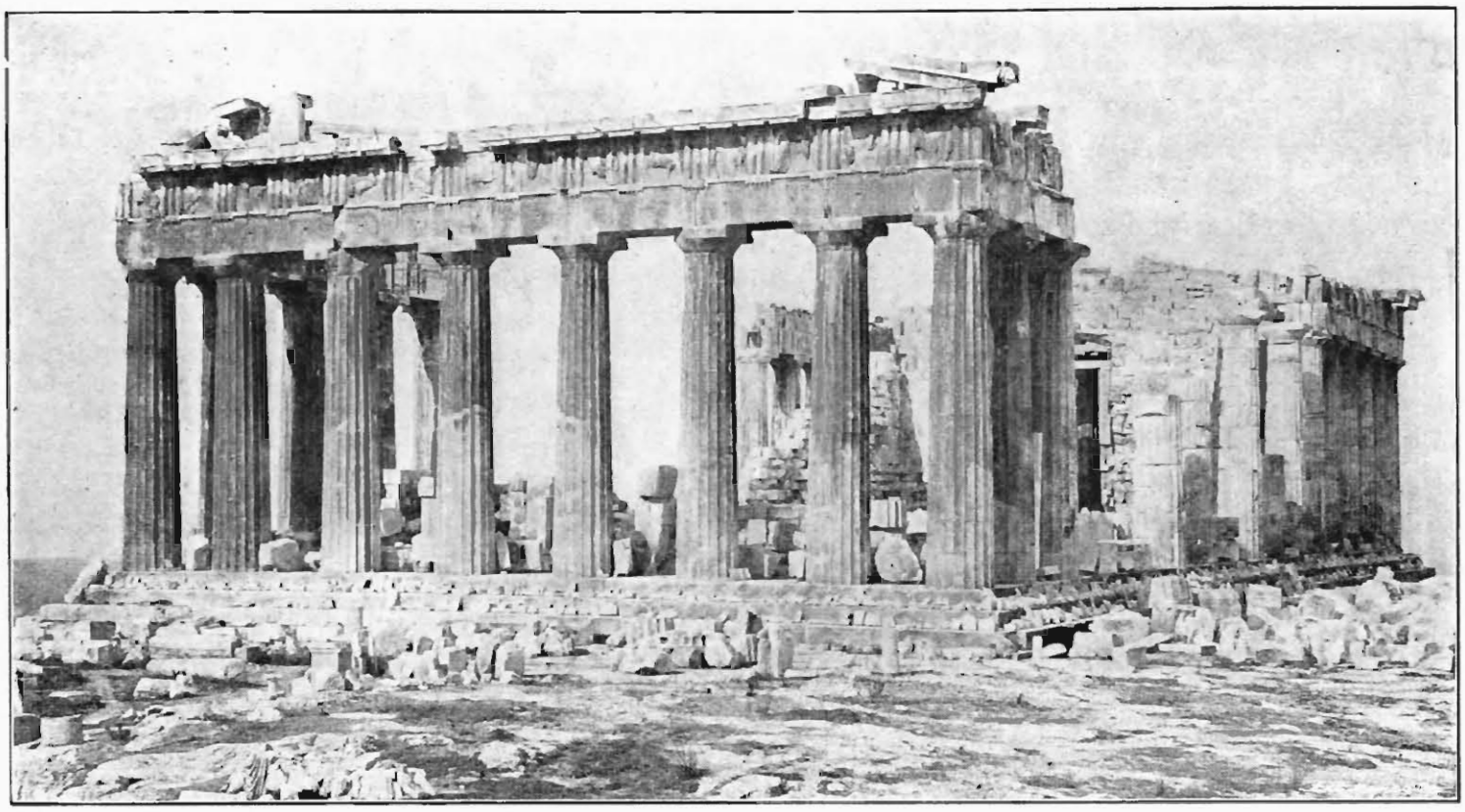

THE PARTHENON, AND THE EARTHQUAKE OF 1894.

By F. C. Penrose [*F.*], F.R.S.

Read at the General Meeting, Monday, 17th May 1897; and registered at Stationers' Hall as the property of the Royal Institute.

I HAVE undertaken to describe the result of an examination of the Parthenon which I made about a year ago, its aim being to advise the Greek Minister of Public Instruction, and the Archæological Society of Athens, as to certain repairs which were in contemplation in consequence of their attention having been particularly drawn to the matter by the effect produced upon the building by an earthquake which took place in the summer of 1894. Three international consulting architects—*i.e.* a French, a German, and a British member—were appointed to confer with a local committee, and I was chosen as one of the three. I think I cannot do better than very briefly mention the principal events which, in addition to the mere lapse of time, have brought the building to its present ruined and insecure condition.

The Parthenon, from the time of its completion, 438 B.C., until about the middle of the sixth century of our era, when, by an edict of the Emperor Justinian, it was converted into a church dedicated to Ἁγία Σοφία (the Heavenly Wisdom), served the purpose intended by its builder Pericles, viz. that it should be the great temple of the tutelary goddess of Attica. We must not, however, call Pericles the founder, for a temple of Minerva must have already existed on the same site for about a thousand years, when Pericles replaced by the existing structure its hexastyle predecessor, which had been ruined by the Persians.

When the temple was converted into the church, as above mentioned, no remarkable change needed to have been made as to the external appearance; but an apse was built at the east end which would seem to have required the removal of two columns of the Pronaos; but the Naos of the Periclean temple must have been greatly altered at that time. The massive colonnades supporting the roof, similar to those of which we have existing evidence both at Pæstum and Ægina—at Pæstum standing, at Ægina lying on the ground—and of which

the traces of the diameters of the lower order are still visible in the Parthenon (at least they were so a few years ago), and which measured about 3 feet 7 inches in diameter, were, at the time I speak of, replaced by others about 2 feet in diameter, which were standing when Messrs. Spon and Wheler visited Athens in 1675. The architraves carried by these more recent columns were formed out of the marble beams used in the earlier colonnades, which required to be shortened about 5 inches to suit the reduced columniation. Of this there are positive evidences on the pavement. Several of these beams exist, and exhibit the operation then performed upon them. It is possible that the Naos may have been injured by a fire, and that the original columns were too much calcined to be left standing; and also that the original beams could only be re-used by shortening their length, and by the reduction of the columniation as above mentioned. This adaptation was done with a certain amount of architectural feeling, and a Doric frieze, with triglyphs, and guttæ band below them, and a cornice to suit, making a regular entablature, was then formed to surmount these smaller columns. All the work of this entablature is very feeble, and exactly conformable to the date at which the temple was converted into the church. Both on the scanty remnants of the Pronaos, and the more extensive remains of the Posticum, of which we shall have occasion to speak more particularly later, there are evidences both of fire and repair. These repairs may have been done at this semi-Classical period. The state of the interior when Spon and Wheler saw it is thus described:—"There is a gallery with twenty-two small columns in the lower tier, and twenty-three in the upper." This exactly conforms to the evidence on the spot if we suppose that the central column of the lower tier at the west end had been omitted to make way for the door by which the church was then entered. Originally there had been no communication between the Naos and the Opisthodomus, although two small doorways had been pierced at some later period. Thus Messrs. Spon and Wheler must have seen the Parthenon unchanged in its external aspect, and internally in general conformity with its original structure, not much more than two hundred years ago. The year previous to Spon and Wheler's visit, whose written description, as published by Wheler, is most interesting, the Parthenon had been visited by the Marquis de Nointel, French Ambassador to Constantinople, who took with him an artist named Jacques Carrey, whose drawings, though very rough, are of very great value in all matters connected with the lost antiquities of Athens, and especially in the grouping of the sculptures of the Parthenon. These drawings are preserved in the National Library at Paris; but there are copies in the British Museum.

