

Excavation of a Glasshouse at Norfolk House, Lambeth, 1968

by G. J. DAWSON

INTRODUCTION

During building operations on this site, a number of features of archaeological interest were found. Most of them were connected with a delFTWARE factory, and these have been published elsewhere¹. Excavation of the basement of the new building cut a section through a structure associated with much glass waste material and this was cleared as far as possible on Saturday 26 October 1968². Due to these conditions, little of the plan of the structure could be recovered, and in effect all that was exposed was a sloping section through it. Its total size and the relationship of the part exposed to the whole is unknown.

DESCRIPTION OF FEATURE (see Fig. 1 and Plate 10).

The structure was constructed entirely of brick and at its east end was an approximately square feature enclosing an area 4 feet 10 inches × 3 feet 10 inches. The walls of this feature (F1) were 1 foot 6 inches wide and 6 feet of its height was exposed though this included neither its top (which had been destroyed) nor its base. On three of its sides (the north side did not survive high enough to show this) the upper two feet were corbelled inwards and in that distance the space between the east and west wall was reduced from 4 feet 10 inches to 3 feet. All the faces of F1 are blackened and the bricks of the corbelling are reduced at their internal ends while the rest of them are bright red. Intruding into this enclosure by 2 feet from the west was an arched feature (F2), 5 feet wide at its base, while the arch itself was 9 inches thick (two brick courses). Where this impinged on the south and north walls of F1 these were reduced considerably in thickness while the west wall of F1 seems to cut into F2. However, the top of F2, east of the west wall of F1, was covered by another brick wall whose top curved upwards to the base of the corbelling of F1. This curving was achieved by chamfering the ends of the bricks and covering them with a rough mortar. These bricks were reduced and the top of F2 below them, but lower down, where they did not survive and the top of F2 was exposed, its bricks were the original yellow colour. The arch itself does not appear to occur west of the west wall of F1 but within it was a smaller arch (F2a) the tunnel of which is only 1 foot 10 inches wide and which must extend further west than F1. The east face of F2a was covered by a thick glassy encrustation and in front of it were two brick pillars which lack this encrustation. The gap between these two pillars (F2b and c) corresponded exactly to the mouth of the tunnel formed by F2a. F2 is encased in a brick structure (F3) 2 feet 6 inches of whose vertical northern face, with mortar protruding from between the bricks, was exposed. On top of F3 was a carefully laid brick floor (F3a) 1 foot 6 inches thick of which 3 feet × 3 feet 10 inches was exposed. Running obliquely across the floor (north-west to south-east) was a brick wall (F3b) composed entirely of headers on

their sides. F3a's northern side had been disturbed but at its west end its base at least extended some way north of the north face of F3, making it at least 6 feet wide though this base may not have borne a floor in this area as it runs below F4.

The western end of F3a is formed partly by another, much smaller, arch (F4) running slightly obliquely to F2 and at a much higher level (only slightly below F3a). It was 1 foot wide at base and about 10 inches high with the arch only 4½ inches thick (one brick course). The floor of F4 was covered by a thick black glassy deposit, about ½ inch thick, and in places this seems to have replaced the mortar between the bricks below the floor. The sides and roof have a similar, but thinner, encrustation which has a rather matt surface. To the west of F4 was a further brick face and built up against this, and over the top of F4, was a wall which consisted of cavities running along it, which were about 5 inches square in cross section, separated from each other only by a single brick. There was evidence for at least four of these, of which the one nearest the centre of F4 was blackened while the outer (westernmost) one retained the original yellow colour of the stock brick. The former cavity also had at least two square holes in its base which connected it directly with F4, and the sides of these holes have the same glassy deposit on them as F4, while above it were two or three rectangular cavities but with the long axis vertical, not horizontal (see Plate 9 for these features). Opening on to F3a was an aperture approximately 10 inches × 1 foot (F5), set at an oblique angle to all the other features except perhaps F3b with which it was almost parallel. The sides of this hole had an encrustation on them as did the two bricks immediately in front of them between which were two bricks covering up this deposit. Further north still, but only in front of F5, the mortar of the bricks of the base of F3a had been replaced by the glassy substance, in the same manner as below F4, and had also been blackened, though penetration of this glassy material seems to have gone deeper than below F4. Running eastwards from the east wall of F1 was another wall (F6), of whose face about 2 feet 9 inches was exposed, but only about 1 foot of its height, and its relation to F1 was not clear. The gravel subsoil for two or three feet north of F3 was very red, differing from its usual brown colour. Sealing the structure was a layer of concrete which included much glass in its base, and above this was a layer of brick rubble with a tarmacadam-type surface over it which formed the surface before building work began.

DISCUSSION OF FEATURES

The structure, as exposed, is very difficult to interpret due to its mutilated state and only very partial excavation. It is clear from the scorching of the gravel that intense heat was produced by the process that occurred in the structure, and the presence of

