

UNSTONE COKE OVENS

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and
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INTRODUCTION

As a result of an invitation from the late Mr R.S. Bramley to examine the coke ovens in the grounds of his home, Ramshaw Lodge, Unstone, members of the Industrial Archaeology Section of the Derbyshire Archaeological Society carried out a clearance of the vegetation and surveyed the remains. Ramshaw Lodge and its grounds were formerly the site of Ramshaw Colliery, lying on the left bank of the river Drone at a point where the river was dammed to form Unstone Mill pond. Early this century Mr Bramley's father extended and converted the colliery offices to form a dwelling; he also landscaped the site to form what is now an attractive garden which gives no obvious clue to its industrial history.

The authors wish to acknowledge the assistance of members of the Society, especially the local knowledge of Mrs K.M. Battye and the technical background of Charles Blick. The Society is particularly indebted to Mrs Bramley and to the present owner, Dr A. Bethel for their co-operation, interest and hospitality.

HISTORICAL BACKGROUND

The place of Derbyshire in the history of coke manufacture is highly significant for it was in Derby that coke found its first major commercial usage. This was in the drying of malt where wood smoke caused an unpalatable taste. About 1640, maltsters in Derby successfully dried malt over a fire of coke or 'charked coals' as it was then known. This development produced a clean tasting malt which led to Derby's national pre-eminence in malting during the closing years of the seventeenth century. At this time coke was produced at Heanor, Denby and Smalley. The technique used was to burn the coal in heaps which were covered in coal dust in a manner similar to that used for the production of charcoal. In the early eighteenth century coke was used for smelting in the lead industry and in smiths' hearths. Martyn¹, in 1729, observed the use of coke as a supplementary fuel to wood in lead smelting at Wirksworth and as the major fuel in the re-smelting of slag.

The practice of making coke in heaps was the principal method employed throughout the eighteenth century. The size of the heap varied with local custom and the nature of the coal being used, but it would seem that a heap of 18ft (5.5m) base diameter and 4-5ft (1.2-1.5m) in height was about the practical maximum. Such a heap would contain 50-60 tons of coal. The heap method had various drawbacks of which the principal ones were the level of skill needed to control the quality, the poor yield of around 30 per cent and the long process time which varied between 10 and 14 days. The great advantage of the heap method, which prolonged its use for years after it had been technically superseded, was its negligible capital cost. The initial stimulus to improved coke production methods was provided by Abraham Darby's successful application of coke to the smelting of iron at Coalbrookdale. Allowing for losses in coking, 5 to 8 tons of

