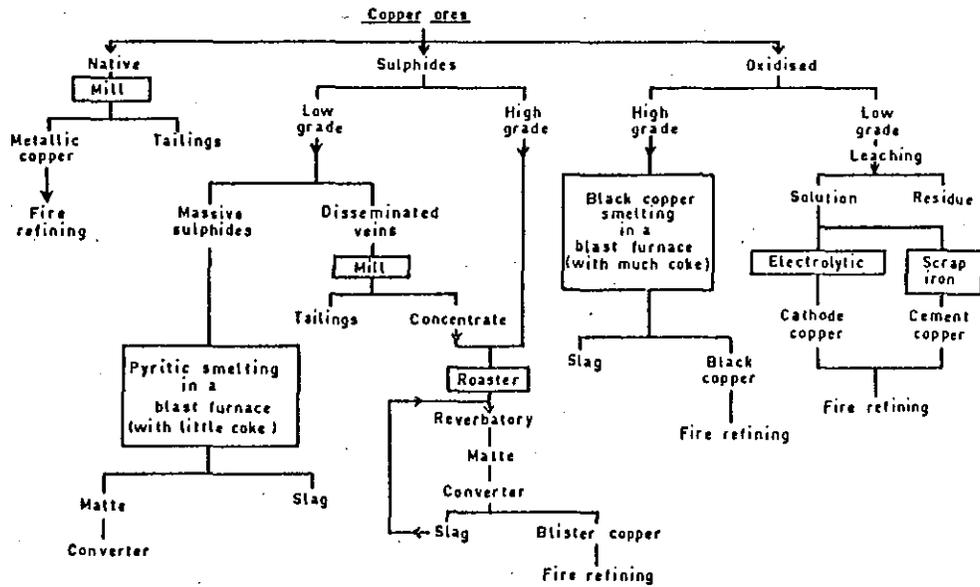
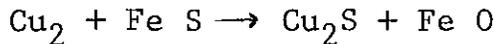


Fig. 1 Grading of copper ores and smelting to metallic copper

Pyritic ores (high in iron sulphide) were calcined at a temperature of 800°C. for 12 - 24 hours in a reverberatory furnace with a capacity of 3 - 4 tons to leave the sulphur in equimolecular portions of  $Cu S_2$  and  $Fe S$ . The product was granulated by quenching.

This calcined pyritic ore was mixed with oxide ore low in iron and then heated in a small reverberatory furnace (2) with a silica hearth at a temperature of about 1150°C. when the principal reaction was:-



The product was a coarse metal or matte with a composition generally 31% Cu, 41% Fe 27% S, the surplus iron oxide being removed with the aid of silica from the hearth as a black slag

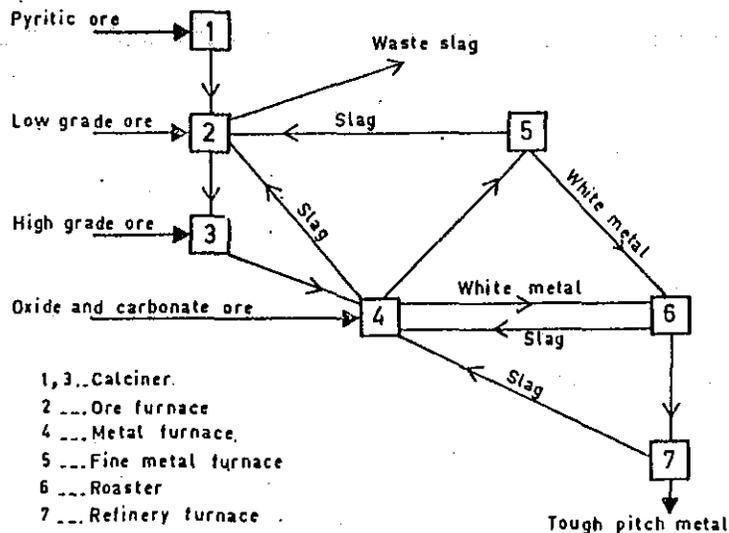


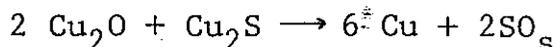
Fig. 2 Flow diagram of Welsh smelting process circa 1830 by Hopkins

with a composition 60% ScO<sub>2</sub> 30% Fe O, and other minor components.

After granulation this matte was mixed with high grade sulphide ore low in iron and calcined (3) to reduce the sulphur content from 30% to 15%; charges of 2 tons were generally treated for 24 hours at 800°C.

The coarse metal from this calciner was mixed with rich oxide ore and transferred to a metal furnace (4) at a temperature of 1200°C. to obtain nearly 100% white metal with a composition of 75% copper 2% iron and 23% sulphur. The rich slag containing up to 5% copper was returned to the previous calciner. If the iron content was too high or rich oxide ores were not available, blue metal with an excess of iron was produced and treated to an additional oxidising fusion in a fine metal furnace (5) to produce white metal of satisfactory quality.

The roaster (6) which followed, induced the exothermic double decomposition process:-



Pigs of white metal were stacked, and gradually decomposed to molten metal over an eight hour period. Slag was skimmed from the surface, and the metal cast into blister pigs.

These were further treated in the refinery furnace for 24 hours in an oxidising environment, followed by a final reduction to pure copper.

This process required in 1850 about 20 tons of coal per ton of copper from high grade ores and 30 - 40 tons of coal for low grade ores.

In the late 1850s blast furnaces came into use for the first three stages of the process. The Pilz furnace was introduced in Saxony in 1866 with a free standing pentagonal hearth and water cooled tuyeres; in the same year water cooled furnaces were operating on the Rhine. Later Bessemer converters were used as at Wallaroo for the roasting of the matte.

About the same time revolving multiple hearth furnaces were introduced for the preliminary roasting. Electrolytic refining of copper in acidic copper sulphate was first used in Wales in 1869.

The dressing of copper ores was revolutionised by the discovery of the flotation process in which ground ore was agitated in water with oil and air, so that a bubble attached itself to one of the components and floated it to the surface.

Recovery of copper was effected by leaching the tailings dumps with acid (generally sulphuric acid) and precipitating the copper from solution with scrap iron. This process was known in the Wallaroo area as cimentation. The result was finely powdered and generally impure copper, the consolidation of which could be expensive..

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