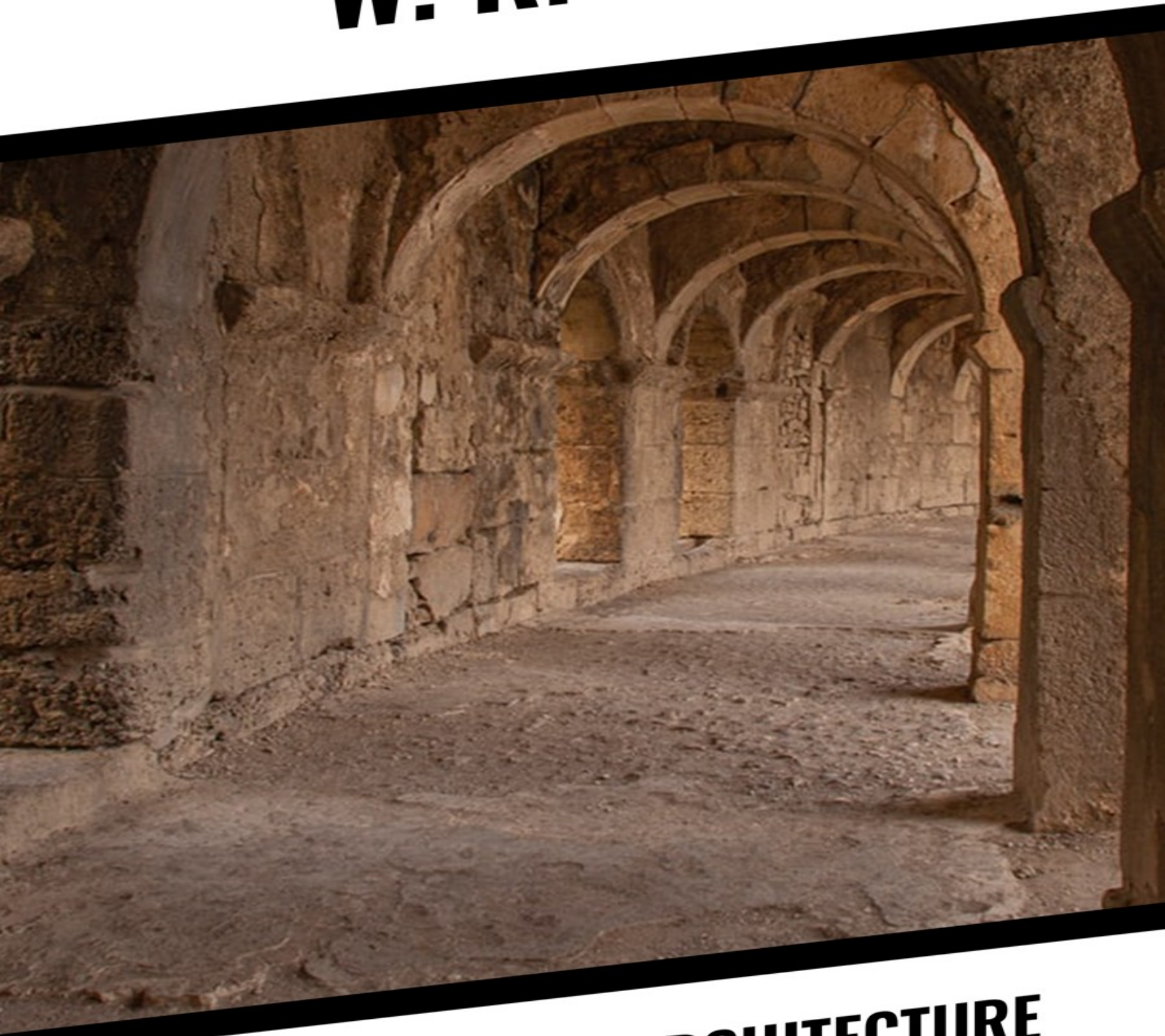
Sharp Ink

W. R. LETHABY



LONDINIUM, ARCHITECTURE AND THE CRAFTS

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Sharp Ink Publishing
2022
Contact: info@sharpinkbooks.com

