Charfield block,tile and brick works

Owen Ward and Will Harris

The Companies and the setting

In its heyday the Charfield works was proud of its modern 'mass production' system of a cavity block which, because of its relative lightness and large size, was a cheaper alternative to conventional brick. It was appreciated by large public organisations anxious to build quickly and cheaply and was often used in situations demanding considerable load-bearing strength. Had there been a supply of more reliable raw material the works might now be meeting a renewed demand for blocks to complete the walls of concrete and steel framed structures where their insulating and soundproofing qualities are advantageous.

The Phormium Cavity Block Company began work on the construction of the site at Charfield (ST 722926) in 1928 and the first kiln was fired in September 1929. We are not aware of clay being dug from the site of the pit prior to this but bricks and tiles for the vernacular buildings of the area must presumably have been burnt in clamps or temporary kilns, using locally dug clay. The existence of works making conventional bricks at Wotton-under-Edge, two or three miles to the north-east, is recorded, and handmade brick is still referred to locally as 'Wotton brick'. The brickfield (ST 927758) lies on the south bank of the stream 200m below Hack Hill. Cursory observation of local vernacular buildings suggests that building with hand-made brick ceased in the third quarter of the 19th Century. Moreover, buildings where manufactured brick was used appear to date from this time. Brunel in the construction of the Bristol and Gloucester Railway (1844) used local materials in the many of the bridges on the line, including pennant sandstone at Mangotsfield and carboniferous limestone at Wickwar. Charfield bridge is in hand-made brick as are most of the station buildings. Conversely, the bridges on either side at Wickwar and Huntingford are in carboniferous limestone.

In 1932 the Phormium plant at Charfield was purchased by the Great Western Brick and Tile Company (of whom nothing else is at present known) who in turn sold to G.H. Downing and Company in 1933-34. We understand that George Downing had been engaged in the manufacture of clay tiles before the First World War, but after 1918 became progressively more involved in the manufacture of tiles and it is said that he was the instigator of the mass production of tiles to counter the heavy imports of tiles from Belgium and France in the early twenties. Initially he had several individual companies either solely owned or in partnership with other people until, in 1933, all were put together on the open market to form G.H. Downing and Co. (1933) Ltd. In the next few years he bought two or three other companies to make Downings by far the largest clay-tile manufacturer in the country, if not the world, at that time. Charfield works was acquired by Downing because it was at that time probably the most efficient and cost effective clay tile work in the country. Mr. Downing died in 1937 at the age of 70 and the management of the company passed at the beginning of 1938 to Mr. A. Hartley who had been manager at Charfield when Downings originally bought it and had left the plant shortly after its acquisition by Downing.

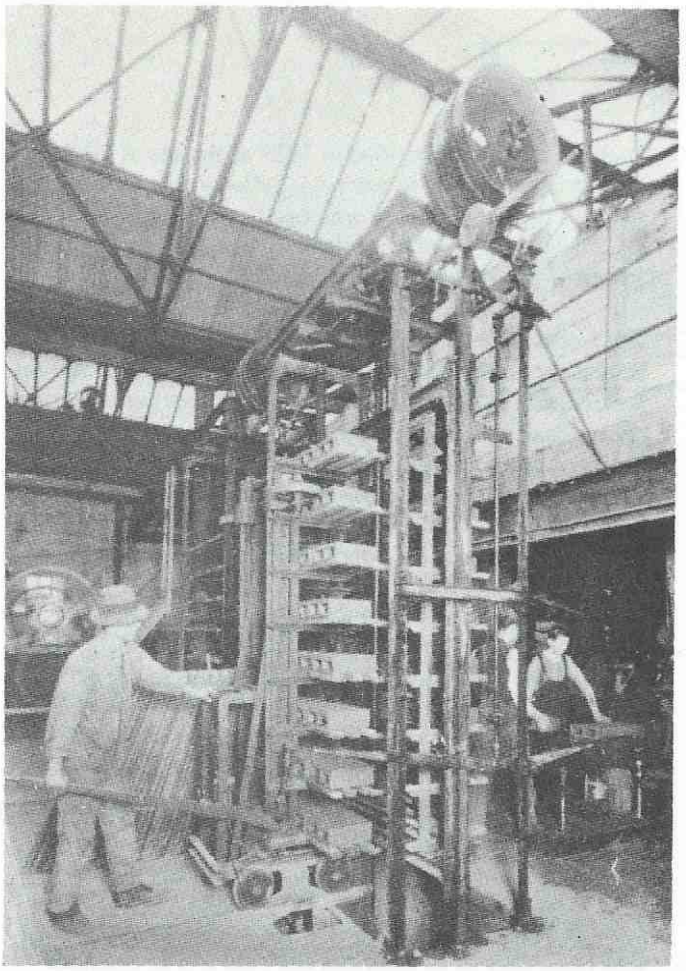
The works were sited on the eastern side of the Bristol-to-Gloucester Railway some 500 m north of Charfield Station. A siding was laid, from the down-road refuge siding, to deliver coal for the boiler and the kilns and also to despatch products. The clay pit lies on the other side of the track some 600 m to the west, set in the bank of Underhill Wood. Of a red marl, similar to Keuper Marl, the pit is some 3-4 acres in extent, with a pool in one corner. Although at a higher level than the works, the pit was connected to it by an overhead ropeway rather than a tramway, presumably because of the railway. One of the bases for the trestles or standards remains as does the terminal bay at the pit.

