new zealand potter vol 22/1 autumn 1980

potter

Cover
Brian Gartside at Ramarama
photo: Ray Ericson

Editorial

We write editorials only when there is something of great moment to comment on. Last years battle with the Customs Department over sales tax resulting in victory for New Zealand craftsmen, must be considered a momentous milestone.

No craftsman or partnership need now register for sales tax if sales are under $50,000 a year excluding export income, if sales are direct to shops, through exhibitions or from the door.

Although the war was waged mainly by the potters, the new measures have corrected anomalies, and some of the red tape restricting other craftspeople has been snipped away. The conditions in this country for the development of the crafts are now excellent.

As we predicted, the government could not ignore the highly articulate front the craftsmen assembled and decided in favour of the Interdepartmental Committee's recommendations which were based on 350 detailed submissions by makers and others concerned about crafts. Without doubt the unrelenting thrust provided by the Crafts Council of New Zealand has shown what unified action from a central body can do. Potters can get behind this organisation by joining.*

Administrative problems rather than policy decisions may have convinced the government to waive the tax. We would like to believe there was some persuasion by the enlightened. In a letter to the *Potter* the Minister states "I am sure that your many readers will be as pleased as I am at the excellent work carried out by the committee and the satisfactory outcome of the inquiry. Government is very much aware of the value to the community of crafts and craftspeople."

We suggest that this heightened awareness by government is due to the imposition of the tax and the subsequent stir it caused. Years ago the introduction of purchase tax in Britain lead to the formation of the Craftsmen Potters Association for the same reason. Some clouds have silver linings.

*$7.00 single, $10.00 double, 110–116 Courtenay Place Wellington.

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Contents

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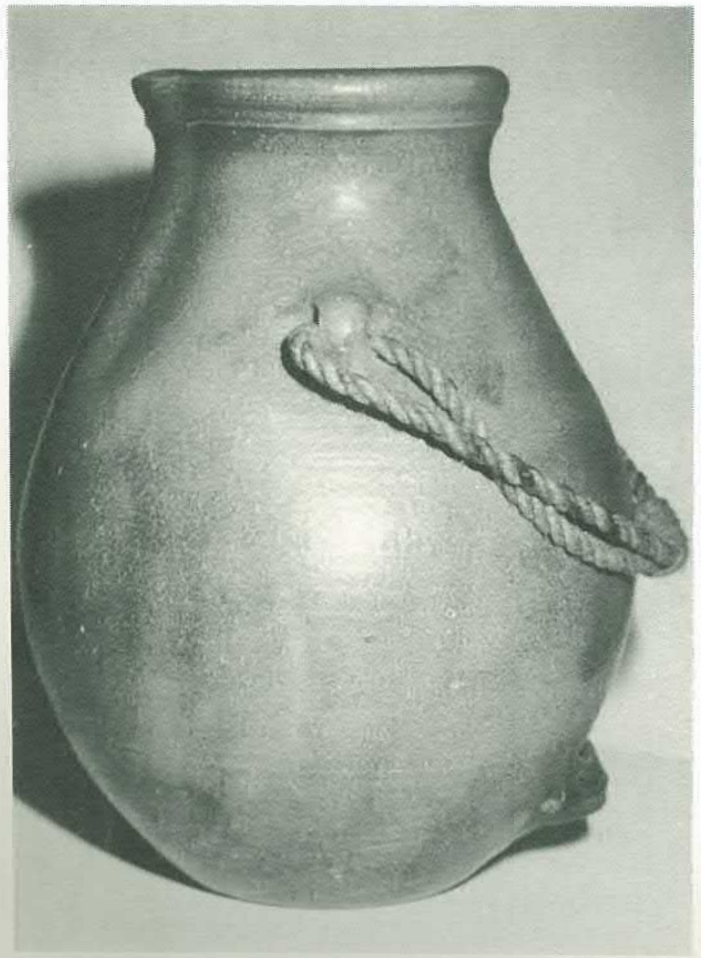
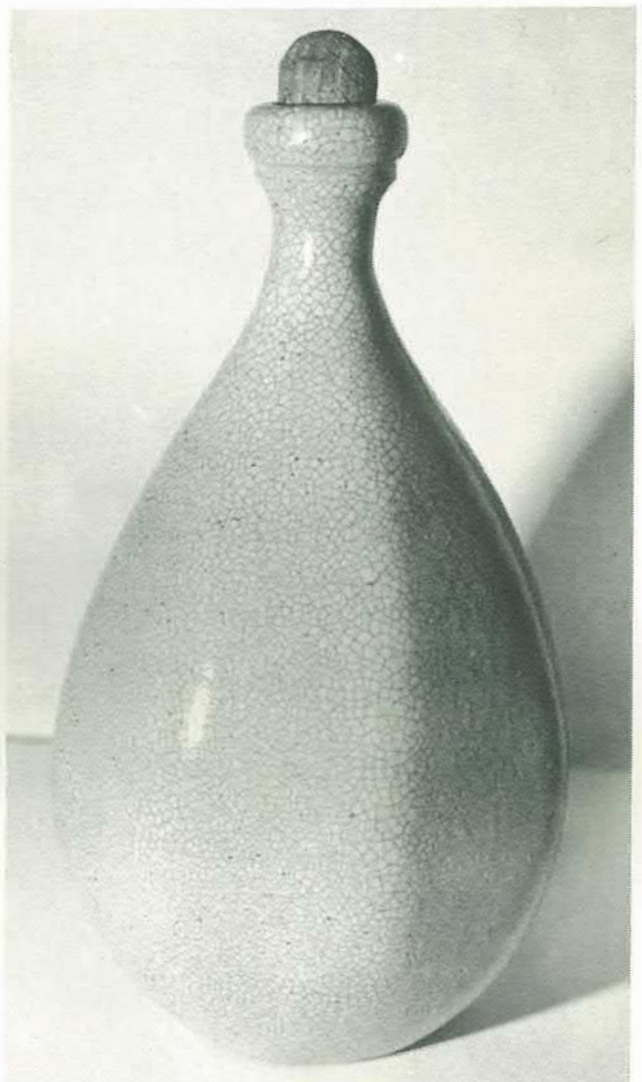
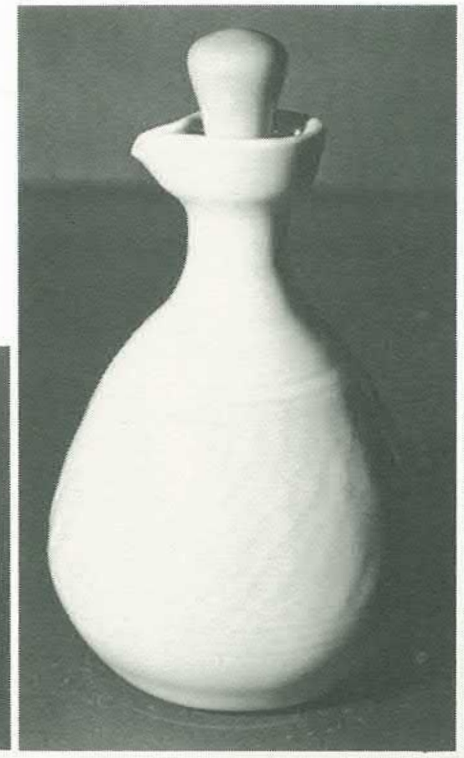
DOWN SOUTH

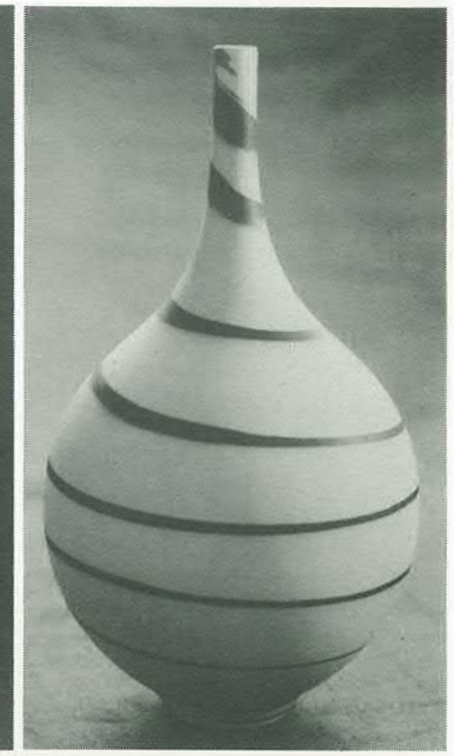
The latest National Exhibition of the New Zealand Society of Potters was held at the Southland Museum Invercargill. The Potter was there and visited some of the local potters.

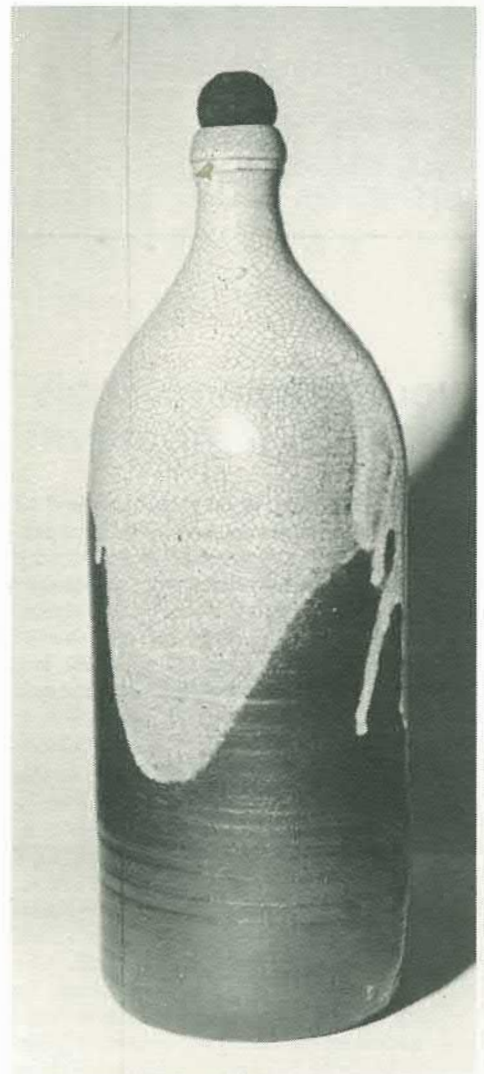


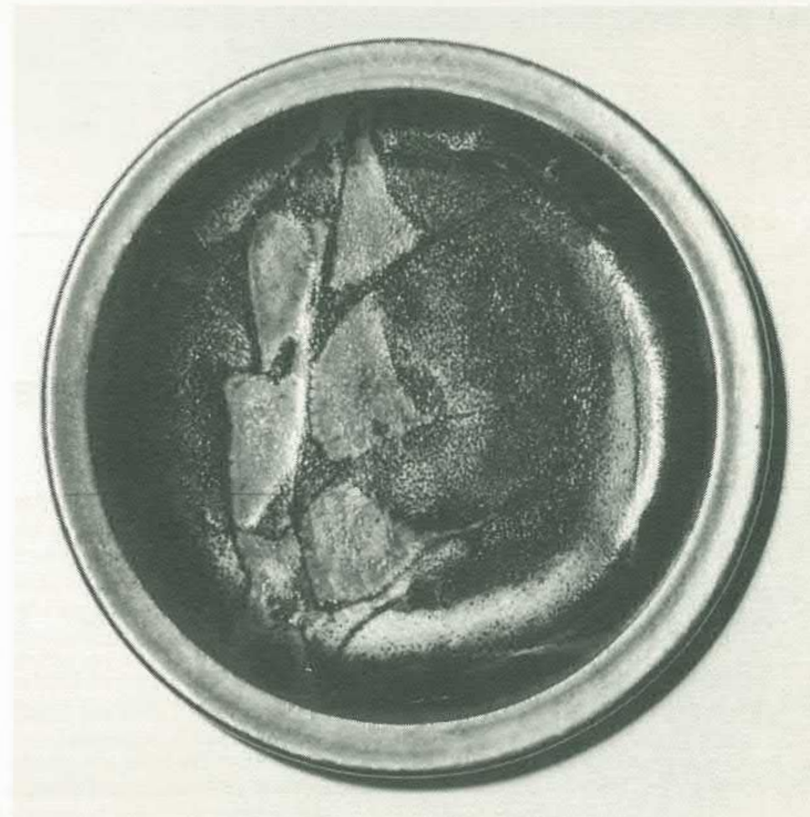


Opposite: Wayne Junghenn water vessel 30 cm high. Below: Roger Brittain coiled pot 27 cms. Left: Ray Rogers 38 cm high 40 cm circumference. This armful of a pot in glowing saturated iron red glaze made a major contribution to the exhibition. Below: Wayne Junghenn's bottle 28 cm high.

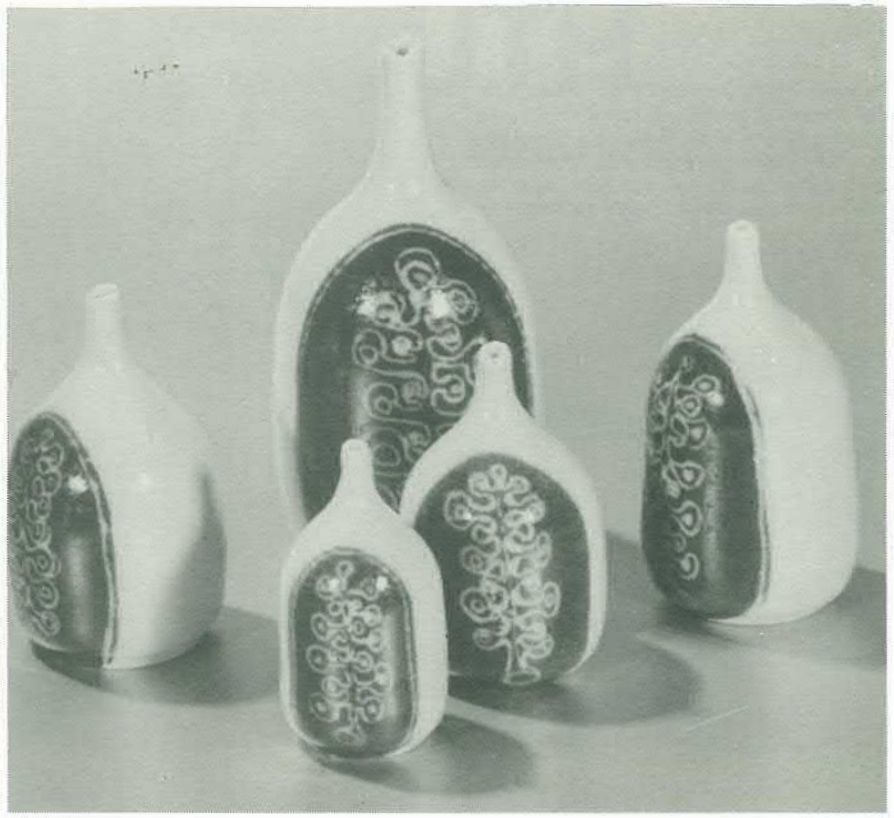








This page: Above left to right: celadon lidded box Kevin Gaskell, celadon oil bottle 19 cm Rosemary Perry, agate bottle 16 cm high John Parker, Below left: bottle Richard Booker, Above: platter 31 cm diameter Flora Christeller.
photos: Lindsay Hazley



Above left: Bottle 29 cm Sally Vinson. Right: Bottles 19–11 cm high Jenny Shearer. Bottom: John Crawford 28 cm high.
photos: Lindsay Hazley from Southland Museum where the exhibition was held

How to photograph your pots

Taking good photographs of pots is not easy so if you are strictly a push-button photographer it would be best to go to professional photographer. For those with some experience with the camera these notes will help.

Background: Pots for reproductions are usually best photographed singly, although a sympathetic group can work. Do not let the background confuse or diminish the strength of your work. Usually a neutral, wrinkle-free cloth is best. It can be darker or lighter in contrast to the colour of the pot. Utilise the entire photo area.

Lighting: Electronic flash and bright sunlight make harsh shadows and glaring highlights. Diffused outdoor light or bright window light is best. Use white card or crumpled foil to reflect light on to the dark side of the pot.

Depth of field: With a cloth background you can utilise great depth of field to emphasise three dimensions of the pot. This means a slow shutter speed so a tripod and cable release are essential for producing a sharp image. After shooting at the optimum f-stop and shutter speed, bracket your shot with one photo at a shutter speed slower, and one photo at a shutter speed faster.

Printing: Go for contrast, that is the darks dark and lights light at the same time not losing the tones in between. Using 400 ASA film, and contrasting 4 paper for printing gives a good result.

Anyone seeking grants or commissions should keep a folio as a visual record of the work. Photographs sent for reproduction in this magazine or any craft catalogue, should have information on the back giving name of pots' maker, size in cms and full description of the work.

Vic Greenaway Invercargill workshop

The guest potter at the New Zealand potters national exhibition was Vic Greenaway from Australia. Vic has been potting since the age of 16. He completed an arts course then worked in a pottery in Victoria. He won a Churchill Fellowship in 1974 which enabled him to travel and pot in England, Japan and Scandinavia. With a Crafts Board grant, on his return to Australia, he established the Broomhill Pottery at Upper Beaconsfield in Victoria.

Vic's workshop ranged over all the basic techniques of potting. Though he demonstrated his methods of wedging turning and decorating, it was his mastery of throwing that made the most substantial impression on his audience. He emphasised the potential of using hands and fingers as finishing tools — in compressing rims, forming galleries and finishing the surfaces of the pots — an impressive and effective economy. His use of water was noticeably sparing. As he is much involved in production in his workshop (there is a Broomhill range of pots), some of his comments arose directly from this concern. Vic laid stress on the need to maintain quality, to be able to reproduce set designs and to meet orders promptly.

Those attending have commented on the impressive display of craftsmanship they were fortunate to witness.

Frances Fredric in praise of 1200°C

For ten years I've been working in earthenware fired to around 1150°C. Then I read an article by Frank Hamer, "In praise of 1200", which captured my interest and last year for several reasons I began working in this cone 5–6 range.

It seems a particularly suitable firing range for an electric kiln, and I believe that in spite of increased power charges, with the present fuel crisis, electric kilns will be used more widely in the future, especially in the South Island where there is an estimated electric power surplus for the next fifteen years. We don't get a regular supply of LPG at this end of New Zealand and so it seems sensible to use the natural renewable resource which is available to us, that is electricity. The challenge lies in making the clay and glazes interesting according to available materials.

Another convincing reason for the change to cone 5–6 is one of economics. The frits on which most earthenware glazes are based have increased greatly in price, and in the cone 5–6 range these could be eliminated, or at least reduced to a minimum percentage.

Since I'm not addicted to glaze chemistry I began by collecting as many recipes in cone 5–6 range as I could find. By the number available, many potters in the U.S.A. and Britain must be working in this field. I made a big chart listing all the ingredients used so that comparisons could be done quickly. Olwyn Dykes joined me and the testing began in earnest. We had some successes and many failures, the latter thought to be due partly to a differing analysis in the materials used. As expected, the colour response from the various oxides is totally changed from our previous glazes. We had a few shocks, especially with cobalt, ½% in some cases producing strong violet hues depending on the other materials, a fact probably known to the experts but one of the many facts we are learning through experience.

There have been some problems. The greatest problem has been pinholing, again not news to the experts but most frustrating to us. It occurs mostly on turned areas and we blamed the slight amount of grog in one of the clays — we use a mixture of two Podmore clays. One is a red clay the other is slightly grogged, and pugged together they provide a suitably maturing clay for this temperature. The red gives a warm colour to the unglazed areas, but we would like to hear of other New Zealand potters who have a suitable clay body.

To correct the pinholing we have so far tried the following to no avail:

(a) using a rib tool on the turned areas,
(b) coating the turned areas with slip,
(c) rubbing down glazed areas after glaze dries,
(d) bisque firing to 1150°C,
(e) dipping pots before glazing,
(f) adding 10% frit to glazes.

Whatever the difficulties this is where I want to work. What should we call it? Low temperature stoneware, the term taken from Scholfield's book *Materials for the New Zealand Potter*, seems appropriate enough yet already I have been asked why my stoneware is catalogued as being underfired. I would like to hear from others working in this field.

I make mainly domestic ware, where I strive for simplicity of form and low key glazes, I like strong rims. My favourite pot is the bowl.

