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The Setting-Out of St Paul's Cathedral

by ROBERT CRAYFORD

THE RESURGAM INCIDENT

In 1975 the tercentenary of the start of work on the reconstruction of St Paul's Cathedral was commemorated in its crypt by an exhibition illustrating the design, the structure and the subsequent repair of the building.[1] 'Resurgam'[2] not only seemed a very apt name for a display showing how St Paul's had risen again out of the devastation of the Great Fire but was of course also that 'single Word in large Capitals' on the 'Piece of a Grave-stone' with which, according to *Parentalia*, Wren had set out the centre of the dome 'at the Beginning of the new Work'.[3] *Parentalia* goes on to say that 'the first Stone of this Basilica was laid in the Year 1675', implying that, as might be expected, the two events occurred fairly close together. But when the material for the exhibition was being prepared, it was thought wiser to check this.[4]

According to tradition,[5] the foundation stone of St Paul's was laid on 21 June 1675, that is, little more than a month after 19 May, the date on which, following Charles II's authorization of the Warrant Design on the 14th, Wren was instructed by the Commissioners for Rebuilding to 'immediately set out the Ground and cause the Foundations to be laid'.[6] Although the building accounts cover a nine-month period running from 1 October 1674 to 30 June 1675, the item for making 'Stakes for the Setting out of the Foundations at the East End of the Church and attending upon the Surveyor in that Work' by the cathedral carpenters[7] undoubtedly refers to activities following the instruction given on 19 May 1675. The wheeling by cathedral labourers of 'earth from thence to the place intended for the inside of the Circumference of the Dome'[8] must also be the result of digging the new foundations. But oddly there is no mention of the most essential operation of all, on which everything else depended, namely the setting-out of the centre of the dome.

This, however, was not the first time that the east end of the new cathedral had been set out; for in the previous accounting period, from 1 May to 30 September 1674, the carpenters are recorded as 'making a 20 ft Rod, and stakes and waiting upon the Surveyor for measuring and staking out the East Part of the ground of the Church according to the New Model'.[9] So this area had already been set out for the Great Model design (Fig. 1); yet again there is no mention of setting out the centre of the dome.

A year before this, however, during the period 1 April to 30 September 1673, the following entry indicates that the centre of the dome had certainly been set out:

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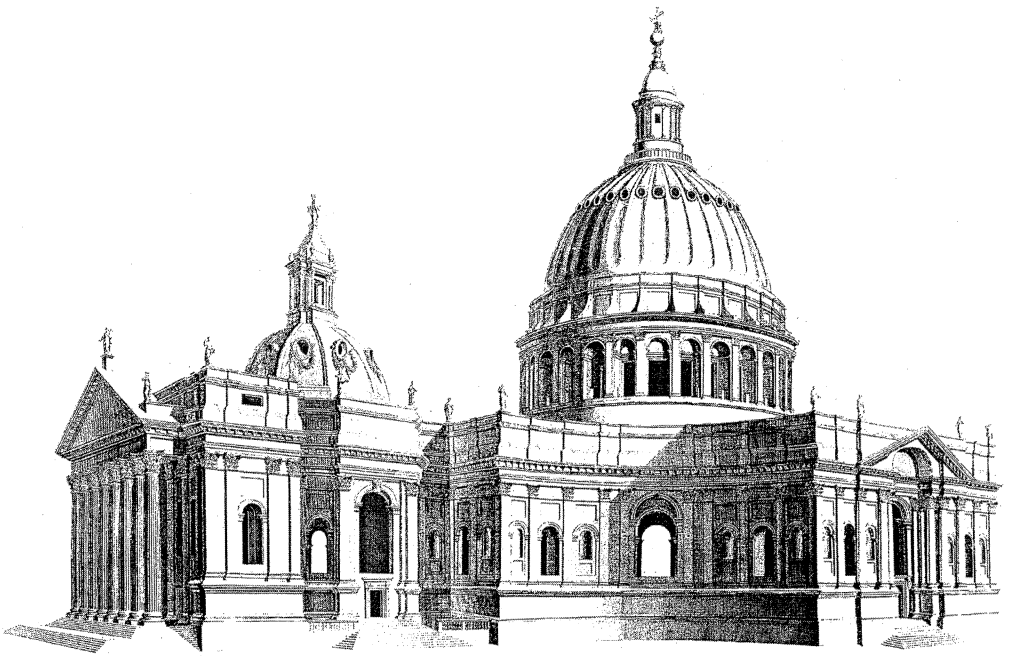