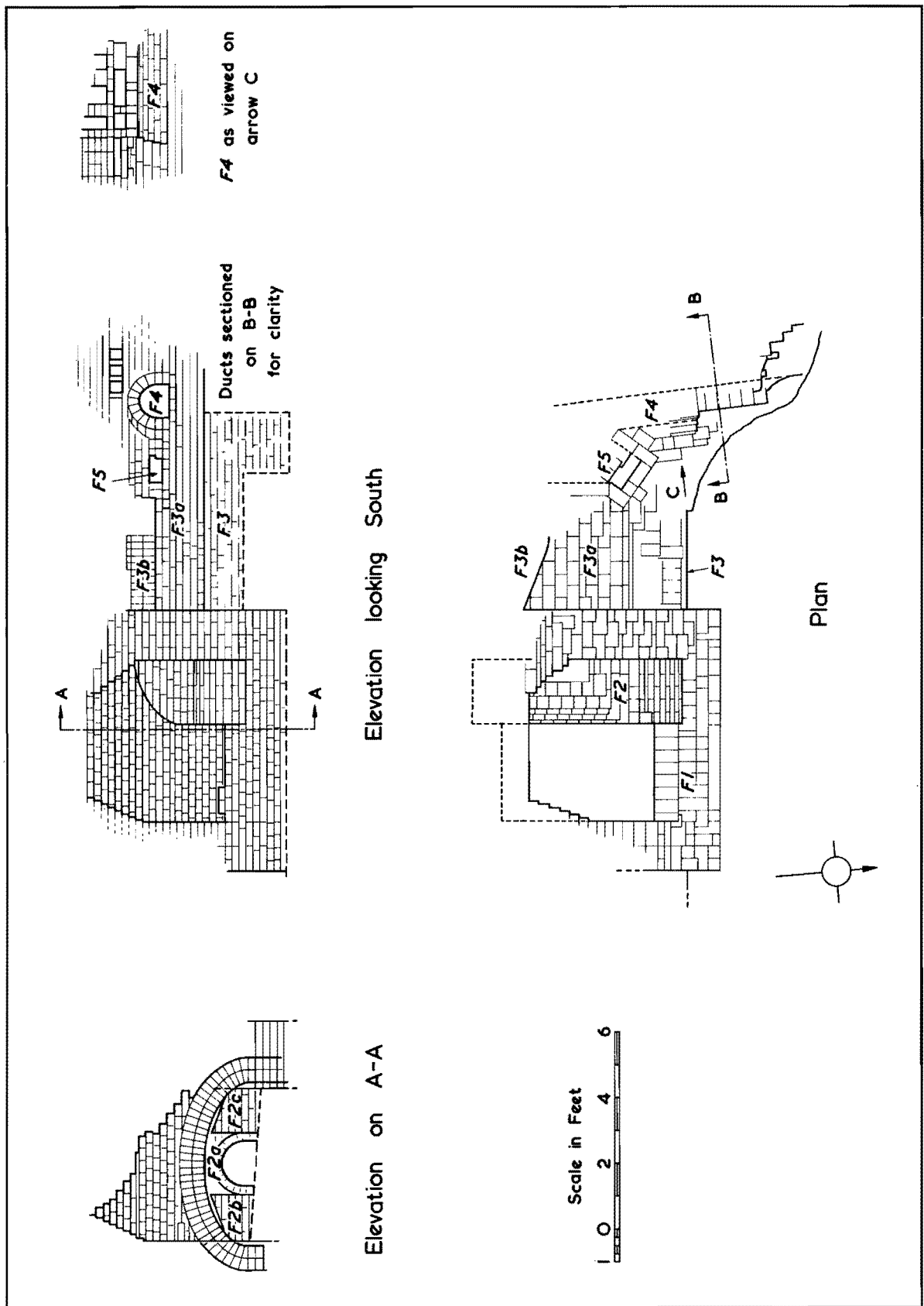


Fig.1. Glasshouse at Norfolk House, Lambeth. Plan and Sections.

large quantities of broken and distorted glass bottles, lumps of glass and tubing clearly shows that the manufacture of glass is involved; that is, that the structure is a glass kiln or furnace. Since F3 has an unfaced northern edge with mortar projecting between the bricks, it was clearly constructed up against the edge of its foundation trench whereas it appears that F1 was built within a much larger foundation pit, as was F6, since it has relatively clean faces. This may indicate two phases, with F1 replacing an earlier feature at the end of the tunnel formed by F2a which would explain the peculiar arrangement of F2a-c within F2.

It is clear that F5 originally extended further north as shown by the continuation of the deposit on its sides beyond its present end at the lowest level of bricks and by the blackening of the bricks and deposition of the glassy substance between them in a band continuing its line northwards. Thus, originally it too could have been a small tunnel like F4 except that it is square not semicircular. These two tunnels meet immediately south of the excavated area. These tunnels were subjected to intense heat in a reducing atmosphere and the glassy encrustation which occurs in them is probably due to self-glazing, rather than to the deposition of glass itself.

Why it should run down and occupy the mortared area between the bricks is unknown. The bricks themselves were clearly refractory bricks since they seem scarcely affected by the heat, and it will be seen that the two marked were imported from Stourbridge, which was well known for its production of clay bricks for glass furnaces³.

Immediately north of the west end of F3, at least, (this was the only place sectioned—see Plate 10) intense heat was present which has scorched the gravel to a considerable depth. It is not known whether this scorching continued all the way along F3, in which case the source of the heat would be within F3, or whether it was confined to this end, in which case the source of heat might have been associated with F4 and F5. Powell, writing in 1882⁴, describes three basic types of furnace in use in glass manufacturing. Firstly, the old-fashioned type fired directly by coal, of which an example survives, though with few surviving internal features, at Catcliffe⁵, in Yorkshire and of which an example has been excavated at Gawber⁶, also in Yorkshire. Both of these were attributed, by their excavators, to the early eighteenth century, but the evidence for such an early date seems very unsubstantial, especially for Catcliffe where a nineteenth-century date would seem more reasonable. Secondly, there were furnaces which were heated by gas, produced in a firebox below the crucible chamber, of which Boltons' furnace is one variant. Thirdly, there was Siemen's regenerative gas furnace, which was the latest development in glass technology. The diagnostic trait of this was a complex arrangement of regenerative chambers made of fire-bricks with spaces between them. Such a description would, in fact, fit the brickwork above F4, and it is therefore possible that this is one of the regenerative chambers. If so, F4, and presumably F5 too, would be tunnels for carrying the products of combustion from the regenerative chamber to the chimney flue, and in a reverse direction gas or air from the gas flue or the atmosphere to the regenerative chamber on its way to the heating chamber. These would then pass down and up respectively through this area of hollow brickwork, losing or gain-

ing heat in the process. It is clear from the discolouration of the bricks that most of this transfer actually took place in the central cavities, but the outer areas would obviously act as insulators of the core.

F4 and F5 would clearly meet almost immediately south of the section excavated and in this position would be over a continuation of the tunnel, F2. As has been said, such tunnels in a regenerative furnace lead to the chimney flue and the gas flue. F1 is easily interpreted as a chimney with its corbelling reducing the size of the flue and hence increasing the draught, which is typical of all types of chimney. If so, F2 would supply a connection from the ends of F4/5 and the chimney, along which the waste products of combustion could pass. Presumably, there was also at this point, but within the section, an exit point for the gas which would be produced in completely separate producers. It is obvious that the regenerative process was not completely efficient in recovering the heat from the combustion products, since F2 and F1 were clearly subject to considerable heat as well as F4 and F5. The process requires two sets of chambers, and it is possible that F3b is the side of another tunnel or regenerative chamber. The place where the glass was actually melted would be directly above the chambers. It is to be expected that a new factory would have the latest type of glass furnace available, and it is not therefore surprising that a factory built, as will be shown in the next section, c. 1879, should be using a gas regenerative furnace.