Bryant Homes Ltd. who purchased the site from G.H. Downing and Co. after 1973 subsequently obtained planning permission, following an appeal to the Department of the Environment, to erect 79 houses. The site was cleared during March/May 1979 and the shed over the kiln was sold. It has recently been re-erected at Hill House Farm, Charfield. One other shed was also sold and all that now remains is the approach road to the siding.

The products

The first company on the site was the Phormium Cavity Block Co. which was established on open fields in 1928. A ‘puff’ of 1932 (in the *Industrial World*) describes their products as lightweight hollow blocks for walls and floors. The works had a capacity of at least 6,000 blocks per day, together with a few ‘Cotswold-grey hand-made sand-faced tiles and machine-made Red Broseley Pattern Roofing Tiles, a certain proportion being finished by hand to meet architects’ special requirements’. Photographs published in 1932 show a block about 10 ins square and 4 ins thick with two hollows and walls about an inch or more thick but the standard sizes of cavity block ‘ranges from 12 ins x 9 ins x 2 ins to 12 ins x 9 ins x 9ins, while a series of gabled blocks, stop ends and other decorative forms is available. The finish can be rough or smooth, while a combination of smooth on one side and rough on the other is manufactured. In addition to these standard walling types, flooring blocks are made, and of these there are two kinds. One is the Phormium (Patent) Broad Span, designed to fill in the voids between the webs of tee beams in reinforced concrete floors and having sides that are curved in section; the other is a standard rectangular pattern, serving the same purpose’. Some, apparently the latter, were installed in the Royal United Hospital, Bath;

where they were laid in the floor over heating and hot water ducting in an attempt to reduce the heat transference to the office floor above. This square style appears to be the type seen in a 1932 photograph of the brick machine.



Part of the hollow-block plant

We are told that the plant was originally designed to produce these hollow blocks, but that because of increasing problems with the raw material, particularly an excess of calcium salts, production of the cavity-wall blocks became uneconomic. The walls of the blocks required a homogeneous clay mix,as small cracks and lumps which have no effect on the strength of a solid wall-brick can cause a thin-walled block to collapse under stress. Given this requirement, it was decided to introduce a more expensive product which would justify careful selection of raw material. Roofing-tile production was added about 1930. This, presumably, is the plant which was photographed for the aforementioned 1932 article; pictures show green (or unfired) blocks being loaded on to descenders ready to go into the dryers and baked ones stacked in the open beside the kilns ready to be despatched. There is also a picture of tile presses at work beyond another descender (or 'mangle' as they are elsewhere called). Fred Barton, who was among the original builders of the works and stayed on as a setter/drawer until 1939, recalled several of the products. In addition to the standard wall block with three cavities and parallel faces he identified floor blocks, also with three cavities, but slightly thicker and having one convex face and one flat one. A channel ran along the outside of one edge of the block and a projecting ridge along the other so that blocks could be keyed into one another. He remembered that, in addition to local buildings such as the Manager's House, Welwyn Garden City took huge quantities of these blocks. Other products included Italian Rolls, a typical continental curved tile with an interlocking inverted mate beneath. Double Roman tiles were also produced, with the help of tilemakers from Bridgwater, (the tiles were known as Bridgwater tiles in the locality), and so-called Broseley tiles. The Broseley company in Shropshire made a high-quality reddish-purple tile and was particularly jealous of its reputation around this time.

