

THE GROWTH OF ARCHITECTURE; BEING THE ADDRESS AT THE OPENING MEETING OF THE ARCHITECTURAL SECTION AT THE SHREWSBURY MEETING.

By CHARLES J. FERGUSON, F.S.A.

I am fortunate in having been asked to preside over the Architectural Section of this Society, at its meeting in this district, for the genius of the place renders my task a comparatively easy one.

It has been said of Shropshire, that it may be considered an epitome of England; within its boundaries are to be found an almost Alpine district in miniature, in sight of gardens, orchards, and fertile meadows; and within that area is written an almost complete history of the growth and development of architecture. A border country with the Queen of Rivers for its earliest highway, it attracted to its domain the Roman, the Angle, Jute and Saxon. The Roman changed the face of the country; he endowed it with roads, bridges, and other means of traffic; he planted stations and built towns. The great north-western road traversed Shropshire; to the south of it, at the foot of the Wrekin, and on the banks of the great river, stood the important town of Uriconium, one of the largest Roman cities in Britain. The remains of it you will have an opportunity of visiting under the able guidance of Mr. G. E. Fox.

The Northman formed his moated mound or burh, as Mr. Geo. T. Clark tells us, at Aston, Caius Castle, Clisbury, Clun, Ellesmere, Salop, Minton, Oldbury, Oswestry, Pulverbach, Quatford, Shrewsbury, Strawardine, Tenbury, Whitchurch.

The Norman set his seal upon the district: his are the great castles, from Ludlow to Whittington; his the smaller fortresses, which at the end of the twelfth century almost equalled in number those of the great border county of Northumberland. His are the great

abbeys of Shrewsbury, of Buildwas, of Haughmond, of Lilleshall, and Wenlock. But his impress is not to be found only in the buildings of the great; his hand is to be seen in the humblest and simplest of the country churches which so plentifully dot the landscape.

If we go a step further, we find in succeeding centuries an equally notable collection of buildings. From Stokesay, an almost unique example of a thirteenth century moated residence, to the magnificent remains of Moreton Corbett, a work of the seventeenth century, we have a complete series of domestic work in stone; and alongside it may be found an equally interesting development of the art of building in wood. Shrewsbury is rich in them, and possesses probably the most complete example of a row of early shops. At Whitechurch finely carved wood cornices and later work abound, and with this work in wood and stone may be found the charming accessories that belong to it—the fine lead spouts, the beautiful plaster work and panelling, the hanging signs and little artistic touches of metal work.

In ecclesiastical architecture, from the work of the Norman to the classic church of St. Alkmund at Whitechurch, we have a well-filled series. The town of Shrewsbury itself provides not a few. Towers and spires crowd upon the scene, and we are entranced not only by the impressions from without but with the richness of the feast provided within—the stained glass of St. Mary at Shrewsbury and of St. Laurence at Ludlow, the woodwork, the ironwork, and all those minor arts which cluster round the parent stem.

The Bishop of Durham, speaking the other day to the miners of Northumberland, called their attention to the view from the railway station of Durham—the bridge over the Wear, built by an early bishop in the twelfth century, the symbol of commerce; the castle rising above it, the symbol of civil government; and then the cathedral rising above all, the symbol of religious life—all having grown continuously through seven centuries, a picture of their English life and of the inheritance they had received. Of that inheritance I have said sufficient to show that Shropshire has a good share.