ISBN 978-80-282-0261-3

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CHAPTER I

BUILDING MATERIALS AND METHODS

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IT is curious that Roman buildings and crafts in Britain have hardly been studied as part of the story of our national art. The subject has been neglected by architects and left aside for antiquaries. Yet when this story is fully written, it will appear how important it is as history, and how suggestive in the fields of practice. This provincial Roman art was, in fact, very different from the “classical style” of ordinary architectural treatises. M. Louis Gillet in the latest history of French art considers this phenomenon. “It is very difficult to measure exactly the part of the Gauls in the works of the Roman epoch which cover the land, such, for instance, as the *Maison Carrée* and the Mausoleum at St. Remy. There is in these *chefs d’œuvre* something not of Rome. The elements are used with liberty and delicacy more like the work of the Renaissance than of Vitruvius. In three centuries Gaul had become educated: these Gallo-Roman works, like certain verses of Ausonius, show little of Rome, they are already French.” We should hesitate to say just this in Britain, although the Brito-Roman arts were intimately allied to those of Gaul. In fuller truth and wider fact, they were closely related to the provincial Roman art as practised in Spain, North Africa, Syria, and Asia Minor. Alexandria was probably the chief centre from which the new experimenting spirit radiated. We may agree, however, that in the

centuries of the Roman occupation, Britain like Gaul became educated and absorbed the foreign culture with some national difference. In attempting to give some account of Roman building and minor arts in London, I wish to bring out and deepen our sense of the antiquity and dignity of the City, so as to suggest an historical background against which we may see our modern ways and works in proper perspective and proportion.

Tools, etc.—Roman building methods were remarkably like our own of a century ago. The large number of tools which have been found and brought together in our museums are one proof of this. We have adzes and axes, hammers, chisels and gouges, saws, drills and files; also foot-rules, plumb-bobs and a plane. The plane found at Silchester was an instrument of precision; the plumb-bob of bronze, from Wroxeter, in the British Museum, is quite a beautiful thing, and exactly like one figured by Daremberg and Saglio under the word *Perpendicularum*. At the Guildhall are masons' chisels and trowels; the latter with long leaf-shaped blades. At the British Museum is the model of a frame saw. Only last year (1922) many tools were found at Colchester. (For the history of tools in antiquity, see Prof. Flinders Petrie's volume.)

A foot-rule found at Warrington gave a length of 11·54 in. The normal Roman foot is said to be 11·6496 in. (also 0·2957 m.). This agrees closely with the Greek foot and the Chaldean. (What is the history of the English foot?) The length of the Roman foot, a little over 11½ of our inches, is worth remembering, for measurements would have been set out by this standard. For example, we may examine the

ordinary building “tile” used in Londinium. In the Lombard Street excavations of 1785 many Roman bricks were found which are said to have measured about 18 in. by 12 in. I have found this measurement many times repeated, and also three more precise estimates. Dr. Woodward said that bricks from London Wall were 17-4/10 in. by 11-6/10 in., and he observed that this would be 1½ by 1 Roman foot. Mr. Loftus Brock gave the size of one found in London Wall as 17 in. by 11⅝ in. Dr. P. Norman gave the size of another tile as about 17½ in. by nearly 12 in. At the Guildhall are several flue and roof tiles about 17½ in. long, and a large tile 23¼ in. long. We shall see when we come to examine buildings that the dimensions in many cases are likely to have been round numbers of Roman feet.

Masonry.—Walling had three main origins in mud, timber and stone. Walling stones were at first, and for long, packed together without mortar. Mud and stone were then combined; later, lime mortar took the place of mud, being a sort of mud which will set harder. In concrete, again, the mortar became the principal element. Stone walling was at first formed of irregular lumps. When hewn blocks came to be used a practice arose of linking them with wood or metal cramps. There are also three main types of wall construction —aggregation of mud, framing of timber, and association of blocks of stone. A later development of mud walling was to break up the material, by analogy with hewn stone, into regular lumps separately dried before they were used; thus crude bricks, the commonest building material in antiquity, were formed. Roofing tiles were developed from pottery, and such tiles came to be used for covering the tops of

crude brick walls. Then, later, whole walls were formed of baked material, and thus the tile or brick wall was obtained. An alternative method of using mud was to daub it over timber or wattle (basket work) of sticks; and this seems to have been a common procedure in Celtic Britain.