In 1956 the decision was taken to stop making the blocks and tiles that had been the main products, for the same reason as the change made in 1930; a deterioration in the quality of the raw material. The production of perforated bricks was introduced, probably of the sixteen or fourteen-hole variety, and also a longitudinal half-brick known as a soap. Optimum production at the new kiln (see below) was 30,000 bricks per day; market forces precipitated the works closure in 1969.

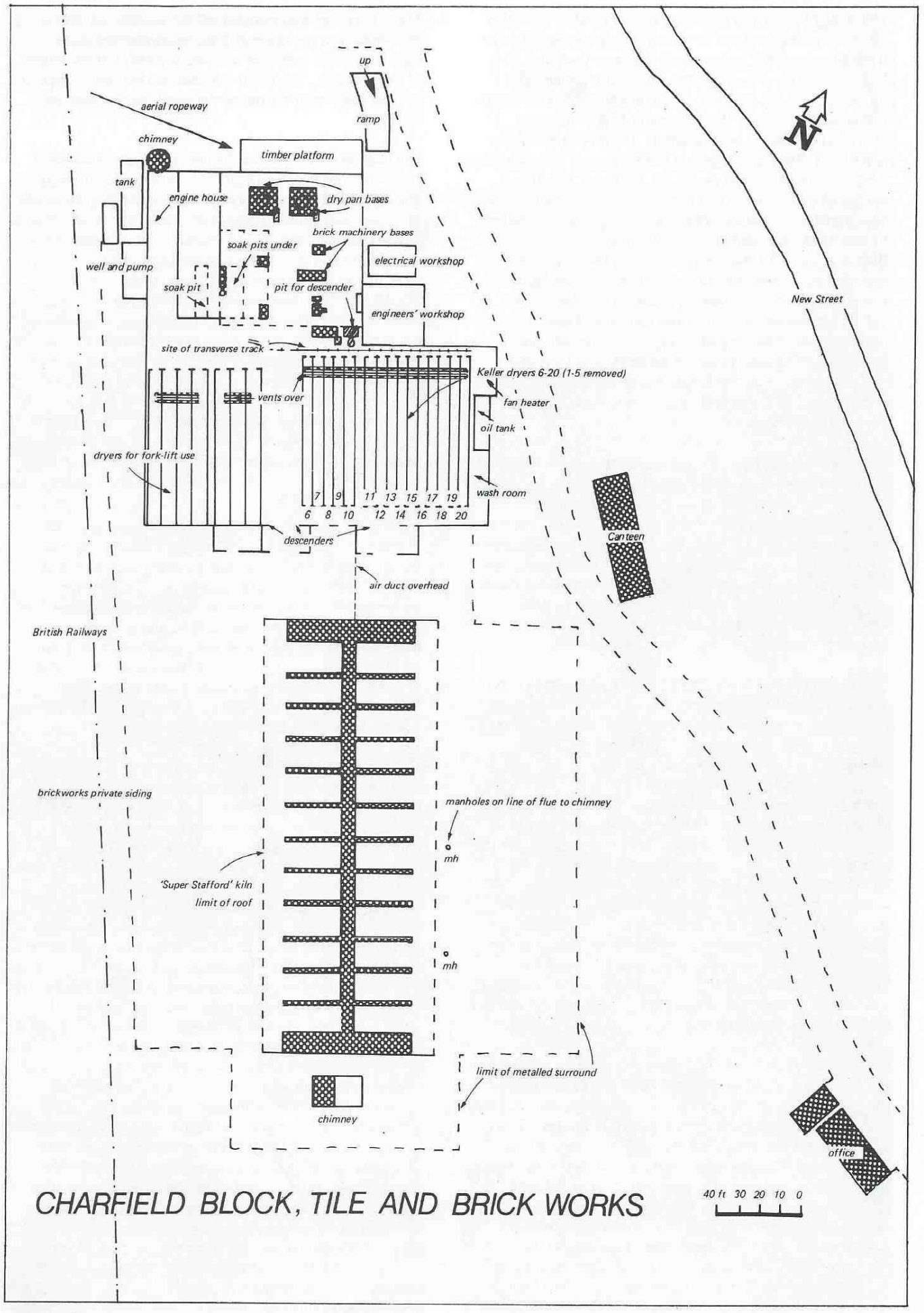
The plant

The clay pit. In the early stages all the clay was dug by hand. Later a mechanical digger excavated the clay and also partially blended it.

The aerial ropeway. Each bucket held 4 cwt; the system could carry only one bucket between standards, and there were five standards between the claypit and the plant. The buckets discharged on to a platform at first floor level of the works building, and the clay was fed by gravity directly into the plant and the manufacturing process. This is fairly common modern practice, although brickmakers traditionally dug their clay in the summer and left it to over-winter in heaps so that the weather would do the lion's share of the preliminary breaking down of the lumps. Modern works adopt heavier and more brutish devices for crushing and pounding the raw lumps. From the platform the clay was transferred via a conveyor and crusher to one of two dry pans. In each stood a pair of heavy grinding wheels, some 5ft in diameter and 1ft thick, shod with an iron band which could be regularly renewed. The perforated base, or chequer, on which they stood carried the clay and revolved beneath them.

All the grit that fell through the chequers was carried on conveyors up two floors above where it was further processed in rotary sieves, to judge by the round holes in the woodwork casing. Chutes took outsize pieces back down to the pans, while the sieved brick earth was dropped down into a 'box' or hopper, which fed it to mixers where water was added.