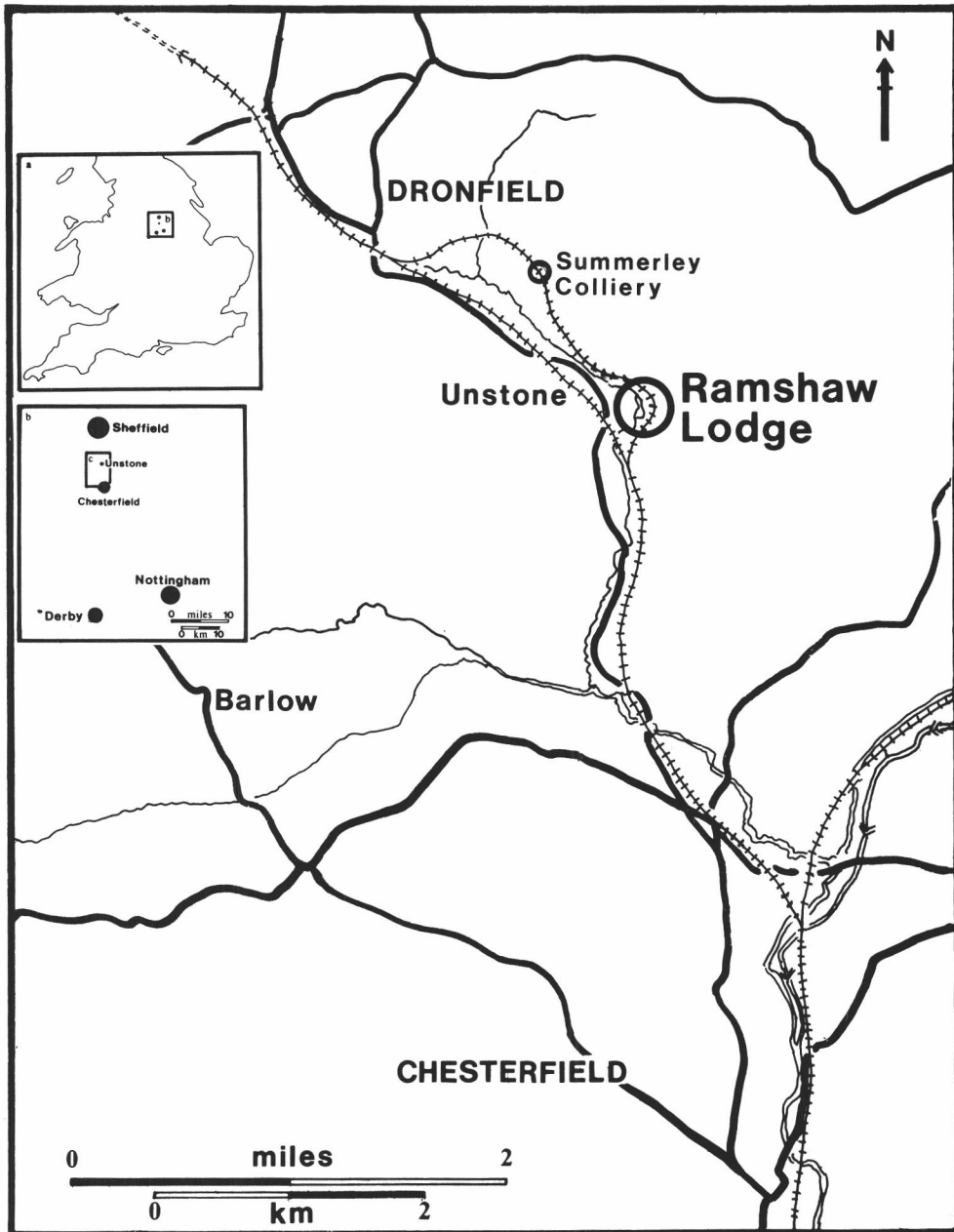


Fig 1 Location of Unstone coke ovens

coal were required to produce 1 ton of pig iron. In Derbyshire there were 9 coke-fired blast furnaces in use in 1790 out of a British total of 81 furnaces.

The first recorded use of a beehive type of oven is variously quoted as between 1629 and 1657. This early use was for charcoal burning and wood-tar recovery; the first use

of a beehive oven for coke production in this country was during 1759.

Derbyshire never achieved a position of national importance in coke production: in 1905, almost at the end of the era of the beehive oven, Derbyshire had 1,160 ovens compared with 14,259 in County Durham.

The north Derbyshire coke ovens came into being in three principal phases. The first was to fuel local blast furnaces; the second — and most enduring — was for the Sheffield crucible steel industry; the third was for railway locomotive fuel prior to the introduction of fireboxes which were suitable for coal-burning without unacceptable smoke emission. In many other areas of Britain the beehive oven was superseded by the Coppee by-product oven, but the rigid belief of the Sheffield crucible steelmakers, that beehive oven coke was of a superior quality for metallurgical work, led to a strong resistance to the introduction of by-product ovens in north Derbyshire and the Sheffield area.

The beehive oven offered an increase in yield to 55-65 per cent of the coal charged compared with 30 per cent for heap coking, but neither method yielded the by-products today associated with coking such as tar, ammonia and phenolic chemicals. The by-product type of oven was in use in Sheffield in 1872 but soon closed because the steelmakers would not accept the quality of coke produced. Initially the beehive oven had the edge on capital and running costs over the by-product type. In 1882 beehive coke cost 1s 4d (7p) per ton to produce compared with 2s 4d (12p) for by-product coke: at the same date comparative costs to build each oven were £50.00 for a beehive type and £225 for a by-product oven. The latter slowly gained ground and by the early 1900s had become more profitable to operate, although in 1901 there were fewer than 1000 nationally compared with 26,000 of the beehive type. After the First World War the demise of the beehive oven accelerated and most had fallen out of use by 1940 assisted by black-out requirements against air-raids.

METHOD OF OPERATION

Ovens were either charged with lump coal through the front door or with small coal through the top vent hole, the coal being carried in a small truck running on a tramway to the oven tops. Neither the layout nor the remains at Ramshaw suggest the latter method. The charge of the oven would be about five tons and after charging the coal would be levelled with a long rake.