DOCUMENTARY DATING EVIDENCE

The first mention of a glassworks on this site, which lay between Pratt Street and Paradise Street, occurs in the *Kelly's Post Office Directory* for the year 1879 when the firm of Cetti, Green (Edward) & Co. were recorded at the Glassworks, Pratt Street, between 12a and 20 and claimed to make flint glass and enamel. By 1883, their range seemed to have increased to include the manufacture of antique colored (sic) sheet glass for church windows. In 1888 the partner, Edward Green, dropped out, and the firm was called Cetti, Edward & Sons. After 1892 no reference is made to a glass kiln on the site. The son involved seems to have been Charles Edward whom the Electoral Register shows to be living at 15, next door to the glass works, from 1884⁷. The Rate Book makes no mention of the Cettis or of a glassworks in Pratt Street in 1880 while it still refers to the glassworks in 1895, but now in the possession of one George Edwards, though it still records Charles Edward Cetti as next door, at 21. However, the Electoral Register supports the directory in that from 1893 it does not locate the Cettis in Pratt Street nor does it refer to a glassworks there. Thus, the rate books must be taken as adjusting to changes in occupation rather slowly and the dating for the life of the glasshouse of 1879 to 1892 can be accepted. It seems likely, however, that the firm, or at least the Cettis, did not cease to make glass because the Electoral Register records that from 1893 onwards Edward Cetti had moved to 12A Middleton (*recte* Myddleton) Square, Clerkenwell, which it says was a glassworks and the directory shows him as at that address from 1894, though it does not describe it as a glassworks (or as anything else) and an Edward Cetti had been living at 1 Myddleton Square before 1892. There is also a firm of Edward Cetti, at 36, Brooke Street,

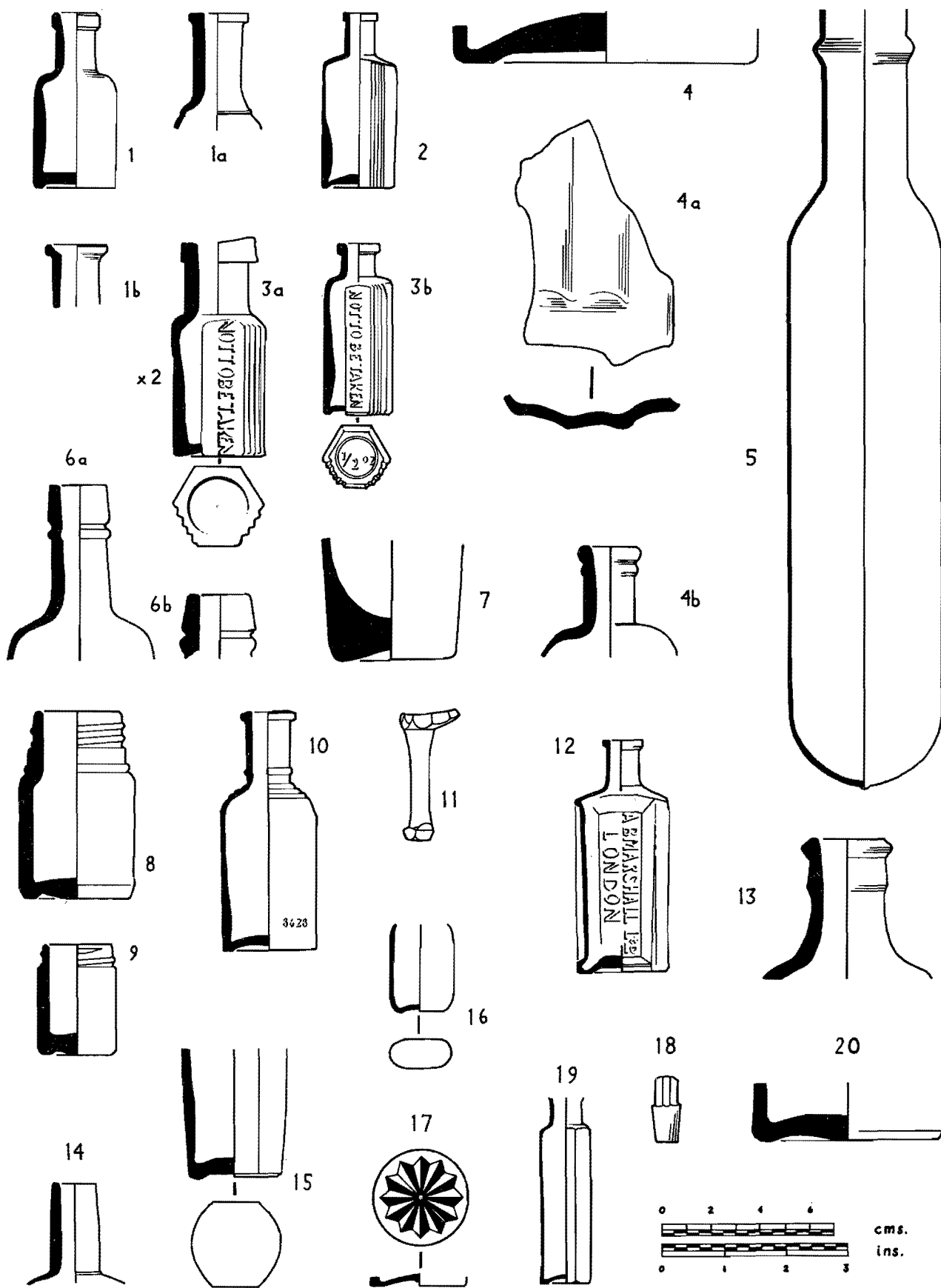


Fig. 2. Material from the Glasshouse at Norfolk House, Lambeth. ($\frac{1}{3}$).

barometer makers, both before, during and after the Cetti firm in Pratt Street, and it would appear significant that in 1893, for the first time, he is described as glassblower as well. Myddleton Square is quite near to Brooke Street and it may be that an amalgamation of firms took place. The unusual surname would suggest that the people involved were related in some way.

FINDS (Fig. 2.)

Glass

All the glass was recovered from on or within the structure, except for those which were contained within the base of the concrete which sealed the structure. Some finds made by the builders are referred to where they throw light on this material, but are not published since their precise context is unknown.

No. 1 Bottle with cylindrical body and neck, countersunk base and rectangular beaded rim. All in transparent glass and with prominent mould lines unless otherwise stated.

Only one complete example (Fig. 2, 1) which has on its base 44 (7?) 9. Body D. $1\frac{1}{4}$ inches, H. $2\frac{11}{16}$ inches: neck D. $\frac{3}{4}$ inch, L. $\frac{15}{16}$ inch. Lacks prominent mould lines. Holds approximately half oz. of water.

All the rest of this type are fragments.

Body D. $1\frac{13}{16}$ inches \pm $\frac{1}{16}$ inch: eleven bases, greatest surviving height $2\frac{1}{2}$ inches, three have a second, fainter mould line and between it and the prominent mould line, the body is flatter than elsewhere (this will be called a facet): four basal side fragments, greatest surviving height $3\frac{2}{16}$ inches, one has $\frac{8}{16}$ inch wide facet: twelve body fragments, six with facet (on five about $\frac{8}{16}$ inch wide) and three with part of it: eleven distorted body fragments probably of this size, six probably with facet (five at $\frac{8}{16}$ inch): one distorted base with $\frac{8}{16}$ inch facet: total 39.