Next the clay was fed wet to a grinding pan and then left to soak in under-floor pits some 20ft square and 7ft 6ins deep The water was pumped from half a mile away to the east, where a stream goes under the railway and where there was a pump house for the works, to a reservoir at the north-west corner of the building. When the product changed in 1957 the soak pits were no longer used. Instead, clay was left out to weather to the east of the plant and possibly by the pit.


up
ramp
aerial ropeway
chimney
timber platform
tank
engine house
dry pan bases
brick machinery bases
soak pits under
electrical workshop
well and pump
soak pit
pit for descender
engineers' workshop
site of transverse track
Keller dryers 6-20 (1-5 removed)
vents over
fan heater
oil tank
dryers for fork-lift use
wash room
7 9 11 13 15 17 19
6 8 10 12 14 16 18 20
descenders
Canteen
air duct overhead
British Railways
brickworks private siding
manholes on line of flue to chimney
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'Super Stafford' kiln
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limit of metalled surround
chimney
New Street
office
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CHARFIELD BLOCK, TILE AND BRICK WORKS
40 ft 30 20 10 0

The power for driving' the ropeway and most of the other machinery, and the heat for the drying corridors, all came from a single steam engine. This has been described as a 500 hp compound engine with a ten ton flywheel and sixteen cotton rope drives. When removed, the Lancashire boiler, approximately 32 ft long and 12ft in diameter operating at 150 psi, was retained. The engine was superseded by a Bellis and Morcom engine driving two generators which provided electric power for the plant, but after a couple of years, power was supplied from the mains via a new transformer house. The original engine was installed in the north-west corner of the plant, with its circular 80ft chimney. All the machinery, even the engine, was supplied by Bradley and Craven (the main manufacturers and suppliers of brick-making machinery today). The engine was probably not of their own manufacture, but may well have been one of Ruston's. Water and coal for the engine presumably came from the sources already referred to, but near the engine house was a well with a pump which drew drinking water. 'A lot was needed; brickmaking is hot work'.