Fig. 1. *St Paul's Cathedral: Schynvœt's view of the Great Model, engraved* c. *1726. The viewpoint of this perspective would be about 100 yards beyond the churchyard.*

Carpenters. Set up Scaffolds & Standards intended for the Center of a New Dome. Scaffold to top of S. Gable, & over Great S. Door to take down same. Fence to Street.[10]

This interestingly relates to the passage in *Parentalia* describing Wren's first work after the ruins had been demolished:

The Surveyor placed Scaffolds high enough to extend his Lines over the Heaps that lay in the Way, and then by Perpendiculars set out the Places below, from the Lines drawn with Care upon the level Plan of the Scaffold.[11]

Several intriguing questions arise from this:

(1) Did the 'Resurgam' incident thus take place in 1673 (a possibility which did not deter the use of the name by the tercentenary exhibition)?
(2) Was the stone positioned on the ground as directed by Wren from the scaffold?
(3) Of much greater importance, was the centre of the dome therefore set out only once?
(4) If so, would the position of the centre of the dome of the Great Model design have been identical to that of the present cathedral?

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'THE HEAPS THAT LAY IN THE WAY'

The following brief synopsis of the demolition of Old St Paul's not only makes more tangible the site conditions in which a new St Paul's had to be set out but also helps one to appreciate the sheer scale of many of the logistical problems that had to be overcome in order to construct it.

1668 Demolition of 'the East End, the old Choir, and the Tower', authorized on 25 July.[12]
Top 80 feet of 200-foot-high central tower demolished by October to reduce danger of stones falling from it.[13]

1669 Though apparently not in accordance with the authorization, some of the nave was demolished as well as part of the choir. While the Gothic work in the choir was simply pulled down, the clerestorey of the Norman nave had to be taken down stone by stone, and a battering ram was used on its piers.[14]

1670 Less demolition work this year, but the north wall of the nave taken down to aisle window-sill level, perhaps before many of the nearby houses were rebuilt.[15] Bottom portion of wall probably then used as part of site enclosure.

1671 Another 40 feet taken off the central tower, including its flying buttresses, in order to make possible the demolition of the piers in the nave, choir and transepts that had supported them. This reduced the tower to the level of the top of its four supporting arches, which were then removed to leave only its four piers. The first of these was demolished with considerable difficulty by battering rams. The east gable wall, about 140 feet high, scaffolded prior to demolition, since it was adjacent to the main thoroughfare through St Paul's Churchyard.[16]

1672 Remaining three piers of tower demolished with gunpowder, together with two nave piers and the junction between choir and north transept. East gable wall and clerestoreys in nave and transepts taken down stone by stone, nave and transept piers by battering ram.[17]

1673 South transept gable wall demolished after being scaffolded, since it too was beside the main thoroughfare through the churchyard.[18]

So, when the centre of the dome was set out in 1673, all that was left of the old cathedral were its west gable wall, with a couple of bays of the nave on one side and Inigo Jones's portico on the other, its north gable and some last remains of the nave and transept outer walls. But the amount of loose stones remaining on the site must have been immense. All the massive walls and piers of the crypt of the new cathedral, as well as the cores of those above them, were built of re-used stone from Old St Paul's, and most of this stone was on the site as loose rubble at the time of the setting-out. Not surprisingly the new work had to be set out from a scaffold platform, however neatly the old stones had been stacked. In fact both the building accounts and *Parentalia* refer to 'scaffolds'.[19]