Glaze recipes:
Orton cone 5

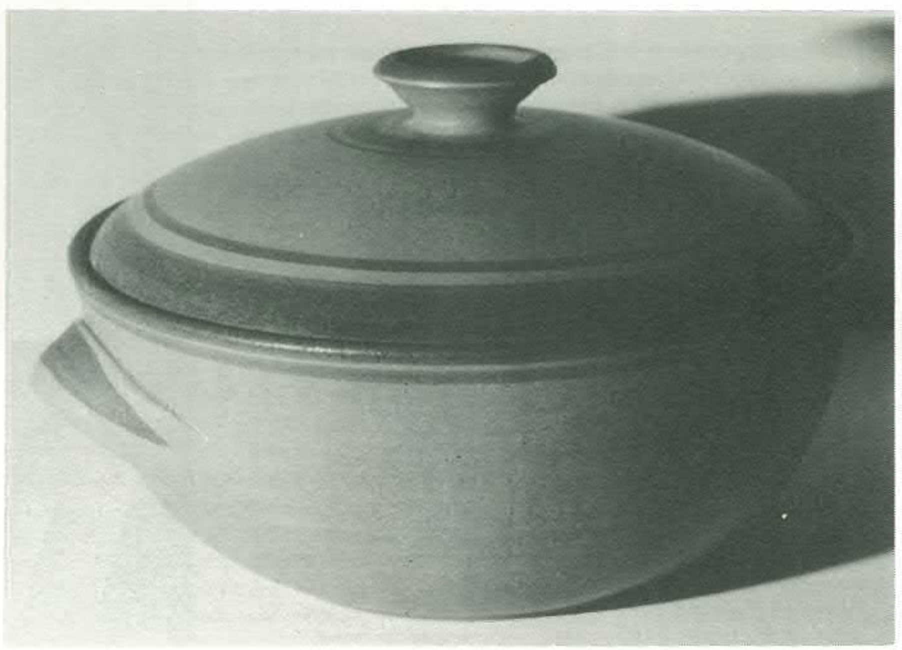
(at cone 6 tends to become shiny)

Feldspar	472 grams
Wollastonite	139 grams
Zinc oxide	102 grams
Whiting	106 grams
Kaolin	181 grams

I get some pinholing on turned edges at times with this one but it is a serviceable wearing glaze for domestic ware.

Orton cone 5–6

Nepheline syenite	1350 grams
Barium carbonate	600 grams
Ball clay	140 grams
Flint	160 grams
Lithium carbonate	70 grams
Copper carbonate	70 grams for "copper blue"



This one I have used for lamp bases and it is best on clay without much iron.

Since we began this testing programme the book "Glazes for the Australian Potter", reviewed in Potter Vol 21/1, has offered many ideas for glazes in this range. Here is a whole new set to be tested and tried. I aim to settle for three or four glazes and hope to learn on the way.

Frances Fredric
Rata Road
9 R.D. Invercargill

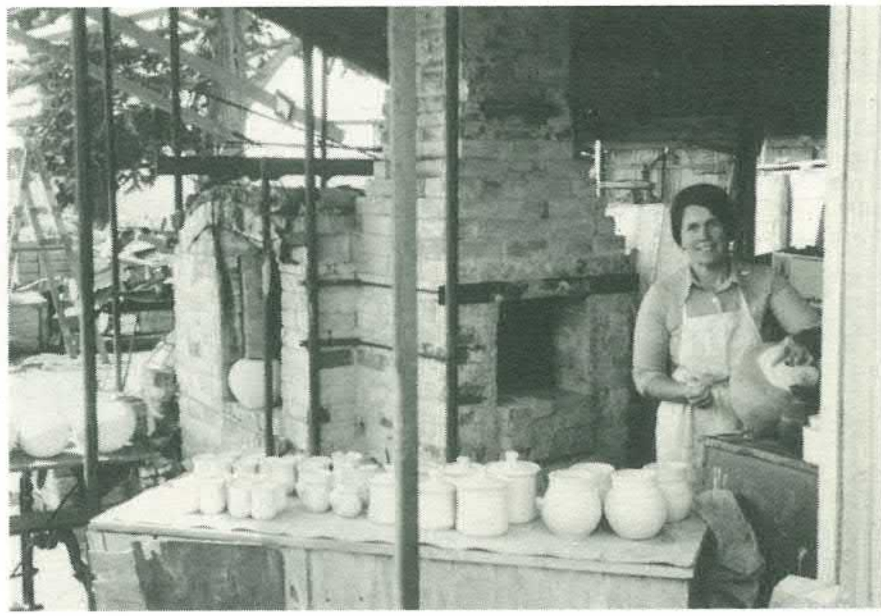
Frances Fredric lives in an acre of bush three miles from Invercargill. Part-time potter because of family committments. Learnt through weekend schools and several week-long workshops. Earlier training in music taught her the value of repetitive practice. Uses electric top loading kiln. Member New Zealand Society of Potters.

Mum I'm going to drop it.

Below: work by Olwyn Dykes

Olwyn Dykes makes decorative domestic ware. Has had graphic art training. Fires in an electric kiln. Part-time potter. Member New Zealand Society of Potters. The platter 32 cm diameter and trinket box 6 cm high are from the National Exhibition in Invercargill.

Ann Bain's wood kiln



After spending about ten years firing earthenware in electric kilns and teaching in the same medium at the Southland Polytechnic, I decided that it was time for a change. With a surrounding farm area to work in, the decision to fire with wood was an easy one. Smelly diesel with its noisy blowers had no place in our peaceful setting, so when Barry Brickell, on one of his visits a couple of years ago, drew a freehand plan of a Dutch-oven, down-draught, 40 cu ft, two-chamber wood burner (similar to his plan shown in the *Potter* Vol 17/1 Autumn 1975) Barry and I commenced construction.

The farm truck was utilised to the fullest to stockpile second-hand bricks from an inexhaustible dump 25 miles away. Steel pipes and angle iron were obtained from another dump. In fact, the only new items used were H35 bricks for the lining of the glost chamber and for the crown arch. When sufficient materials were on hand, a base of concrete was poured and a layer of 18" x 4" firebrick slabs was laid on top to form the floor. (Metrics had no place in our kiln construction — all measurements were in 'bricks'.) Flues were placed on the floor, the glost chamber raised, the firebox tacked on the front and the bisque chamber on the back to form the base of the stack. Steel pipes had been embedded in the concrete base opposite each corner of the glost chamber in order to weld 2 x 2 angles along the intended line of the skewbacks. The pipes were long enough to be used as supports for a roof over the entire complex.

The arch was constructed with a combination of S8 and S12 bricks in a proportion simply calculated by measuring the span between the opposite skewbacks, pegging it on the ground, and placing the required mixture of S8s and S12s on end between the points. Enough bricks were sawn in half to finally set the arch in a bonded fashion. Placing of the arch was accomplished by filling the chamber with apple boxes, laying a sheet of old hardboard flush with the top and forming the rough contour of the arch with wet sand. The bricks were laid (without mortar of course), the sand scooped out, the boxes withdrawn, and against all our expectations the arch stayed in place. Chains were then placed between the upright pipes diagonally across the crown arch as additional strengthening. It was recognised that kilns must be flexible, and these chains, as well as the removable rods placed when the wickets are placed, were hand tightened only. They become taut enough during firing when the whole construction expands.

The rear wall of the glost chamber was built as a single layer between it and the bisque chamber, with its own wicket open to the rear. On top of this low-temperature chamber was built the stack. The bricks were corbelled at the top of this chamber to form the 12" x 12" aperture calculated to accommodate the cubic content of this particular construction. In order to assess the draught effects, common bricks were thereafter loosely placed to the top of the stack, for intended later demolition and replacement if necessary. This temporary brickwork, remains to this day, having survived a few gales and an unusual earthquake last year. Second-hand firebricks were laid as a double skin around the main chamber, with an air gap of about half an inch between the two layers. As further insulation, common bricks were loosely placed across the crown arch. This was found to be quite sufficient.

The first few firings were very much experimental, for although it is generally written in all the good kiln books that kilns must 'settle down' I consider that the operator must also find a level, and through experience, draw together a close relationship between the various factors necessary to bring about a successful firing with wood.

During this breaking-in period, only a few construction measurements were altered. The firebox grate tended to allow too much valuable charcoal to fall. There was no doubt that the heat was there, as the heavy channel-iron supports for the bricks on the grate became red hot, and sagged into the ash pit. The firebox mouth was wide open, allowing an excess of primary air to whistle the flame through the throat and over the bag wall at speed, down through the flues in the base to the bisque chamber and up the stack, melting the inside faces of the top red bricks on the way and pouring forth from the top of the chimney in a glorious roman candle. At night it took on the appearance of one of those early solid-fuel lighthouses. The glost chamber refused to rise above 1100°C in the long (29 feet) cool flame, and the bisque chamber was just as hot. The remedies were simple. The grate was closed up slightly, the firebox mouth was half blocked off and several brick pieces were placed in the underfloor flues between the two chambers. (The flues were made slightly oversize to allow for such an adjustment.) The effect was achieved in that the firebox was converted into the desired gas producer, with the resulting fireball corkscrewing through the throat in the proper manner. Later, a couple of half bricks were removed from the lower part of the bagwall to place eddies in the fireball and bring about a more uniform temperature throughout the glost chamber.

The firebox had been constructed of side-arch bricks of a shape that brought the arch to rather a high centre point — too high above the throat, according to the accepted specifications. But it was found that with the minor adjustments above, no further tuning was necessary.

Consequently the firebox arch remains and the stack awaits reconstruction when the time allows. However, if we ever build another, one alteration would be the raising of the base of the kiln sufficiently above ground level to enable the throat to be as least a couple of bricks higher than the grate. Lowering our grate now to arrive at the same position would mean lowering the firebox and having to stoke at an uncomfortably low angle.

Radiata slabs are readily available from a local mill and arrive in 5 ton loads when required. Five, 20 ft long, wired bundles are tipped at the kiln site and are chain sawn into 3'6" lengths to be stockpiled in a criss-cross stack. The owner-driver truck operator who brings our slabs in when a return trip of phosphate or gravel is on order, knows to select weathered thin slabs at the mill. Consequently drying is no problem and only a small amount of wood is stacked under cover. Each $25 load covers five or six firings, so costs are negligible. But it takes two people a full day to saw and stack five tons of wood. I find that this is the hardest labour in the general sequence of producing wood-fired ware.

My pots, be they terra-cotta, stoneware or porcelain, are built with the end wood-fired result in mind. Ash is profuse at the top of the kiln chamber, and to make the most of this I usually stack oxided pots on the top shelves. Yellow Ochre gives best results in golds and browns. Iron and Manganese become too dark and metallic. When stacking, porcelain pieces are surrounded with other pots to keep the glaze clean. Unglazed porcelain, set on and near the top of the bagwall, attracts flashes of flame and ash, colouring into oranges and reds.

I find that by placing shelves in a staggered fashion, heat is more evenly distributed. Only about half an hour elapses between Cone 10 (Orton) falling at the top of the chamber and the same cone near the bottom.

A typical day's firing starts around 8 am with a small fire, fed with any larger pieces or even wet wood. Keeping the temperature down to a slow steady rise requires some control and I use a pyrometer as a guide. Lunch time sees 1000–1100° then it's steady feeding of dry slabs, split down the middle if necessary, laying each stick at an angle across the previous one and taking care to prevent choking the throat. Around 5 pm the temperature is around 1280–1300° and the mouth of the firebox is further bricked up, leaving a small stoking hole only. Other than this I have no need to worry about the proportion of primary and secondary air by juggling about with so-called mouse-holes or the like. The damper stays open at all stages of firing. A reducing atmosphere becomes evident for a while, around the 1000° mark.

During the soak period of around two hours, very little wood is required to maintain temperature. Care is taken not to disturb the ash in the grate. When the cones are down (and it must be remembered that cones can behave erratically if the speed at which they are taken up is far from the 150°C per hour recommended — even in electric kilns) rings are drawn from the top and bottom spy holes to ensure the maturity of the glaze. This soak period is essential. The kiln could be forced to cone 10 in less than six hours but the pots and glazes would certainly show it. Fast firings are just not on. Ten or eleven hours give the best results in clean, well matured pots and glazes.

Family and friends usually gather for a barbeque during the final few hours. Inspection bricks are drawn at intervals and clear views may be made well into the chambers. When the firing is over, the mouth of the firebox is left open for a couple of hours to maintain a clear atmosphere at that crucial time of cooling.

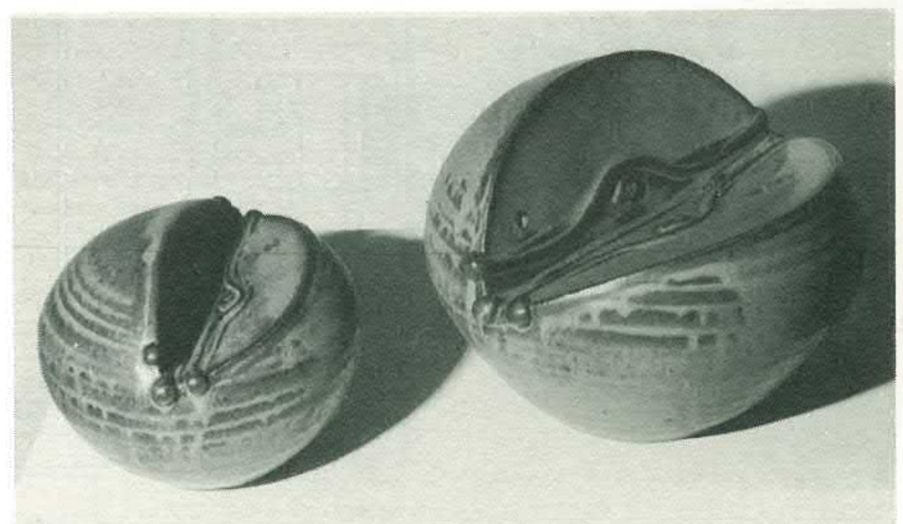
I find that wood is a calm relaxed way of firing, either on my own or with a group of interested potters. Members of the Southland Potters Association have completed a few communal firings and on occasions, raku and sawdust kilns have been constructed and fired under the critical eyes of our circus of sheep and ducks.

I do not pot for an income but as a hobby away from the pressures of business. With many glaze ingredients readily at hand, I do like to experiment. I enjoy working outside and am not put off by the task of firing with wood. The rewards are great...

Ann and Barrie Bain operate their pottery supply business, Southern Ceramic Import from just outside Invercargill.

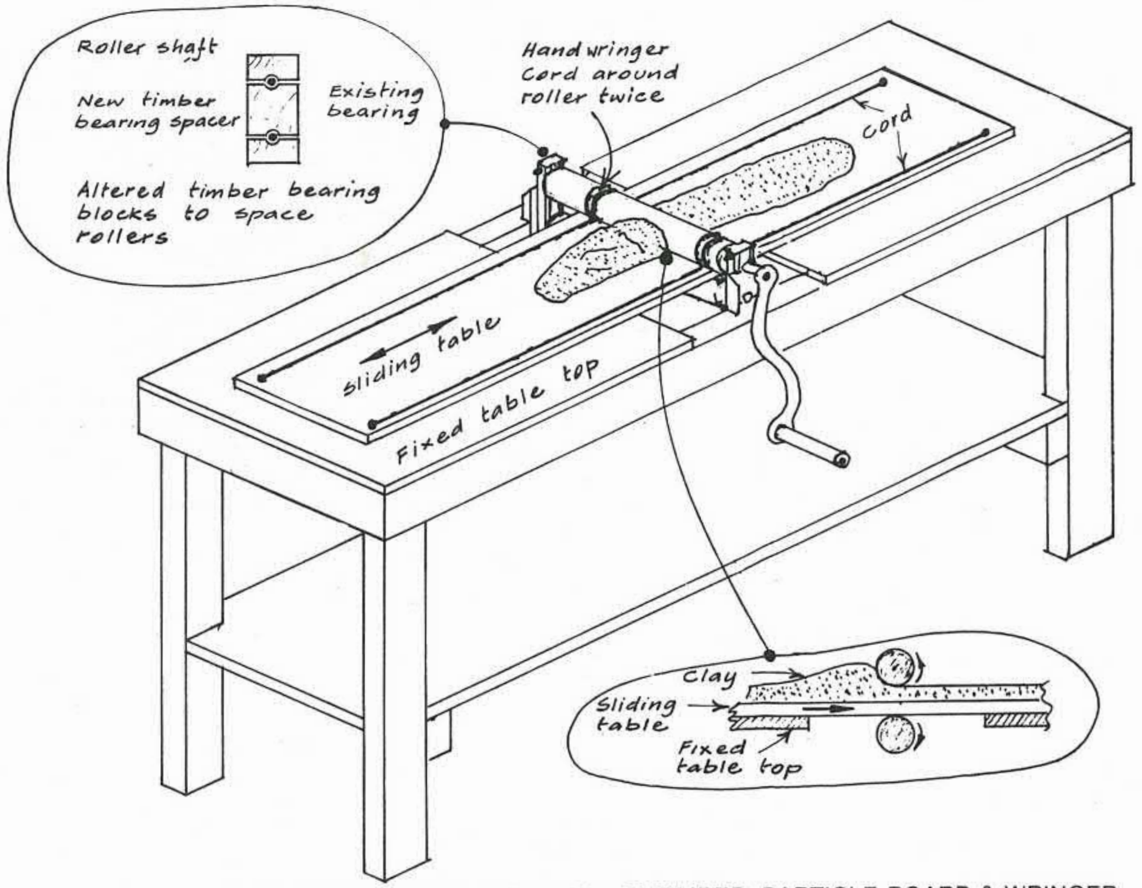
Southland's annual summer potters workshop

Borland Lodge at the lakeside at Monowai is the venue for a potters workshop held each year in mid-January which is becoming one of the established summer schools. This year Brian Gartside, Roy Cowan and George Kojis were the leaders teaching mainly the implications of aesthetics and design.

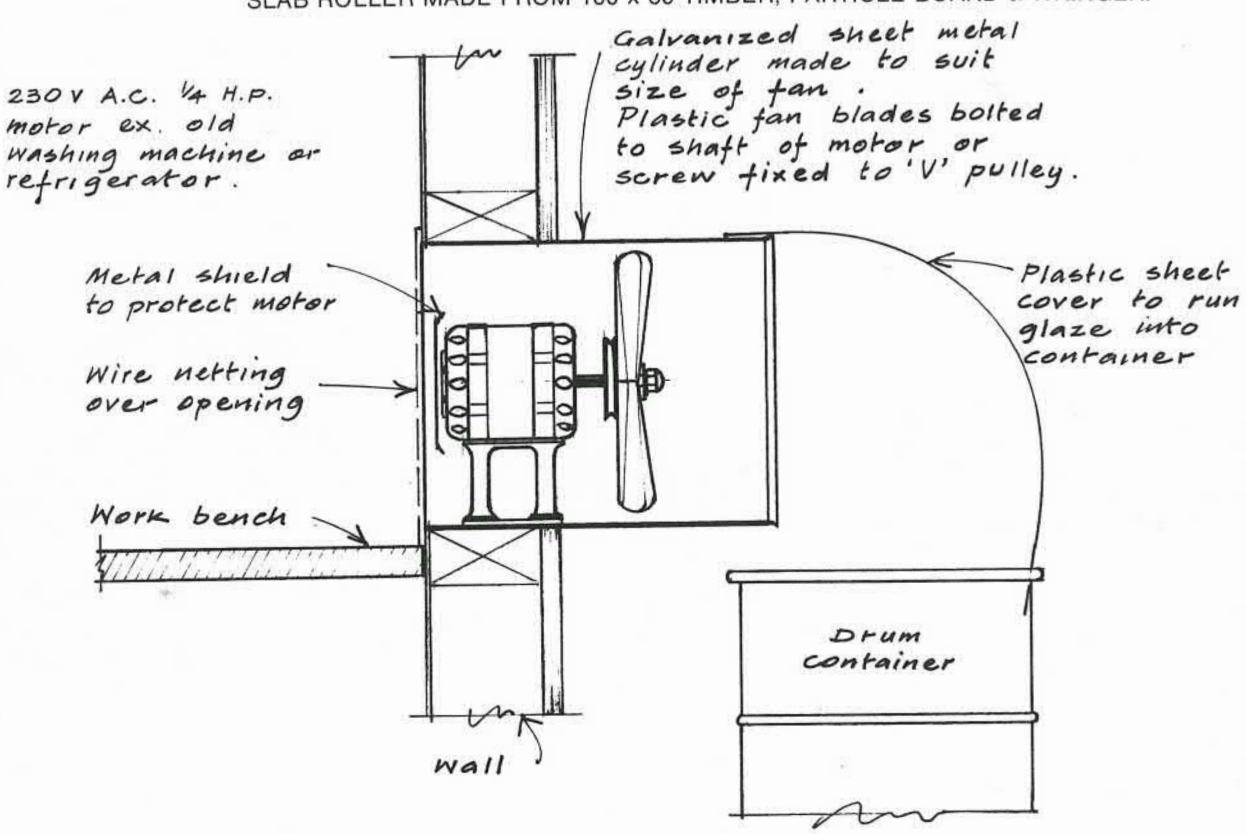


"Blue delicious" John Crawford 13 cm and 17 cm shown at the National Pottery Exhibition in Invercargill.

Both these pieces of equipment made in Invercargill have been found to be efficient. The roller was made and drawn by Peter Goomes 131 Chelmsford Street Invercargill. Alan Young 124 Joseph Street Invercargill has made the extractor fan which should be mounted in line with your working height.



SLAB ROLLER MADE FROM 100 x 50 TIMBER, PARTICLE BOARD & WRINGER.



EXTRACT FAN FOR SPRAY GLAZING

KILNS FROM THE SPACE AGE

Gas kilns and ceramic fibre insulation

The Potter has been accumulating material on potters' experience with gas-firing and on developments in the availability of ceramic fibre insulation and refractory linings. Oil and brick are yielding some ground to the new materials. The two changes have occurred side by side and developments in kiln construction, use of gas in various forms and burners continue.