One of the vicissitudes which befell the Parthenon, but probably did not much affect the construction, was that from the year 1204 Greece was occupied by the Franks, who took possession of Constantinople during the Crusades; and although the Greek princes afterwards recovered Constantinople, the southern parts of Greece, including Attica, remained in the hands of the Franks until they were expelled in 1456 by the Turks. Thus, during about two centuries and a half, the Parthenon was ecclesiastically under the authority of the Pope instead of the Patriarch of Constantinople. The building itself was probably very much neglected, for it is recorded that in 1403 the roof of the Opisthodomus fell in. After the Turkish conquest a Mosque was built within the temple, but apparently without any great alteration of the church which had preceded it. Twelve years after the visit of Spon and Wheler the greatest calamity that ever happened to the Parthenon took place.

The account of what occurred is thus described by Col. Leake, chiefly drawn from Fanelli's contemporary history. In 1687 the Venetians under Francesco Morosini, afterwards Doge, made important conquests in the Morea, and determined to employ the autumn of that year in the reduction of Athens, then held by the Turks, who had retired into the citadel, that is, the Acropolis. On 27th September the besiegers began to make approaches towards the

enemy's outworks, but proceeded with difficulty in consequence of the rocky nature of the ground. The fire meanwhile was continued from the mortars upon the citadel, the Parthenon being the most conspicuous object, and, as the latter occupied a large portion of the platform, it could not long escape injury; but this might have been comparatively unimportant had not the Turks unfortunately placed in the temple, together with their most valuable property, a large quantity of their ammunition for the defence of the citadel. Towards evening on the 28th a shell falling upon the centre of the building inflamed the gunpowder in the Eastern Chamber (that is, the Naos). The explosion overturned all that part of the cella, and threw down the adjoining lateral columns of the Peristyle, with all excepting one column of the Pronaos; but left a part of the Opisthodomus standing, as well as the two fronts, without even displacing more than two or three statues of the Pediments. The conflagration caused by the explosion extended to the houses of the citadel.

After this destruction Morosini took possession of the Acropolis; but only for a brief period, as he found it necessary the next spring to evacuate Attica, so that this terrible injury to the Parthenon was quite gratuitous. The disaster it suffered at the hands of Morosini, however, was not quite complete. He began the removal of some of the statues from the west front, thinking that the car of victory (as he supposed it to be), with its horses of natural size and admirable workmanship, would be a fine accompaniment to his triumphal entry into Venice, and a noble monument of his conquest of Athens; or, according to the more candid expression of the historian Fanelli, "of his voluntary abandonment of the Attic conquest." By the awkwardness, however, of the Venetian engineers, the whole group was thrown down in the act of lowering it, and, according to the testimony of an eye-witness, broken to atoms.

On Morosini's departure the Turks returned to the citadel and restored their Mosque as it appeared when Stuart saw it in 1762.

Lord Elgin's removal of the sculptures, at the beginning of this century, was happily unattended with the mishap which befell Morosini's attempt, and the priceless sculptures he obtained are safe in the British Museum. From time to time the question arises whether he was justified in removing them. The justification which ought, I think, to have most weight is this—namely, that in the war of independence in 1826–1827 the Acropolis was twice bombarded, once by the Greek forces and once by the Turks, and the scars produced by the shells and cannon-shot on those occasions over all the building (except on the north side), and more particularly on the west front, are very grievous, showing the danger the sculptures escaped through Lord Elgin's action. Even now we may feel disposed to think that they are safer where they are than if they still remained on the temple. In one particular, Lord Elgin's agents did a distinct and, I think, an unwarrantable injury to the building—though probably in excess of his Lordship's instructions. On the south side of the temple the explosion had left eleven of the original seventeen columns standing, with their entablatures complete. From the greater part of these entablatures the agents referred to threw down to the ground the cornices, that they might, with the greater ease, withdraw the metopes, thus not only disfiguring the temple, but leaving the rest of the entablatures much more liable to injury from wet, especially as the iron cramps and dowels, which are everywhere largely used in the construction, became exposed and liable to rust and to shatter the marble.

This action of the iron is going on more or less throughout the temple, not so rapidly as would be the case in our climate, but it has done mischief in various places; some I shall have occasion to point out further on. One of these injuries, a very obvious and old-standing one, is common to most buildings of the Classical period, and particularly so at Athens—namely, the havoc that has been made in the Dark Ages by persons hacking away the stonework in search for the metals, iron and lead, which were embedded. The better

protection of the ironwork is one of the points which is very much called for in anything that is done for the preservation of the temple.

Another cause that has to be mentioned has been in operation from time to time for more than 2,300 years. I refer to earthquakes. Athens fortunately lies at a distance from the special lines of seismic action; but both the Parthenon and other buildings on the Acropolis show clearly, and particularly by the twisted drums of some of the columns, that the earthquake of 1894 was not an exceptional one. Indeed, this last earthquake, as it did no very great damage to the fabric, has had the fortunate effect of directing attention to a number of serious weaknesses, which, if neglected, may lead to a great catastrophe; and it is very much to be hoped that the present political disturbances may not be allowed to hinder the execution of the precautions which had already been commenced and are urgently demanded. Almost the whole of the damage which is traceable to the earthquake of 1894 consisted in the fall of a piece out of one of the drums of a column on the north side, and that of a rather large portion of one of the architraves of the Posticum. Both pieces were probably already split and liable to be easily shaken down.