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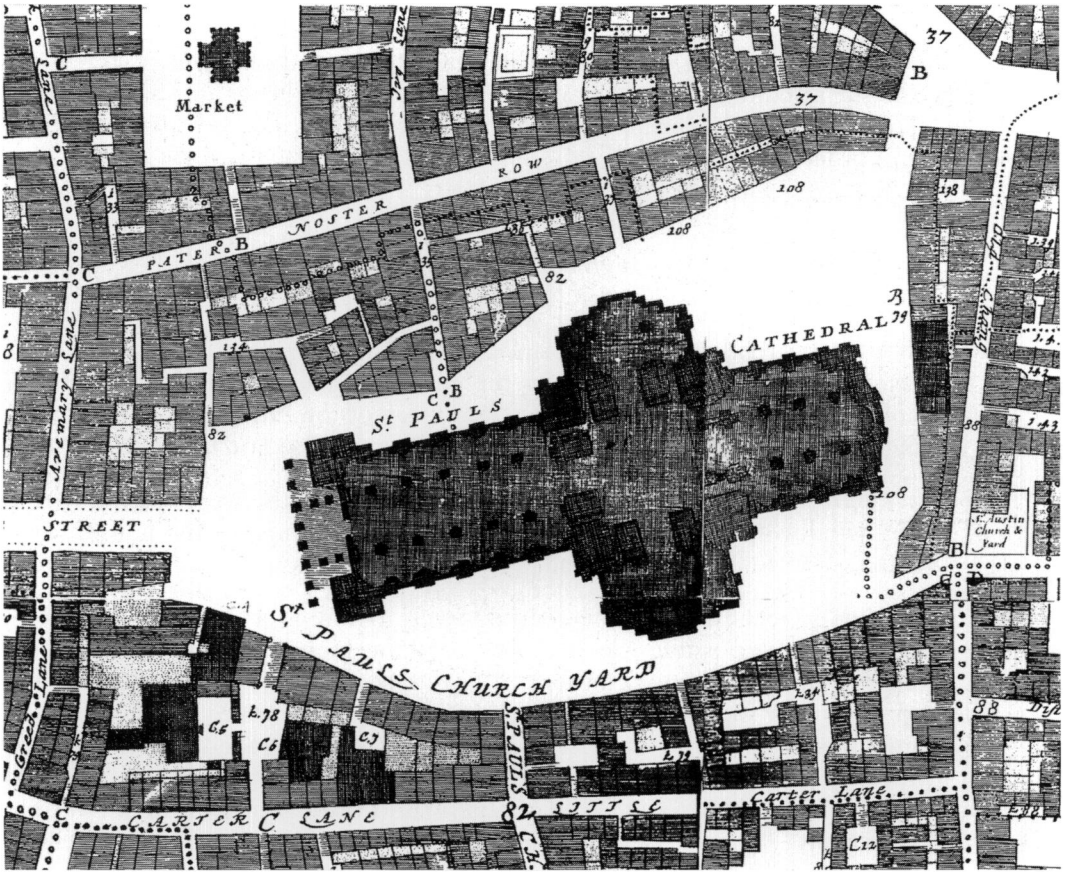

Fig. 2. *London: St Paul's Churchyard as shown on Ogilby and Morgan's map of 1676*

ST PAUL'S CHURCHYARD

The implication from the entries in the building accounts is that the central points of the domes of the present cathedral and the Great Model could well be identical. Since no alterations to the shape of St Paul's Churchyard took place between those made soon after the Great Fire (i.e., the road widenings of 1667[20] and the purchase of a small piece of land at its north-west corner in 1671[21]) until the demolition of the two triangular blocks of houses on its north side in 1710,[22] both designs would have had to fit the same site.

So it seemed worth exploring how, and indeed whether, the Great Model design would have fitted on to the site if the centre of its dome coincided with that of the present cathedral. Obviously to make this possible an accurate plan was needed of the churchyard as it was in the 1670s. At first sight Ogilby and Morgan's large-scale map of 100 feet to the inch (1:1200), produced in 1676 (Fig. 2),[23] seemed purpose-made, but was it accurate enough for the experiment to be convincing?

