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Lewis and Hole Ltd. 1946 to 1996

by Tony Youles

Introduction

The foundry of Lewis and Hole occupied premises at Dudbridge, Stroud, from around 1965 until it closed in July 1996. The buildings were subsequently demolished and the site redeveloped as a supermarket. GSIA members visited the site shortly before it closed, by kind permission of owner Chris Hole, to make a photographic and video recording of the processes.

The Site

Until about 1900, much of the site was a walled garden or orchard, although part was occupied by a small late 19th century iron works, and the site was bounded to the south by earlier industrial buildings. It was developed as an engineering works at the turn of the century. The site contained two main north south ranges, running from the Dudbridge Road to a southern boundary wall. Later buildings linked the southern portions of these ranges, and extended them westward towards a large yard, and eastward to the earlier eastern boundary wall. The yard to the west was used to store fuel, iron, casting sand etc., and waste products awaiting removal. Two cupola furnaces stood here. The culverted River Frome ran north south under this yard, at the north end of which is the stone parapet of the rebuilt medieval bridge which carries the Dudbridge Road over the emerging Frome. To the east, following the road (Selsey Hill) was an early 19th century boundary wall which incorporated the parapet of the former bridge over the Nailsworth Stream, which was culverted under the foundry buildings, emerging from the south end of the yard to its confluence with the Frome. The southern boundary was formed by a massive stone wall, probably early-mid 19th century, all that remained of an industrial building to the north.

The engineering firm of Wesley Whitfield was established here at the turn of the century. Their products included vices for bending walking sticks, some of which are still in use. Hampton Cars were assembled here from 1927 to 1931; the name, painted on the eastern boundary wall, was still just visible.

Early Years

The firm of Lewis and Hole was started in 1946 by Lawrence and Jack Lewis and Sidney Hole, father of Christopher. Both men were from Martyns of Cheltenham, the ornamental ironwork foundry. The original premises were in Brimscombe Port. By about 1965, the firm was established in the Dudbridge premises which it occupied to the end, although originally it occupied only part of the buildings. Later, the foundry took over the whole site (Figure 1). From the start the company was doing specialised casting work to order, mainly valves for Spirax of Cheltenham, in grey iron, bronze and aluminium. Other customers (in time, a total of eighty odd) included Drayton Controls, Hattersley Newman and Hender, Saunders Valve of Cwmbran, Springfield Engineering and Vickers of Swindon - a big company then, on what is now the Honda site. A notable order was for parts of the steering gear for the QE2.

There was a good deal of non-ferrous work in the early days, but it declined in the last ten years or so. The original furnaces for iron had a capacity of about 1.5 tons per hour. If

trouble was experienced with the metal, it was normal then to start again with new pig, but later, with a metallurgist on site, it was possible to "tune" the metal to meet specification. A tensile test machine was available on site, but the test bars were sent out for machining to Donald Edwards of Gloucester.

Greensand moulding predominated in the early days, with much manual work involved in mould making (though a few specialised machines were used), and in reclaiming sand.

Later Developments

In the mid-seventies, two new cupola furnaces for iron were commissioned, each of 4 tons per hour capacity, coke burning with oxygen enrichment of the blast. They were largely built in-house. Ductile or SG (spheroidal graphite) iron casting was introduced, and more own mixing of furnace charges, extending the range of grades of metal offered. Customers increasingly specified the grades they required, instead of leaving it to the moulders. In 1977, part of the yard area was roofed over and incorporated into the building, and the Frome and the Nailsworth Stream were culverted. Other changes included moving the fettling shop and opening up the interior space, resulting in the layout shown in Figure 2.