Interesting varieties of concrete walling were developed by Roman builders. One of these was the use of little stones for the faces of a wall, tailing back into the concrete mass and forming a hard skin or mail on the surfaces, very like modern paving. Triangular tiles with their points toothed into the concrete mass were also used. Then tile courses were set in stone and concrete walls at every few feet of height.

I have been speaking of general principles and history, not limiting myself to Britain and Londinium, but the evolution of the wall is an interesting introduction to our proper subject.

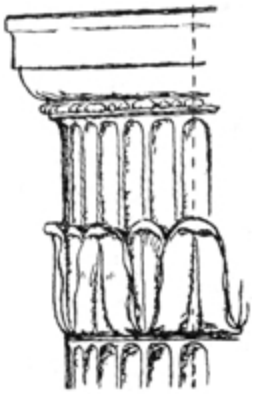

Fig. 1.

In Londinium wrought stonework must have been very sparingly used because of the difficulty and cost of transit. There were columns, pilasters, plinths, cornices, etc., but it may be doubted whether there were any buildings other than small monuments wholly of such masonry. Even in the first century the “details” of masonry were far from being

“correctly classical,” and ornaments were very redundant and inventive. Provincial Roman building was something very different from the grammars propounded by architects. As we may study it in the fine museums of Trèves, Lyons, and London, it seems more like proto-Romanesque than a late form of “classic.” The Corinthian capitals of Cirencester are very fine works indeed; the acanthus is treated freshly, the points of the leaves being sharp and arranged as in Byzantine work; a sculptured pediment and ornamental frieze at Bath are also free and fine. On the other hand, moulded work is usually coarse and poor. An interesting architectural fragment found in London was the upper drum of a column which had several bands of leafage around the shaft and was a remote descendant of the acanthus column at Delphi (Fig. 1). Parts of small columns and their bases have been found, the latter with crude mouldings. I mention them because small circular work was usually turned in a lathe like Saxon baluster-shafts. A small capital from Silchester in the Reading Museum is of the bowl form so characteristic of Romanesque art.

Fig. 2.

A few fragments of mouldings and other stones are in our museums (Fig. 2), and a considerable number of semicircular stones have been found which must have been

copings. Large wrought stones were usually cramped together; lewis holes show how they were hoisted; smaller wall-facings were, I think, cut with an axe instead of a chisel. We find mention of one stone arch (a small niche?) in a Minute of the Society of Antiquaries: “Mar. 8, 1732: Mr. Sam Gale acquainted the Society, yt in digging up some old foundations near ye new Fabric erected Anno 1732 for ye Bank of England Mr. Sampson ye architect discovered a large old wall, eight foot under ye surface of ye ground, consisting of chalk stone and rubble, next to Threadneedle Street, in which was an arch of stone and a Busto of a man placed in it standing upon ye plinth, which he carefully covered up again: there was no inscription but he believed it to be Roman.”

Mortar and Concrete.—Roman builders early learnt how to make good mortar and concrete, being careful to use clean coarse gravel and finely divided lime. They also found that an addition of crushed tiles and pottery was an improvement, and for their good work used so much of this that the mortar became quite red. “Roman mortar was generally composed of lime, pounded tiles, sand and gravel, more or less coarse, and even small pebbles. At Richborough the mortar used in the interior of the walls is composed of lime and sand and pebbles or sea-beach, but the facing stones throughout are cemented with a much finer mortar in which powdered tile is introduced” (T. Wright).

One of the advantages of coarsely-crushed tiles is that it absorbs and holds water so that the mortar made with it dries very slowly and thus hardens perfectly. In *Archæologia*

(lx.) an analysis is given of “mortar made with crushed tiles as grit in place of, or in conjunction with, sand.” In Rochester Museum a dishful of the crushed tile is shown which was taken from a heap found ready for use at the Roman villa at Darenth. I may say here that I have found mortar prepared in this way wonderfully tenacious, and suitable for special purposes like stopping holes in ancient walls. A strong cement made of finely powdered tiles, lime and oil was used by Byzantine and mediæval builders and probably by the Romans also. Villars de Honnecourt (thirteenth century) gives a recipe: “Take lime and pounded pagan tile in equal quantities until its colour predominates; moisten this with oil and with it you can make a tank hold water.” The use of crushed pottery in cement goes back to Minoan days in Crete.