Another cause of mischief is the action of the roots of plants of various kinds which had been allowed to grow on the top of the temple, for the growth of which, soil is amply provided by the ravens frequenting the structure, and these roots, wherever they could enter into an open joint, must have tended to displace the masonry. Originally the joints were made so close that there could have been little danger from this source, but from the shaking by earthquakes and the explosion opportunities must occasionally have been given for the roots to enter. This cause of mischief has been pointed out to the Committee, and, whilst I was there, was being attended to; it is to be hoped that the matter will now be continually kept in view. Besides the physical injuries and mishaps which I have enumerated, about the year 1841 the Parthenon was in danger of what might be called a moral disaster at the hands of King Otho and his architect Von Klenze, who designed a large palace for the King to be built on the Acropolis. Happily he never even began it; but the bad effect, if it had been built, can be sufficiently well imagined. At that period, however, several of the fallen columns of the temple were re-erected—a most unfortunate proceeding, for the joints of the re-erected drums, with their jagged and bruised edges, form no sort of suitable accompaniment to the perfect lines of the original work, in which the joints are only made visible by occasional slight differences of colour in the adjoining stones.

In the year 1872 it appeared necessary to take down the central portion of the lintel over the western doorway, a stone which when perfect was nearly 30 feet long, and to support the superstructure by a constructed beam formed by a brick arch tied with iron bars at the bottom. The original lintel was doubtless in a very unsafe condition, having at some time suffered from the conflagrations I have referred to; but the way in which the repair had been effected was very unsightly, and as a considerable expenditure was being projected in the restoration of other parts, an opportunity seemed to offer itself for a better treatment of this western doorway, particularly as a great part of the expense would be necessarily provided by the contiguity of the general scaffolding required for the Posticum.

When I arrived at Athens in the spring of last year I found that both my colleagues—namely, Professor Dürm, of Carlsruhe, and M. Lucien Magne, of Paris—had already been there, and had given their reports to the Greek authorities. The former also published in Berlin in German an abstract of his report, a copy of which is in the Institute Library. He goes very fully—indeed, much more fully in some respects than the local committee were prepared to follow him—into the question of the defects and remedies; but the report is nevertheless a valuable contribution to the study of the subject. That of M. Magne is a

brilliant and well-illustrated memoir on the construction and ornaments of the temple rather than a more technical report on the defects and remedies; but he calls attention to one very important detail, which seems to have escaped the notice of Herr Dürm, namely, the instability of the angles of the pediments, on which subject I shall have more to say later.

I was received very cordially by the local committee, presided over by M. Cavvadias, the Government Superintendent of Antiquities, and consisting of several Greek members of the Athens Archæological Society and some associated members, including Dr. Dörpfeld, the eminent German archæologist and architect, M. Troump, a resident French architect, and the Government engineer, M. Balános, who was to superintend the repairs. They had already made arrangements for several 14-foot architrave stones (that is, of the full size of the old imperfect ones) being prepared on Mount Pentelicus, and I joined them in an agreeable excursion to the quarries to inspect the fitness of these blocks in the rough.

The part of the temple which demanded the most immediate attention was the hexastyle portico of the Posticum [see plan, p. 354], and a scaffolding had been erected there, which enabled me to study conveniently the state of the superstructure in that part. Ladders were also erected for me in a few other places which could not be properly examined from below; especially for the purpose of dropping a plumb-line from the top to the bottom of some of the columns, which I had so treated just fifty years earlier, to see if any change had taken place. It was necessary to do this rather early in the mornings before the otherwise inevitable wind had

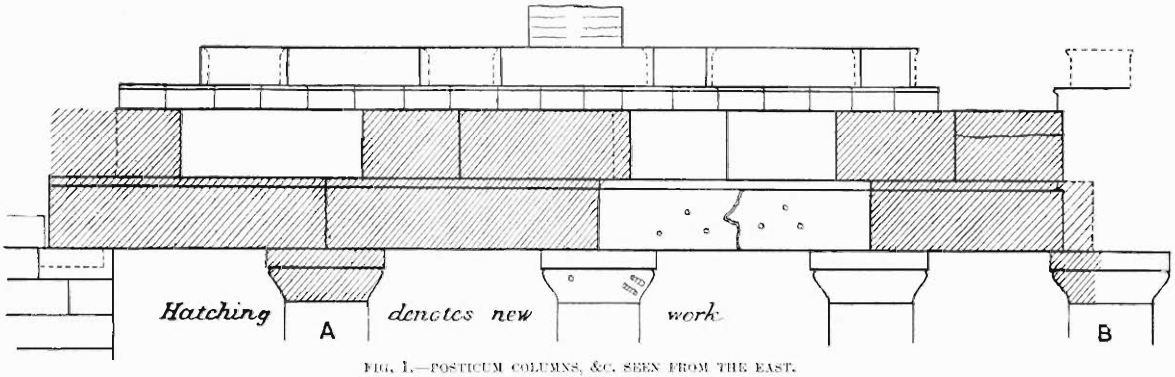

FIG. 1.—POSTICUM COLUMNS, &C. SEEN FROM THE EAST.

arisen. I had by this means the satisfaction of being able to prove that no change in their relation to the perpendicular had taken place, nor, so far as I could reach them, had the old cracks enlarged. After studying the building in this manner for about three weeks I prepared my report, and before I left Athens I had the satisfaction of believing that the local committee had agreed to the whole of it, and that they all seemed to concur in the wish that, whilst what was essential should be done, everything should be executed in the most conservative manner, so that whatever new material had to be inserted, it should be kept out of sight as much as possible.

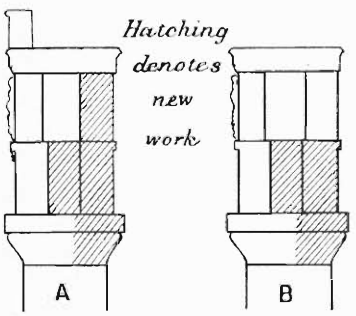

FIG. 2.

The state of the Posticum is such that it is impossible to execute any satisfactory repair without replacing at least five of the architrave stones. Of the six columns composing the portico, four only are free; two of them are more or less embedded in the mass of masonry containing a staircase which was once surmounted by a Turkish minaret. The staircase may, however, have been previously built for the Christian church. This mass at any rate secures