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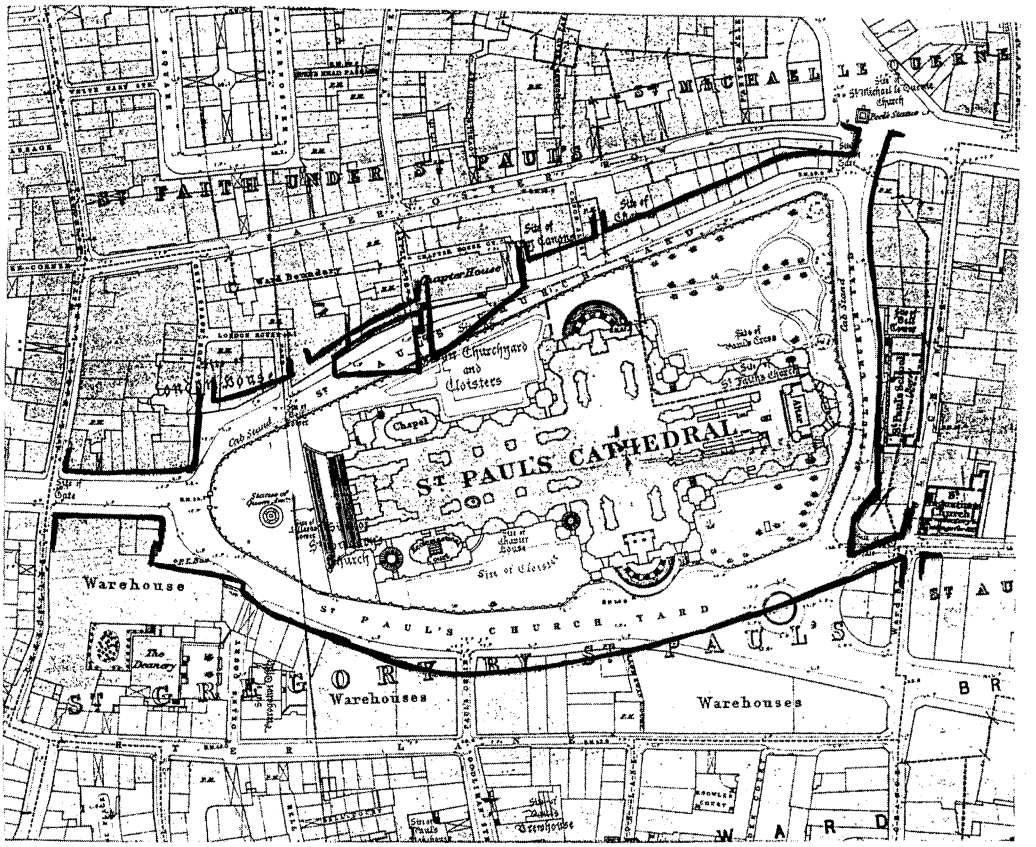

Fig. 3. *London: St Paul's Churchyard as shown on the Ordnance Survey map of 1875, with the outline as on Ogilby and Morgan's map superimposed*

Checking Ogilby and Morgan presented a problem, for the only map of similar scale and detail whose accuracy could be relied on is the 88–feet-to-the-inch (1:1056) Ordnance Survey map of 1875, which had been surveyed in 1873.[24] In the intervening 200 years some critical changes had been made to the layout of the churchyard: the south-east corner had been drastically altered when Cannon Street was connected in 1853–54,[25] and the two blocks close to the cathedral on the north side had been demolished in 1710.

As there was some discrepancy between the actual and stated scales on the copy of Ogilby and Morgan's map that was used, the largest possible dimension between two points that had clearly not been changed in 200 years — that is, from the east side of Ave Maria Lane at its junction with Ludgate Hill to the south-west corner of St Augustine's church[26] — was taken off Ogilby and Morgan and the O.S. map adjusted in size until it fitted.

Initial comparison of the two maps showed many features that had not changed in the 200 years between them. Thus the top of Ludgate Hill was still 45 feet wide on the

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1875 map — the width to which it had been extended following the Fire — and the number of plots along its north side was as shown in 1676, except that two at the east end had been amalgamated into one property and the corner rounded.[27] The archway into Dean's Court and four properties adjacent to it had not changed. Allowing for the rebuilding of St Paul's School in 1823, the agreement of the two maps on the line of the east side of the churchyard was virtually perfect. Likewise the twelve houses fronting the churchyard east of Canon Alley were almost identical on the two maps, although they disagreed about those to the rear, fronting Paternoster Row; and two of the twelve churchyard houses had by 1875 been joined together to form one property. Other old maps such as Rocque's of 1746[28] and Horwood's of 1813, though of too small scale for this exercise, confirmed the lack of any radical alterations in the churchyard, as did old photographs and drawings.

Nevertheless, when a tracing of the outlines of the churchyard as shown by Ogilby and Morgan was placed over the 1875 map, it was clear that the older map could not be relied on for accuracy (Fig. 3). Although there was good agreement on the details of the block of twelve houses east of Canon Alley, their position as shown on Ogilby and Morgan was quite wrong: the whole block was shown too far to the north and the east, and this same inaccuracy applied to Canon Alley itself — one of the most crucial features in making a comparison of the two cathedral plans.[29] There were also minor discrepancies at the north-west corner of the churchyard and another major one on its south side, whose central portion is shown on the old map too far back.

However, though Ogilby and Morgan's map could not be relied on to show the churchyard accurately as it was in 1676, the 1875 map could, once the two main features altered by that date had been plotted on it (Fig. 4). And it had the inestimable advantage of having the present cathedral shown accurately.