Body D. $1\frac{8}{16}$ inches: one base (lacks prominent mould lines): one base fragment (facet $\frac{8}{16}$ inch wide), distorted: one side fragment (facet $\frac{8}{16}$ inch wide): total 3.

Body D. $1\frac{6}{16}$ inches: two bases (one distorted).

Body D. $1\frac{3}{16}$ inches: one base, in blue, translucent glass, H. $1\frac{10}{16}$ inches+: one side fragment in transparent glass.

Body D. $2\frac{1}{16}$ inches: one base, mould line not prominent, has '6 oz and 128' in raised lettering on base: one body fragment, lacks facet.

Body D. $2\frac{12}{16}$ inches: one base, mould line not prominent, H. $2\frac{3}{16}$ inches+.

Neck D. $1\frac{3}{16}$ inches: one rim and neck fragment, height of neck $1\frac{3}{16}$ inches.

Neck D. $\frac{14}{16}$ inch: one rim and neck fragment, height of neck $1\frac{1}{16}$ inches+.

Unsizeable: one rim and neck fragment (distorted): two body fragments: one base: total 4.

From concrete: one body fragment: one base and body fragment: one neck fragment. Overall total 58.

There are a number of other necks in transparent glass with rectangular beaded rims which do not, however, appear to belong to this type. One certainly belongs to a bottle with a rectan-

gular body, though with rounded corners and with the wide sides as slightly recessed panels: rim D. $\frac{15}{16}$ inches, neck L. $1\frac{4}{16}$ inches, body W. approximately $1\frac{3}{4}$ inches. There is a neck of a similar bottle which is smaller and less complete: rim D. $\frac{12}{16}$ inches, neck L. $1\frac{2}{16}$ inches. A third neck from a substantially similar bottle (it appears to be rectangular with wider sides recessed) has a cordon at the base of the neck

(Fig. 2, 1a): rim D. $1\frac{6}{16}$ inches, neck L. (from cordon) $1\frac{8}{16}$ inches. There are also two necks whose beaded rims are larger than usual and which have a rounded not a sharp angle internally at the rim (Fig. 2, 1b): rim D. 1 inch (2), neck L. 1 inch (drawn specimen), $\frac{3}{4}$ inch: undrawn specimen has part of top of body with possible indication that it is rectangular. Two other necks may also have these two characteristics but these rims are distorted and it is difficult to be certain what rim form was actually intended: rim D. 1 inch (2), neck L. $\frac{3}{4}$ inch (1), 1 inch (1).

No. 2 Rectangular bottle in blue glass with corrugations on both narrow sides. One wider side has, in raised lettering, 'NOT TO BE TAKEN' between two bands of vertical corrugations. It has a cylindrical neck with rectangular beaded rim. All in blue glass unless otherwise stated.

Body W. $1\frac{1}{8}$ inch: one complete specimen (Fig. 2, 2), body T. $\frac{5}{8}$ inch, body H. $2\frac{1}{16}$ inches, total H. $2\frac{3}{4}$ inches, holds approximately $\frac{1}{2}$ oz. of water: one base fragment: one body fragment (this may be slightly smaller as the lettering is certainly smaller): total three.

Body W. 2 inches: one base, T. $1\frac{1}{8}$ inches, H. $2\frac{3}{8}$ inches+: two body fragments: one basal body fragment in green glass: total 4.

Body T. $\frac{7}{8}$ inch: one base fragment has 1 oz. in raised lettering on base.

Rim D. $1\frac{1}{16}$ inches: two rim and shoulder fragments (one rim distorted but approximately this size): one has body W. $2\frac{1}{4}$ inches and T. c. $1\frac{1}{8}$ inch: other not measurable: neck L. $1\frac{1}{8}$ inch and $1\frac{1}{4}$ inch.

Unsizeable: four body fragments: one shoulder fragment in thin glass with 'N' in raised lettering between two vertical raised lines but lacks corrugations, possibly blown free and not in a mould, no other examples of it occur. Overall total 15.

No. 3 Similar to last type but hexagonal not rectangular. Two faces have corrugations and between them plain face has in raised lettering 'NOT TO BE TAKEN' with vertical grooves on either side of it.

Face W. $\frac{3}{8}$ inch: one complete example: H. $1\frac{11}{16}$ inches, holds $\frac{1}{10}$ oz. of water (Fig. 2, 3a): complete example except for rim, H. $1\frac{12}{16}$ inches+, body H. $1\frac{8}{16}$ inches: total two, all in green glass.

Face W. $\frac{9}{16}$ inch: one complete specimen, H. $2\frac{5}{8}$ inches, blue glass, holds $\frac{2}{3}$ oz. of water (Fig. 2, 3b): three small body fragments, two green and one blue: one base and body fragment in green glass: total five. All lettered faces framed with two vertical grooves.

Face W. $\frac{6}{8}$ inch: one base and body fragment in blue: greatest surviving height $1\frac{1}{4}$ inches. A complete specimen of this size in the stray finds (H. $4\frac{1}{8}$ inches) holds 2 oz. of water.

Face W. c. $\frac{7}{8}$ inch: one base and body frag-

ment in blue glass: three body fragments, greatest surviving height $2\frac{1}{4}$ inches, two blue glass and one green: total four. All lettered faces framed with vertical grooves.

Face W. $1\frac{3}{16}$ inches: four base fragments in blue glass: four body fragments in blue glass, greatest surviving height $1\frac{3}{4}$ inches: two base and body fragments in green glass: total 10. Complete specimen of this size from stray finds is $6\frac{11}{16}$ inches high and holds 7 oz. of water.

Face W. $1\frac{3}{8}$ inches: one body fragment, greatest surviving height $3\frac{1}{4}$ inches.

Unsizeable: one base in blue glass: four body fragments, two in green and two in blue glass.

Amongst the stray finds, there are also bottles of this type with face widths of $\frac{7}{16}$ inches (H. $2\frac{1}{2}$ inches: holds $\frac{1}{3}$ oz. of water) and $\frac{5}{8}$ inch (H. $3\frac{3}{16}$ inches: holds 1 oz. of water). Overall total excluding stray finds 28.

There are also a number of neck and body fragments which have the diagnostic criteria of these types (i.e. rectangular beaded rim and ribbing on sides) but where insufficient survives to show whether the body is rectangular or hexagonal.

Neck D. (external) $\frac{14}{16}$ inch: two green and three blue necks, L. 1 inch: three blue necks, L. $\frac{12}{16}$ inch: total 7.

Neck D. $\frac{9}{16}$ inch: one blue neck, L. $\frac{12}{16}$ inch: one green neck, L. $\frac{8}{16}$ inch.

Neck D. 1 inch: three, probably four, blue necks, L. $1\frac{6}{16}$ inches: one blue neck, L. $1\frac{2}{16}$ inches: total 5.