Whence came this architectural growth and in-

heritance? We are told that the chief value to us of Roman architecture is that it contains the germs of all that is found in the Middle Ages, and affords the key by which its mysteries may be unlocked; and yet if we compare a Roman temple and a great cathedral church, say of the thirteenth century—the temple of Saturn at Rome and the Cathedral Church of Salisbury—no two buildings can apparently be more dissimilar, and we are led to ask how it came to be so; or, if we go a little deeper, how is it that when the Roman built a wall in England, it differed so entirely from the Englishman's wall, the walls of Silchester from the walls of the Close at Salisbury; or how it is that when the Englishman of the nineteenth century builds a church in Rome, it differs so essentially from anything the Romans ever did, not merely in its outward appearance, but in its construction—different to that of any other wall in Rome, ancient or modern? We are told in the history books that all this is quite plain and simple—each race had a fashion of its own. The Greek man first gave to architecture an intelligible shape—an ancestor of his built himself a wooden hut, and the Greek, being a man of genius, copied it in stone. Before the Greek man, it is true, there had been a trickling stream of architecture, but after his time it became a flowing river. The Roman copied the Greek, and invented the circular arch which accounted for all he did; then came the Goth—and here there is always a pause. Sometimes he invented the pointed arch, sometimes he found it out by accident; he was filled with anxiety to have a row of arches of unequal span and of equal height, or to get over the difficulties of a groined roof, and so discovered it, and after that the rest was simple. But perhaps I am anticipating history, for an ingenious French architect has recently written a book to prove that Gothic architecture is a fraud. The architecture falsely called Gothic is French—invented by Frenchmen, to be seen and studied on French soil alone. Be that as it may, more careful investigations have proved that the Greek did not found his architecture solely on the wooden hut, that the Roman did not invent the circular arch, and did not in fact use a true arch at all above ground, and that the pointed arch

has been known and used by all the great civilisations of the world.

The fact is that all great architectural changes and new developments have arisen from some change in construction, and that the differences in constructive methods arose, not at the dictation of any race or any individual, but from their fitness and adaptability to the particular civilisation of the time or country. All primitive civilisations had, up to a certain period of their existence, a common knowledge of the use and form of primitive tools and implements, and so they had of the primitive ways of building. A new civilisation copied the methods of the civilisation that preceded it up to a certain time, until it got sufficiently established to develop for itself a mode or method suited to its own requirements.

During the five hundred years of the Republic, Rome copied indifferently the methods of her predecessors, and did nothing to advance science or art. It was not until the time of the Empire, when new wants had to be met, that she was able to take a line of her own, and to develop a means of building which enabled her in the next three centuries to erect in Rome, and her dependent cities, buildings such as the world had never seen before—larger and more numerous than ever had been erected in a like period before or since—a method of building impossible to the Greek, and which enabled Imperial Rome to build similar buildings from the shores of the Adriatic to the banks of the Severn. What then were the different forms of construction which so influenced the art of building? We constantly hear of the primitive wooden hut, and the primitive stone building, but a third—the art of building in mud—has almost been lost sight of. With children it still holds its own, and any one who has read a most delightful article on mud architecture by Mr. Simpson, the well known artist and war correspondent, will see what an important rôle it has played in the history of the world. These three, the wooden hut, the stone cell, and the mud hovel, represent the three primitive ways of building, which in their widest sense, include all the ways of building known to the human race. The wooden hut is one form of that method of building which is

tongued, tied or tenoned together, of which the Forth Bridge is a more recent example in iron. The stone cell is an example of that form of construction which is bonded or interwoven together; the greatest example of this method is probably the Parthenon at Athens, the most common the brick house across the street, or to be found in any modern street in any English town. The mud building, a humble type and forerunner of the kind of building that aims at being a monolith, and requires no bonding or tying or inlacing together, is found almost in every country and every climate. In Devonshire and Cornwall it has long flourished under the name of cob, in the north of England as a clay daubing. Its history is set forth with great skill by Ford, the well-known author of *The Handbook to Spain*, in an article which appeared in an ancient number of *The Quarterly Review*. He traces its origin to Cain; its use by the Phœnicians, Greeks, Romans, Goths, Moors and Spaniards, and proves conclusively that the walls were intended to be monolithic from the fact that the usual course even now is to build the walls first and cut out the doors and windows afterwards. Mr. Simpson in his article shows this mud building to be the forerunner of Roman monolithic construction, of which she has left so noble an example in the Pantheon—an example for us to admire and wonder at, for nothing equal to it has been done since.

By the development of these three primitive ways of building all architectural styles and developments arose. In the hands of the artistic Greek, masonry reached probably its highest perfection. In the hands of the Roman architect, buildings expanded and were carried out on so magnificent a scale as hereafter to lead to a corresponding development of all other ways of building. Architecture does not depend solely on its construction for its expression, far from it, but in the natural course of things the mode of construction inspired and influenced the artist. A familiar instance of this may be seen in almost any railway journey, where it may be noticed that the cottage roofed in thatch has quite a different outline to the cottage with a stone or slated roof.