All that remained to be seen of the machinery in the derelict workshop when the authors visited in July 1975 were the machine beds and bolts, and a scatter of stumps where supporting brackets and girders had once stood. The plant had been modified since its installation so a reconstruction of the original process is especially difficult, even though two or three of the men who worked at the plant during much or all of its productive period have been able to help. The following description of the later stages of the process is reconstructed from such sources.

The pugmill beat the air out of the clay with paddles and then compacted it by forcing it along with a helical ram until it was extruded through an appropriate die. Some dies still lay on the site in 1975, probably discarded as being too badly worn for further use.

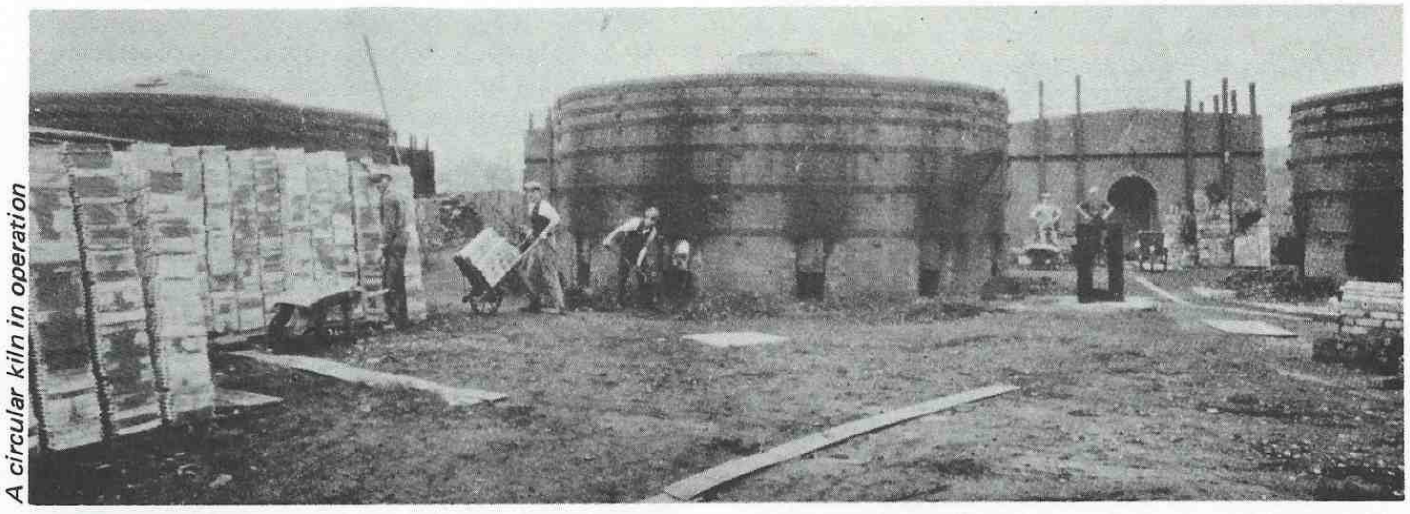
If the early blocks were sandfaced, as they presumably were ('rough finish' is how the 1932 article describes it) the machine to etch or add the facing would then lie before the cutting machine. From the cutting machine the bricks or blocks were fed on to racks ready for the dryers. The tile process is less well known, but one former employee says that the plant started with two presses, rising later to six. The hand tilers produced about 250 pan or Roman tiles per day. Some ridge tiles and specials were also produced. Possibly production started with pantiles, with the Broseley and Double Roman tiles coming later; certainly the photo of 1932 shows Double Romans on the rack.

After the final stages in the cutting and pressing of the 'wet' blocks or tiles, these were fed immediately to racks which were handled rather like modern pallets. They were loaded on to lifts or 'descenders' seen in the 1932 photos. There were brackets to support the ends of the racks and they could be raised or lowered so that a pair of brackets could be offered to the racks at working level. A set of eight racks, one above the other, was then swivelled round on the descender and taken off by a kind of manually operated eight-decker fork-lift truck on rails. Thus loaded, the truck (or 'dram') was pushed onto a turntable or transfer car running on another set of transverse rails set a little lower in the floor and to the great Keller drying corridors. There the dram was wheeled off the transfer car and along the tracks into the dryer and the racks lowered onto eight projecting ledges of brickwork which ran the length of the corridor. The dram was then withdrawn to pick up another load from the descender until the corridor was filled.