In this decade also, the process was organised into something like a production line, by the use of roller conveyor tracks and powered overhead cranes. Starting with a mould box on track in the holding area, the sequence was - bottom mould added - top mould - core inserted - casting area - metal poured - knock-out of sand and casting - box returned to holding area, casting to fettling shop and sand to reclaim mill. Moulds were lined up in the casting area, by product type and metal grade required. The furnace was tapped into a ladle suspended from an overhead crane, transported to the casting area, and the moulds poured in turn. This system of taking the metal to the mould, was adopted as being more suitable to the small specialised batches made to order that Lewis and Hole produced. The alternative of taking the moulds to the metal is better for the long runs typically produced for stock. Most of the building and assembly of furnaces, conveyor tracks, overhead cranes etc. was done in house by the staff, not much being put out to contract. Figure 3 shows the conveyor track layout, and Figure 4 the overhead crane layout. Figures 5 and 6 are sketches of respectively, plan and elevation of the greensand area, whilst Figure 7 is a sketch of the roller conveyor transfer area, necessitated by the need to allow access from the adjacent entrance to all parts of the foundry.

Significant handling problems remained however at both ends of the process. The introduction of fork-lift trucks revolutionised the transport of metal, fuel etc. to the furnaces from the yard storage areas, in skips; likewise the movement of castings from knockout to fettling and on to despatch.

This system, adapted over time, was seen and recorded by GSIA members shortly before the foundry closed in June 1996.

Moulding Processes

In time, three more processes were added to the traditional greensand. These were:-

1. CO_2 sand. This uses dry quarried sand, obtained from Manchester, mixed in a mill with sodium silicate as a binder, and extruded into the moulding machine. It is a cold setting process, using CO_2 gas as a hardener, but with the disadvantage that the sand is not reclaimable. It was much used for core making.

2. Shell moulding. A hot process. The mould incorporates a steel backing plate. Fine dry sand, bought premixed with 3-6 percent of resin, 20-23 tons at a time, is blown from the delivery tanker into a silo. This would take about 45 minutes. It was then gravity fed as required to a moulding machine containing the preheated backing plate, then baked. When the metal is poured the resin burns off in spectacular fashion. Also used for small, intricate cores. A precision process, with the disadvantages that the strong smells are difficult to contain, the sand is not reclaimable, product size is limited, and tooling costs are high.

3. Air set resin. This uses silica sand with the addition of liquid resin and a hardener, extruded as a friable sand into a mould machine. It is a cold process, being self-setting in air. In time the bulk of the work used this process, especially the larger work. About 85 percent of the sand could be reclaimed; it was then tested in the laboratory for tensile strength before the addition of an appropriate quantity of resin.

Greensand moulds are friable, patching of moulds often being needed. Resin moulds by contrast are rigid, more precise, the castings requiring less fettling, and less use of "runners" and "risers". Runners are the necessary entry arrangements for running the metal into the mould. Risers or feeders are added to the running system to ensure sound and homogeneous castings. In the early days of the company, runners and risers might take as much metal as the final casting, perhaps even more, but in time the need for them was much reduced, though not eliminated, by new techniques of moulding, modern design etc. This is part of a general trend away from craft and towards technology; metal composition was more tightly controlled, matched more precisely to the product. With greater control over furnace charging came more control over furnace temperatures and routine laboratory monitoring of the tapped metal.

Metals

SG iron became increasingly important, eventually accounting for about 30 percent of total iron output. When tapping the furnace, carbide would be added to de-sulphurise, the melt would be inoculated with magnesium, and nitrogen bubbled through, leading to a dramatic display of smoke and fumes. Latterly, casting was carried out on three days a week instead of daily as formerly. Two or three different grades of iron might be made in a day, the charge being adjusted appropriately. A bank of coke would be used to separate charges of grey and SG iron.

Large castings were once left out in the yard to weather in the traditional way, but as this practice became incompatible with modern time-scales, castings were sent out for stress relieving, to customers' specification.

Modernity also brought an erosion of the traditional customer/supplier loyalty, and the European Community opened the domestic market to competition, notably from France. Latterly, Lewis and Hole were doing a range of work for a number of customers, rather than a few as formerly. The range included general engineering products, signs including direction signs for royal parks, ornamental work, even welly pullers! Non-ferrous work was mainly valves, the metal melted in two 6 cwt capacity oil-fired tilting furnaces. Castings ranged in size from less than 0.5 kg to 0.5 tonnes ferrous, and 0.5 kg to 400 kg non-ferrous.