I do not propose to ask you to follow me in a *résumé* of

the history of architecture, but to show, if time permits, the effect the Roman methods had on our own buildings, and what that method was.

Professor Middleton, in his well-known book, *Rome in 1885*, clearly proves that there does not exist in Rome a wall of brick or stone or a true arch or vault, in our acceptation of the term, erected after the time of the Empire, but they were all so constructed as to form a monolith, the walls without a joint except on the surface; the arches and vaults like an eggshell, or a saucer, without any thrust.

The walls of the Pantheon are about twenty feet in thickness or thereabouts, and yet the brick facing now visible is but a skin, of a few inches, of specially made triangular bricks. Walls not more than a foot in thickness are thus formed of two outer skins, with no bond or tie save the tenacity of the mortar. Professor Middleton describes the demolition of walls such as these after a life of eighteen centuries, and tells us that whereas the early walls of masonry could be taken away stone by stone, walls of this monolithic character could only be removed by the aid of gunpowder or dynamite.

M. Choisy, a well-known French architect, who has given great attention to the matter, and has published probably the most completely illustrated book on Roman construction, differs only from Professor Middleton as to the detail of the constructive process.

For our present purpose, however, it is not of the slightest importance how these walls grew into shape, we are only interested in the result and the effect it had on the progress of architecture. Hitherto the greatest spans that could be covered in masonry were limited by the size of the stones to be got, but now we find that such a building as the Pantheon comes suddenly into being, with a span of 142 feet on walls of about equal height—such a span could not have been executed in masonry or brickwork. We find floors not more than a foot thick in single spans of 20 feet still standing, with no other support than the side walls. We find groined vaults supported merely on a row of pillars without any abutment whatever on one side, showing conclusively that such a construction had no thrust, and when completed

was of the nature of a monolith. Concrete, a modern word, has been called into existence to describe construction such as this. The constructive process had, however, been in use from time immemorial. The Phœnicians used it for their harbours, the Greeks for their floors, but the Romans gave to it such new uses and developments as practically to create a new method and a new style of building. Concrete, I may add, technically consists of an aggregate and a matrix. The aggregate may be any hard core convenient to use, the matrix must be of a binding and hard setting material, sufficient in quantity to envelope and completely encase every piece of the aggregate. The business of the aggregate is solely to lessen the cost and to lessen the risk of expansion. The character of the wall depends on the matrix, and it matters not whether the matrix and the aggregate are first mixed together or the matrix is first laid in and the aggregate is added, and it matters not whether the aggregate is laid in by hand or laid in at random. The essential difference between concrete and masonry is that the blocks of which the latter is formed require to be bonded or interlaced together to make the wall stand, the former requires no bond whatever. The secret of the success of the Roman concrete was in the admirable cement with which they formed the mortar of the matrix.

The Romans found this cement in a natural product at their feet—the puzzolana, an earth or sand of volcanic origin. The remains in Rome show that they had three ways of using the concrete they made with it. It was either made up between a casing of boards, or between a casing of stone, or of specially made triangular bricks. Modern practice in dock and other works shows that it is a mistake to suppose, as stated by Mr. Wright, that concrete can be poured in, it requires packing and ramming. It is a mistake to suppose that concrete exerts any great pressure on the encasement, the expansion is momentary, for in such a work as the dock walls at Harrington—some 5 feet thick and 30 feet high—it was found that concrete built up continuously would carry its encasement of planks at a height of every 2 feet or so. I am convinced, therefore, that the little encasement of

stone or brick provided by the Romans, built up in heights of a foot or two at a time, was sufficient encasement to allow of the concrete being made up within it.

In England, in almost every instance, the encasement was of stone; these stones tapered to the inner face of the wall so as to allow the concrete to be packed in behind them. They were probably built up for a foot or two in height with a quick-setting cement, and the intermediate space packed with concrete.