Body sherds: seven blue, five with ribbing: two green, one with ribbing: three base of neck, all blue: total 12.

From concrete: one body fragment, blue: overall total 27.

No. 4 Bottle in green tinted glass represented only by bases and body fragments. Drawn example countersunk base, D. 5 inches, has 'B & Co. Ltd.' on it (Fig. 2, 4). Another identical example.

Body sherds: six simply curved: one flat: one with two flat sides W. $1\frac{1}{4}$ inches+, $1\frac{1}{2}$ inches + with concave vertical panels (Fig. 2, 4a). Another type in the same coloured glass but with a square or rectangular body is represented by: one base, circular countersinking in base externally, W. $1\frac{1}{2}$ inches, H. $1\frac{1}{2}$ inches +: three body sherds, one with two sides surviving (W. $1\frac{1}{4}$ inches +, $1\frac{1}{2}$ inches +) and two with one and trace of second (W. 1 inch + and $1\frac{1}{4}$ inch +): neck with half round beaded rim and cordon below (Fig. 2, 4b), probably belongs to a rectangular bottle.

No. 5 Long, narrow, cylindrical vessel in extremely thin, transparent glass with round bottom and collared neck. No rim form known. No mould marks: slight point at base. Most complete specimen D. $2\frac{1}{2}$ inches, neck D. $1\frac{6}{16}$ inches, L. $12\frac{1}{2}$ inches + (Fig. 2, 5). Neck fragments: two, D. $1\frac{6}{16}$ inches, collars less pronounced than on drawn specimen. Base, one D. $2\frac{1}{2}$ inches. Body sherds 22 (identified by thinness of glass). From concrete: base fragments, two: collar, one (identical to illustration): body fragments, 70+: overall total 99+ (minimum number of vessels 4).

No. 6 Vessel with long narrow, cylindrical neck with collar at top and cordon below with possibly rectangular or square body. Two variants, one with distinct cordon below collar, with hemi-

spherical cross section (Fig. 2, 6a). Drawn example in green tinted glass, external D. $\frac{14}{16}$ inch, T. at rim $2\text{-}\frac{3}{16}$ inch, collar L. $\frac{10}{16}$ inch. One other example, external D. $\frac{15}{16}$ inch, T. at rim $2\text{-}\frac{3}{16}$ inch, collar L. $\frac{9}{16}$ inch. One example in blue translucent glass, external D. $\frac{11}{16}$ inch, T. at rim $1\text{-}\frac{2}{16}$ inch, collar L. $\frac{9}{16}$ inch. Neck fragment in blue glass may be of this type but no surviving collar. Other variant (Fig. 2, 6b) has cordon formed by furrow in collar which fades into neck, green tinted glass, external D. $\frac{15}{16}$ inch, T. at rim $\frac{3}{16}$ inch, collar L. $\frac{9}{16}$ inch.

No. 7 Thick, slightly kicked, base of cylindrical vessel: D. 2 inches, H. 2 inches +: one example: in transparent glass (Fig. 2, 7).

No. 8 Square bottle with rounded corners and screw thread on neck: H. 3 inches, neck H. 1 inch, neck D. $1\frac{7}{16}$ inch, body W. $1\frac{3}{4}$ inch (Fig. 2, 8). One side fragment W. $1\frac{1}{2}$ inch: one base, countersunk, W. c. $1\frac{3}{4}$ inch (somewhat distorted).

No. 9 Small cylindrical vessel with screw thread on neck, countersunk base, in white semi-transparent glass: base D. $1\frac{4}{16}$ inch, H. $1\frac{12}{16}$ inch, neck H. $\frac{6}{16}$ inch, rim D. $1\frac{2}{16}$ inch (Fig. 2, 9). One other example which lacks neck: base D. $1\frac{4}{16}$ inch.

No. 10 Neck of cylindrical vessel with long narrow neck, rectangular beaded rim, cordon near base of neck and ribbing on upper body (Fig. 2, 10 is restored from complete specimen of very similar vessel amongst stray finds): transparent glass: only example.

No. 11 Stem of vessel in transparent glass with small segment of body and foot (Fig. 2, 11).

No. 12 One fragment of narrow indented side with 'B. MARSHALL LONDON' in raised letters on it, transparent glass, very distorted (Fig. 2, 12 is a complete specimen amongst stray finds which shows that initial A is missing): two body fragments of narrow side, indented. From concrete, one fragment of indented side.

No. 13 Tall cylindrical straight-sided bottle in light blue glass: thirty-one body fragments, D. $3\frac{1}{2}$ inches (1), 3 inches (7), greatest surviving height $3\frac{1}{2}$ inches. Many have conspicuous mould lines. Three basal angles: one neck with rectangular beaded rim may belong to this type, external rim D. $1\frac{1}{16}$ inches, L. $1\frac{3}{8}$ inches +. 3 shoulder fragments. A rather different rim (Fig. 2, 13) may also belong to this type of bottle since it is in blue glass but has a triangular beaded rim and a collar below it. From concrete: one top of body fragment: one top of body with some neck, and five fragments.

No. 14 Narrow cylindrical neck with simple rims and no beading, in transparent glass, probably with cylindrical body: 20 necks, D. $\frac{11}{16}$ inches, L. $1\frac{5}{16}$ inches + (3), $1\frac{6}{16}$ inches (10), $1\frac{8}{16}$ inches (5) (Fig. 2, 14), all rather roughly finished, 12 considerably distorted. Three base of neck fragments with some of body, distorted: one top of shoulder fragment.

No. 15 Base of bottle in transparent glass with two curved and two flat sides and countersunk base: W. (between two flat sides) $1\frac{6}{16}$ inches, H. 2 inches +. (Fig. 2, 15).

No. 16 Small oval bottle in thin transparent glass

W. (long axis) 1 inch, H. $1\frac{1}{2}$ inches +. (Fig. 2, 16).

No. 17 Base of circular bottle with star pattern externally with central knob in relief and the pattern created by triangular sectioned 'rings'. D. $1\frac{1}{2}$ inches: base kicked (Fig. 2, 17). Base of a rectangular or square bottle with part of similar motif externally: $1\frac{10}{16}$ inches \times $\frac{6}{16}$ inches +: both H. $1\frac{3}{4}$ inches +, sides seem to be slightly dished and base is kicked. Both in transparent glass.

No. 18 Small stopper in transparent glass: consists of plain ground glass tapering cylinder at one end and fluted cylinder the other, which incomplete, L. 1 inch +, D. $\frac{6}{16}$ inches- $\frac{8}{16}$ inches (Fig. 2, 18).

No. 19 Octagonal bottle in blue glass: countersunk base, face W. $\frac{6}{16}$ inches, W. of bottle $\frac{13}{16}$ inches, H. 3 inches +, faces completely plain. (Fig. 2, 19).