the southern columniation. The architraves supported by the four free columns consist of twelve stones. Of these twelve, only five are free from very great defects; but if five of them can be replaced with new material, two can be so pinned together to their neighbours that they may be supported sufficiently well. The worst defects are on the eastern side of the portico. With one exception the western stones are sound, which is fortunate, as they support the portion of the Panathenaic frieze which is still left on the temple. With regard to the defective one—namely, that which once connected the north-eastern column with its neighbour, but does not now perform that office, for it is completely severed into two portions by a bad crack—the simplest remedy would have been to replace it with new; but its removal would endanger a portion of the precious sculptures, and it will have to be keyed to a new stone placed alongside of it. Professor Dürm in his report suggests that the reason of this part of the Parthenon being in so much worse a condition than any other, is, that the original builders had used for an interior part of the fabric a very much worse material than they had provided for the exterior. It is true that the marble of these architraves is more streaky than could be found on the exterior; but the reason must be sought elsewhere, for streaky marble of very similar quality has endured extremely well on the temple of Jupiter Olympius, and another and more effective cause can be assigned to it, namely, one to which I have already referred—that is, fire, which once certainly, at the time of the explosion, as above stated, and I think also at an earlier period, had consumed all the inflammable part of the structure, and had very much calcined the whole of the superstructure of the Posticum, as the state of the surface of the marble gives clear evidence. It had also weakened the lintel of the great western door, to which I have already referred, and some of the columns of the Posticum, especially on their eastern sides, have also suffered. Many portions of the capitals and of the architrave stones in this part retain traces of iron plugs, which can only have been used to fix some material for the purpose of repairing the surfaces which had been split off by the action of fire. It is, however, unimportant to discuss the period at which such fire may have occurred, as we are now concerned only with its effects. It would, and does, completely explain the reason why the architrave stones of this portion of the building, although much less subject to ordinary weather vicissitudes, have become so much more cracked than those of the Peristyle. A large piece from the middle intercolumniation fell down in the earthquake of 1894, split off apparently at an ancient flaw. The course of deep stones above the architrave, which forms the back of the Panathenaic frieze, and ranges with it in level, is also very much cracked and dislocated, so much so that only two pieces in the whole length—that is, very little more than a quarter of the whole—are in a fit condition to be retained. These pieces, however, are neither so difficult to handle nor to replace as the main architrave stones, which have a length about 13 feet 9 inches each. The quarries on Pentelicus, although they are not yet exhausted, do not seem to yield to modern demand such blocks as the ancients were able to find there; and it must be added that the present method of working with the help of gunpowder is not favourable to the extraction of sound blocks of considerable length. It is probable, too, that Ictinus' contractors had better roads for bringing them down to Athens than the wretched tracks which must now be traversed.

When I was at Athens a strong scaffolding had been designed, which was to be surmounted by a "traveller," for the purpose of taking out the condemned blocks and fixing those which were to replace them; but the operation of removing the old blocks was likely to be a delicate one, because of the state of the course above them, namely, the platband, which supported the marble beams that formerly carried the ceiling. This course consisted of through stones, and formed also on the other side of the wall the moulded band under the ceiling-beams over the Peristyle ambulatory. The condition of this course was such that,

although it might very well remain in its present order, it would not admit of being taken off and replaced without great loss; whereas, in consequence of the connection of all the courses together by iron dowels, the lower courses could not be lifted or drawn out sideways if this platband remained exactly as it was. The construction shown on the sections offered the solution of this difficulty. The hollow between the inner and outer frieze, which is sufficient for a workman to pass from end to end, was to be utilised by placing a screw jack over each column, and by means of a light iron or steel beam extending from jack to jack, lifting up the whole length of the platband until the dowels were cleared; and this would also give space for drawing out the defective architraves, and inserting those which were to go in their place, and would afterwards by reverse action allow the platband to descend to its proper level. I understood that this was the device of M. Balános, the Government engineer. Several of the capitals of the Posticum are so much shattered that they must be partly renewed—two of them to the extent of at least one-half—to enable them to support the new architrave stones.

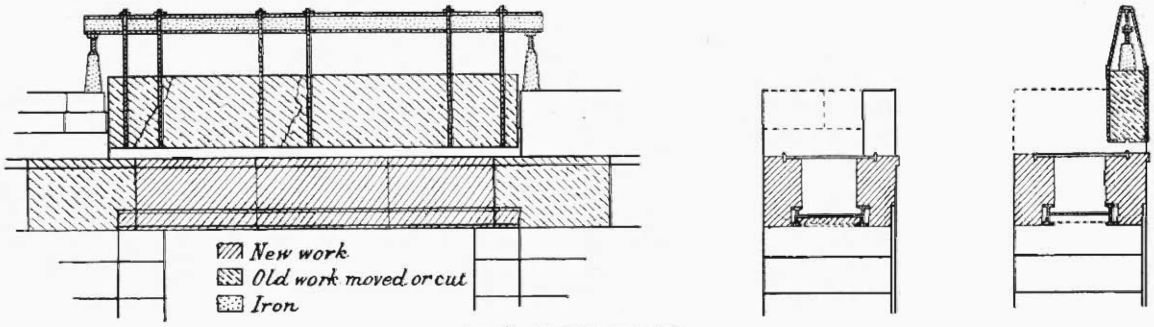

FIG. 3.—WESTERN DOORWAY.

The lintel of the great western door has been already referred to. At present the two ends of this originally magnificent stone remain in the wall, and give evidence of the insertion of the lines of the finished doorcase. All the rest is gone, and, as already stated, the place is occupied by an exceedingly unsightly brick arch. This, it is hoped, will be replaced by marble; but there is not the slightest prospect of a 30-foot beam being found, nor could it be brought to Athens with existing appliances. The plan recommended by me, and accepted by the Athenian Committee, and I presume by my German and French colleagues, to whom it was communicated, is shown in a drawing on the wall. The lower flanges of the real working supports were not to be hidden, but the general appearance would be marble of the same form as the original beam. The upper stone, of great length also, can still remain; but it must be treated very tenderly, because it is much cracked and weakened from the same cause that has produced such a disastrous effect upon the rest of the Posticum. The operation proposed is sufficiently explained on the diagram.

I have already referred to the insecure condition of the angles of the temple. This applies to the north-eastern and the two western angles, but not so much so to the south-eastern, for there the misadventure has already taken place, and the upper members have fallen to the ground.

The cause of the mischief must be traced to the great overhanging stones which supported the angular acroteria having a tendency to slip downwards and drag the neighbouring portions of the superstructure with them. No doubt with so flat a pitch it may be argued that the beds of the stones in question, sloping not more than 13½ degrees, do not exceed the angle of repose; but the theory of the angle of repose does not reckon for earthquakes and

explosions. The chief hindrance to the stones in question slipping down during such vibration is due to the iron dowels which connected them with the masonry beneath. There is also a certain, but very inadequate, amount of joggling. The result in every case has been a considerable amount of outward pressure—in one case, as I have mentioned, sufficient pressure to have precipitated the upper members, and in the three others to produce serious cracks in the architrave, and in one case, *i.e.* the north-east angle, in the great corner-stone of the cornice also. The western front at both its angles has suffered in the architrave from this tendency, but the great corner-stones remain unimpaired. The worst crack in the architrave is over the north-west angle column, where owing to the fall of a large piece at the corner of the abacus the bearing of the outer stone of the architrave is reduced to little more than a point. The thickness of the architrave is here, as elsewhere, compounded of three pieces set up edgewise, each being nearly 2 feet thick and 4 feet 5 inches high.