In London a long, thick wall of concrete formed between timbering was recently found between Knightrider and Friday Streets; it showed prints of half-round upright posts and horizontal planking; it bent in its course and may have been the boundary of a stream. On the site of the old Post Office a Roman rubbish pit was found, about 50 ft. by 35 ft. in size. “In late Roman times the whole pit had been covered with concrete about a foot thick and a building had been erected on the spot” (*Archæol.* lxvi.). At Newgate the Roman structure was erected on a “raft” of rubble in clay finished with a layer of concrete. Rubble in clay formed the foundation of the City Wall.

Fig. 3.

Many walls, described as of chalk, rubble or rag-masonry, have been found in London—one instance at the Bank has been quoted above. Chalk and flints were the most accessible material after local gravel, clay and wood. Mr. F. W. Troup tells me that “in the foundations for the Blackfriars House, New Bridge Street, we exposed a remarkable foundation (possibly not Roman). It consisted of rammed chalk, fine white material about 4 ft. wide and high, laid on great planks of elm 6 in. thick, which appeared to be sawn. These were laid side by side in the direction of the length of the wall, which ran along the west bank of the Fleet River.” I mention this, although it was probably a mediæval wall, as an example of a record; we ought to have every excavation registered. The walls of a room found in Leadenhall Street in 1830 were of rubble forming a hard concretion, with a single row of bond tiles through the thickness of the wall at about every 2 ft. in height. A sketch of this wall at the Society of Antiquaries shows it plastered outside and in. This was one of the common types of walling. Better stone walls were formed with face casings of roughly-squared little stones—what the French call *petit appareil*—as described above. An immense amount of piling was used in wet ground under streets and wharves, as well as walls. Foundations have been discovered of three rows of piles close together with a wall coming directly on their heads (Fig. 3). A wall found on the site of the Mansion House seems to have had only one row of piles; it was plastered outside.

Tile Walling.—The brick commonly used in Rome was a crude or unbaked block; the burnt walling tile was, as said above, developed from pottery, and it always remained

pottery-like in texture and thin in substance. As Mr. T. May has said of bricks: “They were made of heavy clay, well tempered and long exposed; the modern practice is to use the lightest possible clay right off without tempering.” Walling tiles were used in Londinium not only as bonding courses, but for the entire substance of walls. It is usual to write “Roman tiles or bricks” interchangeably, but in origin and character the thing was a tile, and, indeed, roofing tiles with flanged edges were used as a walling material occasionally. Tiles were of various sizes and shapes, but an oblong, 1½ ft. by 1 ft. and about 1½ in. thick, was most usual. In the Guildhall Museum are several triangular tiles which must, I think, have been used for facing walls with concrete cores. Solid tile walling was used in Londinium so extensively that it was evidently a common material for better buildings. The Lombard Street excavations of 1785 exposed “a wall which consisted of the smaller-sized Roman bricks, in which were two perpendicular flues, one semicircular and the other rectangular; the height of the wall was 10 ft. and the depth to the top from the surface was also 10 ft.” Here we have evidence of a brick wall rising the full height of one story at least (*Archæol.* viii.). Roach Smith noticed a wall in Scott’s Yard “8 ft. thick, entirely composed of oblong tiles in mortar.” Mr. Lambert has recently described some walls of brick 3¼ ft. thick found at Miles Lane. A building in Lower Thames Street had walls of *red* and *yellow* tiles in alternate layers. This fact I learn from a sketch by Fairholt at the Victoria and Albert Museum, and such use of bricks of two colours was a common practice. In Hodge’s sketches of the tile walls of a great building

discovered at Leadenhall Market it is noted that some of the courses were red and buff. Price recorded of walls, 2½ ft. thick, found in the Bucklersbury excavations, that “the tiles were the usual kind of red and yellow brick.”