We have published previously a number of articles on potters experiences with gas as a fuel (Vol 16/1, 17/1 and 20/1). It is interesting to observe that with the same fuels and the same insulating materials, potters likes and dislikes, prejudices and preferences lead them by a variety of paths towards the same target.

RAY ROGERS

firing with LPG in a ceramic fibre updraught kiln

To use LPG as a fuel economically, one has little choice other than to build or buy a kiln constructed from ceramic fibre. The following discussion gives some of my experience gained during generally successful firings using this fuel and an updraught ceramic fibre kiln. I hope some of you find it useful since I understand there are those who are having difficulty with this method, and others who are considering LPG but are uncertain whether to proceed.

The specifications of my kiln are —

Capacity: 32 cubic feet.

Burners: Two 2" inspirating Venturi burners supplied by Intertherm, Brisbane. Burner jets modified slightly to allow a very low turndown.
1 only 1" inspirating burner used for bisque start up.

Construction: Two 1 inch thick inner layers of fibrefrax H fibre blanket, backed up with lower temperature fibre, rockwool plus 1 inch insulating rigid board to give a total thickness of 9 inches, all held together in an angle iron frame. Fibre and insulation are pinned with ceramic pins to the board. Fire brick base forming 2 tunnels horizontally fixed, with mezzanine hearth. Three exhaust ports in roof, cast from refractory cement. Designed by Arie van Dyk. Canopy, forming 3 sides and roof rolls away from the kiln. Recesses cut into floor take the wheels of canopy and drop canopy by approximately half an inch.

Shelves: 14 x 18 inches, 4 shelf plan.

NOTE: I feel that this method of firing through brick tunnels and using a checkered floor is superior to the introduction of flame directly under the first shelf. A reducing gas flame is quite severe and should not be impinging directly under the first layer of pots in my opinion.

Economy:

(a) **Bisque firing** With a tight stack fired to 1000°C, LPG used is approximately 35 to 50 litres.

(b) **Glost firing** Between 140–160 litres depending on density of stacks and length of soak. Fired to Orton Cone 10 (plus).

Durability: After two glost firings, the hearth bricks collapsed. They could not stand reduction at the temperature required. These were Kamo Supalume fire bricks. They were replaced by Ceramco using imported bricks from USA which are standing up well. Huntly H60s would be suitable. Fibre shrinkage was expected and quite noticeable for several firings. The blanket has been wrapped horizontally around the inside of the walls with the ceiling separate. Expectably, a gap appeared between the ceiling and walls, approximately 2½% of the height. This may have been in part due to the wall insulation squatting slightly onto the hearth, which though not noticeable was perhaps a good thing as the seal against the brick base was improved.

The gaps at the top inside corners were continuously caulked with fibre until the shrinkage stopped, then replaced with a good strip of fibre which is holding well.

The kiln has been in use for more than 2 years and I have fired 25 glosts. There is no apparent reason why the kiln should not survive for some years to come, barring accidents. The fibre is easy to repair but rather expensive to replace or to patch damaged areas.

Firing procedure: During firing I use a gas analyser (see this issue p. 16) which measures the level of carbon dioxide, is an effective indicator and is simple to use. Using an analyser while firing the kiln serves the dual purpose of helping to conserve fuel by firing efficiently as well as allowing one to monitor and control the amount of reduction in the kiln atmosphere.

Since firing my gas kiln I have never experienced a disastrous firing — a situation mostly due to the analyser. The brand name is Fyrite and it is available from the agents, Teltherm. I do not know the current cost but 2 years ago it was $120.00.

Bisque: Since there are usually a number of larger pots in each firing, I use the small 1 inch burner set quite low and left to burn all night, allowing the pots to be completely dried out, before charging the two main burners. Despite this, it is still possible to place these burners at too high a setting and crack a pot or two at the bottom of the kiln. A temperature of about 150°C is reached overnight and the procedure virtually eliminates bisque cracks. The clay I use is my own blend of Maramarua fire clay and Crum modelling clay.

Glost: I have fired a small LPG updraught fibre kiln and found that one had to be careful not to over-fire the bottom since the flame impinged onto the bottom shelf. One friend of mine is firing an updraught kiln, front opening, with reasonable success, though others have commented that they are obtaining great economies using the downdraught method with almost perfect evenness in temperature throughout the kiln.

My updraught kiln certainly suits my work and my glazes and is not too heavy on gas. The firing cycle which uses between 140 and 160 litres of gas is somewhat longer than I believe others are taking, and I feel sure that the economies they are experiencing are mainly due to their shorter firing time.

I have been told by other users of fibre kilns using LPG that they are firing successfully in 8 to 9 hours for stoneware. It is certainly possible to achieve this with my kiln, but experience has shown me that subtleties in certain glaze effects can only be achieved by longer firing cycles. By choice I fire over a period of between 12–15 hours, depending on density of stacking and glazes being used. I must stress that the longer cycle is by choice,

Above: Branch pot 381 mm high, saturated iron glaze. Right: Branch pot 432 mm high, shino glaze. Below: Plate iron red. All from Ray Rogers' exhibition at Antipodes Gallery, Wellington.

photo: Bill Stephen

not necessity. I have found that slowing down the firing and completing it with a long soak period gives me the quality of glaze that I hope for.

Control of the firing is greatly assisted by checks on the kiln atmosphere using the analyser, which has proven to be invaluable. I believe an advantage in learning to fire with LPG is a completely open mind. I had practically no experience in using oil or wood having been used to an electric kiln of 5 cu. ft. capacity.

The tendency when first firing with LPG is to blast the pots with an oversupply of gas and air until one finishes up with a shelf or two with pot stuck to them and sadly overfired, plus some underfired pots at the top. The difference in cones can be as much as Orton 8 and 12 — maybe even more.

The difficulty is to judge what is happening since there is very little to go on visually. With oil firings flame travel and amount of reduction being achieved can be measured visually by one experienced in firing their particular kiln. With LPG it is possible to vary from oxidation to reduction with no visible change in atmosphere or the flame at the exhaust ports in the case of an updraught kiln.

It is always helpful to keep an eye on the flame burning at the exhaust ports. I have proven to myself that near top temperature an obvious flame appears when the kiln atmosphere is **neutral**.

Use of a damper is critical to the success of firing on LPG. Minor adjustment can take the kiln atmosphere from oxidising to reducing without altering the air or gas. Minor adjustment of air input is only slightly relevant to the rate of reduction.

Control of the rate of reduction and temperature climb is achieved by adjusting back-pressure and gas input.

Therefore positive control of firings is necessary since excessive reduction, oxidising whilst endeavouring to reduce, and variations in atmosphere are difficult to observe or handle using LPG.

Someone once said that nowhere in the books available on potting could they find where it stated one had to do things the hard way. I agree and prefer to enjoy the throwing and firing of my work with a minimum of hard labour, and therefore I try to obtain control using instruments such as the analyser.

Throwing for two or three weeks gives me a tight bisque stack with some overflow into a 5 cu. ft electric kiln. This provides two glost firings and enables any glaze or decoration problems to be eliminated in the second glost if appearing in the first.

Finally, to encourage the use of fibre and LPG kilns, there is a tax incentive for professional potters of 100% depreciation able to be written off in the year of installation; it is a worthwhile consideration which helps offset the expensive nature of fibre for kilns.

PETER STICHBURY Gas Kilns

I have been concerned for some time about the number of potters who have purchased updraught gas kilns. If you surveyed the potters in New Zealand who use oil kilns I'm very sure it would be hard to find a potter who fired an updraught kiln. The first potters in New Zealand worked them out of their system long ago, as articles in early *N.Z. Potter* show.

Why then updraught in gas? I estimate that none of the makers of gas kilns here have had experience with flame-fired kilns prior to actually making gas kilns (with perhaps the exception of one — Arie van Dyk). Most have made electric kilns — here in Auckland anyway. It is too easy to make a kiln chamber, using the new Kaowool or such fibre, place two highly efficient burners at the bottom and a hole at the top and state that it is a highly efficient kiln. Emile Bourry in his *Treatise of the Ceramic Industries* (1901)! — stated of updraughts

> "In the burning space the movement of the flames and gases may be ascending, descending or horizontal. When this circulation is ascending (i.e. updraught) it is necessary in order that it may be regular that the temperature should be absolutely uniform on each horizontal plane. If in any one place the temperature is raised, it has a tendency there to make a quicker circulation and in consequence to attract the flames there, so that the defect is more and more aggravated. There are then formed, in the middle of the ware of the kiln, vertical currents that are very great and very hot, called in practice by the name of "chimneys", which afterwards it is often very difficult to stop and may endanger the success of a firing.
>
> It is not the same when the circulation is descending (downdraught)".

In the smaller kilns, which I have discussed with potters who have purchased them, the point of uniformity of temperature is not evident at all. One manufacturer claimed a temperature difference of 10°C top to bottom. One potter claimed it was more like 50°C–60°C and she had a real hassle in trying to even it out with little success. Glazes ran on to shelves at the bottom and were quite underfired at the top.

With all this in mind and predominately with past experience of oil kilns to the fore, I looked for a kiln with 4 burners, good flame development space, *DOWNDRAUGHT*, and built to take two stacks of 16 x 16" shelves. The requirement was mainly to fire larger platters and bowls which do not fit happily into any oil kiln with shelves of 16" x 12" size.

The kiln I chose was an extension (to my measurements) of a 15 cu. ft kiln made by Furnace Engineering. The kiln thus became a 17.28 cu. ft downdraught kiln, with four burners. It has proved admirable. I aimed to fire in 13 hours as I see little point in the very fast firings which so excite some. Results have been almost identical to the oil kiln in glaze and body quality. Top and bottom temperatures are absolutely even when the kiln is packed *tightly* — and correctly.

I have fired eight times and with a firing cycle of 13 hours firing with ½ hour soak results have been almost identical.

Costs:

Oil 207 litres (approx) to fire 18 cu. ft of *stacking space*, (chamber 45 cu. ft) = 207 × 0.1919 = \$39.53. Cost per cubic foot = \$2.19.

Gas Approx \$25 to fire 8.5 cu. ft of *stacking space*. (17.2 cu. ft chamber). Cost per cubic foot = \$2.94.

With the latest oil price increase costs have already probably evened out — or certainly will in the future.

Disadvantages of gas fired kiln:

1. Quick cooling for *some* glazes where matt finish is due to slow cooling procedures. Cooling at present has not taken into account possible blocking off of fire ports, which could be a little difficult, but which could slow cooling somewhat.
2. Glazes are a little more bland — to the keen eye — but not so much as to discredit the use of gas.
3. Cost of bisque is extra and not included in the above — no estimate is available as I have only had a bisque once — otherwise I have used the surplus from heavy packing of the oil kiln.

Stacking of this gas kiln appears best with taller pots (up to 10 ins) on the bottom shelf with tight packing above this. More open stacking firings take longer.

The gas kiln is very sensitive in its control by use of damper, primary air adjustments on burners, the ease of blocking off part of secondary air. *Dust* from the fibre is evident during both packing and unpacking the kiln and could be a hazard over long periods of using the kiln.

AUDREY BRODIE a lightweight portable updraught gas kiln

Several sizes of ceramic fibre insulated kilns fired by LPG are made by Marcus Engineering of Kumeu. They range from 2 to 10 cu. ft. For my needs I chose the 3.7 cu. ft model.

The kiln is light and can easily be moved around on its castors when installing or repositioning. The firebrick floor for heat retention, and a firm base for stacking the shelves, is the heaviest item. The walls are made up of six one-inch layers of Kaowool grading from insulation to refractory. The upper working limit is 1300°C, and the makers estimate the fibre would stand approximately two hundred firings, but fibre life depends very much on careful handling. Mechanical damage from shelves and contamination by glazes has to be watched if repair and early replacement are to be avoided.

The kiln can be stacked so as to optimise the flame path. Stacking is less close than in an electric kiln and adequate space around the ware, that is between the top of the pots and the shelf above (10 mm) and around the edges of the shelves (20 mm) needs to be allowed. Alternate shelves can be placed close to the wall at each side, to encourage the flame to traverse back and forth across the kiln before reaching the flue.

The kiln consumes about 12½ lbs of gas for a five-hour firing and the rate of gas consumption is relatively even after the first hour. The draw-off from the single 20 lb bottle which I use is sufficient to cause icing and consequent reduction of gas pressure so that warming by running tap water over the bottle is necessary. This slight inconvenience could be eliminated by linking in another bottle.

Firing: The kiln reaches 1300°C readily in 4½ to 5 hours. The results in a glaze-firing do not seem to be impaired at all when compared with those from extended oil-firings. The kiln reduced readily in direct response to gas/air adjustments. With an open flue the height of the flame that becomes visible around 900°C is a sensitive indicator of the oxidation/reduction situation. I am using Orton cones pyrometer and character of the flame, at present as a measure of the kiln performance during firing. Perhaps a gas analyser would allow a further refinement.

After the critical drying for about an hour, with the temperature kept less than 250°C, bisque firings can be taken to 350°C in another half hour, and then on at rates of 150° to 200°C per hour. The rate of temperature rise increases at each increase of gas and air settings and then slowly falls away. One plateau has occurred around the 600°C mark, but I have not planned a deliberate pause at this point.

With minimal settings of the gas and air, firing performances can be repeated with little difficulty. I am very pleased with the controlled performance of this kiln. The construction of a single equivalent kiln oneself would probably not turn out to be much cheaper, considering the very high cost of the fibre materials.

Included in the cost of the kiln is an initial demonstration firing by the makers — a very reassuring factor for those like me, not familiar with the niceties of gas firing.

PETER STANFORD

"Elecfurn" fibre-insulated, natural gas fired kiln, model GFF 7.5, manufactured by The Electric Furnace Co, Auckland.

I am writing these notes after only 10 firings, so our experience is limited, but I hope they will assist those contemplating this type of kiln.

Kiln construction and size: The kiln appears to be robust and of a very high standard of workmanship — remarked on by most of the visitors to our pottery. The manufacturer quotes the kiln size as the usable volume above the bottom shelf, which seems to me not very logical. I understand some quote the total chamber size, which would be misleading. It pays to be sure you are getting the kiln size you require. We were interested in a 7.5 cu. ft (0.21 cu. metres) usable volume kiln, but the model delivered (for the same price!) was 10.9 cu. ft (0.31 cu. metres) usable volume. Fortunately our gas supply was able to cope with the larger demand.

Shelf arrangement: This is an updraught kiln, and the manufacturer recommends a shelf above the pots immediately below the flue opening and 30 mm below the roof, which presumably increases the flame path and so helps obtain uniformity of temperature. Below the bottom pair of shelves of ware is a 40 mm space, then another pair of shelves and a 120 mm space below them, into which the flame is directed. The double shelf arrangement presumably again helps with temperature uniformity. One pair of shelves is included in the price of the kiln.

Burner equipment: Elecfurn maintain that it is not practical to fire with natural gas without a blower, as the mains pressure is not high enough to allow a venturi to suck in enough air. Many kilns do operate that way, so the statement is not strictly true, but perhaps you just need more burners. This kiln uses a Tellus vacuum cleaner, the commercial blower quoted for not being obtainable at delivery time. This appears to be satisfactory, but I have doubts about how long it will last. The gas is supplied via a regulator set at 0.75 kPa or 3" water gauge, to the gas/air mixer and thence to the burner. A flame safety device ensures that if the pilot flame goes out, the gas is cut off, even if the main flame is still alight.

The rate at which gas is supplied to the kiln is intended to be controlled entirely by the air supply. A valve is fitted to the air line for this purpose, but my engineering instinct tells me that a vacuum cleaner, being designed to run at constant air flow, which also cools the motor, would not take kindly to the air being throttled — it heats up very quickly. I have therefore made an air bleed device, which is merely a long slot in the air pipe, and the length of slot open is controlled by a sliding cover. The blower then passes a constant amount of air, and any surplus passes out through the slot according to how much of it is open.

The position of the burner was not correct as supplied — the flame striking the side of the port in the brickwork. This would not be serious if the brackets holding the pipework were easily adjustable, but they are not. I hope the manufacturer has accepted my suggestion that they should be.

Firing: We quickly found that the heat input could not be controlled to a low enough rate at the start of firing, using the air control alone. We are therefore faced with controlling both gas and air, and trying to judge that the mixture is right from the flame colour, for the first 3–4 hours of a bisque firing and the first ½ hour of a glaze firing. I am sure that was not the intention of the mixer valve manufacturer, and I intend taking this up further with Elecfurn.

The heat input appears to be ample. We have fired to 1230°C in 4½ hours, but most firings have been longer than that — a far cry from the 12–15 hours our electric kiln took! Now that the kiln and heating equipment are not the restricting factors they were with conventional kilns, the next question is how fast can you go? Presumably the clay and/or thickness of the ware and/or its shape are the critical factors, together with what the shelves can stand.

Tentatively, the criteria are, for bisque, to restrict the rate of temperature rise to 600°C in 3½ to 4 hours, then turn the heat up full. For glaze firing, restrict the rate to 700°C in 1½ hours, then turn the heat up full. Our only basis for this is instinct — ours and that of a friendly expert! We know it works with GB2 and RM2 from Nelson Clays, but only time will tell what the real limits are. We have not yet attempted any reduction firing.

The fuel cost of a bisque firing is about $1.50, and a glaze firing $3.50.

General impression: Despite a bad start with much delayed delivery, and the problems of control, we are satisfied overall with our purchase, and I am sure our problems will be overcome. The manufacturer has been receptive to our constructive criticisms, and commented that he rarely gets that sort of feed back from his customers. My impression is that the kiln was developed using LPG burners, and probably all the problems were sorted out. The burner system we have does not seem to be a fully developed design, so to some extent we are guinea-pigs.

CATHERINE ANSELMI

building a gas kiln

The 10 cu. ft front loading downdraught kiln, built by Catherine Anselmi, using ceramic fibre with firebrick floor inside a 20 gauge galvanized steel case with separate door, is working satisfactorily. The costs were:

Galvanized steel case	$ 91.56
Fibre	467.00
Bricks	125.00
Stainless steel pins and caps	81.00
Regulator and change-over valve	61.26
Burners and hoses	257.30
Steel	8.30
	$1,091.42

Flames across the Tasman

Our contemporary Australian potters have been into gas and fibre for some time longer than has been the case here. Tom and Brigitte Cockburn of Red Mill South in Victoria talk about their experiences firing with LPG.

Our experience has been in the use of equipment with 100 lb cylinders when full with 100 lb pressure, put through a pressure reduction valve to deliver 15 lb pressure to the pipeline and controlled by a second pressure reduction valve to vary the amount of gas to the burners.

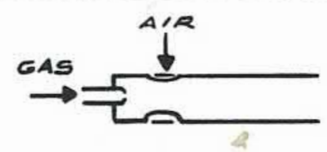
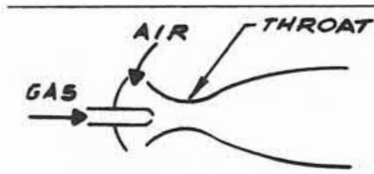
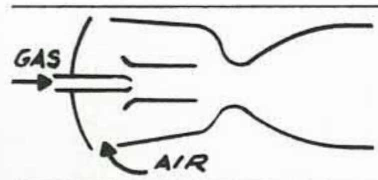
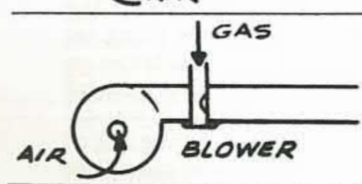
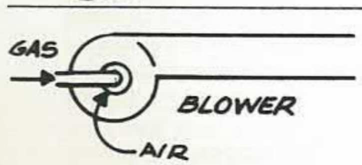
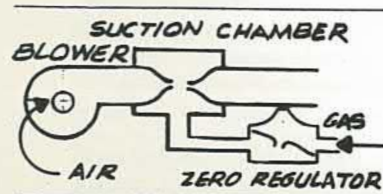
It is not advisable to make your own burners because gas is an explosive fuel that needs to be handled the right way and in conjunction with correct control equipment. We suggest burners be bought as units; two we can recommend. On the dozens of kilns we have built, "companion burners" of varying sizes to suit the size of the kiln have been used; they have been very successful in economising gas consumption and allowing better control of firing. The other burners are produced by the Gas and Fuel Corporation of Victoria.

Both these burners are used at what is termed High Pressure — up to 15 lb per square inch. The gas burners used for natural gas or town gas can be used if the LPG is reduced to what is termed low pressure, i.e. about 4½ inches water pressure.

Forced draught is not necessary if the correct balance between air intake and size and height of flue is obtained. Balance also has a lot to do with the amount of fuel consumed and the control of atmosphere (neutral or reduction) for different stages of firing. It is necessary to have the correct pressure reducing equipment, and suitable means of controlling the amount of gas to burners to give sufficient, but not too rapid heat increase. Some of our local authorities enforce the use of flame failure devices as a safety measure. There is a very good Australian firm that sells nothing but LPG equipment.