THE HOUSES DEMOLISHED IN 1710

But while the south-east corner of St Paul's Churchyard as it was in the 1670s can be drawn on to the 1875 map with considerable confidence, neither this map nor Ogilby and Morgan's can help to establish the exact position of the two triangular blocks of houses on the north side that were demolished in 1710. Ogilby and Morgan show them too far north and east, while the 1875 map shows no more than the frontage of the properties that stood originally north of the westernmore block.

The exact position of these two blocks, which at their furthest point projected some 70 feet forward of the general frontage of the north side of the churchyard, is of critical importance for setting out St Paul's on the site. These are the houses which Wren mentions in his 'Letter on Building Churches' of 1711, saying that they 'were but eleven Feet distant from the Fabrick, exposing it to the continual danger of Fires'.[30] Fortunately, however, it is possible from other sources of information to plot these long-vanished blocks precisely on the site. In 1969–70 the area between the Chapter House and the cathedral was excavated for the formation of the Undercroft, an underground service area and workshops for the cathedral maintenance staff. It was found that the basement walls of the houses survived, the tops of the walls being only sixteen inches below the road surface of the churchyard. It was fascinating to see the

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various walls shown by Ogilby and Morgan come to life when they were measured and plotted.

But perhaps the most important discovery of all was made by the careful laying-out of a trench for temporary heating pipes west of the main excavation area. Previously the Chapter House had been heated from the cathedral boiler-house directly south of it by a pipe underneath the roadway between them. By routeing the first leg of the temporary pipes parallel with the north wall of the cathedral and about twelve feet away from it before it turned northwards up Paul's Alley, the acute ends of the two blocks at the south end of the Alley were revealed and could be plotted. This information enabled the easternmore block to be plotted precisely, but much less was discovered about the western one which was outside the main area excavated. Nevertheless measurements taken of it show that the dimensioned plan among the cathedral drawings (KD 203 in Kerry Downes's catalogue[31]) is accurate. And thus the two long-demolished blocks of post-Fire houses can be plotted with complete confidence.

POSITIONING THE CATHEDRAL ON THE SITE

The position of the present cathedral is set out from just three straight lines (see Fig. 4):

Line 'A' is the centre line of the top of Ludgate Hill;
Line 'B' runs from the centre of the churchyard end of Canon Alley over to the south side of the churchyard;
Line 'C' runs along the length of the cathedral from the centre of the dome to the external face of the west portico.
Line 'B' is the north–south axis of the cathedral and 'C' its east–west one, and where they intersect is the centre of the dome.

Line 'A' is obviously firmly fixed and cannot be adjusted, but as 'B' seems fixed only at one end at Canon Alley, it would have been possible to swing it by a small amount to suit the length of 'C'. There is, however, good reason to suppose that this was in fact not done. For, when lines 'A' and 'C' were drawn on an enlarged version of the 1875 O.S. map, they appeared to intersect a few feet to the west of the external face of the west portico.[32] Such a small discrepancy would not, however, be noticed in practice, but, as will be seen later, it was almost certainly significant. The intention of setting the centre of the west front on the centre line of the top of Ludgate Hill was of course to give an axial view of it from the top of the rise,[33] while placing the centre of the dome on a line from the centre of Canon Alley gave a dramatic slot view, starting from the base of the north transept right up to the ball and cross of the dome.[34]

To ensure that the plan of the outline of the Great Model design used for the experiment was as accurate as possible, the actual model in the Trophy Room was newly measured. (The model was constructed to a scale of $\frac{1}{2}$ inch to one foot (1:24): thus its 20-inch-high-by-2-inch-wide pilasters would on the executed building have been 40 feet high by 4 feet wide, as are those on the present cathedral.) A plan of the Great Model was drawn on tracing paper to the same scale as the copy of the 1875 map being used; it was then placed over that of the present cathedral so that the centres of