More recently a bath chamber has been found in Cannon Street built of tiles which on the illustration are indicated in alternate courses of red and yellow. In the description in *Archæologia*, it is remarked: “It would appear that the yellow was preferred, the red being employed where they were not visible.” Years ago Charles Knight observed that the tiles used in the City Wall at America Square varied from “bright red to palish yellow.” This has been confirmed by more recent accounts in *Archæologia*. Finally, Roach Smith, describing the discovery of a part of the South or River Wall of the City (*Archæological Journal*, vol. i.), says that the tiles used as bonding bands were straight and curved-edged (that is, flanged roof tiles), red and yellow in colour. At the Guildhall there are a roof tile and a flue tile of yellow colour. Building with tiles may for long have been customary, but the use of red and yellow tiles in the way described would probably have been a fashion during a limited time only, and in that case it follows that the buildings erected with red and yellow tiles are likely to be nearly contemporary; the date would, I suppose, be the fourth century. Specially made tiles were used for columns. At the Guildhall are several round tiles 8 in. diameter, suitable for the piers of a hypocaust. Also some semicircular tiles 12 in. in diameter. In Rochester Museum are some quadrants making up a circle about 1½ ft. in diameter. Tiles, eight of which made up a circle, have lately been found at Colchester, and in the

Guildhall Museum is a course of a round column made up of twelve tiles around a small central circle. A large number of columns were evidently of such bricks plastered.

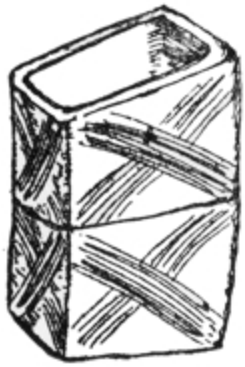

Fig. 4.

Arches and Vaults.—The arches in the City Wall, where it passed across the Walbrook, described by Roach Smith, were of no great span (3¼ ft.). They were constructed of ordinary tiles and were of a roughly-pointed shape. Arches of this form were not infrequently used in Roman works; they were not the result of inaccurate building. About a dozen years ago a well-built pointed arch of alternate tile and tufa, found at Naples, was described in *Archæologia*. The tiles, although thin, were sometimes made slightly wedge-shaped, and the city gates at Silchester seem to have had arches of such bricks.

The only London vault which I can find mentioned is one found exactly two hundred years since at St. Martin-in-the-Fields. A Minute of the Society of Antiquaries reads: “May 2, 1722: Mr. Stukely related that the Roman building in St. Martin’s Church was an arch built of Roman brick and at the bottom laid with a most strong cement of an unusual composition, of which he has got a lump. There was a square duct in each wall its whole length, of 9 in. breadth; there were several of these side by side: this building is

below the springs on the gravel.” This building that was an arch, with its many flues, and cement floor—doubtless *opus signinum*—was obviously a Roman bath chamber, but probably it was quite small.

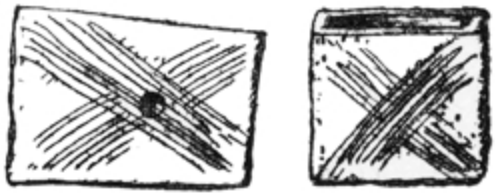

Fig. 5.

Evidence of the existence of fairly large vaults has been found at the Baths of Silchester, Wroxeter and Bath. These were all constructed in a most interesting and suggestive way of voussoirs made as hollow boxes in the tile material. Similar box voussoirs have been discovered at Chedworth and elsewhere.

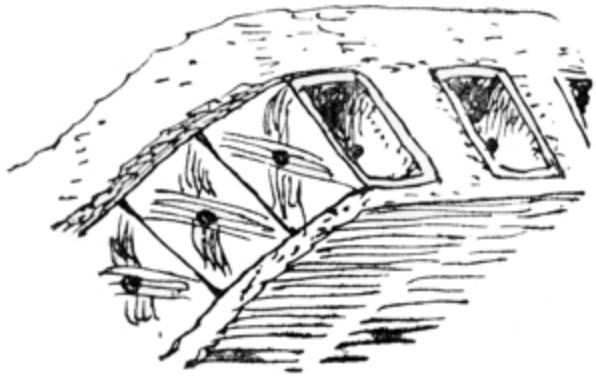

Fig. 6.