The ingredients of a Greek wall and a Roman were thus oftentimes the same—stone and mortar—but in the one case you might abstract the mortar with no injury to the wall. Its only use amongst the Greeks was as a softening medium, to facilitate the moving and setting of large stones. In the other case the mortar was all in all, without it the wall would not stand.

From the Pantheon to Uriconium is a long step, but there you find the same processes and the same results, for in districts where the natural cement failed them, the Romans had learned to make, with the greatest skill and precision, an artificial hydraulic cement that took its place so efficiently that Mr. Thomas Wright, the well-known antiquary and historian of Uriconium, states that many of the walls which surrounded the towns in Britain have stood there for upwards of sixteen centuries. He describes the construction of these walls as consisting of two parallel facings of stones and tiles, the interior filled up with a mass of mortar mixed with rubble, that is the refuse stone from the quarry, and other materials—a mixture now best known as concrete. He goes on to say further, that in many cases bonding tiles were used—I admit the tiles, but deny the bonding. No tiles simply abutting on each other could ever make a bond. In the lake country, where it is necessary to bond with slate, the slates are always made to overlap. In the Roman wall they are not used at all. Their probable use was as a closure to the amount of work that could be accomplished without a break, which left the wall with an absorbent surface, instead of that glassy face which forms on finished concrete, and which in modern work has to be picked over before new additions can be made to it. It is, however, too technical a matter to go into now; we are

looking not at details but at results, and the result of this application of concrete to the art of building with such an organisation and on such a scale as Imperial Rome alone possessed, was that arched forms, which hitherto had been used almost entirely underground, were brought forth and set up aloft; that spans that never before had been attempted were covered over with arched forms; difficulties of roofing, before insurmountable, were made easy, and the erection of buildings on an enormous scale was made possible, with results that astonished the world.

When arts and letters again revived, all nations who had come under the influence of Rome, copied in their infancy the Roman way of building. France was its cradle, Provence its nursery, but look where we may, the nations that arose on the melting away of Roman power, and who had come under their influence, copied their methods as well in construction as in appearance.

Ireland, almost alone, held to the more ancient way of building. She always built in masonry. No concrete used constructionally is there to be found, and consequently there is a marked difference in the early buildings of Ireland as compared with the work of the Saxon or Norman. These buildings and the arts accessory to them have been admirably illustrated and described by Dr. Petrie and Miss Stokes. They are almost invariably small in size. Mortar, where used, was used in the Greek manner, as a lubricant or softener to aid in setting. The immense height of the pointed arches and the remarkable devices to lessen their thrust, show their buildings to be amongst the earliest efforts to emulate, in a construction of small stones, the greater concrete buildings of Imperial Rome, and prove them to be one of the earliest pioneers of Gothic architecture.

The Norman copied the Roman and built in concrete. Take for instance the White Tower in the Tower of London: if you examine the circular staircases in it you will find that they consist of a single central pillar of stone, and from it there springs to the surrounding walls a spiral vault of concrete. The stone steps on which you tread could not carry themselves, because they are in short lengths detached equally from the pillar and the wall:

they rest on the concrete vault. It is the same in the staircases in Rochester keep, and you may see on the under side of the vault at both places the impression of the wood centering on which the concrete was formed—short tapering pieces of wood like the staves of a barrel. Again, you find it in the staircases at Canterbury Cathedral, the work of Lanfranc; and I remember when it was pointed out to me that the lower part of the western angle of the north transept was the work of Lanfranc, encased in the later work, and that in that angle was a staircase behind a locked door, I said to myself, "If that staircase is the work of Lanfranc it will be of concrete"; and when we got access we found it was so. The result was remarkable; for two-thirds of its height the staircase was of concrete, and then it suddenly changed to stone construction, showing conclusively the work of a different date and period. At the great keep at Bamburgh you have the same record. The first twenty-three steps of the staircase are of concrete, the remainder of stone; for all later staircases, as we all know, were formed of solid slabs of stone, one end worked upon the newel, the other resting in the wall, so that as you go upstairs you see the under side of the steps above your head.

The concrete may be seen again in the soffits or ceilings of the arches; for instance, as you pass through from one division of the great rooms in the White Tower, you pass under a circular arch, formed in the thickness of the wall, precisely as in Rome, or Pompeii, where the edges of such an arch, alone, are formed in brick and the core is concrete; so in the White Tower, the edges alone of the arches have a stone encasement, the core is concrete.