We fire our current 18 cubic foot kiln around $A10. It takes 24 hours to fire, 36 hours to cool and uses 110 lbs of LPG. We make fine quality functional stoneware and have been using this kiln for four years.

Burner types

Diagram	Operation	Traits/Problems	Advantages/Disadvantages
	Modified Venturi using a pipe section. Primary air is entrained only by velocity of gas stream.	Needs highest gas pressure available to draw in sufficient air for combustion.	Burns back into tube with reduced gas pressure. Least efficient.
	Venturi Burner. Gas velocity causes partial vacuum at throat, draws in air which mixes in tube and burns at mouth.	Needs secondary air to complete fuel combustion in firing chamber.	Efficiency can be maintained by changing orifice with change in gas pressure. Minimum maintenance. Economical.
	High BTU Gas Venturi Double Throat. Enables adequate air entrainment with high BTU gas stream. For propane and butane.	Solves the problem which exists when trying to maintain same heat output from Venturi Burner above, that was available from natural gas.	Same advantages as above. Most expensive Venturi Burner.
	Forced Air Burners. Offer most concentrated heat from given burner size.	Blower speed affects heat ouptut. Dangerous if blower fails.	Should be equipped with an automatic shut-off. Higher initial cost. More efficient.
	Forced Air Mechanical Mix Burner. Gas is fed into blower intake. Blower does efficient mixing of gas/air mixture for better burning.	Same problems as above. Good burning rate. Requires blower with sealed case.	Same as above. Better efficiency than above.
	Zero Pressure Regulator Mixer. Allows control of burner output governed by air flow only. Adapts well to automatic system. No gas flow without air flow.	Quiet, most complete combustion, smallest combustion chamber, fastest combustion speed.	Same as above. Excellent efficiency. Most costly. Safe.

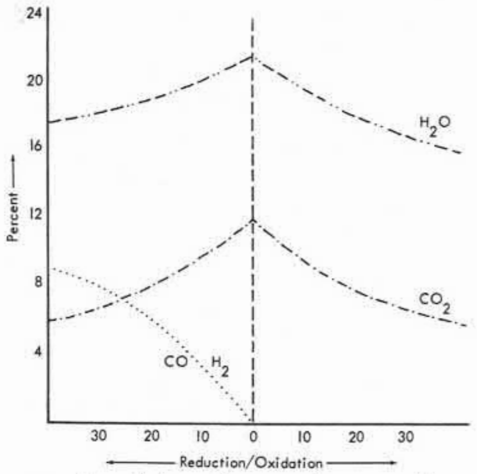
Doing away with pot luck firing

A new parameter in kiln control — CO_2 percentage

Instead of the generalisations – reduction and oxidation – we now have available means to determine the proportion of CO_2 present in the kiln atmosphere at any time during firing. This index gives us precise information on the degree *of reduction or oxidation and enables the kiln atmosphere to be controlled. The measurement is made by means of a gas analyser available commercially in New Zealand at something over $100.*

George and Nancy Wettlaufer in "Getting into Pots", chap. 13 (Prentice-Hall) – see Studio Potter Vol 5/2 p. 82–3 – describe what the CO_2 analyser is and how it works.

A potter inserts a quartz tube through a small hole in the firebrick toward the interior of his kiln and pumps a rubber ball (like a blood-pressure pump) about 20–25 times to draw out a sample of the kiln's atmosphere. The gas sample is sucked into a glass tube containing a chemical (potassium hydroxide) which absorbs the carbon dioxide and expands as a result. The increase in volume causes the fluid to rise in the glass tube whose numbered scale indicated the percentage of carbon dioxide present in your kiln's atmosphere at the time you take the sample. As you can see from the figure, a number (8% for example) can occur either in reduction or oxidation. Which side of neutral (maximum CO_2) you are on is not difficult to determine.



In using an analyser, the first thing you should try to determine is the maximum percent of CO_2 possible, or neutral. This is theoretically perfect combustion (the peak on the graph) requiring the least amount of fuel and giving off zero pollution in the form of carbon monoxide. To do this, set your kiln so that plenty of air (excess air) is entering the kiln and you are sure that you have an oxidising atmosphere. Then start gradually closing down the amount of oxygen entering the kiln (closing off both flue and burner openings). Each time you do this, after waiting a few minutes for the kiln's atmosphere to stabilise, take a gas sample. You should be reading progressively higher numbers on the analyser scale. When the numbers begin to decrease, you know that you have reached neutral and started into reduction. For maximum efficiency, set your flue and burners so that your analyser gives a reading just slightly lower than the maximum number on the oxidising side of the scale.

When glaze-firing, from cold up to 1000°C (about cone 06), we set the kiln for maximum fuel efficiency as described above (see Fig.) — a reading of about 11–12% or just slightly oxidising. From 1000°C to 1050°C (cone 06 to cone 04), we reduce the clay body. We decrease the air supply until the analyser records about 8% carbon dioxide, fairly heavy reduction. Remember that as the numbers are decreasing, the amount of reduction is increasing. This takes about an hour. 1050°C is the point at which our glazes begin to fuse, and it is here that we begin a lighter reduction, measuring about 10% CO_2 on the analyser. We hold this reading until the kiln gets up to temperature, about 4½ more hours.

Note: When and how much body reduction, is a function of clay porosity at a given temperature and the amount of iron in the body. You may want to begin body reduction slightly earlier, or you may want to vary the amount of body reduction to suit your glazes.

When bisque-firing in our gas kiln, we maintain an oxidising atmosphere, reading about 9% on the oxidising side of the scale, until the carbon burns out of the body — or up to about 700°C; then we go to almost complete efficiency, or 12% oxidising, for the remainder of the bisque firing.

One consideration to keep in mind is the balance between the flue and the burners. We try to maintain a 5–6' per second gas flow through the kiln during oxidation and about 3–4' per second flow during reduction. This is done by closing off the flue and adjusting the burners in proportion to each other — it takes some experimentation. (The oily rag method described by Olsen works well for measuring this.) The settings will vary slightly depending on the *weather* (change in atmospheric pressure outside the kiln.) If wind is a problem in maintaining atmosphere or gas flow, it can be adjusted for by installing an atmospheric damper in the flue, such as those commonly found in oil burner flues. Too strong a draft tends to cause irregular temperatures and to make the kiln overly responsive to wind changes (similar to a sailboat again). Not enough draft may result in too much reduction.

Weather may have other effects on firing. We have mentioned atmospheric pressure. (Firing on a clear day gives a different draft pattern than on an overcast day.) We have also talked about wind, which may give an irregular draft. Both will affect the kiln's atmosphere. Humidity will also tend to give a different reading on the gas analyser.

Cold weather will also affect the cooling rate. Normally, upon shutting off our kiln, the temperature drops about 100°C, and the atmosphere returns to neutral almost immediately (even with the flue and burner holes blocked up). If the initial temperature drop is more rapid, and it may be in winter, the surface of our glazes tends to become more crystalline. It is possible to run a neutral flame for a few minutes to compensate for the colder weather, allowing the kiln to cool more slowly — more like the summer cooling curve.

Generally, in a firing cycle, what happens on the way up with temperature and atmosphere is reflected on the way down in a mirror image way — almost like a balancing scale. The amount of reduction during firing influences the amount of reoxidation on cooling. Much colour development takes place during cooling. If you assume that normally, the cooling half of the process is constant, you can adjust the heating half accordingly. The other thing to keep in mind is that the chemical reactions between gasses and oxides will be the most extreme at the higher temperatures.

With U.S. glaze recipes already including the CO_2 percentages necessary to achieve the desired performance we can look forward to seeing this new tool increasingly used in New Zealand.

Next Potter, Part II of CO_2 gas analyser. How to convert from one fuel to another and still achieve the same firing results.

Lynn & Mike Spencer

Lynn and I came to New Zealand in 1971. We had no idea then that we'd still be here in 1979. We did, however, know that we wanted to become potters. Our experience was limited to a few night classes that we'd attended in Montreal which gave us only the most rudimentary knowledge. Soon after we arrived in New Zealand we built a large continental-type kickwheel basing the design on wheels we'd used in Montreal. But secondary school teaching drained us of so much energy that we could never spend enough time potting. Lynn quit teaching first in late 1973 — the immediate cause was our first successful glaze from the small electric kiln we'd bought. (It was a garish cobalt/chrome mix, and could scarcely be more dissimilar from what we're doing now.)

While I continued teaching for another term, Lynn practised throwing, learning the hard way by trial and error and trying to put into practice methods described in books — not so easy this latter feat! The experience Lynn thus acquired was a help to me when I started throwing later.

Obviously the pots we eventually came to make are designed for use, but with form always in our minds, we try to make pieces in different styles. I make press-moulded pieces to complement Lynn's thrown ware. The shapes we make have evolved through a succession of small modifications and this process continues. There never seems to be a final shape for a pot.

Our first kiln, disrespectfully named "Old Unfaithful", is 35 cu. ft., diesel-fired, using two pot burners with Tellus vacuum cleaners as blowers. It is an agonizing devil — being temperamental in the extreme. It takes us 24 hours to fire, with cone 8 over at the top for the last 8-10 hours! There is a 2-cone difference from top to bottom and stacking is so critical that a few inches either way can result in over or under-firing some glazes. We gave up blessing it early on, finding a good thump on the door and a strong "You behave!" works better than appeasement. We do find that the glaze quality from the long firings is much better for most glazes: they are softer and gentler. The years have taught us that probably the flues are much too small and/or the number of burners are too few, but glaze quality prevents us wanting to change.

More recently, we have built a much larger, two-chambered kiln (100 plus 60 cu. ft.) which fires very evenly with five pot burners in a mere 16 hours. As a result we are presently very involved in re-adjustment of the old and development of the new glazes for this kiln — all but the shino and ash have to be changed. Each individual kiln seems to be precisely that — completely individual.

We use only iron as a decorant or colouring in glazes. Kokowai, a red iron-bearing clay from Mount Egmont is used to decorate some bowls or is used as a simple wash over a semi-matt glaze containing 1% iron. Iron in various percentages in different base glazes gives us a reasonable range of colours. We feel that this gives us ample scope to work with at the moment — the variations seems endless even with this self-imposed restriction.

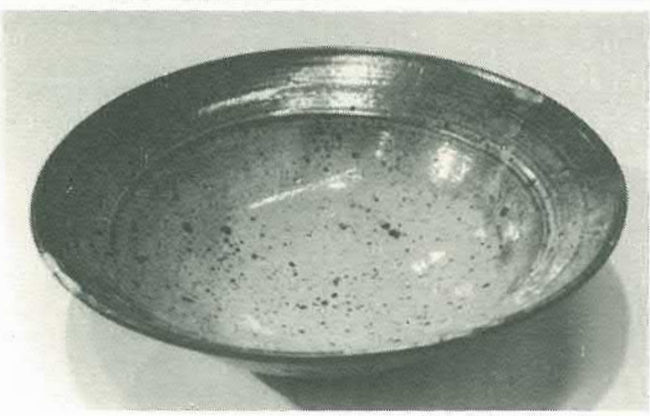
Our usual way of working is to make pots for about a month and then to spend another month glazing and firing (it takes four to five firings to get through all the pots). This method of multiple firing has some advantages in rapid feedback but can be very exhausting. We hope that as we can develop new glazes for the big kiln — we'll be able to fire it more frequently. That way we'll only need two or three firings!

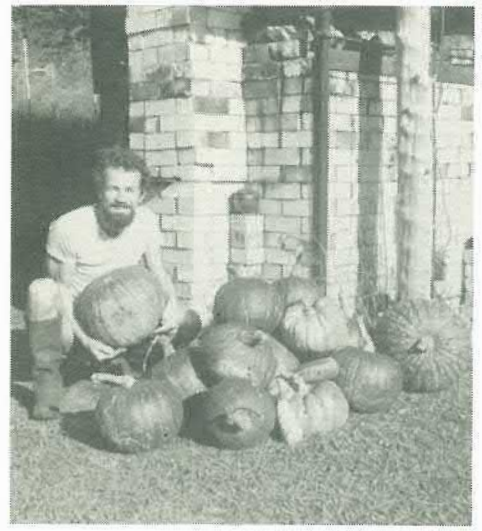
Currently all our clay mixing is done the hard way — wedging by hand. We use a mix of McPherson's XXX, Hyde Ball Clay, Huntly FG and AF 30 fireclay, and Hume Clay.

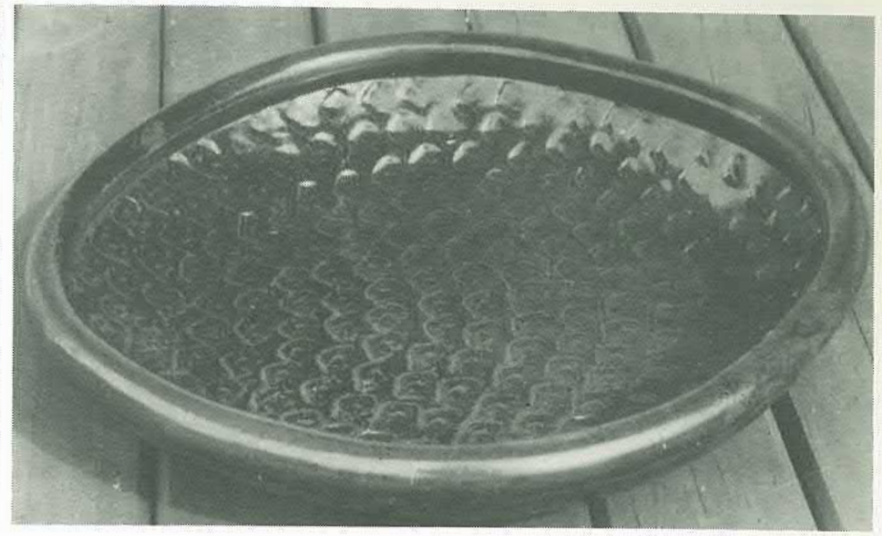
We have found cones notoriously unreliable in providing really accurate indications as to when to shut off the kiln and now rely on test rings to guage the final stages. This works very well but one needs to find a glaze for the rings that doesn't flux completely until maximum temperature is reached. Since our ash glaze needs a full cone 10 or more to flux adequately, it serves our purpose well. We can't claim that we never under or over-fire but we certainly do it less often.

Mike Spencer

Some of Lynn's pots, shino glaze, 1% iron glaze with kokowai slip inside.
photos: Mike Spencer







Mike Spencer's pots.
photos: Mike Spencer

Patea Ceramic Club

For a town with a population of 2,000, Patea has a surprisingly active club. With a membership of only 30 it has its own clubrooms with three electric kilns which are never cold. Night classes at the local High School cater for another 18 keen learners.

Interest has built up over the past three years through weekend schools arranged by the Taranaki Polytechnic and conducted at Patea High School. Three schools in 1978 were followed by five last year and 17 potters attended a full week school in September tutored by Jane Capon. Individual members also travelled to attend courses elsewhere.

A full programme is planned for 1980 concluding with a summer camping school in January 1981. For information contact John Rough, 32a Gloucester Street, Patea.

A porcelain clay body

I am sending a formula for porcelain that we use at our studio. We have found this an excellent porcelain for throwing large forms normally outside the range of porcelain. Due to the large amount of Bentonite it is necessary to dry mix this formula thoroughly.

feldspar	20
kaolin	20
ball clay	35
silica	25
bentonite	5

Jeff Bickner, Santa Cruz California

It's your Potter magazine. Have you a contribution?

The editorial committee welcomes contributions for consideration and publication from any potter old or new who has contributions to make in technique, philosophy, work routines, kiln building and firing, technical information on equipment you have found useful. Send photographs or drawings of all aspects of your background and work to editorial committee, Box 12-162, Wellington.

Pottery for sale

Kaiuna Valley: 3 bedroomed cottage with character on 1 acre of land. Established fruit trees, garden, paddocks. Double garage with sales area, workshop, kiln shed (35 cu. ft wood-fired kiln optional). Situated Blenheim-Nelson highway (6 km Havelock) $30,000 negotiable. Contact Lindsay Smith RD1 Havelock, phone 27 S (after June).

New Zealand Society of Potters

Many of our readers will be interested to know what the New Zealand Society of Potters is and what it does. We asked the society to outline their aims and function.

PRESIDENT: Leo King VICE PRESIDENTS: Neil Grant, Sally Vinson

The society exists to assist the development of all aspects of pottery and ceramics.

MEMBERSHIP

Exhibiting Members
Open to all who work creatively in a ceramic medium and at a professional standard. Membership which is open to all applicants is by an annual selection process. Annual subscription — $20.

Associate Members
Open to all who are interested in pottery and ceramics and wish to further the aims of the society. Annual subscription — $12.

Newsletter Subscribers
For those who wish to receive only the information on the activities of the society. 5-6 newsletters a year. Annual subscription — $9.

For information please write to the secretary:
R.M. Toplis
P.O. Box 881, Auckland.

or contact our regional delegate:

Invercargill	Francis Fredric, Rata Rd, Otatara, RD9, Invercargill
Dunedin	Richard Booker, P.O. Box 19, Hampden, Otago
Christchurch	Fredrica Ernsten, 46 Aintree Street, Christchurch
Nelson	Peter Gibbs, Waimea Rd, RD 1, Brightwater
Wellington	Patti Meads, 31 Ngaio Rd, Kelburn, Wellington 5
Hamilton	Peggy Judge, P.O. Box 9434, Hamilton North
Auckland	Michael Lucas, 6 Cracroft Street, Devonport, Auckland.
Palmerston North	Stan Jenkins, 24 Nelson St, Feilding.

Planter by Douglas Wasywich of Coromandel shown at the New Zealand Academy of Fine Arts' 1979 Craft Exhibition.

A self sufficient craft village in Coromandel?

I have plans for a co-operative building scheme on five secluded acres of residential land on the edge of Coromandel township. Hopefully it will enable at most six families to live in harmonious surroundings, developing their half acres on a self-sufficiency basis and freeing the craftspeople to devote themselves to their crafts with the minimum of distraction.

Deep in pines, regenerating native bush with over an acre of grazing, the land desperately needs a wood-firing potter and a spinner and weaver whose small flock will graze out long, sweeping firebreaks along which children could ride their Welsh ponies.

The land is already surveyed and pegged, electricity and telephone cables and water pipes are laid underground and the council approves the venture. I think the scheme would suit people of my own age, fortyish, vigorous enough for some small-scale pioneering, yet aware of the needs of retirement. Half acres will be available for between $5,000 and $8,000 but there will be discounts for those who are prepared to contribute to the benefit of the group.

For further details write to

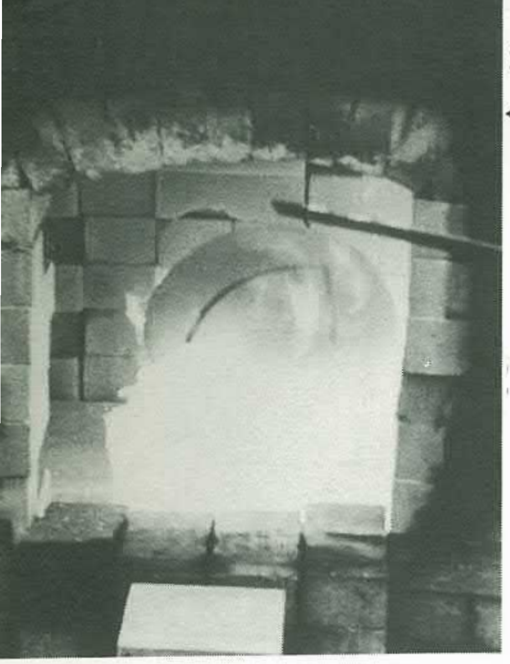
Ray Morley,
Box 12-162,
Wellington, Nth

The flame is thick, slow, and smoky, filling ½ the chamber. It's easy to see which is the hottest part of the kiln; the pieces in the direct flame are warping gently towards the flame. Once, a shallow plate, leaning vertically against the wall, was turned inside out by the flame brushing one side only. Some of the glazed areas are shining and in other parts of the chamber the glaze seems to be boiling and blistering – looking very much like boiling mud pools. All glazes seem to go through this stage before becoming fluid. It is difficult to see all the pieces as they are piled on top of each other leaning and touching the kiln wall and themselves. One of the slips is peeling and crawling making an interesting surface. Some of the pots can be removed now. Those unglazed do not need any more heat if their main treatment is going to be smoking. Unglazed surfaces needing salting to complete their design wait to be moved around. Others need to be moved too. One to cause the fluid glaze to run in lines down the form, another to receive more heat and soak in it. Much of the action and designing is taking place in the chamber and with the flame itself. Tongs lift out pieces and are needed to reposition kiln furniture (small parts of bricks) and to reposition the remaining pots. The crudely made lightweight fibre door is replaced and firing continues. Pots removed are being worked in the smoke →

LOWFIRING IN OPEN KILNS

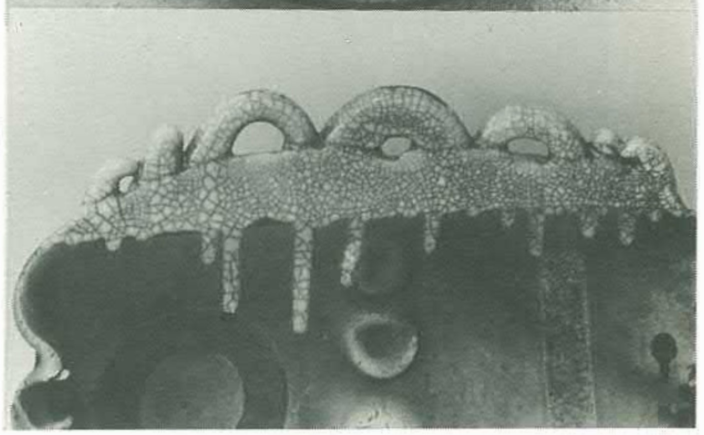
DURING 1979 OVER 50 FIRINGS USING OPEN KILN METHODS SIMILAR TO RAKU WERE COMPLETED. THESE FIRINGS INVOLVED ABOUT 60 PEOPLE FOR VARYING PERIODS OF TIME AND IN VARIOUS PLACES: MASSEY SUMMER SCHOOL NORTH SHORE TEACHERS COLLEGE THE WAIKATO SOCIETY OF POTTERS at ORINI, TWO SUMMER COURSES IN SURREY, ENGLAND, AND AT RAMARAMA, SOUTH AUCKLAND.