No. 20 Base in dark green 'bottle glass'. Thick, countersunk base. D. 3 inches, H. 1 inch +: externally on base has (2?) 5. A and C. B. (C?). (Fig. 2, 20).

Unillustrated

No. 21 Amber glass: 6 curved body sherds. Vessel type unknown, perhaps cylindrical.

No. 22 Flat thin green-tinted glass with one straight edge with half-round beading along it.

No. 23 Fragment of flat glass with raised bobs on one surface (like frosted glass).

No. 24 Fragment of flat translucent greenish-brown glass with blistered surface.

No. 25 Fragment of transparent glass with straight edge $\frac{3}{16}$ inches deep, above which side curves outwards. Internally, base curves upwards towards centre of vessel.

No. 26 Two fragments of straight-sided vessel with countersunk base and half round moulding round basal angle.

No. 27 Distorted circular ring in cloudy transparent glass—possibly a neck and appears to have rectangular beaded rim but diameter would be large (approximately $1\frac{1}{2}$ inches).

From concrete: fragment of a circular glass object of which between a quarter and a half of the circumference survives, edges formed by half round mouldings, transparent glass: fragment of vessel in transparent glass, has indented panel on side, with large area of top surviving but no trace of neck.

Miscellaneous

Bases: 5 blue, D. $1\frac{3}{4}$ inches +, $1\frac{10}{16}$ inches +, c. $2\frac{1}{4}$ inches, $2\frac{6}{16}$ inches +, $2\frac{1}{2}$ inches, one with B102 on it: one green D. $2\frac{4}{16}$ inches.

Body fragments: 18 blue: four green: 75 transparent: two very pale green/cream opaque (in concrete).

Lumps of solid glass: six large, one comprises cylindrical piece of green tinted glass fused to piece of transparent glass, one has two pieces of green tinted glass with white opaque glass between, others transparent glass: 16 small lumps of transparent glass.

Hollow glass tubes: D. (external) $\frac{2}{16}$ - $\frac{3}{16}$

inches, 5 (one with narrow hole): D. $\frac{3}{16}$ inches, 11: D. $\frac{3}{16}$ - $\frac{4}{16}$ inches, 24 (two with thick walls): D. $\frac{4}{16}$ inches, 1. From concrete: few pieces, D. $\frac{3}{16}$ - $\frac{4}{16}$ inches, associated with fragments of Fig. 5.

Bricks

(1) Reddish orange to dark grey, ?refractory: $4\frac{4}{16}$ inches \times $2\frac{4}{16}$ inches \times $7\frac{7}{16}$ inches +, impressed with 'J. B. FISHER & CO. STOURBRIDGE'.

(2) Bright red to creamy white with dark brown sheen. Seems to have been fired at very high temperature and is very friable. Impressed with 'M. N. T. & CO.' $4\frac{8}{16}$ inches \times $2\frac{6}{16}$ inches \times $9\frac{14}{16}$ inches.

(3) Brown to grey very hard $4\frac{3}{16}$ inches \times $2\frac{6}{16}$ inches \times 6 inches +. Impressed with 'HICKMAN & C [o] STOURBRIDGE'.

Tiles

Two buff (one has one side dark brown), very hard, refractory?: $4\frac{6}{16}$ inches \times $4\frac{11}{16}$ inches + \times $\frac{8}{16}$ inches and 1 inch (no other complete dimension).

Crucibles

Only one possible crucible was found in the glass kiln. All that remained of it was a tapering cylindrical base which was roughly rounded, $4\frac{5}{8}$ inches in diameter, reducing to $2\frac{5}{8}$ inches at bottom, 5 inches of its height survives and it is composed of a very hard light grey fabric. Internally it has large lump of transparent glass.

Besides this, amongst the stray finds, was the base of a crucible in a similar very hard grey to grey/black fabric, about 19 inches in diameter externally. The base varies from $1\frac{3}{4}$ inches thick to $2\frac{5}{8}$ inches in centre, the side is 2 inches thick and $5\frac{1}{2}$ inches of the height survives. Internally mauve surface, has fragments of dark green and light green glass adhering to it. Externally band of off-white glaze near base, while elsewhere surface purplish grey with sand tempering, or glassy black and on base there is also a patch of glaze.

DISCUSSION OF FINDS⁸

Introduction

With so few complete specimens, it is difficult to be certain as to which type the fragments belong. For example, there are twenty necks of No. 14, but no bases are assigned to it because, in the absence of a complete specimen, its base and body forms are unknown. However, it is possible to suggest that the bases listed under No. 1, which have a facet down the side, which the type specimen lacks, may in fact go with No. 14 necks. The numbers would suggest this because there are at least eighteen of these, while there are only four neck fragments of No. 1. No. 14 is the complete reverse having twenty necks and no bodies or bases. The association therefore seems reasonable. Further, a large number of the bodies with a facet are distorted, which is also true of the No. 14 necks, but the examples of No. 1 which clearly lack facet, are not distorted. If these can therefore be associated together, the resultant bottle, besides having

the diagnostic facet on its body, would have a neck which is considerably narrower in proportion to its body than Fig. 1. In other examples, such as No. 4 and 13, various fragments are grouped together on the basis of their colour similarities (or in one case the extremely thin glass they are made of). This seems more reasonable than assuming that there are two different types of vessel present in the same type of glass but that only one part of one and a different part of the other survives.

Date and Use

Despite its comparative proximity in time, relatively little seems to be known about the material recovered in this excavation⁹. Much of the material derives from bottles illustrated in Fig. 2, Nos 2 and 3 which are clearly poison bottles, their colouration and ribbing being to prevent accidental usage in the dark as well as in daylight. Ribbing on bottles was invented *c.* 1860 by Savory of Savory & Moore, chemists of Bond Street, but it was never patented and *c.* 1868 the Pharmacy and Poisons Act made some such indication compulsory on poison bottles. Hexagonal bottles were common *c.* 1850-1880/90 after which they were generally replaced by rectangular bottles (No. 2) due to the introduction of automatic machines for making bottles¹⁰. The comparative rarity of rectangular bottles at Norfolk House compared to hexagonal ones shows that the deposit dates from early in this transition period.

However, all the examples from Norfolk House are blown in a mould (as shown by their mould lines), except for No. 5 which is blown without a mould. Moulds were introduced from the 1840's onwards to produce a more standardized bottle which was very important in pharmacy. Certain sizes were isolated amongst material recovered from the kiln based mainly on the width of the faces. For only three of these are there complete examples for which a size in ounces can be ascertained, but a group of stray finds from the site show that a number of other sizes occurred and a range at the lower end of the scale was produced though the quantities are not, perhaps the obvious ones. No. 1 type bottles are probably chemists phials, and this is almost certain for the example with '6 oz' on it. Since this example is less than twice the size of the complete example which only holds $\frac{1}{2}$ oz of water, this must clearly have held some substance considerably denser than water; perhaps a solid. It is somewhat surprising that only one of the poison bottles has its capacity marked on it.