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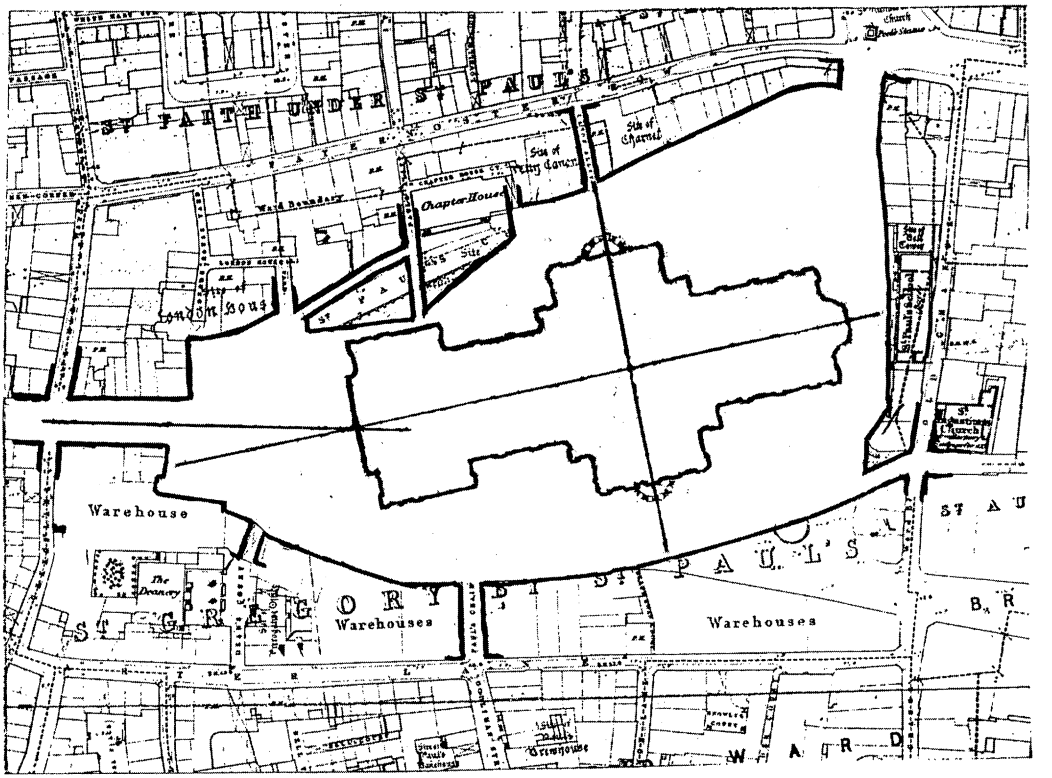
Warehouse
Warehouses
Warehouses
Chapter-House
Site of Charnel
Site of Penry Corner
Old Deanery
Warehouse
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Warehouse

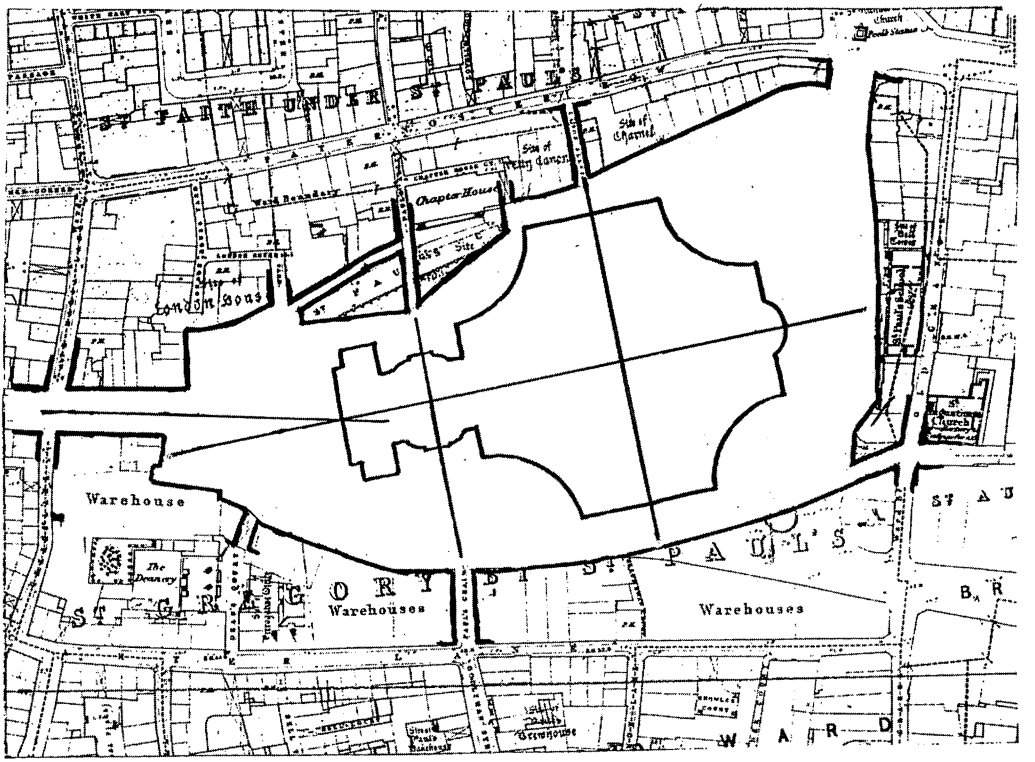

Fig. 5. *London: St Paul's Churchyard, with the main setting-out lines used to position the Great Model design*

the south line up exactly with the north and south doors of the western vestibule of the Great Model. This is perhaps the most telling piece of evidence of all.[36]