After charging, the oven front door was bricked up and plastered over to exclude air. The brickwork incorporated air holes with stoppers which were capable of being removed both to adjust the air supply and to observe the state of combustion. The dome of the oven retained sufficient heat from the previous charge to 'ignite' the coal. At Ramshaw the fumes from the process escaped through the top hole direct to the atmosphere. In some later installations flues were used which led to a chimney and waste heat could be recovered for steam-raising. Many ovens did not use flues as, in addition to the higher capital cost, it was felt that the coke quality was adversely affected.

The carbonisation process lasted for 72 to 96 hours. When ready for drawing the bricks forming the top of the oven door were removed and the coke was quenched by hosepipe. It was important that the quenching was not too severe or the oven temperature would be reduced to a point at which the new charge would not be 'ignited' by the residual heat. After quenching the coke was drawn on to the coke bench using drawing tools which were usually suspended from an iron crossbar mounted in hooks on either side of the oven door. None of the Ramshaw ovens show any traces of these hooks although they are clearly present on other ovens in the Unstone area². The lower range of ovens at Ramshaw (range 1) show no sign of a coke bench and maps of the

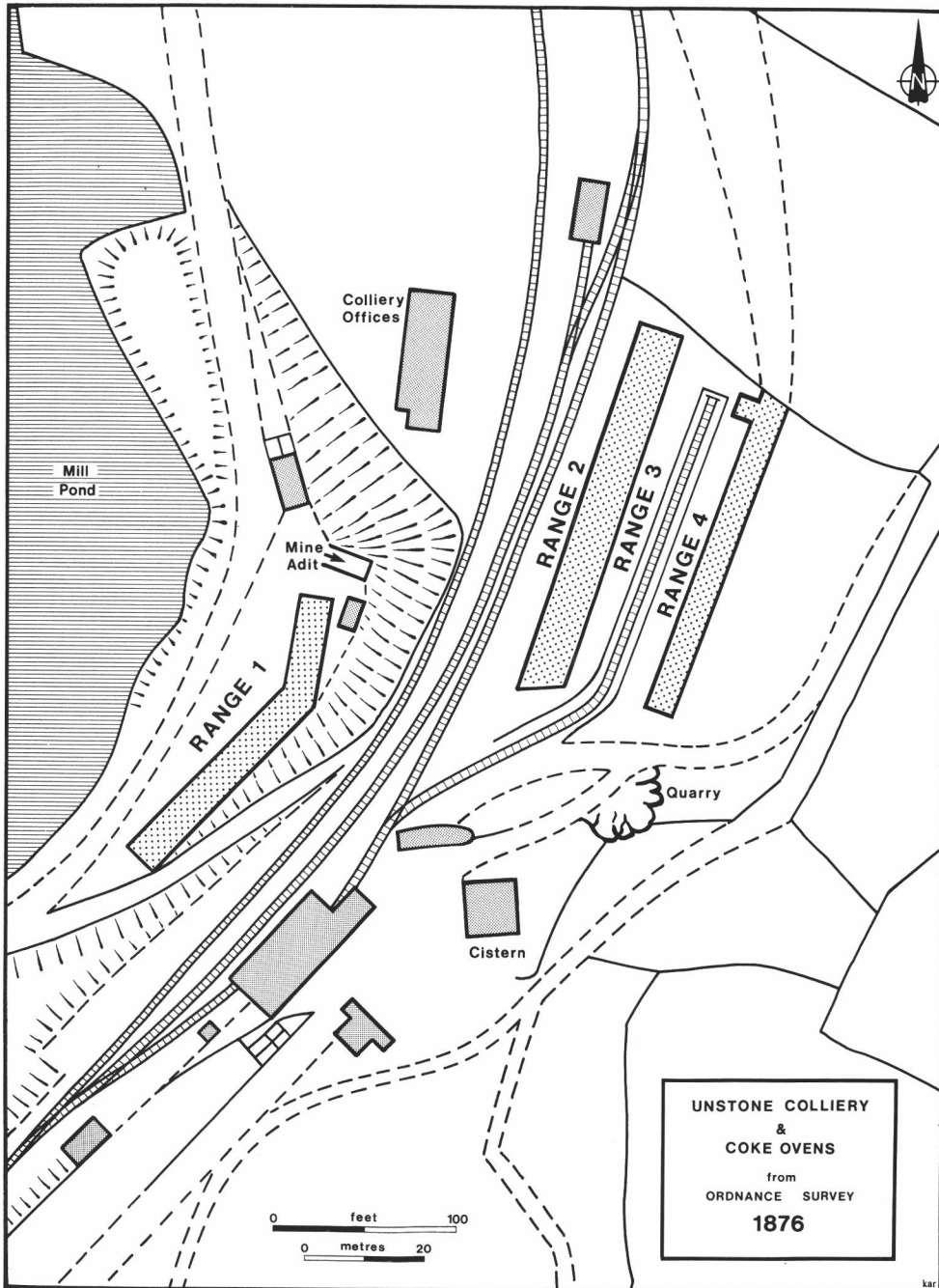


Fig 2 General layout of site

period give no indication. This suggests that the bench was near ground level. On the other ranges (2, 3 & 4) benches were arranged to allow loading into railway wagons.