Between the fourth and fifth columns of the west front, reckoning from the south, a crack through the architrave has been produced by a cannon-shot, and the abacus of the fourth column has been so much shattered that it does not give a bearing to more than about half the thickness of the architraves which rest upon it. The exfoliation of iron cramps connecting the architrave stones at the top has also injured all but one of the vertical joints, but beyond the breakages of the large splinters which have fallen, the injury from the iron cramps at these places does not seem likely to extend. Very careful attention should be paid to the north-east angle. The perspective sketch, which is an enlargement of one I made in 1846, appears to show it exactly as it remains at present, and it really seems a marvel that it survived the shake of the earthquake of 1894. The other diagrams will show a curious piece of construction of these parts: how a rather shallow trough has been formed on the top of the great angle-stone of the cornice parallel to the fronts, to the end of which trough a piece of stone about 30 inches long, and measuring in section no more than about 18 inches by 5 inches in depth, seems to have been thrust in after the pediment was fixed. The object of this construction is extremely difficult to explain. From the first I thought it seemed to denote some change of purpose, and my colleague, M. Magne, I find, has come to the same conclusion. However, at the north-east angle it is now performing an apparently useful purpose, for, without its support, it seems as if the lion's head which bears immediately over it could not but fall down. Another diagram [fig. 5] shows the manner in which I have suggested the angles should be secured from slipping any further in the direction above referred to, namely, by connecting the great horizontal corner-stones by means of strong gun-metal cramps with the main cornice at a sufficient distance, so as to provide an adequate amount of weight to resist the tendency. If this great

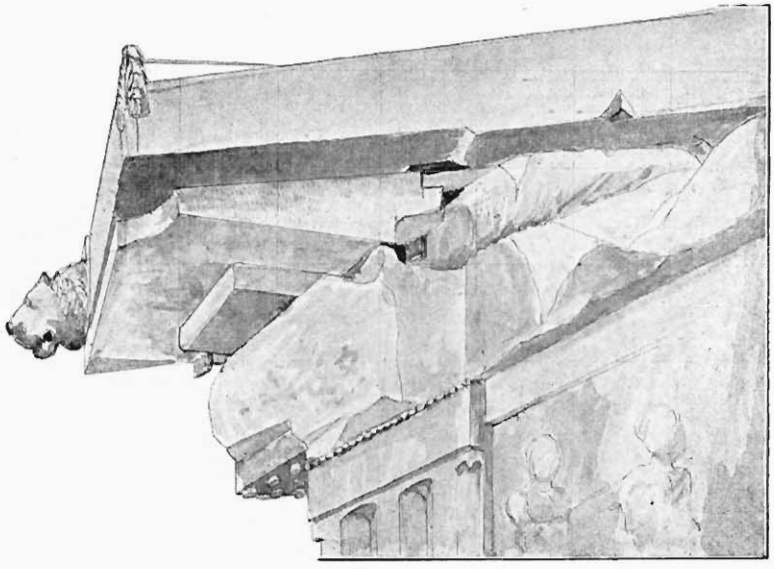

FIG. 4.—NORTH-EAST ANGLE.

stone were made immovable, the dowels and such joggling as there is would be available to connect the sloping bed above very firmly with it. The north-east angle would require some extra cramping, as the great cornice-stone is itself cracked across. This cramping would be unnecessary at the south-west angle, for the reason given above.

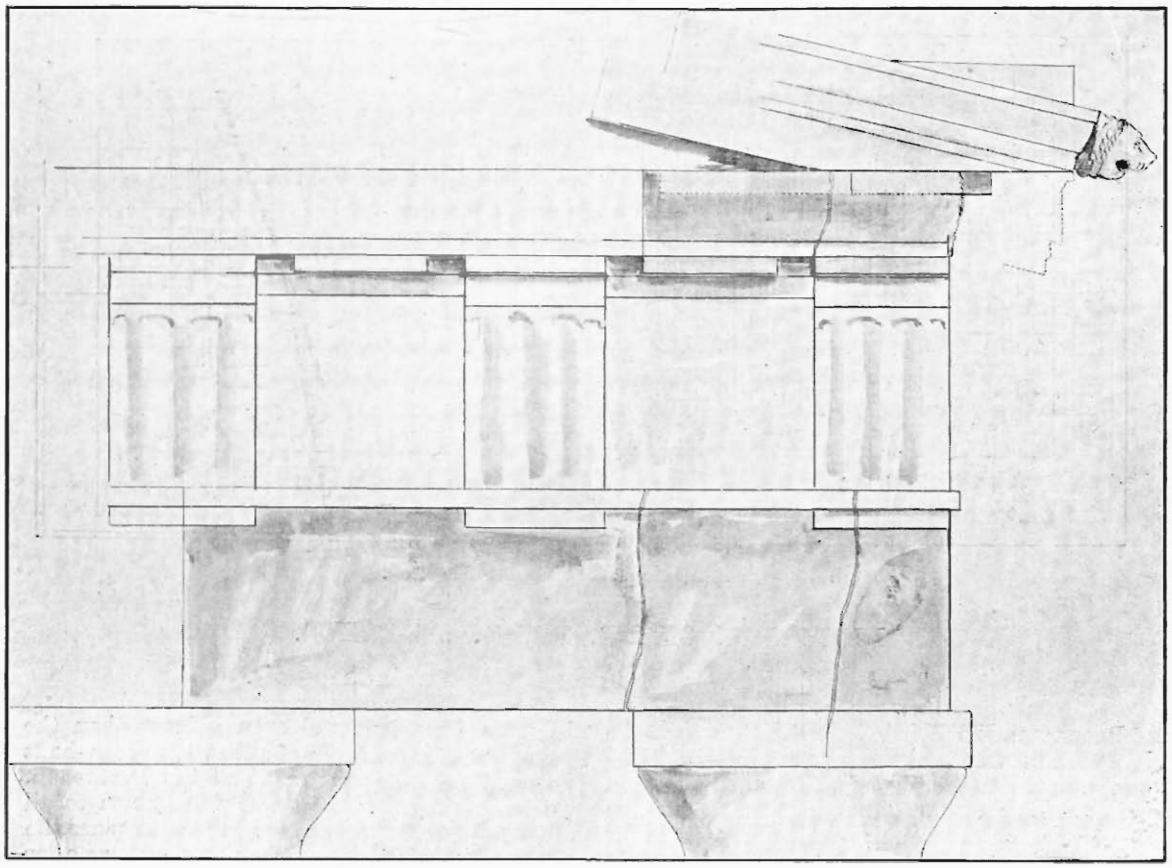

FIG. 5.—NORTH-EAST ANGLE.

Several other points were discussed, and amongst them the pointing of all the open joints at the top of the building, the bringing down of any small loose pieces that there might be, &c.

Very few of the new stones which would have to be introduced would make any difference in the general view of the temple, and scarcely any of the steel- or bronze-work; and the new stone could be stained, as I was able to show by experiment, with copperas, so as to be almost indistinguishable from some of the old time-stained marble.