Pattern Making

Wooden patterns were produced in the pattern shop from customer supplied drawings of the product. Metal shrinks in cooling, at a rate depending on type and grade. SG iron for

example contracts by 1 part in 192, ordinary iron by about twice that amount. The pattern therefore must incorporate an allowance for shrinkage. Measuring rules incorporating such allowances are available for various metals, but knowledge and experience is required to apply these rules to specific products. For runs of more than about 200, an epoxy resin or metal pattern might be made by casting from the wooden pattern. The metal one of course required a double shrinkage allowance.

Core Making

This was mainly in the CO_2 sand process, but pre-baked resin sand cores were made for small intricate work. It was necessary to know how to strengthen the cores, using nails, brads etc., and how to vent gas from the core during moulding.

Safety

Hot metal casting can be a hazardous occupation. The older men habitually kept a watchful eye on their mates in case help might be needed. Later, under pressure of piecework, this aspect declined somewhat but did not disappear.

It might be expected that the modern concern with workplace safety would lead to problems with the Health and Safety Executive, but by taking the subject seriously, sometimes making their own equipment, and consulting the HSE (Health and Safety Executive) in advance over important details, such as air velocities over grinding machines, a good relationship with them was built up. The fettling process produces large amounts of dust and particles. About twenty years ago, a member of staff watching the television programme "Tomorrow's World" saw a newly designed safety helmet which incorporated a built-in supply of filtered air for breathing. Lewis and Hole were the first UK foundry to use these helmets, still produced by Airstream.

Staff and Social Aspects

Although the staff were divided into categories - pattern maker, core maker and so on - rigid job demarcation was discouraged. People were expected to be flexible, to work as a team where appropriate, to participate in team decision making and to be their own inspector. In the early days there were several Italian moulders, remembered as being very good craftsmen. One in particular, who had a stump leg is recalled as having a special way with intricate things. He now lives in South Wales, the others, all retired, live in the Stroud area.

Winter could be a hard time in the early days. Water pipes sometimes froze, old oil drums might be used as braziers, people might light a tin of white spirit for a little warmth. By contrast, summers could be very hot inside, especially when knocking out resin moulds to reclaim the sand. At first, people provided their own overalls, as was common in industry then, but later on, flame-proof overalls were provided. There was a big tea urn in the canteen from which a cup of tea could be obtained when wanted; alternatively, some had a kettle handy. People brought their own lunch, some to eat at the workplace, others in the canteen which was furnished with tables and chairs, and an ancient toaster, which was black!

Basic working hours were from 7 am to 5 am, but it was usual to leave only when casting was completed and all the metal was out; which might be at 6, 7, or 8 pm. Originally work was on time rates, but piecework was introduced 8-10 years ago and led to a general speedup. Nevertheless, the spirit of comradeship did not disappear: when a member retired for instance, everyone chipped in to give him a good send-off.

Acknowledgements:
My thanks are due to Chris Hole, proprietor of Lewis and Hole Ltd. for kindly allowing the GSIA team to record foundry operations before it closed, and for invaluable help with this article, and to the following ex members of the foundry staff for the time and trouble they took to impart their experience and knowledge: Rob Poulter, Brian Dainty, Bob Vick, Andrew Eliot. To Brian Dainty also, for kindly producing Figures 4, 5 and 6 and for invaluable help with Figures 2 and 3.

Thanks also to the members of the GSIA recording team: John Loosely, Ray Wilson, Jim Simmons and Harry Townley who took photographs, and Alan Garner who produced a video, of the processes. My description of the site is a précis of a much fuller description in a report of the Royal Commission on the Historical Monuments of England, written by Alan Stoyel. My thanks are due to him and to the Royal Commission for permission to use this source.