NOTES BY BRIAN GARTSIDE
Photos mostly by RAY ERICSON AND PETER HICKMAN



SALTING

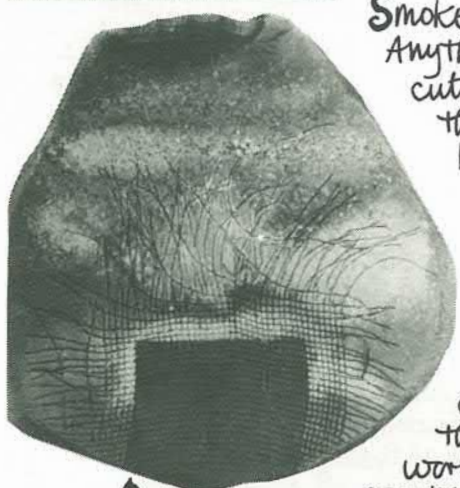
"FAULTS" LIKE
PINHOLING
CRAWLING
PEELING
CAN BECOME
STRONG DESIGN
FEATURES



CONTROLLED
FLUID
GLAZING

Once again the door is removed and the contents studied thoroughly. Some mo pieces are removed and those remaining can be salt fired. Salt, soda and frit can all be applied ① into the hot firebox ② scattered into the chan or ③ applied in a concentrated local area as part of the design on a piece. All methods give different results and tremendous variations of glaze surf achieved. The kiln is sealed again for five or ten minutes so that the vapour can do its work. These last pieces are removed by ton and the chamber allowed to cool down for a while. Loading car commence as long as the next pieces have been pre-warmed (usual on the roof of the kiln.)

Smoke is caused by the hot piece of pottery touching some combustible mat. Anything that burns will serve the purpose – straw, sawdust, grass cuttings, leaves are common. Completely enclosed or immersed in smo the pores of the immature clay immediately take on carbon anc becomes black. The shrinking glaze crazes and the smoke enters the cracks make intricate networks of black lines. Pigments change colour. Withdrawing the pot from the smi enlivens the whole surface. Air cleans away the carbon an the colours change again. Subtle and ever changing shades of black and grey demand quick decisions. Once below 500°C the surface is too cool and stops working. Unsatisfactory design and surface can be returned to the hot kiln for a new start.



UNGLAZED SALTED AND SMOKED. Ⓑ

SLABFORM TORN AND FOLDED.
THIN GLAZE RESISTS SMOKE
detail

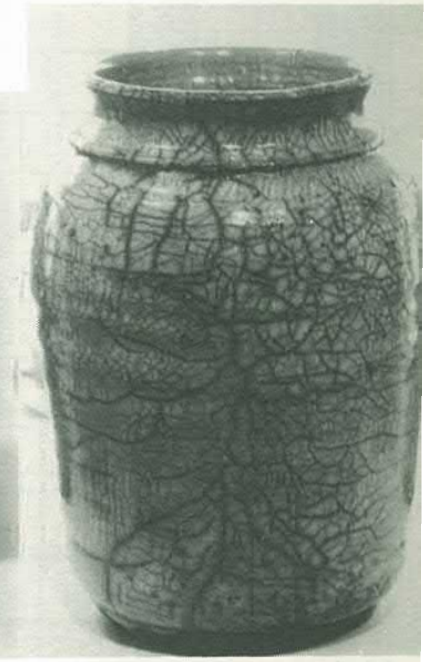
LYN MILLER of RUSSELL

Penny Harvey of Albany – A selection of landscape tiles employing unglazed and glazed areas in creative way

Gill Peacocke of Benneydale.

Strawmarks fixed permanently in carboned surface.

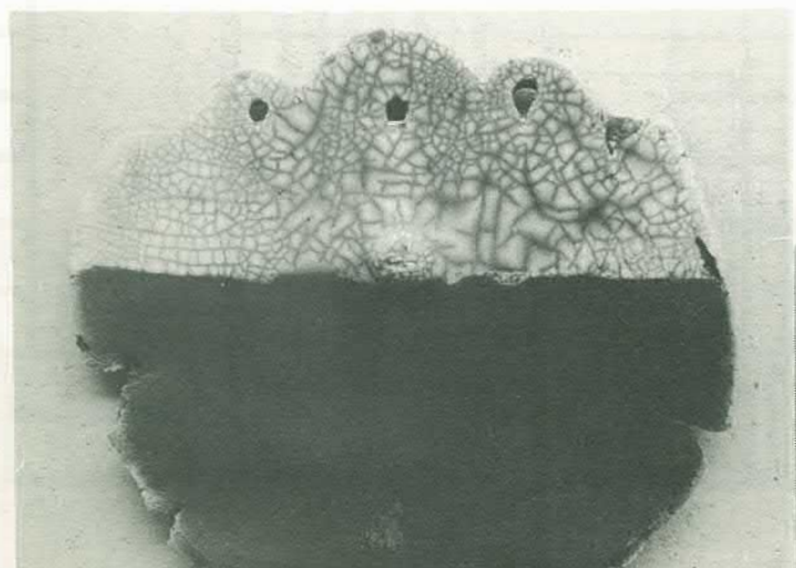
Catherine Anselmi
Smoke on glaze



Intricate and varied effects of smoke on glaze – probably caused by thickness of glaze

Lex Dawson of Ararimu

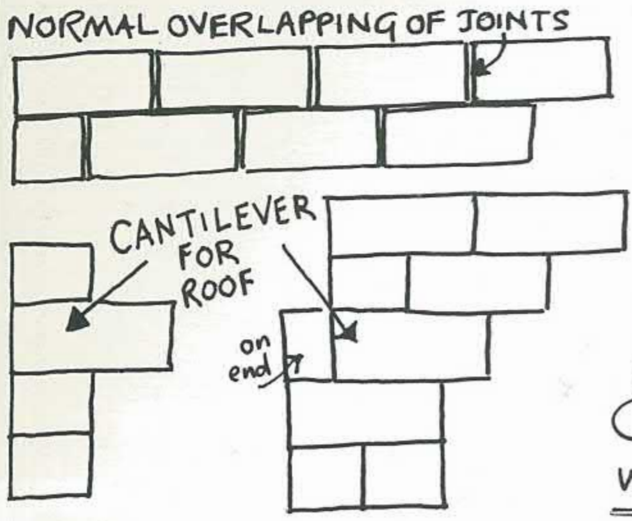
BRIAN GARTSIDE: Slip and glaze completely chittered away – leaving soft network of smoke lines.



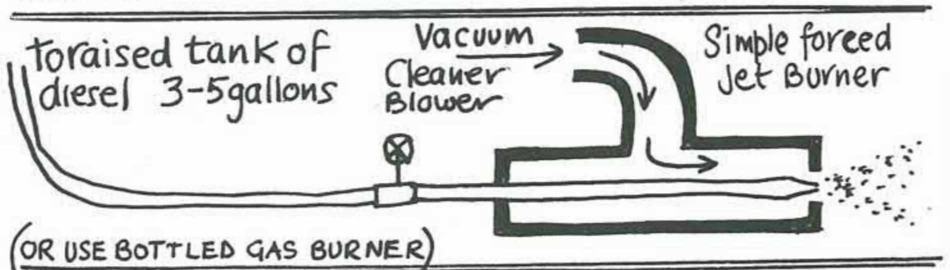
Four unglazed pieces

TWO SMALL KILNS SUITABLE FOR LOW FIRING

NOTES, PLANS.

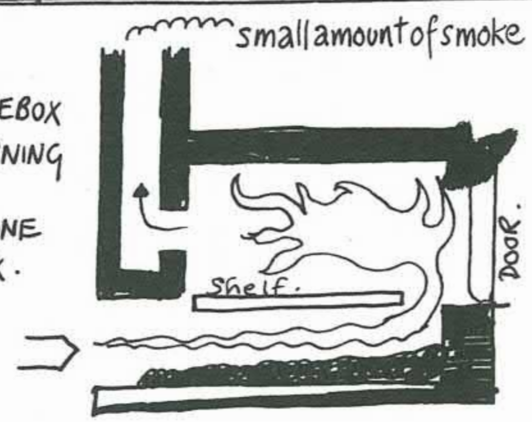


Any bricks will be suitable : temp. up to 1000°c
Prefer firebricks : especially for firebox
Level site : can be raised on concrete blocks
No mortar needed (clay and sand if wanted)
Door: Removable loose bricks or Fibre backed with thin metal sheet.
Fuel: Both kilns can burn wood and coal to supplement diesel or gas.
Chimney: not essential but can be built with extra bricks or use a steel pipe.

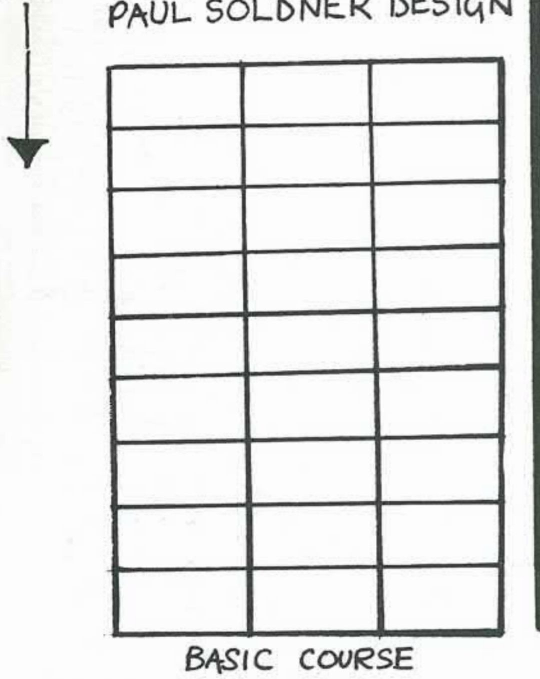


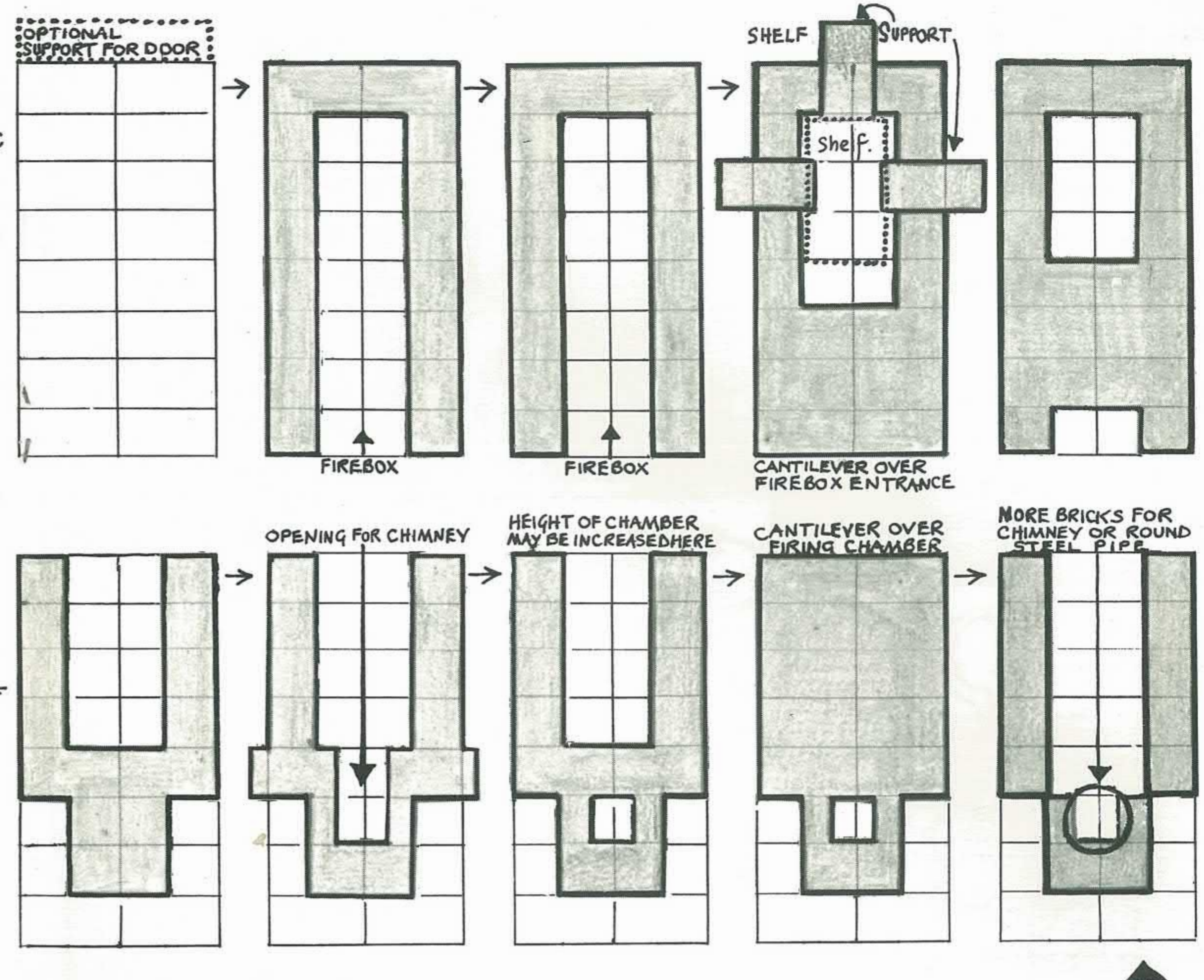
FIRING

LIGHT A WOOD FIRE IN FIREBOX
SPRAY DIESEL ONTO BURNING WOOD EMBERS.
STOKE TO KEEP ABOUT ONE THIRD SOLID FUEL IN BOX.
FROM RED HEAT KEEP A SLOW LAZY SLIGHTY SMOKY FLAME!



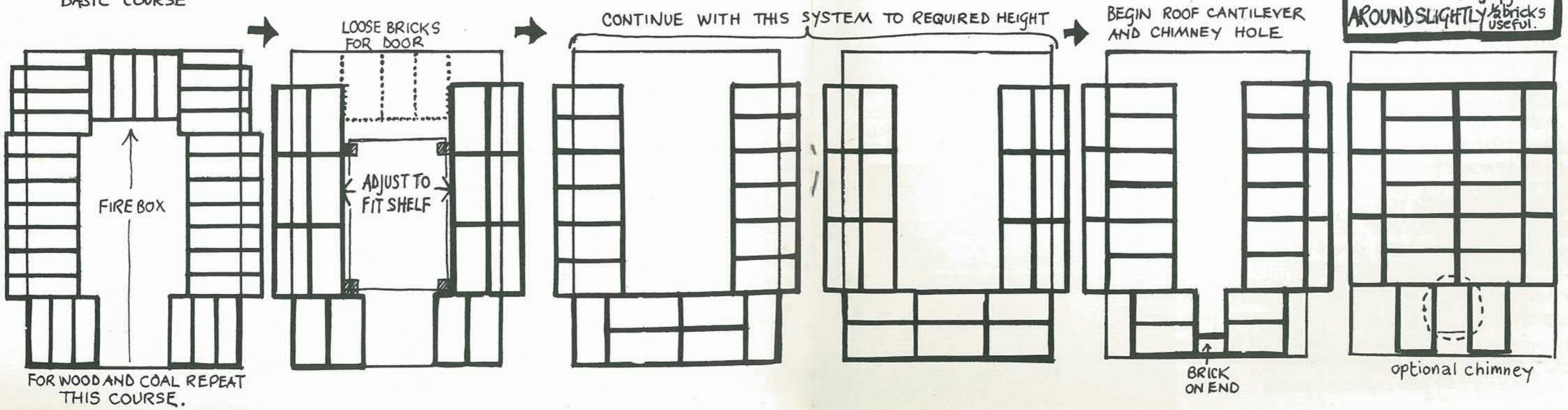
KILN ADAPTED FROM PAUL SOLDNER DESIGN





APPROX. 120 BRICKS

BRICKS IN BOTH KILNS MAY HAVE TO BE JIGGLED AROUND SLIGHTLY ½ bricks useful.

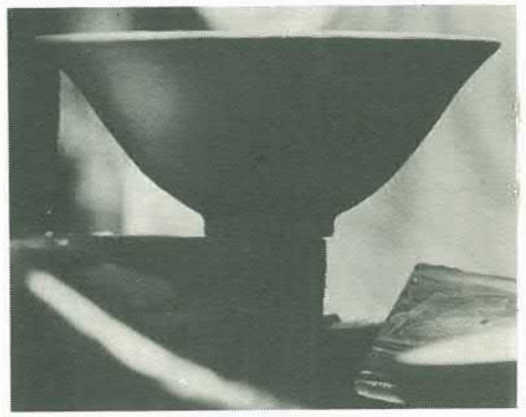


250 to 300 BRICKS

CARVED WHISTLES BY VALERIE MOSS of Kaitaia

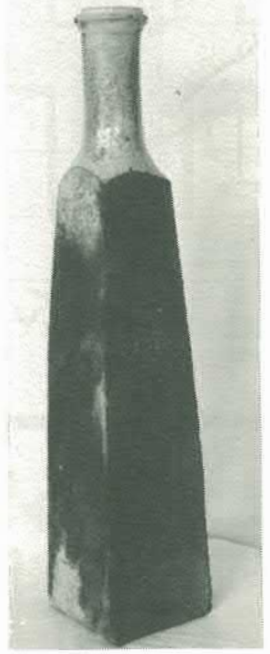
WHAT FORMS ARE SUITABLE FOR LOW FIRE?

FINELY THROWN AND BURNISHED PORCELAIN BY CATHERINE ANSELMI. → of Bombay.



Landscape carved by SUE CATLEY of ORINI

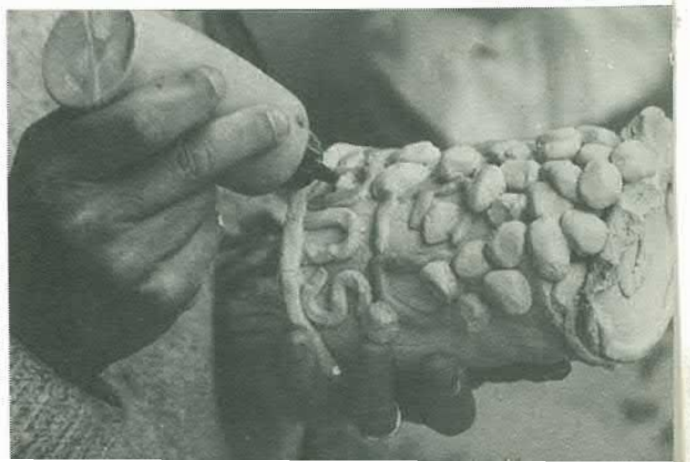
Glazed and unglazed surfaces heavily smoked.



TALL CYLINDRICAL FORM + SLAB BOTTLE BY SUE JUDD OF HAMILTON.

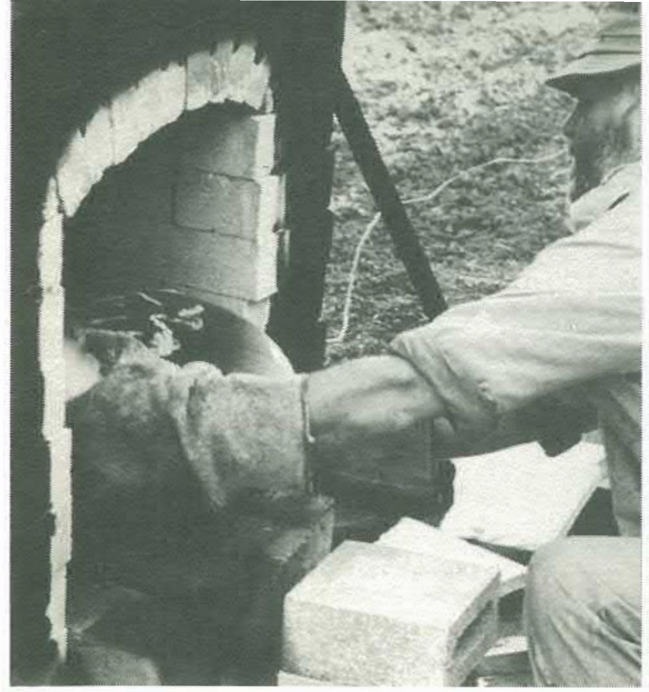
Slab fired horizontally turned and salted four times 60 cm.