The other types are, on the whole, more fragmentary and it is rather more difficult to suggest specific uses for them, though all except Nos 7, 10, and 22-26 seem to be bottles of one sort or another. The fragments described in association with No. 13 seem to represent a much larger bottle than the poison bottles, but since they are in blue glass, they are probably to be associated with a pharmacist and the same probably applies to the amber glass which may be from smaller versions of the same type. The other bottles seem more likely to be general-purpose containers, and it is difficult to establish what they were meant to contain. No. 4 would seem to belong to large bottles, perhaps for cordials, and it is not clear whether 'B. & Co. Ltd.' is the name of the bottle maker or of the retailer. Nos 8 and 9 would seem to be the sort of bottles in which ointments or such would be sold, and No. 10 probably held some sort of expensive per-

fume or cosmetic. All these would be relevant to a pharmacist but No. 6 is the type of bottle in which sauces or essences might be retailed¹¹, while No. 8 and No. 9 could also have been used to contain paste of some sort. The bottle with 'Marshall' on it almost certainly contained some ingredient for cooking, since the firm supplied cook's materials, freezing machines, cooking apparatus and gelatine.

The bottle illustrated in Fig. 5 raises some problems, since its shape is so peculiar and a use for it is difficult to suggest. It may be that its use was scientific in some way, and it may be associated with the glass tubing, as, in fact, it is in one concrete lump (though little significance can be assigned to such associations), and it may be significant that, after 1893, Edward Cetti of Brooke Street describes himself as scientific instrument maker at a time when it has been suggested the two Cetti firms amalgamated. This may indicate that Cettis of Pratt Street did make scientific instruments. On the other hand, the glass tubing may have been for taking iron or acid medicines to protect the teeth or may even derive from baby's feeding bottles. If either of these is the case, it may more easily be associated with the poison bottles as pertaining to a pharmacy.

The bottles Nos. 15-17, which are more decorative, may have been used to contain proprietary medicines or confections, for which a more attractive container was thought to be necessary. No. 19 is the only phial found which was for the dispensing of single doses to be consumed at one gulp. Earlier in the nineteenth century this was the standard method of prescription, though usually in round phials¹². Octagonal ones do occur in the mid-nineteenth century but are going out of use by *c.* 1880¹³. The small stopper, No. 18, the only means of sealing a bottle found on the site, would fit into the neck of the rectangular bottle described under No. 1 but since this lacks grinding of the glass, they are unlikely to be connected. Since No. 18 has an area of ground glass it was probably intended to seal a bottle containing a volatile substance. No. 20 is the only piece of normal green 'bottle' glass but even this has a flat base and it is therefore unlikely to be a wine bottle but is probably another container for some pharmaceutical substance.

Other than bottles, only one or two fragments occur. No. 7 is almost certainly the base of a tumbler, while No. 11 looks like the stem of a drinking glass of some type. Three unillustrated fragments (Nos 25-26) may also derive from drinking vessels while Nos 22-24 are the only possible candidates for the window glass which the Cetti's claimed to be making. Two fragments are coloured but hardly seem to fit the description of 'antique colored sheet glass for church windows'. It is odd, considering the quantity of coloured glass bottles on the site, how little colour there is, in fact, in the glass which has been melted down into lumps. There is also some additional documentary evidence for the finds themselves. Firstly, there are two bricks with identifiable makers names on them, both of Stourbridge¹⁴ in Worcestershire. Hickman & Co. apparently started production between 1828 and 1850¹⁵ but are described as red brick-makers till 1865 when they are recorded as firebrick manufacturers¹⁶, though they did not close down till *c.* 1920. The other firm, Fisher, occur in 1865 as Fisher Brothers & Co. but in 1873 as Fisher, J. B. & Co. firebrick and red and blue brick manufacturers¹⁷ and were apparently taken over in the early 1900's. Thus, both bricks are late nineteenth-century

in date, the Hickman one almost certainly some time between 1853/65 and 1920, and the Fisher one between 1865/73 and c. 1900, so both would fit easily into a date for the construction of the kiln in the 1880's. Of the glass itself, only one has an identifiable mark, and that is 'A. B. Marshall'. A firm of this name appears in the directories from 1885 onwards (and well into the twentieth century) so that in giving a *terminus post quem* of 1885 for the deposit, supports its dating to the end of the kiln's life c. 1890.

It has been shown above that the firm of glass manufacturers ceased to exist after 1892 on this site. Since the destruction layers included so much glass, and much of that distorted, it is unlikely that the kiln survived as a structure after the close of the firm for, if this had happened, its destruction layer should have been more mixed and with much less glass in it. If it be accepted that it is cullet, it is unlikely to have been brought to the site long before its end, as cullet would be used fairly rapidly. As the factory closed down in 1892, the assemblage must date to c. 1890 and it will be seen from the foregoing discussion that this fits in very well with the dates assigned to the glass by Mr Scott. However, it would appear that the site itself provides a better dating basis and the argument should really be turned the other way round and the site used for dating the glass.

Source

The problem then arises as to how far this assemblage represents the products of this kiln, for it is a notorious problem with glass sites that glass is re-used as cullet, in the process of manufacture. There appears to be four conceivable sources for this glass assuming it to be cullet:

1. the waste products of the Norfolk House kiln itself
2. another glasswork(s)
3. a general non-manufacturing source, i.e. of used bottles
4. a functionally specialised version of 3.

The third alternative can be ruled out because the range of vessel types is too restricted and certain types do not occur which ought to, especially mineral water bottles and wine bottles. The fourth alternative can be ruled out because, although the assemblage is functionally specialised since most of the types could be associated with a pharmacist, these types also occur as distorted vessels which clearly could never have been used. Thus we are left with a glass manufacturing source. On the whole, it seems reasonable to assume that glass is made on the site in a case like this, unless there is any evidence pointing the other way. But here there is some evidence for this because, as has been said, the assemblage is of types most of which can be associated with a retail pharmacist while Cetti, Green (Edward) & Co. are described in Kelly's directories as 'flint glass and enamel manufacturers, antique colored (*sic*) sheet glass for church windows' which is at complete variance with the material found which included almost no window glass or enamelled glass at all. On the other hand, it does fit remarkably well the description of the products of James Andrew Curle of Homer Road, Victoria Park Road, E., who is described as 'glass bottle manufacturers, glass blowers and manufacturer of every description of druggists sundries, perfumery bottles, plain and stoppered in white, blue, green, actinic green, amber and other colours'. Although there are other makers of medical glass in London