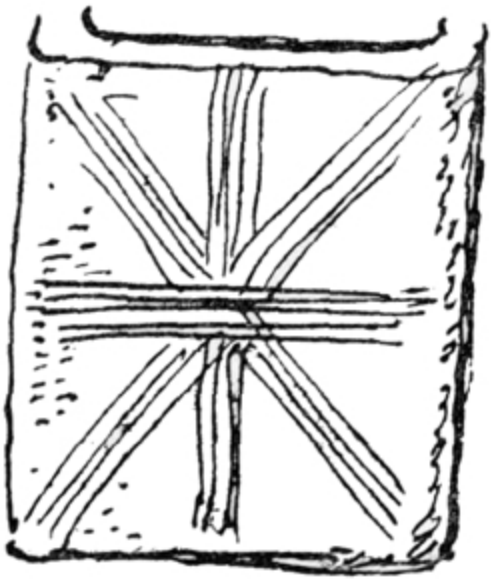

Fig. 7.

Fig. 8.

I have found two such box voussoirs in the Rochester Museum, each about 9 in. by 6 in. on the face and 5 in. on the soffit (Fig. 4). The surfaces are roughly scored across with parallel lines forming an X. These two tiles together show an obvious curvature; they came from a villa at

Darenth. In the Guildhall Museum I have also found a box voussoir which is almost identical with those at Rochester. It is thus described: “74, Flue (?) tile, red brick, the front decorated with incised cross lines; in the centre both front and back is a circular perforation: 9½ in. long, 6¾ in. high, 6½ in. wide.” The longest dimension is not in the direction of the tube, and the height is greater at one end than the other, so that the wedge form is quite apparent. The small holes in both the larger sides were doubtless to give better hold to the mortar in which they were set (Fig. 5). Roach Smith recorded what must have been broken parts of similar voussoirs as found in Thames Street in 1848 (*Journ. Brit. Archæol. Assoc.*, vol. iv.), but here they seem to have been used as waste material in building the little piers of hypocausts. Roman builders also constructed vaults of pipes and pots set in mortar concrete as were our box voussoirs, but I know of no British examples. Vaults of wide span seem to have covered large chambers in the Basilica at Verulam (see *Victoria County History*). The method of using the box voussoirs has been well explained from the Silchester examples by the late Mr. Fox in *Archæologia* (cf. Fig. 6). A fragment at Westminster Abbey is either part of a voussoir or of a short flue tile (Fig.7).

Some notes made at Bath further explain the interesting methods of building vaults with box voussoirs. There are several such voussoirs in the ruins of the Great Bath, 12 in. to 13 in. deep by 6 in. and 6½ in.; 6¾ in. and 7½ in.; 8¼ in. and 10 in.; 8 in. and 11 in. at the top and bottom. Fig. 9 is a sketch of the third; it is scored on the face. The notches cut in the sides take the place of the holes in the London

examples, and doubtless were for the mortar to get a better key; Fig. 10 is from a vault of this construction which was further strengthened by a series of curved tiles set in the outer concrete mass, which was 6 in. thick; Fig. 11 shows the ridge of such a vault—this may be an imagination of my own. One of the fragments showed six or eight flat tiles set longitudinally crossing the lines of the box-tiles (Fig. 12). The ridge termination (Fig. 16) is also from Bath.

Fig. 9.

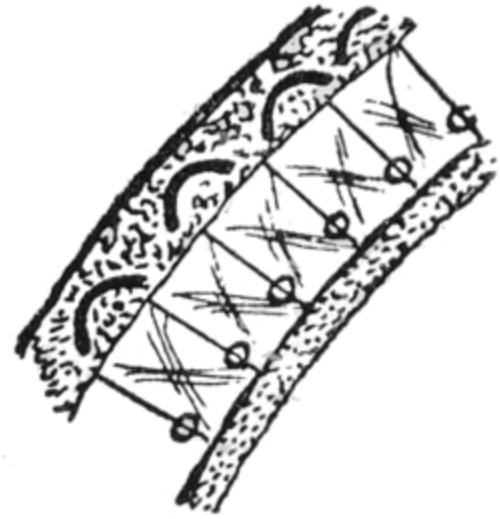

Fig. 10.