In conclusion I will quote a few passages from my Report in reference to the question of rebuilding, as far as possible, the fallen fragments:—

"I have heard a rumour that there is some desire to re-erect some of the columns which were thrown down by the explosion. I trust that this is only a vague rumour, and that there is no intention of this being done.

"The unfortunate attempt which was made on the north side in the beginning of the reign of the late king in this direction ought to be a sufficient warning.

"The columns were originally built up with the drums rough-hewn externally, and

finished and fluted afterwards. The great perfection of the joints which was the result is one main source of the great beauty of these columns. The re-erection of the fallen columns with these edges broken, and in many cases requiring to be pieced with new work, can only produce a discord, which is much to be deprecated. I was exceedingly glad to be told that this was not part of the authorised programme."

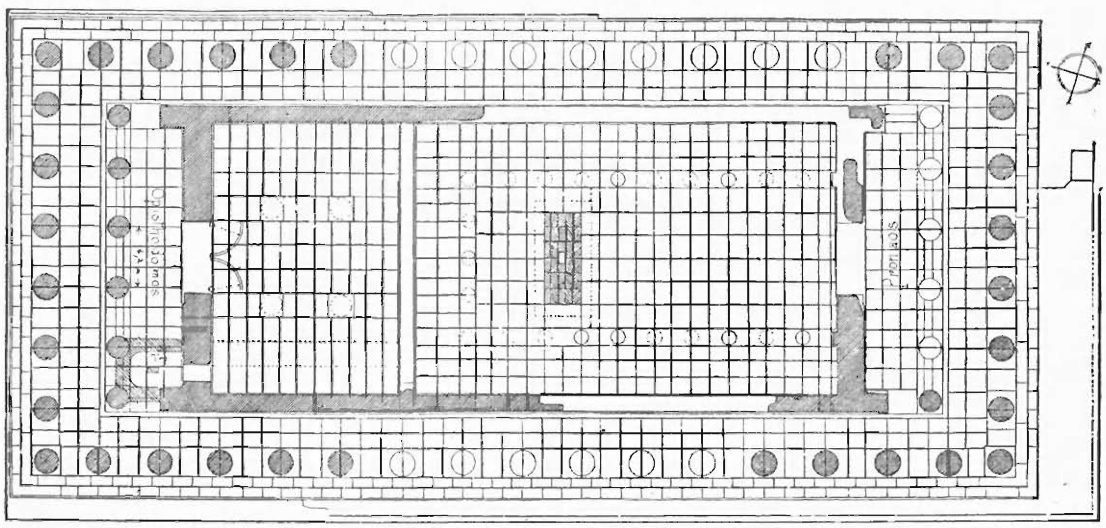

FIG. 6.—PLAN. Reproduced from Professor Dürm's Report.

DISCUSSION OF MR. PENROSE'S PAPER.

The President, Professor ARTCHISON, A.R.A., in the Chair.

PROFESSOR ERNEST GARDNER said that he had been in Athens at the time of the 1894 earthquake, and therefore was able to speak from personal observation of its results, and of the appearance of the fragments immediately after they had fallen. After the earthquake the first thing he had done was to go to the Acropolis to see the fragments that had fallen from the architraves of the columns. He could confirm one point which Mr. Penrose mentioned. The damage to these fragments was not done by the earthquake itself. There was hardly any trace of new fractures upon them; in fact, the greater part of the surface within the crack was overgrown even with lichen, and it was considerably discoloured, so that it was obvious that the cracks were old ones, and that the pieces had been just hanging on, until the slightest shock brought them down. There were questions on two or three points which he desired to put to Mr. Penrose. The first was as to the lower part of the minaret, of the great western door and the columns, and the inner lining of the great door. As regards the columns and the possibility of their re-erection, Mr. Penrose had already spoken in a tenor which the speaker was quite sure was in accordance with the general feeling of the Meeting. Nothing could be more discordant and even hideous than the mangled remains of columns that had been built up again upon the north side of the Parthenon. The reason of it was of course well known to all architects—viz. that it is impossible to place the pieces of a fluted column one above another after they have been fluted. The fluting in the Greek buildings was made after the erection of the columns, and the result of any attempt to build them up again was most disastrous. In comparing those mangled remains of columns built up with those not fallen, one felt how hideous they were. He thought it was impossible to rebuild the whole of the Parthenon. There was not material for it, unless a great many new blocks were cut, which no one would propose; and to cut a few blocks would simply destroy the symmetry of the building. The explosion had produced a kind of symmetry, the columns descending from each end towards the middle, and that was entirely destroyed by the remains of columns built up again. He wished that Mr. Penrose had recommended that those columns set up should be pulled down again; since they disfigured the building with the brick patches that had been put into them. With regard to the great western door, he was very glad to see that there was a proposal to replace

the unsightly brick arch in a much more adequate manner, but he desired to know what Mr. Penrose would propose as regards the sides of that door. The present jambs of the door, on which that brick arch rests, are put inside the original jambs of the door. There are thin casings which were put up most probably when the Parthenon was converted into a church; and it was proposed, some three or four years ago, to remove, if possible, those extra jambs. As regards their removal there was one consideration—namely, that the blocks which had been built in by those who altered the Parthenon into a church had long inscriptions on the back of them which were perfectly illegible, and those inscriptions would be an extremely valuable document from an historical point of view. He would like to hear the opinion of Mr. Penrose as to the advisability or possibility of removing them without damaging the building. As to the lower part of the minaret that still remained, Mr. Penrose said it might possibly be the staircase that belonged to the time of the Christian church, and not necessarily to the Mosque. It afforded a great deal of support to the defective architraves there. The scheme of removing it as a later addition had been discussed some four or five years ago, and he (the speaker) had expressed a very strong opinion, from the historical point of view, as to the undesirability of doing so. After Mr. Penrose's lecture it was clear that its removal was also a serious danger to the building. Summing up, he said that he thought anybody who had looked at the Parthenon carefully must have been extremely alarmed at the cracks all over the building, and at the most inadequate way in which the heavy blocks were supported; but it was most reassuring to be told now by Mr. Penrose that the building might be made safe with such a small amount of restoration and of repair as had been suggested.