The huge drying corridors, fifteen of which remained in 1975, were an imposing sight even in their derelict state. The solid black wood doors were encumbered with weighty bolts and levers, and padded and lined with a kind of black-painted bitumenised felt. In operation each block of five (there were two such blocks in the 1932 photos. and two more blocks of five were added), was filled with steam supplied by the steam engine and controlled by a system of pressure valves adjusted to minimise the accumulation of condensed water in the dryers. Each block of five was ventilated by a huge timber vent, or 'economiser', similar to an oast-house vent, set in the roof above. The word 'economiser' as used here should not be confused with its more usual connotation associated with the steam engine to which reference is made below. One block of five Keller dryers was demolished in 1956-7 and replaced by a set of seven 'home-built' ones wide enough to take fork-lift trucks.

A transport system, similar to that previously described, retrieved the products when dry with the final delivery to the kilns made across the yard on a four-rack high trolley, running on portable metal plateways. The eight-rack descenders therefore had to be unloaded in two stages. These latter descenders were still in situ in 1976; those between the brick machines and the corridors were not present, but the pit for one, and the base of a turntable for the dram immediately alongside it were noted. Oral evidence confirms that these were dispensed with while the plant was in operation, partly succeeded by fork lifts.

The Kilns. The Phormium Cavity Block Company built a battery of four rectangular down-draught kilns. The temperature of the first kilns was judged by thermascopes viewed through two small holes left in the wicket. One of the first firings was done by a burner from Cattybrook, but the wrong thermascopes were being used and the kiln was grossly overheated. When the Great Western Brick and Tile Company purchased the plant in 1932 work was started on a continuous eighteen-chamber Staffordshire transverse-arch type of kiln, of which only the foundations were ever completed. When G.H. Downing and Co. assumed control they built a number of circular down-draught kilns and the 1955 O.S.O. map shows perhaps nine circular kilns. In 1956-7 these circular and rectangular kilns were demolished and an eighteen-chamber transverse-arch kiln constructed in their place. This was oil fired and could be loaded and discharged by forklift truck. In 1960 six additional chambers were added at the east end of the kiln, three either side: the buttressing at each end of the kiln was much more substantial than that at Shortwood, Mangotsfield. The design of this kiln was suspect. At some point the internal flue system collapsed and an external underground system that encircled the kiln was excavated to replace it. Ducting carried exhaust gases from the chambers through a vent in the wicket into the subterranean flue. A fan at the foot of the 1956-7 chimney drew the exhaust gases from this flue. A second overhead flue system suspended from the girders of the kiln roof carried hot air drawn from



A circular kiln in operation

vents in the chamber roots via portable ducting to the drying corridors.

Steam drying was abandoned because the hot air system offered energy savings in drying of the order of 70%. (However, the workers claim that hot air drying was 'never as good' as steam drying). As a consequence of these changes in 1956-7 the steam engine was scrapped, the economiser by Greens sold to H P Sauce of Birmingham, the boiler to a buyer in South Wales and the railway siding lifted. When the engine was removed it was replaced by two Bellis and Morcom generators. With the increase in output of the new kiln, the ropeway was no longer sufficient to handle the supply of material from the pit. Road haulage was used instead but the ropeway was retained in reserve and test run once a month. The last kiln was fired in June 1969 not quite forty years after the firing of the first kiln. The arch of one chamber collapsed on to the bricks inside it during firing, so that the chamber was never drawn. It remained so with its load of bricks until the site was cleared.

The brick industry was about to embark on a period of major technological change, and with this, coupled with continuing problems in the quality of raw material, meant that the site did not justify the investment required to replace the plant. Downings continued to remove bricks from the site after production ceased, employing three men initially, until Joe Clark was laid off in July 1973.