Penny Harvey glazing "Baked beans"

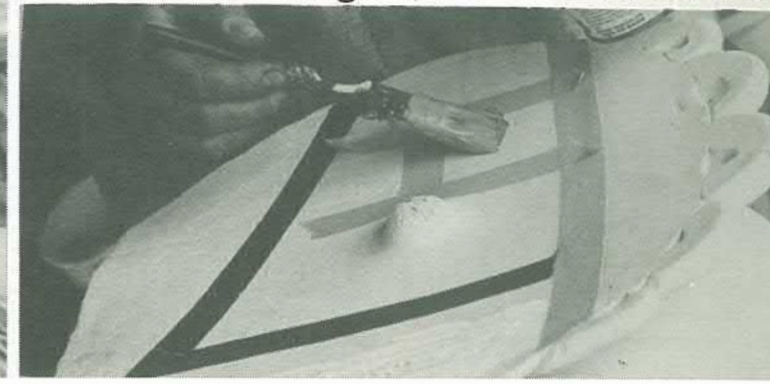


It does appear that anything that can be made with clay can be made for low temperature open kiln firing as long as the clay is "opened" with sand, grog, sawdust and the like. Even solid forms fired slowly can survive. It pays to take extra care when joining pieces of clay together. Burnish, model, carve imprint, coil, throw, pinch, slab the form and surfaces. Biscuit fire slowly before the final firing.

Some dry, unfired pieces have survived but it is risky and somewhat antisocial when others glazes are peppered by your exploding pieces



I have been creating designs and surfaces on my pots for about eight years in both reduction and oxidising kilns. Low temperature open kiln working allows me to have more "say" in the burning part of the process and therefore extends the design possibilities. Ideas for me flow more freely and more quickly. The platters shown on the following page contain environmental symbols and employ only a small amount of glaze area →



BT Ramarama 1979

CLAY BODIES

Any clay mixed with sand. Clay dug with spade on site usually the best!

Basic Mixes

50% Fireclay
30% sand or grog
20% Talc

Probably not necessary

25% AF30 Fireclay
25% Standard
30% Sand
20% Talc

these three mixes are very short and can be mixed with other clays for plasticity

R. Cowan tile making mix.
100 Fireclay
Equal volume fine sawdust
20 Silica sand
75 Other clay
this mixture fired easily without bisque firing
Solid pieces made.

Coarse shredded glass fibre helps in constructing and drying of large handbuilt shapes. Knead it into fired mix. Mica in clay is excellent in resisting thermal shock. A low shrinking mix allows the embedding of gravel soil metal and tin metal objects like pins nails wire

ENGOBES, SLIPS

→ applied to bisque

Stoneware glazes fired at low temperatures make fine dry engobes. Add varying amounts of pigment or oxide up to 50/50 mix.

Bat wash or shelf wash
Chinaclay 50 / Silica 50
use thinly
use thickly for peeling texture

Dry white surface
Feldspar 80 Frit 20
(engobe discovered by mistake when mixing 80/20 glaze)

Night Red slip borrowed from Ceramics Monthly article "Sun Valley" 9/79
Frit 20
Silica 40
Chinaclay 80
140 + 140 Red iron ox.

Black magic pigment
50 Copper ox 50 Iron ox
Watch this one reacting in the smoke!

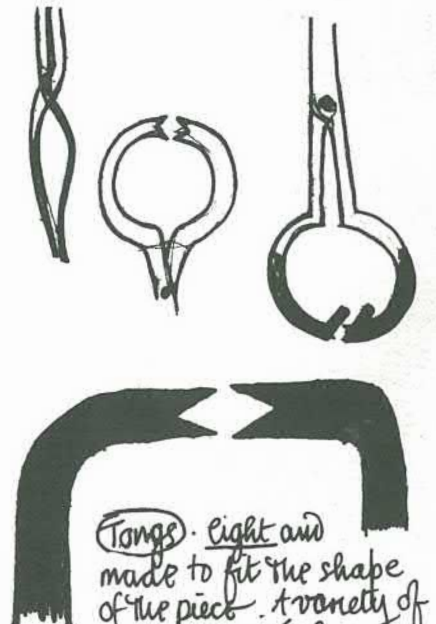
GLAZE

Frit	90	80	70	60	50	etc.
Feldspar	10	20	30	40	50	

more fluid — the widely used "apple crackle" — dry

Books on Raku are full of recipes. It would be possible to work a lifetime with the blend shown above. Try different frits and varying amounts of pigment. Lead frits. Borax frits. Colemanite. Gerstley Borate if you can obtain it sets like a jelly thus demanding inventive and innovative ways of applying it to the work. Remember that the clay body offers an immense range of smoke effects. Smothering everything with glaze is not the only way!

materials can be **POISONOUS** — Wash hands frequently — Food + glaze doesn't mix



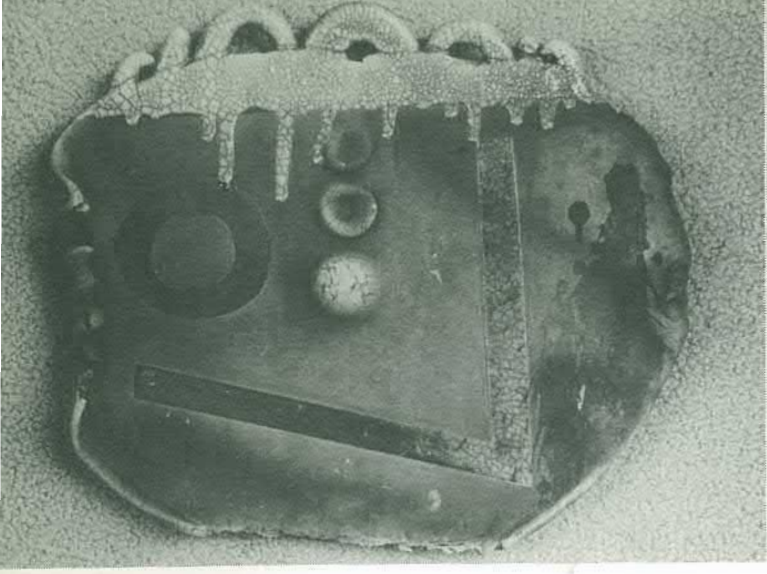
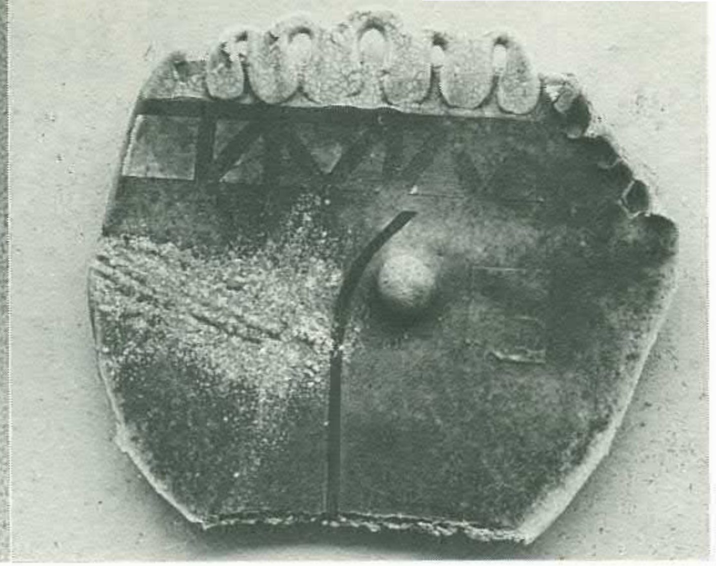
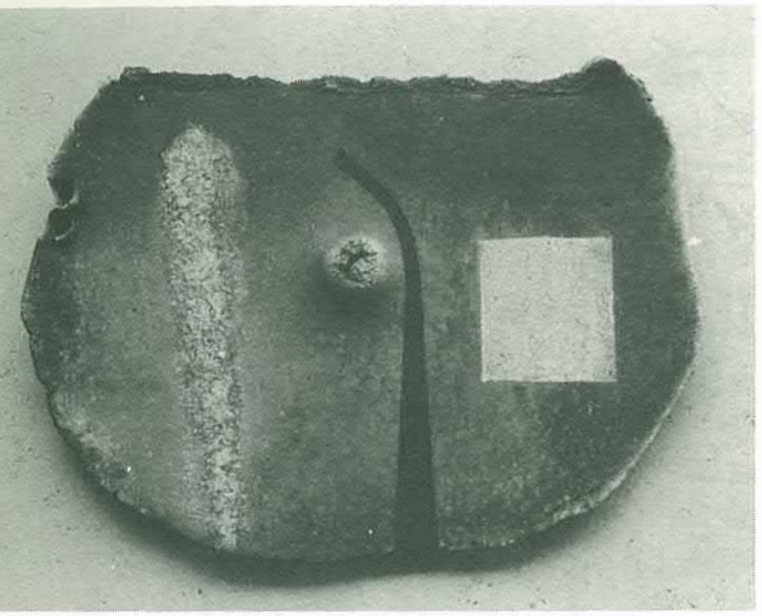
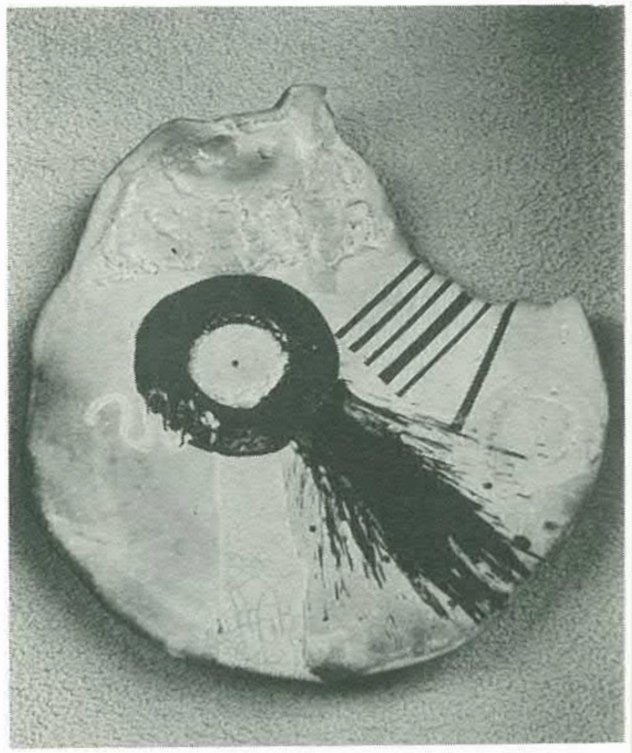
Tongs: light and made to fit the shape of the piece. A variety of ends are useful.

Heat resistant gloves ESSENTIAL

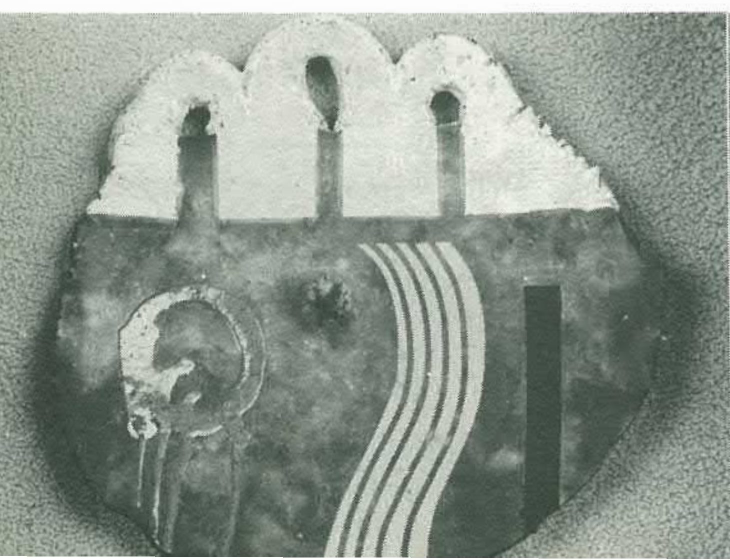
Clothing: none at all is best — if its getting too hot skin will tell you more quickly than any other covering.

Tools in general are best made to fit the purpose and as they are needed.

Primitive Pottery: Hal Riegger
Raku: Art and Technique: Hal Riegger
Raku: Tyler and Hirsch
Ceramic Monthly: USA Magazine
All good reading!

PLATTERS 40-50cm. BRIAN GARTSIDE.
DESIGN BOTH SIDES : LOW FIRED, SMOKED.
BRIDGE AND LANDSCAPE FORMS.




Industrial revolution strikes again
Firing stoneware with Waikato coal

Barry Brickell

Bituminous coking coal from Westport and Greymouth has from the earliest days of NZ industrial, and later, studio potteries, been well known and respected as a direct-firing kiln fuel for up to 1300 degrees centigrade. Millions of sewer pipes, traps, crocks and bricks have been through the salt-glazing process using this ideal fuel. About the mid-sixties, the odd studio potter started to build small salt-glaze kilns more or less modelled on the large industrial ones with their simple, narrow fireboxes and sloping iron firebars working on natural draught. The free-coking nature of the coal allowed plenty of air to pass through the fire and so fan it up to a tremendous temperature. The incandescent fuel bed also provided an excellent place for the salt to land on for rapid volatilisation during salt-glazing.

However, with the closing down of virtually all of the works producing coal gas in NZ, (replaced by Australian petroleum gas or natural gas), the Mines Dept. no longer stocked bituminous coal in their various depots. To date this has affected only a very small minority of the potters. But with the alarming and steady increases in the prices of dieseline, electricity and to some extent, bottled gas, many potters are looking towards alternative, cheaper fuels. Although the modern ceramic-fibre refractories now available have revolutionised the economics of gas firing, by cutting down fuel consumption by 40 to 60 percent, these materials are unsuitable for ash and dust-bearing cheaper solid fuels and for salt-glazing. It is conceivable, however, that a flux-resisting coating of perhaps zirconium oxide may be developed which could alleviate this problem.

Sub-bituminous or *non-coking* coals are rather abundantly spread throughout NZ, and will always be available at a comparatively cheap price. The major deposits occur at Kamo-Hikurangi (north of Whangarei), Waikato Basin (Huntly, Kopuku, Rotowaro, etc), Taranaki (Ohura, Mokai), Collingwood, Charleston, Canterbury (Glen Tunnel, Mt Somers), Otago (several localities) Southland (Shag Point and others). Lignites are even more abundant. Areas without coal are Bay of Plenty, Central North Island Plateau, Hawkes Bay, Wairarapa and Manawatu; Marlborough has small deposits only. Even in the Coromandel district, there may be small deposits. The current price of sub-bituminous (non-coking) coals from the Mines Dept. is thirty-one dollars per tonne at the mine itself.

The purpose here is to describe the series of modifications we made to an old wood-fired stoneware kiln for the successful burning of Waikato coal. My own aim has been to make the method thoroughly accessible to other potters. Various potter friends have visited Coromandel while the experiments have been in progress and so far there have been four successive firings up to stoneware temperatures. The very first trials with a step-grate were unsuccessful. We relied on natural draught and this proved insufficient to burn the terrible accumulation of fine char which built up on the lower parts of the grate. I replaced the step grate with one made of cast iron firebars from an old boiler, and set them horizontally at the bottom of a square brick firebox with an arched top, with the original throat into the kiln chamber near the top of the firebox. Pre-heater secondary air flues were built into the sides of the firebox, outletting just before the throat on each side but I think that this elaboration is not necessary.

As with wood fuel, it is simple and convenient and perfectly practical to leave the stoking hole continuously open for both the secondary air to enter and the coal to be shovelled in. The people who have used the kiln since the change to the firebar system, with forced draught under the grate, have been able to pick up the rhythm of stoking without too much difficulty, although the system is still capable of some refinements. We have found that a maximum of one eighth of an inch water gauge pressure of air under the firebars is sufficient to get rid of accumulating char. We achieve this with an old forge blower driven by a half horsepower electric motor. As the firing proceeds, it is necessary to more or less continuously adjust the primary air from the blower with a simple damper at the fan outlet. This gives an immediate control of oxidation-reduction conditions in the kiln. As each shovelful of coal is thrown in, the damper is almost shut, then gradually opened to full. Contrary to some expectations, opening of the forced air damper increases *reduction* for a short period, as it forces the more intense combustion of the coal as the fresh fuel is thrown in. As the fresh coal burns out, the blower air is increased until oxidising conditions prevail when another shovelful of coal can be fed. This cycle maintains a remarkably constant type of atmosphere in the kiln. A certain amount of skill is required, but certainly little more than in the firing of a wood-fuelled kiln; indeed some comments have been that it is more relaxed. It must be remembered that this approach is not comfortable for the "convenience first" kiln firers, and that as with any solid fuel firing, continuous attendance is necessary.

It is necessary to maintain a fairly even thickness of fuel on the bars, so each shovelful of coal should be directed over the blow holes which can be seen easily through the fire hole. An occasional rake-over with a small blade on the end of a long steel rod helps; if there is any unburnt coal left, it will soon be exposed to the draught and probably give a momentary shot of strong reduction.

Reference to the accompanying drawings will help to explain the firebox we have been using.

The kiln chamber itself (without bagwall) is 36 cubic feet in size and is a standard, simple downdraught type, previously wood-fired with a normal type of dutch oven firebox. The ash pit was excavated deeper and a 6 inch air duct built into it to deliver the forced draught. For anyone contemplating this design, the air could be introduced from the side to leave a front door for raking out ash after a firing. The secondary air pre-heating flues are simply three inch gaps left inside the double firebox walls, and separated by spaced layers of header courses, to give a zig-zag length of flue. The firebars, as seems usual, have lugs on them which give a gap of about half an inch for the air. They must be placed firmly against each other to prevent warpage, and must be strongly supported by steel cross bars set into the brickwork.

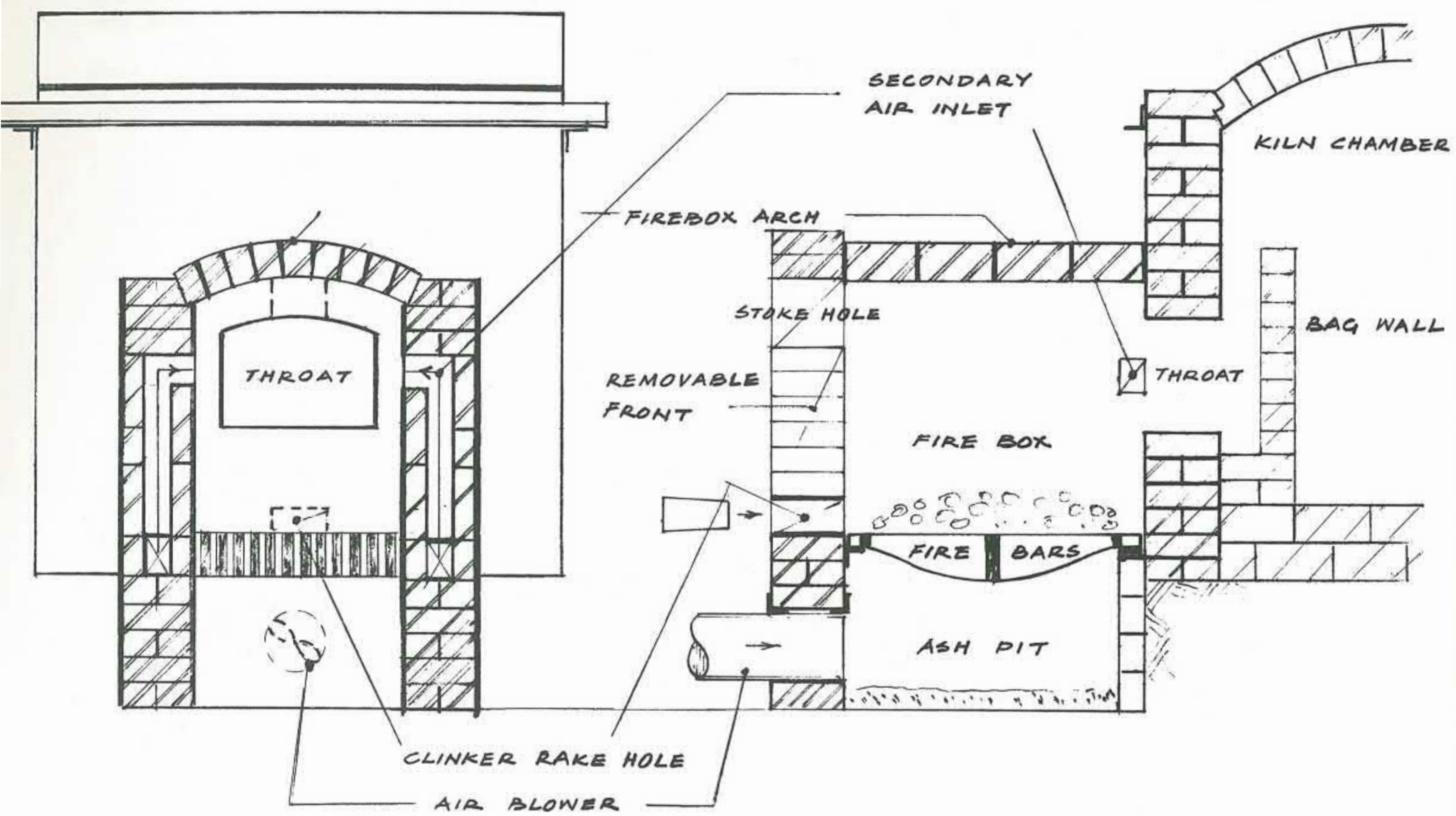
The only practical problem we have encountered with our coal firings has been the removal of clinker. The damn stuff builds up on the top edges of each firebar and slowly blocks up the air gaps. Clinker is fused ash, virtually a sort of glaze. The stronger the forced draught, the more rapidly will clinkering take place. Also the higher the ash content of the coal, the sooner will clinker be formed. So far, over a test period of four stoneware firings, we have had to stop firing for a brief period and de-clinker for only two of them. It seems that with well-cleaned fire bars and good stoking technique, the kiln will fire to maturity just before clinker becomes a major problem.