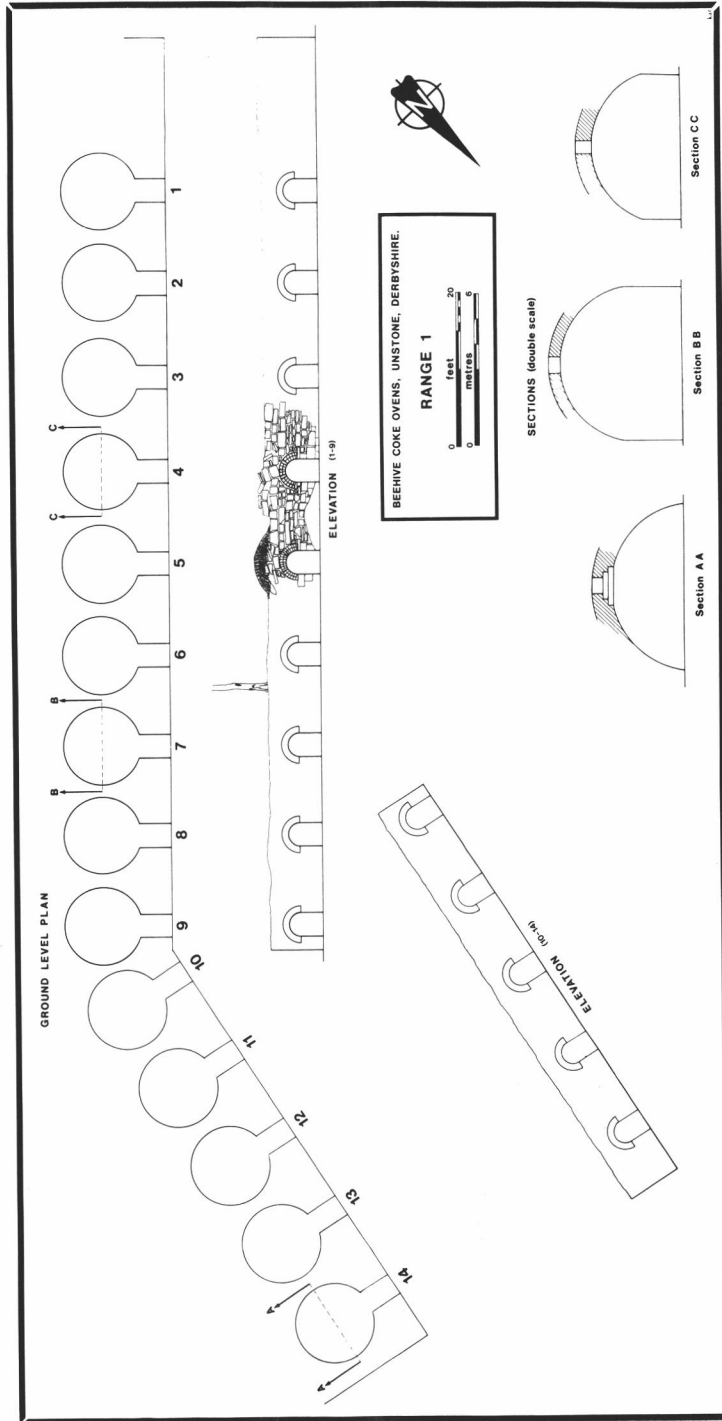


Fig 3 Beehive coke ovens, Range 1

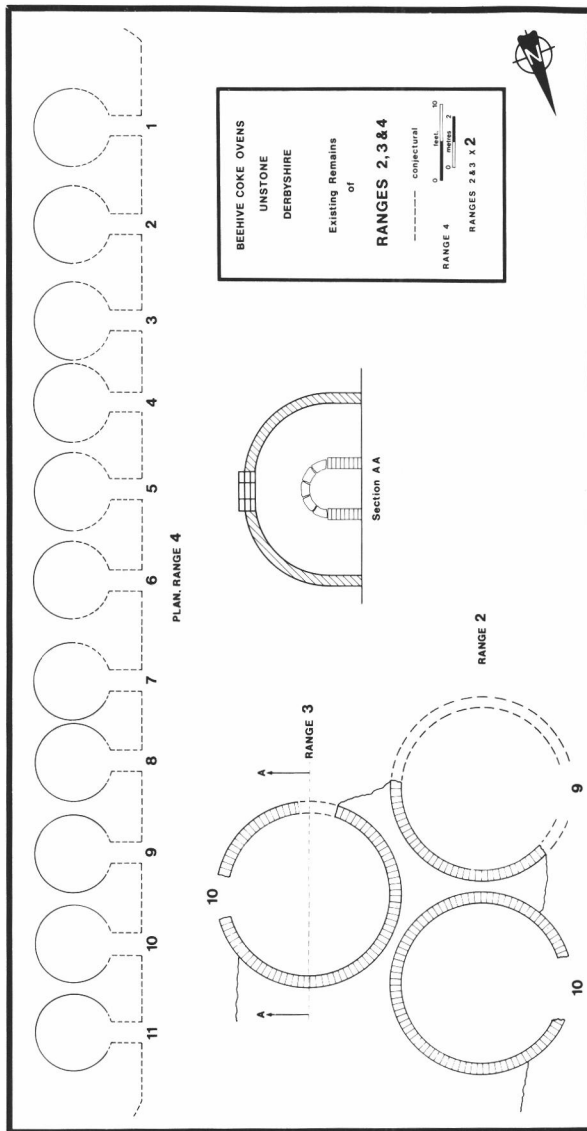


Fig 4 Beehive coke ovens, remains of Ranges 2, 3 and 4

The ovens at Ramshaw fall into two groups. Range 1, adjacent to the river Drone predates the railway. The ovens are at ground level and back into the hillside without the commonly found raised loading platform. This lower range is faced in freestone and most of the ovens were substantially intact at the time of the survey in 1983.

The upper ranges, 2, 3 & 4 were built when the railway opened and were laid out with coke platforms for rail access. The first edition 25in Ordnance Survey (Derbyshire XVIII/6) surveyed in 1876 shows rail access to ranges 2, 3 & 4, but none to range 1 (Fig 2). By the second edition of 1901 all the lines to the ovens are shown as lifted. The upper



Plate 1 Beehive coke ovens, Range 1

ranges were arranged freestanding in three parallel lines; ranges 2 & 3 built back to back on level ground and range 4 set into the hillside. During the 1920s a hard tennis court was built on much of the upper site resulting in the destruction of all but the end three ovens in ranges 2 & 3 and the removal of the outer wall of range 4. The condition of the remains is summarised in the appendix.