Mr. R. PHENÉ SPIERS [*F.*], F.S.A., after referring to the President's visit of fifty years ago and to his own of thirty years ago, said that it was impossible to point to any other structure with regard to every five feet of which one could find a fresh view to be taken. Looking carefully at the drawings and photographs exhibited, there seemed to have been little change in the structure. All the stones of the west front, the angle stones, seemed to be very much the same. Slight differences were to be met with near to the north-east angle—that is to say, to the left of the west front. The crack (as shown in one of Mr. Penrose's drawings) seemed to have increased a great deal since his visit, and he found, from the drawings exhibited, that there must be some greater damage done to the abacus of the capitals than what was seen in his own drawings. But apparently the effect of the earthquake was to shake down the loose portions, and very little damage was done to the building itself. Mr. Penrose spoke of certain stones being laid on the tiles. Did he mean the marble tiles? [Mr. Penrose assented.] Another question he desired to ask was: What was the actual cause of the discolouration of certain parts of the sculpture? To what were those beautiful yellow tones due—to the decomposition of the material of the marble, or to the discolouration from the iron dowels inside? When drawing the east front he had been greatly struck by the still visible traces of the shields there. They were originally gold, and were replaced by bronze shields about the third century A.D.; and although more than 1,500 years had passed, a trace of the shields was still visible. After referring to the general gratification at the President and Mr. Penrose having both been asked to form part of the international committee, Mr. Spiers said that he felt Mr. Penrose's propositions dealt with the building in a sparing way, as far as the restorations were concerned. Iron was very unsightly, and the employment of beams of similar materials to that which formerly existed would be better. It was rather difficult to say now, as one could not judge until the stone was in place; but when it was in place it was of such intense whiteness that it might be worth while to discolour it so that that intense whiteness might be avoided. He begged to be allowed, in conclusion, to propose a very hearty vote of thanks to Mr. Penrose.

Mr. T. J. WILLSON [*A.*] said that the whole architectural world might be congratulated on the happy result that the accident was not so bad as was thought. Testimony from Athens proved that pieces had come down, but they were not actually split at the time of the earthquake; they were old cracks. He congratulated Mr. Penrose on being the happy bearer of this news, and hoped he would soon find that all the repairs and precautions which he had recommended would be realised. He begged to be allowed to second the vote of thanks.

Mr. JOHN HEBB [*F.*] said that he had been most agreeably reassured by the statement that Mr. Penrose had made of the methods he had employed for repairing, and not restoring, the Parthenon. There was a vast difference between those two terms. There was no doubt that any attempt to set up the ruined frustrums of the columns would result in injury to the building. He was cordially in harmony with the general procedure which had been employed. Nothing could have been better than the ingenious way in which the architrave was raised, and the lintel placed underneath. If any other material than marble could be obtained, he did not know why it should not be employed for the actual repairs. As regards this being a blot which would show that something new had been introduced into the building, he would not be afraid of that. By all means let it appear as a repair, the brick arch which was placed over the western doorway being unquestionably a modern work.

Colouring the marble so as to make it imitate the colour of the old work was extremely risky. Nature would soon colour the marble, or, at any rate, if not soon, Nature had a wonderful habit of taking all buildings to herself, and of colouring them in harmony with the landscape.

MR. HUGH STANNUS [*F.*] felt that they were very much indebted to Mr. Penrose for the manner in which he had approached and dealt with this subject. If he (the speaker) might be allowed, he should rush in where angels and elders feared to tread, and venture to submit some suggestions which, if they brought down upon him some obloquy, would, at any rate, provoke some discussion. He should like to submit for consideration the question whether this restoration of the Parthenon might not be carried one or two steps further. Mr. Penrose suggested about the pointing of the cracks and joints, and the ironwork, and protecting them from the disintegration produced by moisture. Many of the walls of Pompeii were protected by tiles. That of course was a very proper thing at Pompeii, because the walls themselves were brick; and there was a certain fitness and sympathy between the tiles and the bricks of the wall. But in the case of the Parthenon the *whole of the tops* of the walls might be rendered in cement with a slight weathering-slope, so as to throw the rain off. That would protect them for many years to come, and he thought that, taking advantage of that interesting little staircase in the south-western angle of the Opisthodomus, the guardians would be able to arrange for periodical inspection (say annually) of the whole of the tops of the walls—that they need not wait for the earthquakes, which happened at irregular intervals, but that once a year, or oftener it might be, some person should feel it his duty to go round and see that there was no crack of any kind whereby water could get in, or herbage find root to disintegrate the walls. He further submitted for consideration whether they might not also re-erect such other portions of columns as still existed. It was a thousand pities that those lay about, being spoiled themselves, and spoiling the plateau on which the Parthenon stands. It was objected that they were much damaged; but on examining the columns in the Olympeion, near by, it would be seen that those were very much hacked about at the joints, for extracting the iron and lead, as had been the case also at Baalbek. If that argument were held to be worth anything, surely they ought, for a similar reason, to pull down all columns that were mutilated or hacked at the joints. But no one was vandal enough to suppose that they should pull down the columns. In dealing with the Parthenon they ought to think not what an "anti-scrape" would think, but what Ictinus would wish to be done to his building. That was the problem to be dealt with now. It "is a noble ruin"; but they must remember that Ictinus built it with a wall forming the cella, with a peristyle round that. The materials of more than half the number of columns were still extant; and he would respectfully submit that these might be re-erected so far as the remains allowed. Of course they were damaged at the joints, and they knew that when first built up and the flutes were first cut, then they had microscopic joints; but these broken joints when the columns were built up would be quite in keeping with other broken joints in the other columns and the wall.* He would go one step further: he would submit that the cella wall itself might be built up all round. The hiatus was shown in the photographs and drawings; and still more, one felt profound melancholy in looking at the building itself from the valley of the Ilissos, or from the modern city of Athens. They saw that a building which was intended to be one great whole was now *in two pieces*. He would like those two pieces to be joined even by a wall of sandstone, so that they might have that solid mass against the sky as it was left in 438 B.C. The cella walls should be connected. It would have two advantages in addition to what he had just spoken of: the making of one grand group on the horizontal line against the sky which would compose so grandly and so nobly with the lines and contour of the Acropolis itself. If it were solid and made of the same thickness as the original wall, they might bring gun-metal stay-rods from the wall to the top of those columns, and thus make them more secure; and this was a constructive reason for the wall. But there was another reason that should have equal weight, and that was an æsthetic one. They must bear in mind that the building as designed by Ictinus was meant to be a *solid* building. Now it was only the bare skeleton of the building. It would be seen that those parts of the building which had a wall behind showed the effect Ictinus desired: that the columns should stand out *light* against the *dark* background. He would ask that the background should be put back again, so that they should have the effect he meant it to have.