Some large voussoir box-tiles from Gaul are shown in the British Museum, No. 394, in the section of Greek and Roman

life.

Fig. 11.

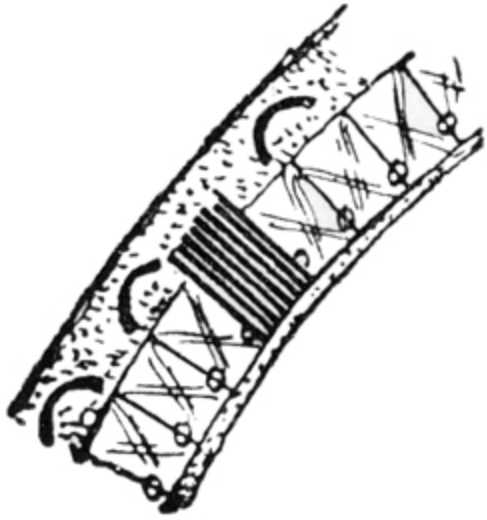

Fig. 12.

Well-constructed arched sewers have been found in the City (see *Victoria County History*).

Many socketed water-pipes are in our museums. Such pipes were occasionally used in Rome as down-pipes, and we might do worse than revert to the custom and get rid of the iron rust nuisance. In the British Museum there are some larger socketed pipes with small holes cut in them along a line. These must, I think, have been for draining surface water, for which purpose flue tiles were also used. Larger sewers were of brick or stone.

Carpentry.—In mediæval days the carpenter was the chief house builder, and much timber would have been used in Roman London. In 1901-2 remains of piling was found in

the bed of the Walbrook at London Wall. These piles had served as supports for dwellings. “The large quantities of loose nails indicated that the superimposed dwellings were of timber” (*Builder*, December 13, 1902). Timber piling has also been found at St. Martin’s le Grand and other sites. There was clearly much soft wet ground in the City. The better-class dwelling in Bucklersbury, to which belonged the fine mosaic floor now at the Guildhall, seems to have been largely of timber. In December last (1921) Mr. Lambert described at the Society of Antiquaries a remarkable piece of wharfing on the river bank at Miles Lane. This was a solid wall of squared balks of timber about 2 ft. square, laid one over the other and having ties into the ground behind. The construction showed an interesting set of tenons, halvings and housings. A bored wood pipe was also found. In Thames Street a house found in 1848 had a well-made drain made with 2 in. planks forming bottom and sides, which is said to have been covered in with tiles.

Wattle and Daub.—It was ever a problem in London how to build without stone. Wood, gravel and mud were plentiful, and these were the common walling materials during the Middle Ages. As lately as the eighteenth century some of the suburban churches were described by Hatton as being of “boulder work,” that is, a concrete of coarse gravel; and the walls of the Temple Church, before the falsifying restorations, were of some sort of concreted rubble skinned over with plaster on the face. Hearne reports that Wren said that there were few masons in London when he was young. Mud walls are mentioned in mediæval records, and “daubers” were, I suppose, primarily those who did the

filling in of post and pan work. The smaller houses of Londinium were largely of wattle and daub, and doubtless others were of crude brick. For the use of wattle and daub we have plentiful direct evidence. In the account of the excavations in and about Lombard Street in 1785 (*Archæol.* viii.) curious fragments were found which are thus described: “About this spot and in many other places large pieces of porous brick were met with of a very loose texture, seeming as if mixed with straw before they were burnt. They are commonly channelled on the surface; their size is quite uncertain, being mere fragments, their thickness about 1½ in. or 2 in.” Again, chalk-stone foundations and “channelled brick” are mentioned together. The “brick” fragments were of daubing, and the channels were the marks of laths, as has been shown by other finds. Similar remnants have recently been discovered on the Post Office site and in King William Street. “Débris of a wood and daub house which had been destroyed by fire.... In several cases the plaster was still adhering to the daub” (*Archæol.* lxvi.). Other fragments are preserved in the Silchester collection at Reading. The London fragments were found under conditions which showed that they had belonged to first-century dwellings. This method of building had been practised by the Celts, and we may imagine that the “populace” of Londinium was housed in small huts of wattle and clay roofed with reed thatch. In the country, old garden walls are occasionally found, I believe, built of mud daubing on both sides of wattle work, and sheep shelters of wattle-hurdles and dry fern are, I suppose, direct descendants of the old British manner of building.