in 1891¹⁸, none have a range of products which fits so completely the range found on the site. Thus, although *a priori* unlikely, a derivation from another glassworks, perhaps that of Curle, seems more reasonable than that the material represents the products of the Cetti factory. It seems possible that the coloured glass was imported specifically to produce the coloured antique sheet glass in which the Cetti's can be presumed to have specialised. Fig. 25 is, however, rather different. Firstly, it is the only type on the site which was not blown into a mould. Secondly, it is so thin that it is difficult to believe that it could survive for long unbroken in the cullet heap, which may indicate that it was made at Norfolk House. There does, however, seem to be some differences between the types, in the presence or absence of distortion. For example, none of Nos. 2 and 3 are obviously distorted whereas all of No. 14 look unfinished even where they are not considerably distorted. Many show, for instance, widely varying thicknesses of glass in the same vessel and this may have been the reason for their rejection. Presumably, those which show neither of these characteristics were accidentally broken. It is, however, difficult to explain the complete specimens or why distortion seems to be confined to certain types unless the source was different. If the distorted bottles were derived from a glassmaker, and the undistorted ones from a pharmacist, it would explain this and would also explain the complete specimens (on the assumption that when used, they were discarded and not reused). It is, therefore, possible that only some of the types are derived from another glassblower, and the range would then fit almost any bottle maker.

Technical

In the absence of any tools and with only one or two small fragments of crucible, it is difficult to discover much about the methods of manufacture of the bottles, except for the furnace technology discussed above.

The only possible crucible actually recovered during the excavation is rather a puzzle, since it is unlike most crucibles in tapering from top to bottom and lacking a flat base. It is not unlikely, in fact, that it is not a crucible but the large lump of glass adhering to its interior clearly shows that it is connected with the glass manufacturing process. The other fragment, though a stray find on the site, can be taken as deriving from this glasshouse with a fair degree of certainty, for, unlike the glass itself, there is no reason to believe that broken crucibles would be imported on to the site from another glasshouse. This is the more usual type of crucible found on glasshouse sites, though in size it falls between the two sizes at Gawber¹⁹. The glaze on its external surface is almost certainly due to self-glazing, as in the furnace itself, and it seems likely that the heat has caused the surface to partially disintegrate and self-glazing has occurred on the fabric thereby exposed, thus producing the three bands. The reason why the whole surface has not peeled off is probably due to differences in temperature. The fact that the tapering fragment shows no signs of this self-glazing, would suggest that it is not a crucible proper, that is it has not been used for melting glass, though clearly molten glass has been placed in it.

As has been said, all except one type were blown into a mould but there is no evidence for the bottles being made by machine. This is probably to be expected

at this date though the precise point at which automatic machinery was introduced seems to be in some doubt. It is noticeable that on rectangular bottles the mould line goes obliquely across the shoulder but not between the corners, though on the hexagonal and on the one octagonal, the mould lines go down the junction of two faces. Further, the mould lines become weaker on the neck and disappear on the beaded rims, because the necks and rims were not formed by the mould but by neck-forming tongs²⁰. It is also noticeable that none of the bottles have a screw thread within the neck and all must have been closed by some sort of stopper. There are only three examples of bottles with external screw threads which were presumably closed with a metal lid. This suggests that metal caps with screw threads did not become common till after 1890.

CONCLUSION

This appears to be the first glass furnace to be excavated, if that be the right word for this rescue operation, in London, and also the first time that waste material from a glassworks has been recovered in South London, though isolated occurrences of what are probably such waste material have been observed before, particularly small lumps of melted glass (such have been found for example, at Emerson Place²¹ and Montague Close²²). This is rather surprising since there is documentary evidence for a considerable glass industry in Southwark and Lambeth in much the same area as the delft industry which has produced vast quantities of waste material. For example, Buckley²³ mentions eight in the seventeenth and eighteenth centuries and others are known to have existed in the nineteenth century, especially the Falcon Glass Works in Hopton Street, owned in the mid-nineteenth century by Apsley Pellatt. It is to be hoped that in future more evidence about this important industry in South London will be found.

NOTES

1. *Post-Medieval Archaeology* V, (1971).
2. Acknowledgements are due to the landowners, the Metropolitan Police, and the builders, Humphries Ltd., for permission to undertake the rescue excavation, to Mr Potts and Mr Glaze, agents for these two bodies, for their co-operation on the site, to the members of Southwark and Lambeth Archaeological Society who helped in the excavation and processing, especially Dick Shepherd, to John Creswell for the drawing of the structure, to George Wilson and Brian Bloice for photography, to Martin Allen and Roy Edwards for drawing the objects, to J. R. Scott for advice on the finds, to J. Ashdown for advice, to Mrs G. Dawson for typing the drafts of the reports, and especially to John Collins for assistance and advice throughout the writing of the report.
3. Apsley Pellat, *Curiosities of Glass Making* (1849), 58.
4. Spon's *Encyclopaedia of Arts and Manufacturers*, ed. G. W. Lock (1882), 1049-1055.
5. G. D. Lewis, 'The Catcliffe Glassworks', *Industrial Archaeology*, I (1964) (No. 4), 206-11
6. D. Ashurst, 'Excavations at Gawber Glasshouse, near Barnsley, Yorkshire', *Post Medieval Archaeology*, IV (1970), 92-140.
7. In the Minet Library, Lambeth. The rate books only survive at five year intervals.
8. Where references are not given in this section, the source of the information is J.R. Scott of the Wellcome Medical Museum.
9. This may, of course, be due to the ignorance of the author but there seems very little literature on the subject and most of what is published seems to be collector orientated.
10. A. Davis, *Packaging and Print* (1967), 46-7.
11. A somewhat similar bottle is illustrated on Plate 37 in A. Davis, *Packaging and Print* (1967).
12. All the medicine bottles at Gawber, *op. cit.* note 6, for example, were phials. See also J. K. Crellin and J. R. Scott, 'Fluid Medicines, Prescription Reform and Posology', *Medical History*, XIV No. 2 (April 1970).
13. They are thus a little anachronistic in a dump of c. 1890 and their scarcity compared with bottles is as it should be. However the smaller versions of No. 3 may have replaced them as single dose containers.
14. I would like to thank the Local History Department of Stourbridge Library for the information which follows.
15. *Slaters' Royal National Commercial Directory 1850*.
16. *Jones' Mercantile Directory, 1865*.
17. *Littlebury's Worcestershire Directory, 1873*.
18. This year of the directory was searched with this possibility in mind.
19. Ashurst, *op. cit.*, Note 6, p. 129.
20. Powell, *op. cit.*, Note 4.
21. Excavation in 1964 by the author.
22. Excavation by the author 1969-.
23. F. Buckley, *Old London Glasshouses* (London 1915).