Rail access to the site was from a branch line built to serve Unstone and Summerley collieries; it opened in 1873 at the same time as the Chesterfield-Sheffield direct line on the Midland Railway. This branch line also served the larger battery of more modern beehive ovens at Summerley Colliery.

The Ramshaw coke ovens were worked by Henry Rangely. Rangely is noted in 1846 by Bagshaw's *Directory of Derbyshire* to be converting large quantities of coal into coke for the Sheffield steel industry. From the census returns of 1841 to 1871 the number of inhabitants of Unstone employed in coke manufacture is shown as between 8 and 12. Although this suggests a fairly small industry, the figures may well be misleading as other colliery workers were employed on a casual basis for coking as required. The period of rapid rise in the Unstone area's coal output was from 1870 to 1872. In this period rail-borne coal to London rose from 3,000 to nearly 41,000 tons per annum. After 1872 the fortunes of Unstone collieries went into decline until by 1895 they had nearly all closed. The fortunes of the Ramshaw coke ovens followed this trend but after 1871 a rapid decline in coke demand occasioned by the use of coal instead of coke for

locomotive firing (which produced a national coke surplus), must have accelerated the decline of the Ramshaw ovens. It is probable that the total period of coke production there was less than 20 years.

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- 2 For example at Summerley Colliery, Dronfield.