To remove the hard, crust-like thin layer of clinker, I let the fire die down, shut off the air and broke it up with a heavy, pointed iron bar poked down through the stoke hole. Heavy and hot hard work indeed. It was then necessary to rake it out through the hole provided. This takes about quarter to half an hour during which time the kiln seems to lose very little heat if the stack damper is closed.

All of the trials have used Rotowaro coal with an ash content of 4%, which is about the average for most of the commerically available coals. Increasing the width of the gaps between the firebars will delay clinker blockage, but let more coal drop through. Most of the sub-bituminous coals break down into slack or granular sandy material on prolonged exposure to the weather. This is due to the natural water content (the bituminous coals are stable and anhydrous). So the ideal compromise is to obtain fresh coal from the mine or agent and store is in a bin away from sun. Rain will not hurt. With such coal, the ideal gap size would be about five eighths of an inch (16 mm) between the firebars.

For experimental purposes, another innovation to combat the clinker problem was tried. We built a steel trolley and set the firebars on it so that the whole grate could be removed for cleaning if need be.

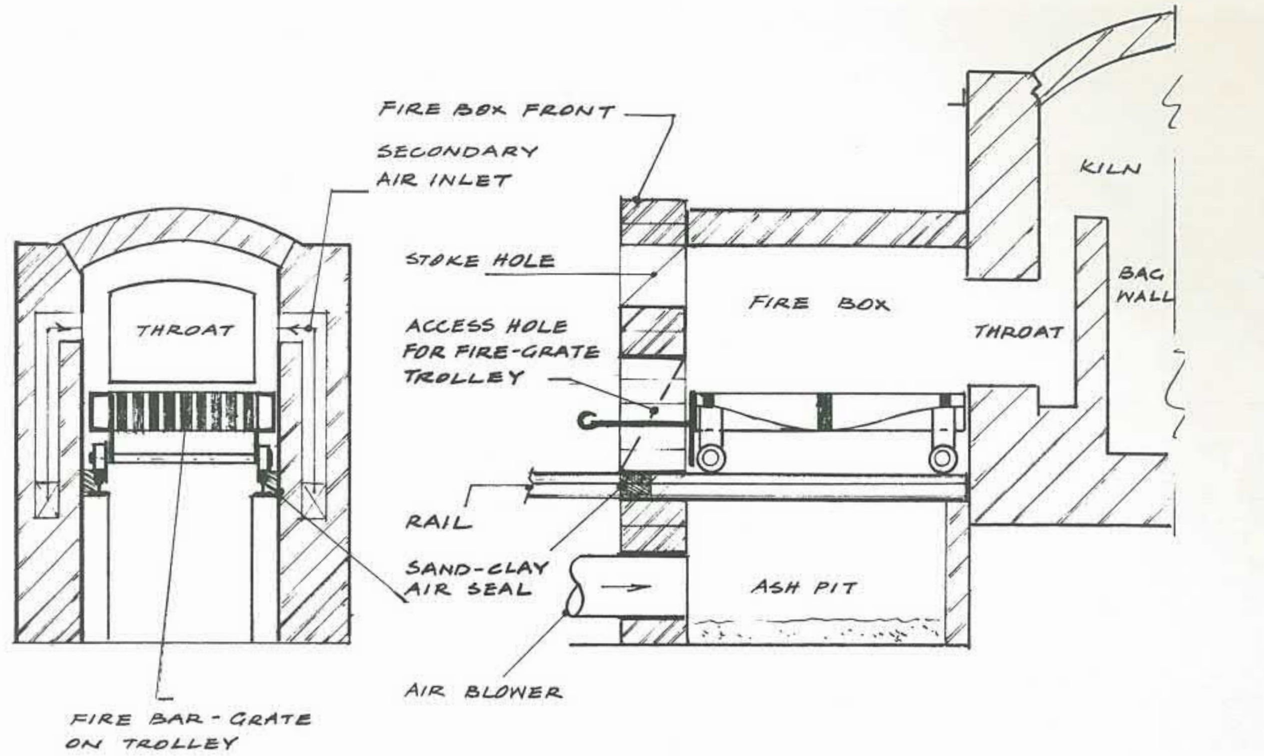
When the two types of arrangement are compared (see first drawings), it



will be noted that the firebox volume is now much smaller, due to the extra height of the trolley. So far we have had only one full stoneware firing with the trolley grate, and fortunately, or unfortunately, we did not manage to have a "clinker up". This was probably due to the fact that the bars had been very thoroughly cleaned as they were placed in position on the trolley. The kiln fired perfectly well and reached a very good temperature throughout and used less coal than in previous firings. I attribute this in some part, to the smaller firebox; less combustion was taking place in it which meant a longer and hotter flame in the kiln itself. We blocked off the secondary air pre-heater flues which proved that they are not really necessary. Our only trouble was that I had not made a tight enough seal at the back end of the trolley, so the resulting gap let excess air blow through and a lot of fine char drop down into the ash pit. This resulted in excess heat building up around the back set of wheels. However, despite the red heat, the small cast iron wheels (4 in. or 100 mm diam.) still revolved on the plain steel shaft as we extracted the trolley after the firing. There is normally no reason for the trolley framework to get very hot at all, as the air from the fan should keep it reasonably cool. To ensure a good, easy-to-replace air seal around the front of the trolley, a piece of thick asbestos rope can be used between the front plate marked "A" in the diagram, and the front brickwork. As along the sides, a sand seal at the back of the trolley would eliminate the trouble we experienced. The trolley itself is quite simple to make up: bricks must be set in along its sides and ends to protect the steelwork. The cast iron firebars do not seem to suffer from the high local temperatures, and it is certainly a very good idea to be able to withdraw them when firing is over. The whole trolley unit can be shoved out of the way and the kiln allowed to "blow down" as usual before bricking up.

Effects of the coal fly ash on glazes

The ash from the Rotowaro coal turns out to be fine, yellow material, obviously containing iron oxide. Despite the shovelling, odd raking and air blast, the atmosphere in the kiln seems surprisingly clean. Pots placed on the bagwall get a pretty fair, iron-rich lambasting on one side. On porcelain mugs and beakers, this is very much to my



TROLLEY - GRATE FIREBOX

delight. Pots on top of the setting are always warm and rich, a little darker flashings than with wood firing. Nepheline syenite-based glazes (e.g. the so-called "shinos") react very sensitively to the coal ash with warm, rich tonings. Iron glazes seem redder than with wood, but as with wood-firing, a nasty crystalline metallic sheen can occur with high iron glazes which would normally work well in a gas or oil-fired, more oxidising atmosphere.

Starting up

It is very convenient to light up the kiln on wood. We like to burn wood until the firebox is at a dull red heat, without the fan going, and with natural draught entering the ash pit. This gives the coal a chance to light as it is a more inert fuel than wood and takes more heat to really get going. On changing to coal, the ashpit air brick or bung is replaced, and blower turned on with air damper set low. Odd air leaks around the front can then be sealed over with wet clay. An easily operated air control rod beside a comfortable old chair, close-by heap of coal and a good old, long narrow coal shovel with various long poker rods should suffice. In case of clinker, a long pointed, chisel-ended steel rod and one with a four-inch diameter semicircular steel disc welded to the end for raking, will be very handy. Remember to clean out the ash pit properly between firings, and clean the firebars with a hammer and chisel.

Quality of coal used

On the two occasions when the kiln required de-clinkering, we used over a waggon load of coal (our rail waggons hold about 6 wheel-barrow loads). The last firing with the trollley grate used less than one waggon-load — at a guess about one third to one half a ton of coal — as well as the barrow load or two of wood at the start. This 36 cu. ft kiln before conversion used about a cord or less of dry pine slabwood. The coal would be about one quarter the volume of the wood, and a little less labour-intensive in handling. At 32 dollars plus 25 dollars per ton cartage, we are burning about 20 to 30 dollars-worth of fuel per firing. Those who fire on dieseline can thus work out the comparative benefits. On an estimate this kiln would need about 50 to 60 gallons of oil using drip-feed. At the present cost of 1 dollar 22 per gallon (27 c per litre), this works out to 60 to 70 dollars. Less than half! The cost of power for the blower motor is approximately the same as that for heating water for the various cups of tea or coffee needed to keep the chief stoker *et al* "in steam" during the session. Our firings, so far have taken about 9 to 10 hours.

Conclusion

We look forward to trying out the other coals available on the market. By comparison, the Rotowaro coal seems of good average quality and has a calorific value of 10,100 BTU per pound. (Westport coking coal is 13,800.) I have only once before fired up to full stoneware temperatures on a sub-bituminous coal; this was at Port Chalmers, using Ohai coal (11,000 BTU) in a crude, step-grate dutch oven firebox with natural draught. (ref. "NZ Potter" Vol 18/2, Spring, 1976). This coal has a definite, although slight, coking ability.

For those who are particularly interested in firing with coal, which has for long been regarded as obsolete and dirty, I recommend they contact the NZ Coal Research Association (Inc), P.O. Box 3041, Wellington. They are most helpful and can make available a lot of information on various coals. Their printed analyses of these coals allow an excellent comparison with those I have used.

This article has been concerned with only *one* aspect of coal burning for stoneware potters — the direct combustion method. It is crudely workable, but capable of future refining. Another way of burning coal for use in an even greater range of pottery kilns is the *secondary combustion* technique. Here, the coal is gasified in a "producer" and then the raw gas is lead along to the kiln (or kilns) to be burned, with secondary air either pre-heated or cold, through burners. Using this method, the more inferior types of coal, peat, lignite, etc, can be gasified at less than clinker-forming temperatures. The gas is then burned in the kiln as explained, up to full stoneware temperatures if required. I am keen to get on to this as a next project.

Michael Lucas & Jill Totty

by Karen Pattison

Over the past year or so Michael and Jill have been establishing their Phoenix Pottery in Craycroft Street, Devonport on Auckland's North Shore. Their roles in the potting partnership are clearly defined. He is the potter, she is the decorator.

Michael began potting in suburban Remuera, moving when pressured by a neighbour and council to Puhoi in Northland's countryside. Five moves and three kilns later in the search for a sympathetic environment to live and work in, he discovered Devonport where a cooperative council actually encourages craftsmen.

Michael prefers to make domestic ware, "pottery that works and pays the bills." He does the making, firing and glazing. Jill works her imaginative designs (often calligraphic), on Michael's plates and platters. During the recent tax troubles they made ideal vessels on which to convey pertinent political messages. Both enjoy the craftsman's way of life, sometimes hard and precarious, but giving them flexibility to organise their own time according to inclination and pocket.

Michael has made a speciality of plates. He throws with fairly wet, finely grogged clay on to a bat, forming the rim early and then drawing out. The plate is cut from the bat after throwing and as soon as the base is firm enough is turned over. It is turned straight on to the wheelhead and the rim is sponged to make the plate stick. He fires all his plates in saggars for ease of loading. They must be within one eighth of an inch on the rim either way and the diameter too can be critical, requiring a variation of not more than half an inch. Sometimes he bisques them on their rims upright, but usually in stacks of five all the same way up. Jill's decorations are on the bisque and glazes are by dipping.

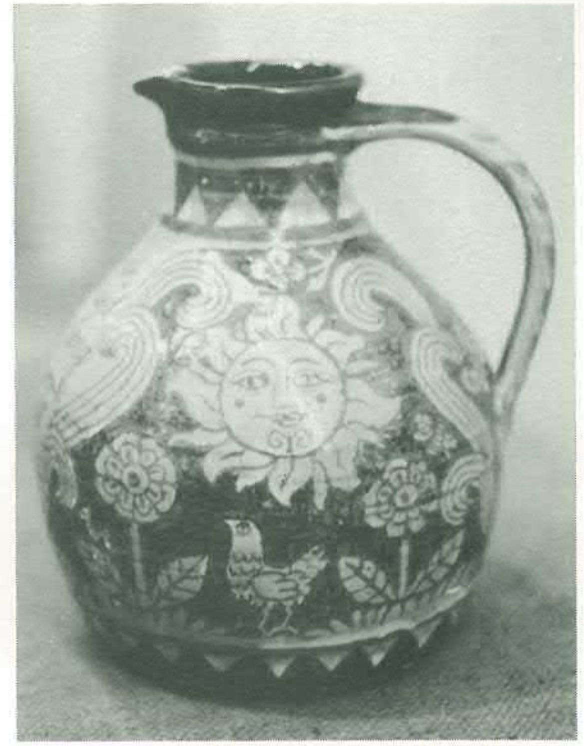
A substantial kiln shed was considered necessary in the new workshop. A sound concrete block building reduced noise. The 50 cubic foot oil fired kiln has two chambers fired by four burners. Michael starts on two pots and lights one of the jets (based in the Major burner and firing into a bag wall), at 400°C and another half an hour later. Between 700°C and 1000°C he brings in the other two. Firing takes from 12 to 18 hours. A gas kiln may replace the oil kiln for environmental reasons. Michael wants a smaller kiln where he can fire a run of decorated exhibition plates without the pressure of throwing a whole kilnload just to get the plate fired. A most attractive stained wood studio was built at modest cost.

Jill is an experienced graphic designer having graduated from Ilam, Canterbury University DIP FA (design), in 1960. She has worked on book illustration and typographic design and on scenery and costumes for Mercury Theatre.

When Jill and Michael first got together she started painting birds on some of his plates. "He has put up with my decorating many of his plates ever since. Michael is the organised one. I delay the bricking up to finish just one more. I still get excited waiting to see the work come out of the kiln — it's as if the painting really happens in there, independent of what I have done. Colours fade or glow and ordinary work can come alive. Of course one has disappointments too, for work that has taken many hours can be obliterated. I like doing new things so I enjoy working for exhibitions. Because of this I like the challenge of testing new ideas. Repetitive work bores me."

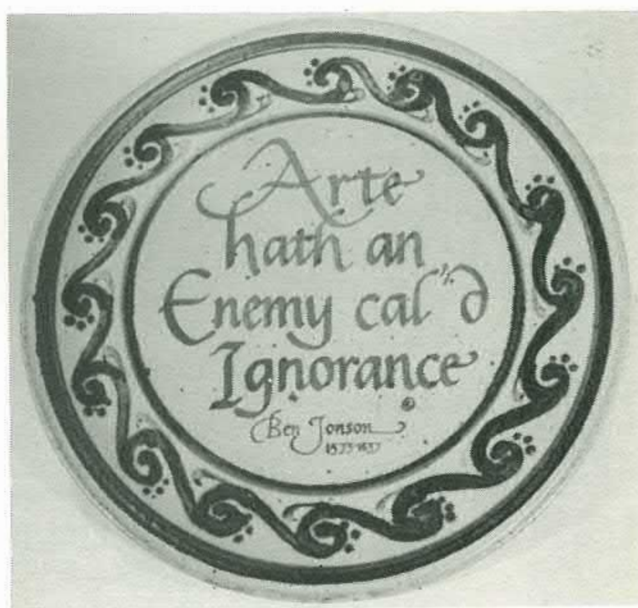
Jill paints in oxides on the biscuit so that she can scrape away mistakes with a knife. Sometimes a fluid looking line has to be laboured over — especially in calligraphic work — the brush cannot draw a fine edged letter on fired clay in one stroke as it can on paper. Control is difficult and the flourish on the tail of a decorative letter must look smooth and free." In my case spontaneity is achieved with care and patience." She feels her love of pattern and intricate detail can result in a tendency to over decorate. However, as this is a style that comes naturally, its end result can often work really well and thus be exploited.

Michael and Jill call themselves Phoenix Pottery — strength from the flame, and from the ashes they know beautiful pots will arise.



Puzzle jugs. Can you drink without spilling a drop?
The clue to the solution is that the handle is hollow. Right: Harvest jug decoration carved in slip. All pots made by Michael, decorated by Jill.

photo: Auckland Herald



Steve Rumsey's Low Temperature Stoneware

For the last six and a half years, Steve Rumsey has been producing vitreous stoneware pottery in the firing range: Staffordshire Cone 3–Cone 6 (1140–1200°C). He is preparing a book on the subject that is expected to be released later this year. In the meantime he gives some advance information in this article.

With the energy crisis becoming more acute, high temperature stoneware potters are desperately looking for ways of reducing their fuel and/or power bills. The Low Temperature Stoneware presented in this article does exactly that — but the fuel savings tend to be off-set by the use of more expensive clays, fritts and fluxes. However, overall, there *are* worthwhile savings and advantages:

Shorter firing cycle: 8-10 hours to maturing temperature.
Cheaper, thinner sillimanite shelving.
Longer kiln life.
Longer electric element life.

Throughout the history of pottery (some 14,000 years!), the temperature range 1150°C–1200°C has been a problem area — the technicalities of which will be left for the forthcoming book. The purpose of this article is to supply clay body and glaze recipes as starting points for potters wishing to produce vitreous stoneware at lower temperatures.

Clay bodies:

If we accept 0.5–3% porosity (water absorption) as the permissible range for "vitreous" craft stoneware, then the following body will fire from below Cone 3 (1140°C) to above Cone 6 (1200°C). It may also be used down into the earthenware range.

	SR-122D
Crum Clay (Dry Powder)	26
Steetley's Ball Clay "H"	46
Winstone's AF-30	6
Nepheline Syenite	13
Silica 200	9
Winstone's Fine Grog #36	4·5
Water of Plasticity %	28·5

Notes:

1. I find it necessary to 40 mesh sieve the fine grog to eliminate lumps of siderite and other waste. Coarser grog may be added for large pottery or for more vigorous texture.
2. Yellow ochre may be added to enrich the body colour, but it will shorten the firing range and in excess of 1% may induce "bloating".
3. "Goma" spot may be achieved by adding 0.25% coarse Manganese dioxide to the body — iron compounds do not melt readily in bodies at this temperature.

The following is a similar body using *plastic* Clark clay:

	SR-122J
Clark Clay (Plastic)	32
Steetley's Ball Clay "H"	46
Winstone's AF-30	7
Nepheline Syenite	13
Silica 200	10
Winstone's Fine Grog #36	4·5
Water of Plast. % (of Dry ingredients)	28·5

Notes:

See above — Yellow ochre additions are unnecessary as Clark clay is rich in iron colouration.

The following body, using Mintech "Koclay", has a somewhat shorter firing range (Cone 4–6: 1160–1200°C), but is a very clean and fine grained body suitable for domestic ware — but visually much improved by additions of yellow ochre and manganese dioxide.

	SR-122K
Mintech GM·10 Koclay	20
" " GM·40 Koclay	10
Steetley's Ball Clay "H"	40
Winstone's AF-30	8
Nepheline Syenite	11
Silica 200	11
Winstone's Fine Grog #36	4·5
Water of Plasticity %	28·5

In general, it should be noted that these Low Temperature Bodies tend to be 'shorter' than the usual high temperature bodies (which have greater clay content) and require slightly different techniques and greater care in forming lips and handles. They also air dry more rapidly, but can be re-wetted more readily.

Glazes:

Staffordshire cone 4–6: (1160–1200°C).

In this Low Temperature Stoneware region, the firing range of glazes is rather short (about two cones maximum) and it may be necessary to develop additional glazes for cooler or hotter regions of your kiln.