In the course of thirty-five years or so Downings remodelled the plant more than once. The difficulty of tracing the process in detail has already been explained. A de-airer and its associated vacuum pump were on order in 1939 but cancelled with the onset of war. The de-airer was intended to remove air from the clay mix so that it was easier to work and to reduce the danger of laminations occurring in bricks and tiles. This was an inherent tendency in bricks produced from these works, aggravated in thinner wares like cavity blocks, but the likelihood is that it was caused by some constituent in the clay rather than by incorrect preparation. Curiously enough the addition of a little barium carbonate to the clay, normally a successful palliative to reduce staining and scum due to sulphate salts, only made matters worse. Production was suspended at the outbreak of the Second World War but was resumed, at least partially, later in the war when cowls were fitted over the kilns to maintain the blackout. The plant was also used to produce parts for air raid shelters and at one stage material for munitions were stored in the drying chambers. A number of wooden huts were erected on the site by the military. At the end of the war, one of these huts was converted into a canteen whilst the others were moved to other Downing plants to perform the same role. It is known that most of the working machinery which was dismantled before 1973 went either for scrap or to a works then being re-equipped at Accrington.

The site in 1975 - the first survey

The buildings were impressive and abandoned. Every bit of glass (and there was a lot of it) was smashed in, doors. windows and roofs. At the corner of the workshop stood a splendid round chimney, disused since the engine was removed from the adjacent house. There was no machinery left in the shops, but the circular emplacements for the two grinding pans were obvious and several machine beds, which were all noted and measured, have helped to reconstruct the processes. The wooden cases for the elevators remained beside the great circular pits beneath the pans from which they carried the ground clay dust up to the first floor. The round holes in the woodwork showed where the sieves stood, and the timber chutes for returning the outsize pieces to the pans survived, but had been taken apart. The box or hopper into which the sieved clay was dropped still stood, but it had lost the conveyor in its floor to carry the dust to the pugmill.

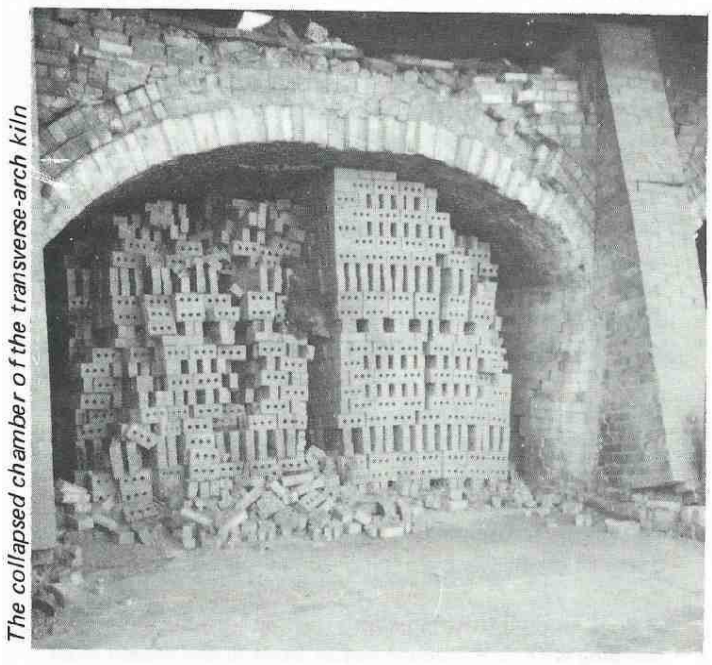
There were a number of fuseboxes on walls and pillars with labels referring to the brick-making machinery, ancillary equipment and lighting circuits. These labels were the only 'documents' recovered from the site; it is regretted that the authors did not manage to follow the circuits in more detail before demolition of the works.

At the opposite end of the working area was a descender pit, and sets of rails for the drams. They were set in front of the bank of fifteen long black corridors some ten feet high, a pair of dram rails running the whole length. At the far end the transverse rails led to the surviving descenders. Some of the pallets were lying around, damaged.

A huge air duct led from above the kiln into the main building with fans drawing hot air both to the fifteen older

corridors and to the seven new ones, the cavity block walls of which were crumbling at the corners.