If you look at the roof of the chapel of the Tower of London, it again is concrete pure and simple. It is apparent to the eye that it is not masonry, and rubble, the refuse of the quarry, would not carry itself; but, still further, if you examine the soffits, the under sides of the arches of such an arcade as that of St. Peter's, Northampton, you will find there is not a single through stone in it, you will find only an edging of stone, a core of concrete even in a wall as thin as it is; and you will find the same in every Early Norman building. In the soffits of the arches of the old work not a through stone exists,

the work is concrete with a stone encasement like Roman work.

Now, to build in concrete on a large scale requires an almost military discipline—a thoroughly organised and central power—for the least hesitation, the least defect in the making or the setting, and concrete is a failure. This discipline and this centralization the Norman had not. The individual state and the man began to come to the front, the artisan and craftsman appeared on the scene, and for him must be provided a mode of building suited to his grasp.

You find, therefore, that even in Norman times the concrete gradually disappears from sight. The encasement of stone supersedes it. In the nave of Carlisle Cathedral no concrete is visible, the encasement of stone is complete. One illustration shows the process in the arches of an arcade. First you have a flat arch right through the wall, a flat soffit with an edging of stone only at the sides of the arches; then you find a single stone on a lower or inner bed on which an outer stone is made to rest, and so a stone encasement is prepared for the concrete to rest on. By degrees the edges of these stones are more and more completely moulded, the construction disappears out of sight and you have a completely moulded stone arch. The wonders the Roman had achieved in concrete caused the Gothic man to emulate and try to do the same in stone, in the same way that the introduction of the electric light has caused so great an improvement in the use of gas.

Concrete in the hands of the Normans was a total failure; when it was good it was very, very good, but when it was bad it was—in fact, it tumbled down! The tower of Winchester, erected towards the end of the eleventh century, fell in 1107. The tower of Ely, erected about the same time, fell in 1321. At Worcester, the central tower fell in 1175, the two lesser ones in 1221. At Bury St. Edmunds the central tower in 1210, the western tower in 1430, and so on; Evesham, St. David's, Chichester, Ripon, Selby, Lincoln, all fell, and then we may compile a list of those taken down to avoid their falling, which may be read in an admirable paper on Kirkby Stephen Church, by the Rev. J. T. Hodgson, in the

*Transactions* of the Cumberland and Westmoreland Antiquarian Society:

On the other hand, we have the remarkable instance of the taking down of the south-west tower of Canterbury Cathedral, recorded in the *Gentleman's Magazine* by the late John Carter, who states that it was so sound and good that it had to be destroyed by violent means, and that it was built with two outer faces of stone, with no bond or tie from bottom to top—in fact, in the Roman manner.

Hence it was from the inability of any but an imperial power to cope with the difficulties of concrete that our ancestors were led to go back again to construction in pure masonry, but with this difference, that having seen the arched forms and lofty buildings of the Roman, they tried to emulate them in a different way—they brought out the pointed arch to obtain a diminished thrust, they thinned the walls and devised buttresses to counteract the thrust of their arches; in fact, the whole history of Gothic from the thirteenth to the fifteenth century was a constant transition—a perfecting of a new way of doing things, and no new style of architecture can ever arise until some new way or new development of an old way of building takes place.

The great glory of Gothic art, however, rests not in its scientific balance and its apt adaptation of material, it rests rather in the fact that it gives liberty and opportunity to the craftsman and the artisan. Without the slave Greek architecture could not have been created. The patient labour of those great columns, the innumerable capitals, the facsimile of each other, hardly speak to us of the free man. The architecture of Rome speaks of the dictator, but the work of the Middle Ages is racy of the soil. Do not think that I imagine that the design of the great buildings, which are a part of your inheritance, was due to the artisan. Far from it, but he gave them life and individuality, he clothed the capitals with the flowers of the field, he touched each individual stone with originality and life—and so it is that our interest in the architecture of our own land is something deeper than a mere interest in mouldings and shapes, for it speaks to us of the life and progress of the human race.