The following glazes use limited amounts of Borax Fritts, and it must be pointed out that *"Standard" Borax Fritts are not all the same!* Some fritts appear more expensive than others, but in practice they may be cheaper to use because they have a more powerful fluxing action. For example, if we take the following Cone 5 (1180°C) glaze:

	Na_2O	K_2O	MgO	CaO	Al_2O_3	B_2O_3	SiO_2
Molecular Formula	·09	·16	·25	·50	·45	·35	3·06
% Composition	1·8	4·8	3·2	9·0	14·6	7·8	58·8

then the weight % recipes using the same basic materials but different fritts, are as follows:

		Glaze Recipes					
	SR-	166M	166N	166P	166Q	166R	Fritt Cost per 25 Kg
Fritts	Podmores P.2244	15					—
	Wengers 1462WA	—	19				$48·44
	Ferro 3134	—	—	32			—
	HM 362192	—	—	—	41·5		42·35
	Davies Std. 14018	—	—	—	—	42	32·00
	Aust. Pot. Feldspar	44	33	11	4·5	1	
	Talc	9·5	9·5	10	10	9·5	
	Wollastonite	10	14·5	4·5	5	8	
	AF30 Fire Clay	20	24	42·5	36	35	
	Silica 200	1·5	—	—	2	4·5	
	Glaze Cost / Kg	—	0·66c	—	0·89c	0·72c	

As can be seen, glaze 166N uses the most expensive fritt, but produces the least expensive glaze.

If we look at the percentage composition of the three costed Borax fritts, then we see that cost and B_2O_3 content tend to be related!

% Composition	Li_2O	Na_2O	K_2O	MgO	CaO	Al_2O_3	B_2O_3	SiO_2	Fritt Cost/25Kg
Wengers 1462WA	← 6·2 →			-	11·4	7·2	40·1	35·1	$48·44
HM 362192		9·0	1·2	-	15·0	7·5	18·3	49·0	42·35
Davies 14018		7·1	4·7	-	12·1	9·6	17·9	48·6	32·00

B_2O_3 is the principal fluxing agent in these fritts.

When dealing with low temperature glazes we need to use the most fusible ingredients available, so that:

Instead of using *Calcite* (Whiting) + *Silica* use *Wollastonite*.
Instead of using *Dolomite* + *Silica* use *Talc* + *Wollastonite*.
Instead of using China Clay use Ball Clay.

Flint is preferable to quartz ('silica') but costs twice as much — so I don't use it!

Incidentally, for some odd reason, coarser ground Calcite appears to promote a more fusible glaze than finer ground Calcite! Mintech Red Stripe Calcite therefore appears preferable to Blue Stripe or Blue Square.

The following glazes mature between Staffordshire Cone 4–6 (1160–1200°C) with craze-free, smooth surfaces suitable for domestic ware (with the exception of 126v). The usual colouring oxides may be added. Either oxidation or reduction firing may be employed.

Glazes 1160 — 1200°C	Glossy Transparent				Semi Gloss Textured Opaque Beige			Satin Matt Opaque Off White			Fine Matt Opaque Buff	Semi Gloss Khaki Dark Yellow-Brown to Black			Semi Gloss Tenmoku Dark Brown/Black	Cream Matt w/Rough Red-Brown Speck
SR-	128B	125K	166H	130S	166K	126T	166E	166L	166F	166G	126U	166J	166B	166D	126G	126V
1462W Std. Borax Fritt	12	12	12	12	18	19	19	18·5	18	18	20	14	14	14	11·5	18·5
Nepheline Syenite				9		7	7				7				7	24·5
Mixed Feldspar	49	49	49	-	46							36	36	36		
Eng. Pot. Feldspar								30								
Aust. Pot. Feldspar									30	30						
Nelson Feldspar FA				32		28	28				30				21	
Calcite					11			11	11	11						
Wollastonite	19	19	19	21		13	13				14	15	15	15	16	14
Talc	3	2	2		9	9	9	9	9·5	9·5	10	2	2	2	1	8
Wengers #2 Ball Clay	14							29				8				
Steetley's Ball Clay "R"		16				24			31·5				9·5			
Mintech Kaolin "H" (N.Z. Ball)			12	5			18			23·5	19			7	8·5	
Devon Blue Ball Clay					16											
Crum Clay (Dry Powder)																35
Silica 200 (Quartz)	3	2	6	21			6	2·5		8		13	12·5	15	23·5	
Red Iron Oxide												12	11	11	11·5	

THERE ARE ONLY SEVEN BASIC GLAZES ABOVE — THE OTHERS USE ALTERNATIVE MATERIALS.

Other types of glaze such as Chün, Celadon (under reduction), ash and salt glazing are possible. One notable exception is the Tessha glaze which requires high temperature for the metallic red surface crystallisation of the iron.

Borocalcite, Colemanite or Gerstley borate may be used instead of an industrial fritt. However these minerals contain a high proportion of chemically combined water, and when this is driven off during the firing, glaze particles are 'spat' all over the kiln making a terrible mess of kiln furniture and probably shortening the life of electric elements. An industrial fritt does not have this problem.

Deflocculation:

Some clays and minerals, and especially some ball clays, borocalcites and alkaline fritts, tend to flocculate those glazes that contain them. This causes the glaze to dry slowly on the bisque ware after dipping. The wet glaze slowly slumps in "curtains" on vertical surfaces and runs away from thin rims. To overcome this the glaze container is allowed to stand overnight, some of the clear water siphoned from the top and a *small* quantity (0.1–0.5%) of a deflocculant (such as sodium carbonate, sodium silicate, tannic acid, etc.) is added to the de-watered glaze to electrolytically increase its fluidity. This de-watered glaze will now be found to dry more rapidly on the ware, without "curtaining".

However do not add too much deflocculant as the process will be reversed, and the glaze will then have to be restored by flocculation with acetic acid or magnesium sulphate. This same problem occurs when "raw dipping". The un-fired "green ware" is not porous enough to take up surplus water. Deflocculation of the glaze slip (as above) can help overcome this trouble.

Toxic Materials:

Barium carbonate (the principal ingredient in some rat poisons!), Zinc oxide, Lead compounds, Lead bisilicate fritts and "Low Solubility" Glazes are **all poisonous in the unfired state** and are not recommended for craft pottery use. All colouring oxides — except Iron and Manganese — are poisonous and should be handled with care. Eating and smoking should not take place in areas where toxic glazes are prepared or used. Working surfaces and floors should be washed and vacuumed regularly.

Pyrometric Cones:

The measurement of time and temperature for kiln firing is hardly a problem for the practicing potter — once he has determined the make and number of pyrometric Cones suited to the maturing of his pottery.

However, when you come to write an article on the subject, it becomes more difficult! Not all makes of Cone are universally available and *there is no commonly agreed International Standard for manufacturers to use, in calibrating their particular cones:* so that when you come to compare pre 1979 Staffordshire Cones (calibrated at a temperature rise of 240°C per hour) with Orton Cones (calibrated at 150°C per hour) things don't always seem to work out in practice at some other temperature rise! Another recent complication is that Staffordshire Cones are apparently no longer made in Staffordshire but in the U.S.A., have a new calibration and are now called Harrison Cones. I have not tested these yet.

In my experience *at this temperature* (1180°C) under oxidation, there is fair agreement in practice between most makes and systems — with the exception of Orton Cones. For some reason the U.S. National Bureau of Standards' calibration seems to differ from others in this temperature area, although there is agreement round about 1300°C.

The following comparison appears to apply in practice:

"Equivalent" Temperature	Staffordshire Cone (pre 1979)	Seger Cone	Orton Cone	Buller Ring #72 White
1180°c	5	4a	6	27

Returning to the subject of Low Temperature Stoneware — there are a number of other approaches to problems in this temperature range and these could be considered in future articles, if there is sufficient interest.

Some of the Borax Fritts mentioned above are available from:

Wengers Standard Borax Fritt 1462W — Smith & Smith Ltd.
Harrison Mayer Borax Fritt 362392 — Talisman Potters Supplies Ltd.
James Davies Borax Fritt 14018 — C.C.G. Industries Ltd.

Other Borax Fritts may be available from your local dealer.

It would be helpful to have some "feed-back" – through the columns of the 'N.Z. Potter' – from potters who are bold enough to experiment in this area.

continued from page 31

Analyses of coals so far used with stoneware firings

	Moisture	Ash	Volatile Matter	Fixed Carbon	Calorific Value	Sulphur	Coking Ability	Ash Fusion
Westport	6	3	33	58	13 800	1.10	8.5	1300
Ohai (Southland)	15	3	35	47	11 000	0.26	0	1180
Rotowaro (Waikato)	18	4	35	43	10 000	0.22	0	1240

BOOK REVIEW

Glazes for the Studio Potter, Emmanuel Cooper and Derek Royle 1978.

The authors have produced a very comprehensive work covering how to make and test glazes and how to understand the glazing process. It is written in a clear and simple style and each process is fully explained so that nobody should have difficulty in understanding what is being said.

It begins with a discussion of clays, the methods of making pots and the different kinds of pottery. They follow with a chapter that gives detailed instructions on the making, testing and colouring of different types of glazes. Anyone who spends the time to follow these instructions carefully cannot fail to discover what makes a glaze work, but clearly there are no short cuts. It takes time and effort. The chapters on understanding glazes are well set out, descriptive and easy to follow.

There are numerous useful tables at the end which are excellent for quick reference.

I tested the earthenware glaze recipes and found most of them were satisfactory though some needed adjustments as they crazed on red clay. Those for stoneware do not always state whether they should be fired in oxidation or reduction and one recipe is incomplete.

This book would be especially valuable for the beginner and the studio potter who wants to learn more about the mysteries of glazes.

Flora Christeller

FILMS FOR POTTERS

National Film Library has films for loan. The following have been selected and shown to students at Wellington Teachers' College. They are available from National Film Library, PO Box 95831, Wellington.

Title	*catalogue No.*
Abuja Pottery (Michael Cardew)	B4894
Michael Casson	B3667
Indian Potters of San Idlefonso	C2273
A Potters World (Bernard Leach)	C676
Potters of Japan Part I	B4034
Potters of Japan Part II	B4112
Mexican Ceramics	B4347
Ceramic Art of Japan	B3986
Barry Brickell	B3927
Bizen Pottery	C1653
Creating with Clay	A3424
Fingers and Clay	A3322
Earth, Fire and Water	B1916
Clay	B3935
Earth and Flame	B1269
Basic Wheel Forms	B4485
Design Topics	
Discovering Creative Pattern	B2877
Form and Imagination	C1847
Discovering Form in Art	B3942
Discovering Texture	B2334

We wish to correct an error in the last issue. Alan Howie is Head of the Art Department at Teachers' College. Laurie Lord is a Senior Lecturer responsible for ceramics in the Art Department though much of his time is spent on College administration and in liaison with the Education Board. Recently college students have been stimulated by the first firing of the new kiln designed by Roy Cowan.

PUBLICATIONS

Pottery in Australia, 48 Burton Street, Darlinghurst NSW 2010, Australia. $A7 provides technical articles and a comprehensive view of ceramic activity in Australia.

Ceramics Monthly, Box 12448 Columbus, Ohio 43212, USA. $12 ten issues. Recent issues have had interesting accounts of the work of some of Americas best potters, as well as practical articles including "Kiln for Fast Firing" from NZ Potter Vol 20/2 and an article on New Zealand pot burners by Nancy and Bill Malcolm.

Studio Potter, Box 172 Warner, New Hampshire 03278, subscriptions $8.50 two issues, in US funds. Magazine for the homesteading potter. Vol 7/2 describes the Phoenix woodburning kiln which can be fired to C/10 in four hours. A highly practical magazine imaginatively presented.

Ceramic Review, 17a Newburgh Street, London W1V 1LE, £7 six issues. Some colour gives this informative magazine a fresh look.

Hamada and Leach Exhibition at Waikato Art Museum 27 May to 29 June 1980

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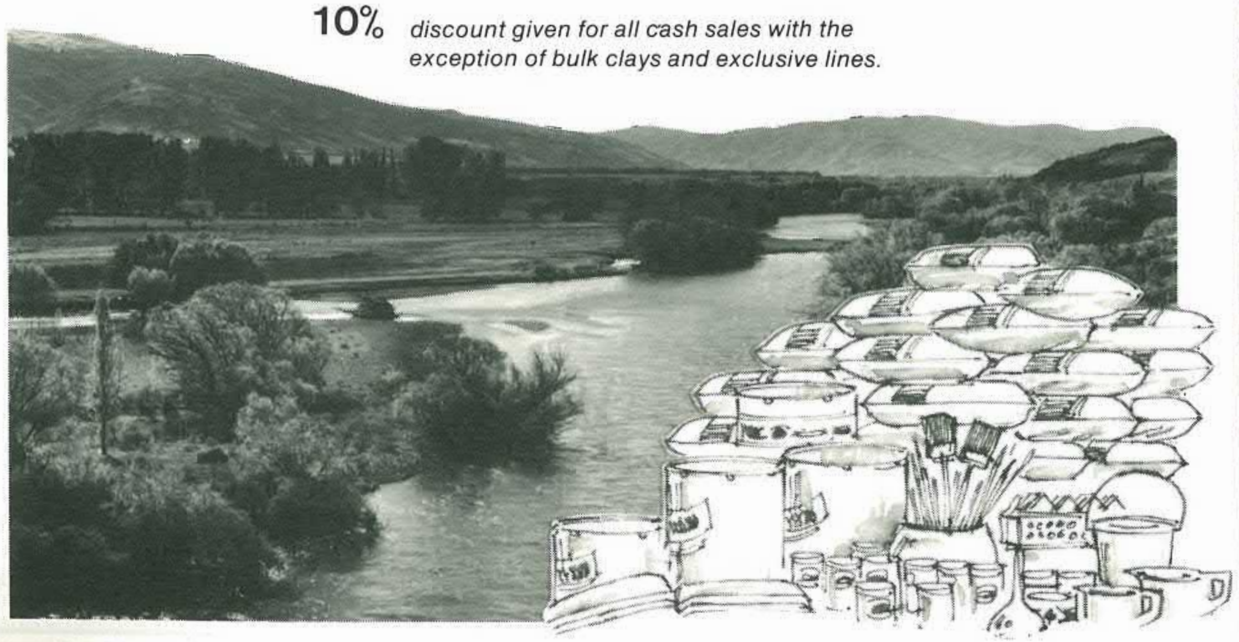

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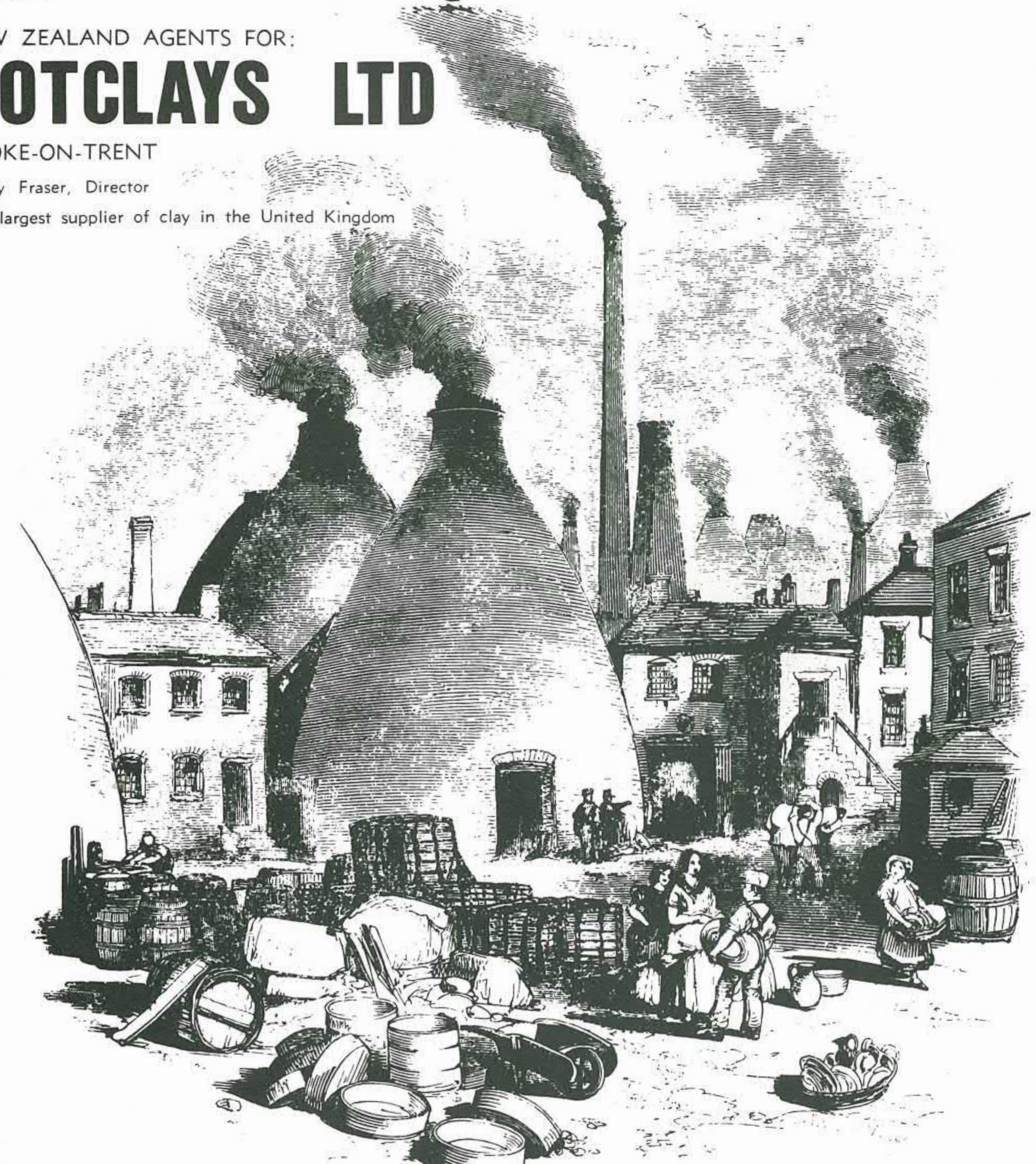

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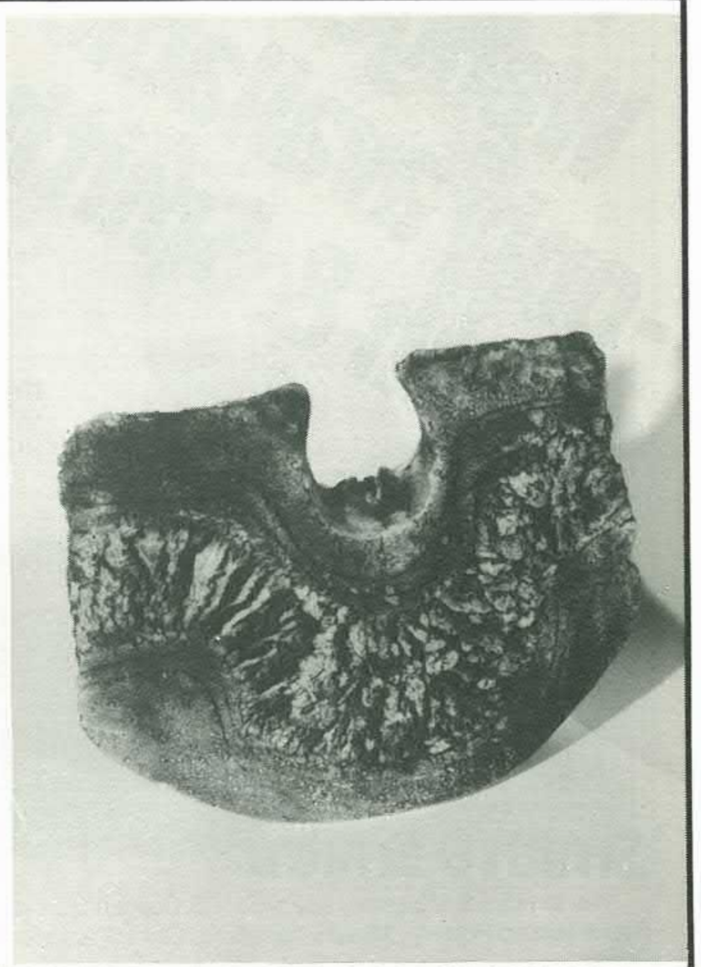

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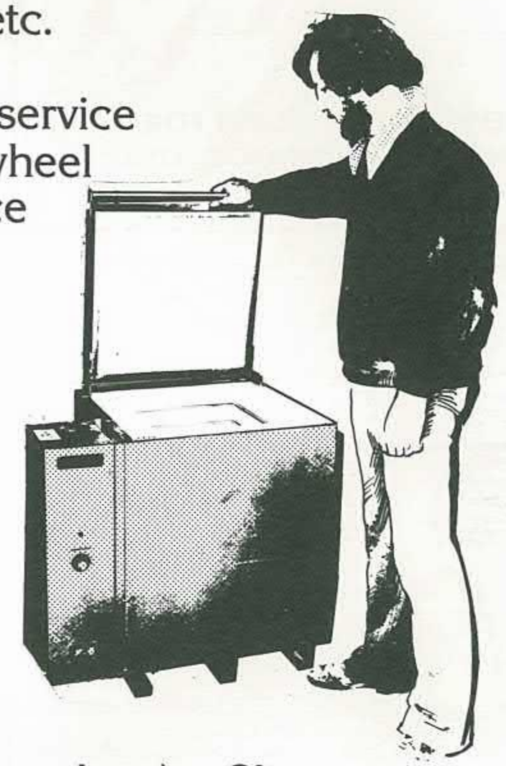

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