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APPENDIX

Condition of the Ovens

Range 1

14 ovens. Internal diameters vary from 9ft 6in (2.9m) to 10ft 6in (3.2m) and heights from 4ft 6in (1.4m) to 7ft 3in (2.2m).

1 Door arch collapsed. Front retaining wall collapsed. Brickwork in good condition and flue intact. There is evidence of slagging on the bottom six courses of brick inside the oven.

2 Outer part of door arch collapsed. Front retaining wall partly collapsed. The oven dome is cracked around the door but is otherwise good. The flue vent is intact except for one brick. Heavy slagging on bottom six courses.

3 Door arch, front retaining wall and part of dome have collapsed. Internal brickwork badly corroded and much spalled. Bottom seven courses covered in deep purple slag, becoming thinner and reddish brown extending up to flue vent.

4 Door arch and front wall intact. Interior intact although brickwork is badly spalled. Slagging similar to 3.

5 Door arch and front wall intact. Internally complete although brickwork condition is variable with random slag deposit. Lower four courses contain a type of large firebrick found only in ovens 5 & 6. The condition suggests a re-building using a mixture of old and new bricks and that the oven was not subsequently used.

6 The outer arch is broken but in all other aspects is identical with oven 5.

7 Outer arch broken but retaining wall intact. Dome and vent complete. The entire interior is covered in a shiny vitrified slag. There is some distortion of the dome.

8 Inner doorway arch broken but outer arch and retaining wall in good condition. Heavy slagging on lower seven courses and around the vent. Interior brickwork in good condition.

9 Outer door arch and part of retaining wall collapsed but interior in good condition. This oven was full of rubbish to the top of the vertical walls.

10 Retaining wall collapsed and door arch is on point of collapse. The dome has partly collapsed, allowing the oven to fill with rubble.

11 & 12 Owing to collapse of front wall a landslip has buried these ovens.

13 Door arch, front retaining wall and front of dome have all collapsed. There is heavy slagging on the bottom six courses and around the vent. Remaining brickwork in good condition.

14 Same as 13.

Beyond oven 14 is an adit entrance to a coal mine. The portal is constructed of good quality ashlar masonry: the keystone carries the date 1869. The partly blocked entrance was entered but thick ferruginous mud prevented further exploration.

Ranges 2 & 3

From the dimensions taken from the O.S. 25" map it appears that each range contained ten ovens. Those which remain from range 2 are numbers 9 & 10 and from range 3 number 10.

Range 2, Oven 9 A portion of the back wall remains standing to a height of 10 courses. This is sufficient to extrapolate a diameter of 10ft 9in (3.3m).

Range 2, Oven 10 The oven is intact except for the door arch and the front retaining wall. The brickwork is heavily corroded although there is little sign of slag. Internal diameter 10ft 9in (3.3m), height 6ft 5in (2m), vent diameter 1ft 8in (0.4m).

Range 3, Oven 10 Oven and door arch complete although retaining wall is demolished. Brickwork shows no sign of slag or corrosion. Internal diameter 10ft 7in (3.2m), height 7ft 1in (2.2m). The vent is oval, 1ft 3in x 11in (0.4m x 0.3m).

Range 4

The rear half of this range of eleven ovens is still standing although the front has been demolished. The diameter of the ovens varies from 10ft (3m) to 10ft 3in (3.1m); height is 6ft 3in (1.9m); vents are oval, 10in x 11in (254mm x 279mm).

No oven showed evidence of heavy slagging or brickwork corrosion. No 4 is buried beneath a landslip and was the only one not examined. Its position on the plan (Fig 3) is conjectural.

The condition of all the surviving ovens in ranges, 2, 3 & 4 suggest a short operating life.

Three types of brick have been used for all the ovens except some portions of numbers 5 & 6 in range 1. These are, for plain brickwork, $8\frac{7}{8}$ in x $4\frac{1}{2}$ in x $2\frac{3}{4}$; for tapered bricks two sizes, one $8\frac{7}{8}$ x $4\frac{1}{2}$ x $2\frac{3}{4}$ tapering to 2in and one $8\frac{7}{8}$ x $2\frac{3}{4}$ x $4\frac{1}{2}$ tapering to $2\frac{3}{4}$. The dome of the beehive and the circular base are all constructed by mixing these three types.

The door arch facings, both inner and outer, are of brick in Range 1 and of dressed gritstone in Ranges 2 & 3. The retaining walls are of local freestone rubble masonry both coursed and random.