THE RESURGAM STONE

When the Surveyor in Person had set out, upon the Place, the Dimensions of the great Dome, and fixed upon the Centre; a common Labourer was ordered to bring a flat Stone from the Heaps of Rubbish, (such as should first come to Hand) to be laid for a Mark and Direction to the Masons; the Stone which was immediately brought and laid down for that Purpose, happened to be a Piece of a Grave-stone, with nothing remaining of the Inscription but this single Word in large Capitals, RESURGAM.[37]

Although this passage from *Parentalia* conjures up a picture of chaos, the quantity of material produced from the demolition of Old St Paul's and the limited room on the site would have made orderly stacking of it essential. Old gravestones in particular, being large flat pieces of stone, could readily be stacked neatly, the more so in that Wren had an important use for them. In his letter of 11 June 1681 concerning Tom Tower, Wren informed the Bishop of Oxford that, in order to avoid or minimize settlement, his practice was to 'lay stones at first of large beds such as old broken

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Gravestones or the like'. An example of such re-use was found during the 1969–70 excavations in those pier foundations of the Chapter House that were on weaker pockets in the ground. The old gravestones of which the piers were constructed undoubtedly came from the remains of the medieval Pardon Churchyard which would have been disturbed by the excavations for the Chapter House foundations.

Against *Parentalia's* statement that the gravestone Wren used to mark the centre of the dome had 'nothing remaining of the Inscription but this single Word in large Capitals, RESURGAM', it is interesting to note the following description of one of the ledger stones of Old St Paul's in Strype's edition of Stow's *Survey of London*:

> John King, Bishop of London . . . lies buried in the South Isle of St Paul's . . . having only a plain Marble over him, and *Resurgam* written on it for his Epitaph; as himself directed in his Will.[38]

Was it completely by chance that this 'piece of a grave-stone' was chosen? As *Parentalia* observes, it was regarded only 'by some People as a memorable Omen'.

ACKNOWLEDGMENT

I would like to thank Sir Bernard Feilden, who, when Surveyor to the Fabric, queried the date of the *Resurgam* incident and gave me the opportunity to research this topic in 1974, and Professor Andor Gomme for so much kindness and help in finally getting it published.

NOTES

1 The 1975 exhibition was thus opportune for showing the works carried out and the discoveries made following the 1970 appeal.
2 'I shall rise again.' *Resurrection* of course comes from the supine of the same verb.
3 Stephen Wren (ed.), *Parentalia, or Memoirs of the Family of the Wrens* (London, 1750), p. 292. 'Resurgam' is still to be found in large capitals beneath the phoenix in the south-transept pediment.
4 This article is a recast version of research done in November 1974.
5 Several early sources give this date for this somewhat mysterious informal occasion.
6 Guildhall Library, MS 25622/1.
7 *Wren Society*, XVI, p. 206.
8 Ibid.
9 Ibid., p. 204.
10 Ibid., p. 201.
11 Wren, op. cit., p. 284.
12 *Wren Society*, XIII, p. 23.
13 Ibid., XVI, p. 190.
14 Ibid., pp. 191–93.
15 Ibid., p. 194.
16 Ibid., pp. 196–97. A tower pier about 10 feet square by 60 feet high would weigh about 375 tons. Thus many of the details and the version of events on p. 284 of *Parentalia* are contradicted by the building accounts. It is clearly not true that Wren used battering rams only after he had tried gunpowder.
17 Ibid., pp. 197–99. The damage to a neighbouring property resulting from the use of gunpowder recorded in *Parentalia*, p. 284, is confirmed in the building accounts (*Wren Society*, XVI, p. 199).
18 Ibid., p. 201.
19 See above nn. 10 & 11.
20 Authorized by the Act of Common Council of 29 April 1667, pursuant to the 1667 Rebuilding Act.
21 *Wren Society*, XIII, p. 24 & XVI, p. 197.
22 Ibid., XV, p. 191.