The kiln itself with its enormous corrugated-iron shelter, was the most impressive feature of the site, although the heat had cracked and distorted the brickwork of the arches and the tiling on the roof. Two rows each of twelve big chambers, back to back, were linked to one another by half a dozen small trace holes, 18ins high and a foot wide, at ground level. At each end of the system the spinal wall, just over 5ft thick, was pierced by an arch some four feet high and three wide so that the continuity of the system could be maintained around the kiln. The chambers were completely open on the outer sides, but the huge blocks of fireclay material which were fork-lifted to fill the openings were on site; they bore dates in December 1963. Each chamber had a dozen or more feed holes down through the roof for oil fuel, and several other ducts some of which originally drew off exhaust gases from the burn in the one direction, while others took hot air from the chambers which were cooling in the other. The small built-in flues could be seen along the spine of the kiln but they had crumbled and cracked, or simply collapsed. The fuel oil was supplied by three narrow pipelines which ran along the roof with twin nozzles at regular intervals. A number of two-wheeled frames with oil pipes fitted on them were lying about the drying area, together with small electrically driven controllers on tripods. These together pumped an oil spray down into the chambers, powered by a 5 amp cable with a socket to each bank of fuel feed holes. There was also a compressed air main, tapped and capped at each chamber, and labelled to distinguish it from the oil pipe. After the built-in flues collapsed, the exhaust gases were drawn out through grids in some of the blocks which formed the wickets; some sets of metal piping were on site, and the underground flue was coated with an oily black residue. The air duct which once led from each chamber to the spinal flue was tapped, and a new branch led out to the roof. It was normally sealed by a large cement plug with a ring in it, but could be connected with the replacement duct, a pipe some 2ft 6ins in diameter, by means of portable piping in two sections, a riser with a damper in it, and a right angle bend. Apart from the distorted chamber walls, and the previously-mentioned chamber which had collapsed on to the bricks inside it, the fabric of the kiln generally, including the buttresses which were added to support it, was cracked and insecure.



The collapsed chamber of the transverse-arch kiln

Large quantities of stock lay stacked around the site, including hundreds of cavity blocks. Several outhouses, for electrical gear and stores, and the small office building still stood.

The floor of the office was littered with publicity material dating from 1970; the Charfield works was not then included in the list of Downings factories.

The site in 1979 - the last survey

As described at the beginning of this article, the buildings on the site had been flattened, revealing the flues all round the kiln as open trenches with water standing in them. They used to collect water when the site was operating, which reduced the effectiveness of the draught, and may be the reason why two brick-lined sumps about six feet square were dug and could now be seen, one at each end of the kiln. The re-usable shelter and hard core had been taken for local use, and the site was ready for development.

A note on Shortwood Brickworks

In *BIAS Journal* Vol.8 (1975) was an article on the brick-works at Shortwood, which up to 1969 produced a variety of quality facing and engineering bricks and similar wares. As predicted in that article, in September 1979 the main workshops were razed so that the valuable clay deposit beneath could one day be quarried for brick-making either at Cattybrook or possibly on the present site. The kilns and drying sheds still remain.

Acknowledgements

The authors are happy to acknowedge the willing help of:-
Fred Barton, who helped to build the works in 1928/29 and then worked as a setter/drawer until 1939.

'Joe' Clark, who spent much of his time operating the brick machine. He started in September 1929 when the first kiln was fired and stayed on after production ceased until 1973 when the site was sold.

'Holly' Roberts, who was employed in the fitters' shop from 1933 until 1961.

Douglas S. Hartley (FICeram), Chairman and Managing Director, G.H. Downing and Co Mr. Hartley's father, Mr. A. Hartley (FICeram), the President of G.H. Downing, was Manager at Charfield from the inception of the works until its acquisition by G.H. Downing & Co. In 1938 he became Managing Director of G.H. Downing & Co.

Mr. Michael Biddle, Chief Engineer, Bryant Homes, for permission to survey the site and remove material.

Donald Eames, of Wotton~under-Edge, who has a private collection of historic photographs.