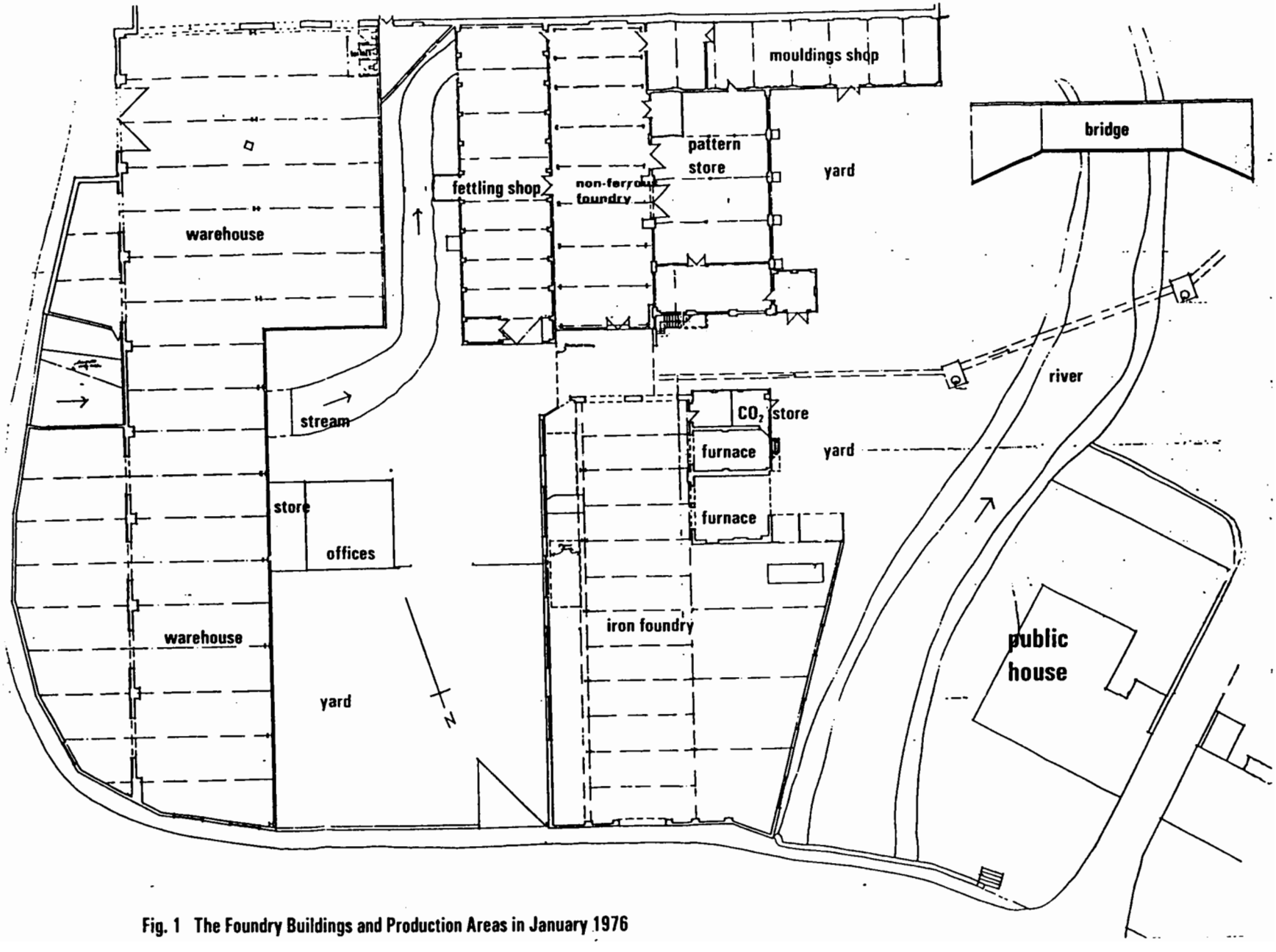


Fig. 1 The Foundry Buildings and Production Areas in January 1976

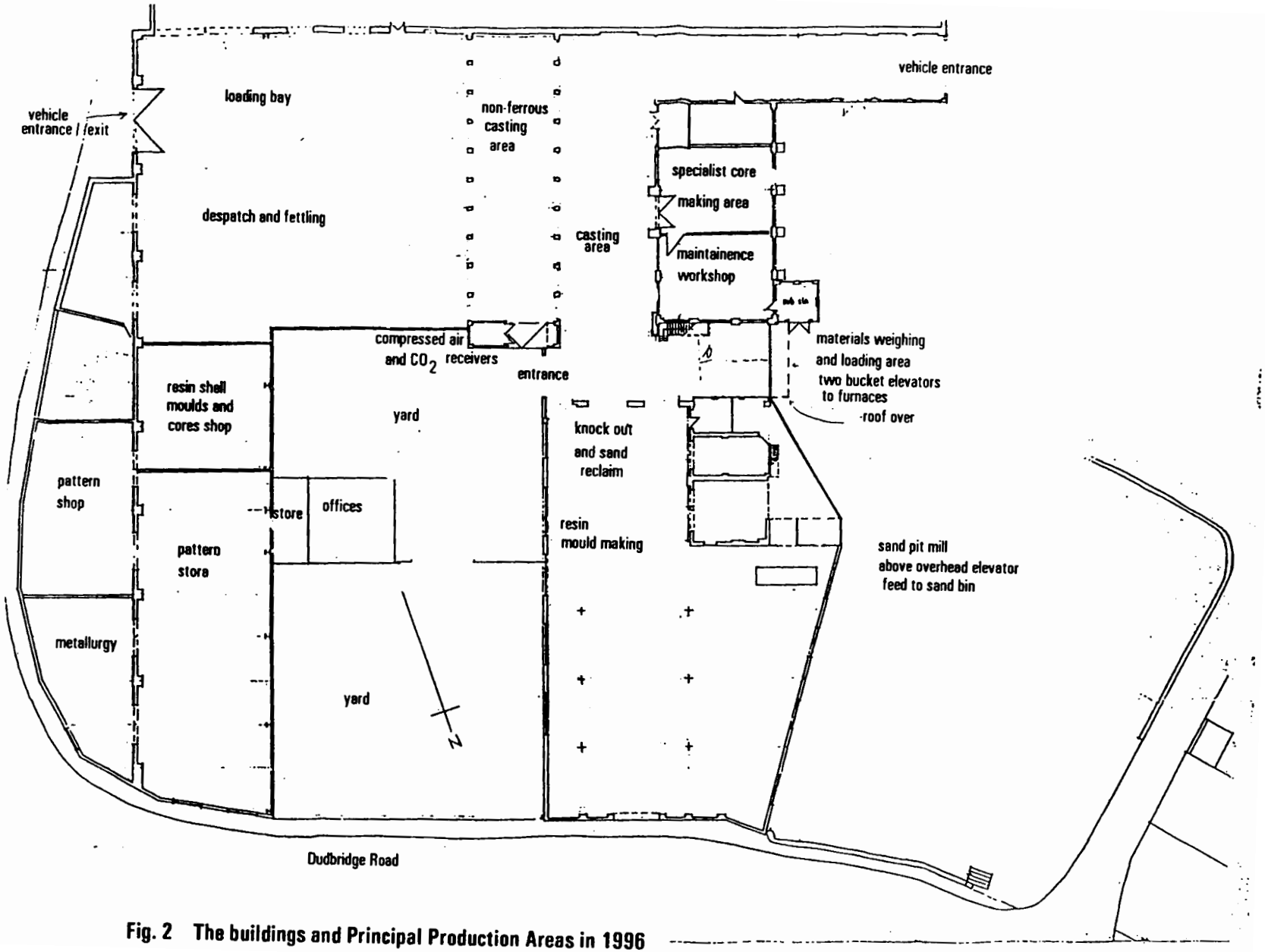


Fig. 2 The buildings and Principal Production Areas in 1996