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23 Now conveniently to hand as *The A to Z of Restoration London*, published by the London Topographical Society, no. 145 (1992).
24 Also now to hand in the Godfrey Edition, 'St Paul's 1873', sheet 7.65, 1987.
25 W. Kent, *An Encyclopaedia of London* (London, 1951), p. 69.
26 Shown as a vacant site by Ogilby and Morgan, since the church was not rebuilt till 1684.
27 Shown as one property on the third edition of Horwood's map of London, 1813, now available as *The A to Z of Regency London,* London Topographical Society, no. 131 (1985).
28 Likewise, *The A to Z of Georgian London,* ibid., no. 126 (1982).
29 Ralph Hyde, in his introductory notes to *The A to Z of Restoration London*, p. xi, warns that 'the user must always bear in mind' that Ogilby and Morgan's map 'is not a large-scale Ordnance Survey plan, and it should not be used as if it were.'
30 Wren, *Parentalia*, p. 321: probably a slip of memory on Wren's part since he also says that 'The Houses were seventeen', while the building accounts record in June 1710: 'To Richard Billinghurst. For Pulling down 19 Houses on the North Side of Church, and Cleansing the Bricks of same at £5.14.0 per House, as by Agreement. £108.6.0.' While Wren says that the houses 'were but eleven Feet distant from the cathedral', the distance measured in 1969 was only 9 feet 3 inches from the corner of the western block at the end of Paul's Alley to the plinth of the cathedral. The main rusticated face of the cathedral is another 2 feet $9\frac{1}{2}$ inches back from that of the plinth, thus making a total of 12 feet $\frac{1}{2}$ inch.
31 Kerry Downes, *Sir Christopher Wren: the Design of St Paul's Cathedral* (London, 1987), p. 181. The drawing was formerly known as Bute 32.
32 Some idea of how this setting-out was done may be formed from the following. From what is known of the relationship of the present cathedral to Old St Paul's, it would have been possible to extend the centre line of the top of Ludgate Hill, line 'A', through the old south aisle door and then for some 80 feet along the old south aisle, whether directly, with or without removing stones from the door jamb, or by a parallel alignment around such obstacles. Line 'A' could then have been marked by the 'standards' mentioned in the building accounts. Similarly the north-south line from the centre of Canon Alley, Line 'B'. could be sighted through the old north transept door and marked out. Line 'C', set out at a right angle to line 'B', would intersect line 'A' conveniently inside the south aisle of the old cathedral.
33 The changing of the axis of the new cathedral from that of Old St Paul's in order to have an axial approach from the top of Ludgate Hill also allows the north elevation of the cathedral to be sunlit for longer and for a greater part of the year.
34 The 'slot view' could still be seen in the early post-war years before it was destroyed by Holford's Paternoster scheme. This replaced it by a ridiculous view of not much more than the stumps of the north portico columns! It is intended to reinstate the dramatic slot view in the new Paternoster scheme by Sir William Whitfield.
35 The problem of maintaining 45–feet width for the main thoroughfare was thus transferred from the south side of the churchyard to its east side in the siting of the new cathedral. A dimension of 45 feet between the apse and the east side of the churchyard is marked on the drawing no. 45 in vol. III of the Wren drawings at All Souls' Library, Oxford (reproduced as Plate I in *Wren Society*, XIII); but it is clear that the 45–feet dimension must be measured from the main rusticated face of the apse and not its plinth, which (see n. 30 above) projects 2 feet $9\frac{1}{2}$ inches beyond.
36 Thus the Great Model design continues the tradition of Old St Paul's in which Paul's Alley and Chain led to the Little North and Little South Doors respectively and virtually established a right of way across the nave. But the shorter distance around the west front and the flights of steps into the Great Model should have prevented this from being reinstated. As interesting as this echo of Old St Paul's in the Great Model design may be, the straight line connecting the ends of Paul's Alley and Paul's Chain was of far greater importance in determining the design of the new cathedral. For the main north–south axis from the end of Canon Alley, i.e., line 'B', on which the centre of the dome was placed, had to be parallel with this line between Paul's Alley and Paul's Chain. The constraints not only of fitting the Great Model design on the site so as to leave both 45 feet clear around its southern edge and a reasonable space around its northern, but also of placing its west front axially on the centre line of Ludgate Hill, this would have left very little freedom indeed to vary the dimension between the centre of the dome and the external face of the west front.

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37 Wren, *Parentalia*, p. 292.
38 John Stow, *A Survey of the Cities of London and Westminster . . .* 6th edn, ed. John Strype (London, 1754), I, p. 659.

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