Mr. Bushe-Fox has remarked that one of the earliest houses at Silchester and the earliest houses at Wroxeter were of wattle and daub construction. See also Mr. Lambert's paper in *Archæologia*, December 1921.

Hypocausts and Flue Tiles and Wall Linings.—Several examples have been found in London of the Roman system of heating buildings by hypocausts. These were low under-floor spaces a foot or two high connected with an external stoke-hole in one direction and having a flue or flues in the other. When the hypocaust, as was frequently the case, occupied the whole space below a chamber the floor was supported on a large number of roughly-built little piers with a row or two of flat tiles above spanning the intervals, and over them a layer of concrete and a mosaic or other floor. The flues were usually box-tiles, and in the case of the hot chambers of a bath one side of a wall or even more might be lined with them. A hypocaust with its stoke-hole and flue or flues was really a kiln of low power, in which people were warmed on a similar principle to the baking of pottery. The box-tiles were much the shape of a modern brick, and about twice as big; they were hollow and usually had scorings or impressed patterns on the surface to make mortar or plaster adhere (Figs. 6 and 7). Frequently they had a hole or two holes in their narrow sides, so that the mortar might better hold them in place. In the British Museum there is a long and large pipe with ornamental scratchings on the surface which may possibly be a chimney.

The system of central heating by the hypocaust seems to have been an admirable contrivance. Lysons illustrated an example at Littlecote where flue tiles ran up in the angles of

a room like Tobin tubes, being cased round only by the plaster. The two best known London hypocausts were found in Lower Thames Street and in Bucklersbury. The former extended under the floors of two adjoining apartments. The Bucklersbury example had channels under the floor spreading to several wall flues, each being of two box-tiles placed side by side. (See Price's account and *V.C.H.*) Occasionally flue tiles had two smaller channels; there is a broken example of such a tile in the British Museum. Flue tiles were sometimes of a rounded form ∩, and in this case the wall itself must have served to enclose the flue. In the excavations in Lombard Street in 1785 (*Archæol.* viii.) a brick wall is described which had two flues, one being "semicircular." A long and well-made ∩-shaped flue in the British Museum, with an impressed lozenge pattern on the surface, is described as a ridge-tile. There is also a fragment of still larger diameter at the Guildhall. Similar flues found at Woodchester were used as horizontal heating channels under the floor.

Here also one of the walls was found to be lined with flanged tiles, set thus, ⎸__⎸⎸__⎸, with the flanges against the walls. This may have been a provision against a damp wall. I have seen a similar wall in Rome—I believe subterranean—also another very similar where large flat tiles, having four projections at the back like short legs to a low stool, were used as linings. Each of the four studs was pierced for a nail. Fragments of tiles found at Newgate in 1877 were about 1½ ft. square and 1¼ in. thick, "with rough clay stubs for attachment"; they were scored over the surface with wavy lines, and were probably used internally. (In *V.C.H.* it is said

that these may have been mediæval, but the examples just given show that they were Roman.) In the British Museum and at the Guildhall are some flat tiles, scored on one side to receive plastering, and with four notches in the sides to allow of nails being driven between two adjoining tiles. These, too, must have been for wall linings.

The impressed patterns on the surfaces of some of these flue tiles are quite neat and pretty, and they are interesting in the history of design as being “all-over patterns.” In some cases at least, they seem to have been produced by a roller having a unit of the design cut on it in the style of a butter print. A tile found in Kent, illustrated by Haverfield (*Romanization*, p. 33), has the inscription: “Cabriabanus made this wall-tile” (*parietalam*)—“The man who made the tiles apparently incised the legend on a wooden cylinder and rolled it over the tiles, producing a recurrent inscription.” The patterns superseded the scorings and seem to have been for the same purpose—to afford a better hold for the plaster than a plain face. Fig. 13 is of tiles found in Thames Street. Fig. 14 is a fragment illustrated in Roach Smith’s Catalogue.