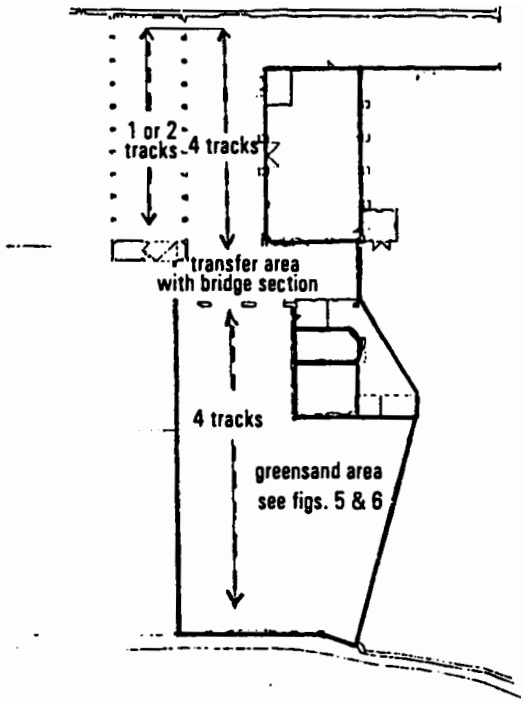


Fig. 3 Roller Conveyor Tracks Layout (not to scale)

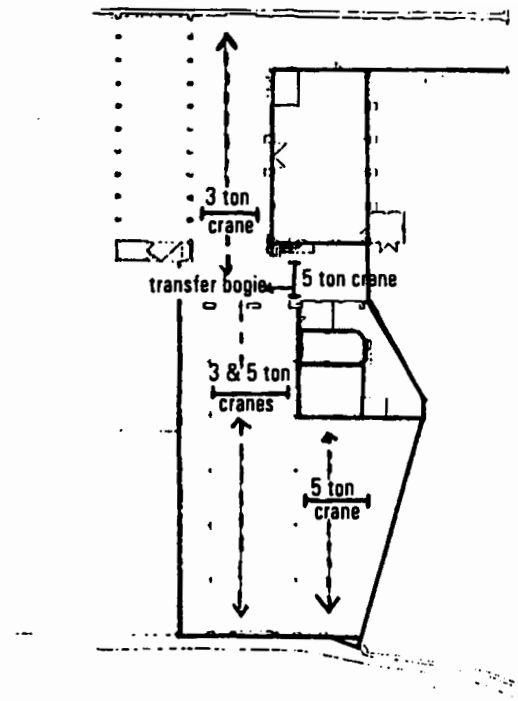
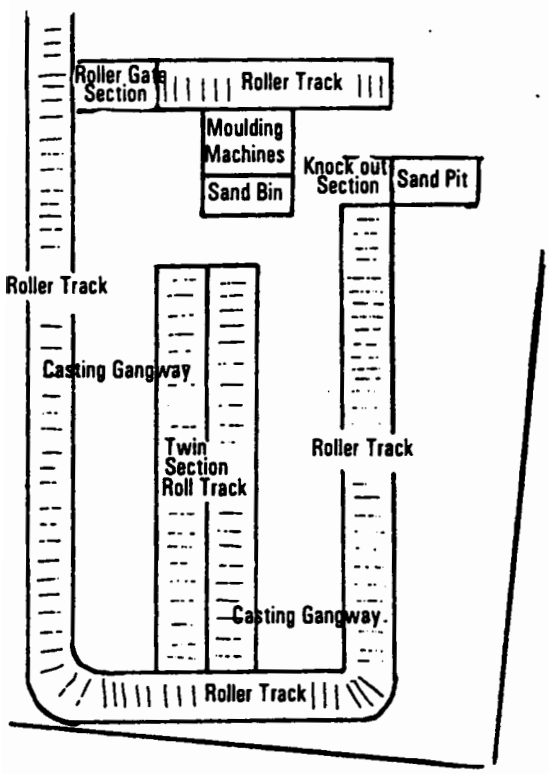


Fig. 4 Overhead Crane Layout (not to scale)



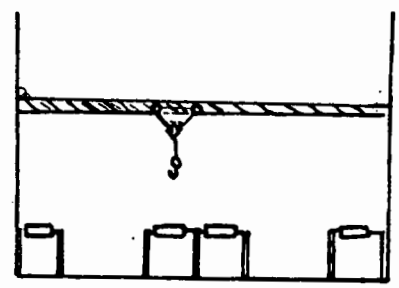


Fig. 6 Elevation of Greensand Area (not to scale)

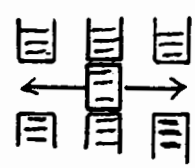


Fig. 7 Conveyer Transfer Area (not to scale)