MR. ALEX. PAYNE [*F.*] said that in his opinion if anybody could restore those columns that had fallen down into the same state as the columns that had never fallen down, then possibly there would not be any objection to putting them up again. But anybody looking at the Parthenon could pick out in a minute those two or three columns on the north side which had been built

* I would desire to add, in reference to what was said by Mr. Payne: I agree that the appearance of the re-erected portions of columns is unsatisfactory. They are probably parts of different columns, put together without proper care, at a time when the *Entasis* was not so well understood as at present; and any re-erection of the other remains should be accompanied by a taking-down and re-adjustment of these. The adjustment would not be difficult with our present appliances for haulage, and greater skill in measurement.—H. S.

up, on account of the bad fitting of the joints; there was a stone and then a slight variation, and then another stone and another slight variation. The whole had a jagged outline, very different from the perfect columns, which appeared as if made of a single stone. The case was different with the columns which had been cut into to get out the metal dowels, but in which the original outline was not disturbed. The restored columns in this case with their jagged outlines certainly destroyed the harmony of the building. If these columns could be set up like the others no one could object. Comparing some photographs taken during a visit to Athens twelve years back with Mr. Penrose's drawings, he desired to ask Mr. Penrose a few questions. Taking the west front in his photograph, part of the top of the capitals of the two right-hand columns was gone. The third column was just like Mr. Penrose's drawing. The fourth column likewise, but (he supposed it was the effect of the earthquake) the central lintel at the time he got that photograph was comparatively perfect except for the cannon-shot. The next two were like the photograph; but as to the last one, the corner of the capital appeared to have gone since the photograph was taken. He desired to mention an additional advantage in the Elgin Marbles being safe in the British Museum, and that is, that not only was the Parthenon subjected to bombardment, but the Turkish soldiers made the figures that remained targets for practice!

Mr. J. M. BRYDON [*F.*] begged to ask Mr. Penrose how much of the frieze of the cella still remained. It had been incidentally mentioned that part of it was remaining on the western portico, but how much really was complete?—With regard to the frieze, it must have struck many how it was that the Greeks spent so much skill and labour on this magnificent frieze where it was so badly seen; that is to say, it was placed up inside of a wall behind a colonnade, at which one has to look up, at a very acute angle, so as to see it, in a very imperfect light. When Pericles had the Parthenon designed originally, it was designed as a cella wall with a portico at each end, and the frieze was on the external wall; but finding that the public money he used so liberally came in in great quantities, the design was altered, and he made it more magnificent by adding the porticoes all round. A certain support had been given to the theory in that the outer portico was not in alignment with the inner portico, namely, the eight pillars at each end are not quite in line with the six behind. He would like to hear Mr. Penrose's opinion on this German theory.

The PRESIDENT said that it appeared to him to be a very sad thing that the Greek Government, or some Government that would find the money, had not covered over the portion that was now left uncovered between the outer porticoes and the Posticum, where the portion of the Panathenaic frieze still remained. There is torrential rain occasionally in Greece which, more or less, soaks into the marble. He did not know whether there were frosts in midwinter, but thought it extremely likely, the consequence of which would be that the whole of the surface of this inimitable and priceless sculpture was being gradually destroyed. If the open parts were merely covered with boards, the expense could not be very great. This Panathenaic frieze was seen in reflected light; it is now left open to the sky, and another effect is produced; for the light coming from above cast the shadows downwards, while originally they were cast upwards.

Mr. F. C. PENROSE [*F.*], F.R.S., in reply, referred first to Professor Gardner's question about the inner lining of the great doorway, and said that he always supposed that it was desirable to maintain as much as possible the historical part of the building, where it did not greatly interfere with the classical; and even then with very great compunction. For instance, although it did not exactly refer to the Parthenon, he regretted exceedingly that the Frankish tower had been taken down, and with the same feelings he would regret that the inner lining of the great doorway, which explains itself perfectly, should be removed; but there should be no difficulty in taking out any pieces of it that might contain valuable inscriptions, and, after rubbing, putting them back again. As to the suggestion of covering over the lintel with marble beams, it is supposed entirely to rest upon the old wall without any help from this inner casing. Very little would be visible of the new stones. Of the front of the Posticum portico there would be not one stone. It would only be visible when one got inside and looked up. Between the Opisthodomus walls and the column no doubt the lintel of the great door would be seen; but from no other point. With regard to the cracks, he had paid a great deal of attention to them during his stay at Athens, and this he was able to do by means of ladders, and he did not find any change at all from cracks which he had measured and very carefully recorded in 1846; the rest he examined by binocular, and could not satisfy himself that there had been any alteration. The cleaning of the shields was very peculiar, because there was a very remarkable difference of colour in the surface covered by the shields; but one might suppose that those shields, especially the bronze ones, may have come down to a very considerable date, and therefore 500 or 600 years of natural discolouration went on outside them and not inside them. In his opinion, that sufficiently accounted for the difference of the stones inside and outside. The discolouration came from the iron which was invisible in the fresh Panathenaic marble, but is present in all marble when brought out by the oxygen and other vapours of the air. The Panathenaic marble was the natural substance to use,

both on account of its local value, and from the fact that it was more easily accessible. The colours of the Pentelican marble would suit the old, when it was a little time-worn, but originally the Panathenaic marble was certainly stained. We have records that staining was used on the marble, and the fresh marble is almost insupportably bright in the Attic sunshine. Therefore time has given us an advantage on the building which the ancients never had in that one respect. The covering up of the protection of the iron which he had supposed to be done with cement, and which the committee were anxious to do, was simply pointing with a very quiet and dull cement, on the top of the joints. Referring to the injured capitals, he had no doubt that there were several capitals on the west front in a worse state of repair than was shown in his drawing. Those marked in the drawing were those which he had marked on his sketch for the purpose of considering what was important and what was not. Where a capital was broken off, he did not mark it, as being of no particular consequence; and those that appeared to him to be marks in the construction, he believed he had marked sufficiently. He suggested this explanation of the difference between his drawing and the photograph. With reference to the sculptured frieze, he said that a very small portion remained on the south side over one columniation, a matter of 14 or 15 feet. Then it went as far as the fifth column of the hexastyle portico of the Posticum, and there was broken off. If covering it over with glass could be done efficiently, and without looking modern and weak and poor, it would be a great advantage to the sculptures. He had no doubt that the marble, if protected above, as it is by the overhanging moulding, would bear a great many centuries of disintegration from Attic storms and tempests. The frosts in Attica were not very severe.

*** The illustrations to Mr. Penrose's Paper included, besides the diagrams referred to—the more important of which are reproduced on foregoing pages—some water-colour drawings made by Mr. R. Phené Spiers in 1866, and lent by him for the occasion. These drawings represented the west and east façades of the Parthenon, the north-east angle, the east front from the south-east corner, and the interior. Mr. Spiers also lent a series of photographs taken by Mr. Stillman in 1869: two of the interior (one showing the ruts in the pavement worn by the great bronze doors of the Opisthodomus), a view taken at a high level in the west peristyle showing portions of the Panathenaic frieze still *in situ*; and six photographs, taken by the late Ernest George Spiers, of the west and east fronts, and general views of the interior and south sides.

9, Conduit Street, London, W., *20th May* 1897.

CHRONICLE.

Architects and Reinstatement of Buildings after Fire

[pp. 174, 239, 328–30].

The following letter, addressed to the Editor of the Journal, has been received from Mr. E. Cozens Smith, General Manager of the Imperial Insurance Company, Limited:—

Sir,—My attention has been drawn to the correspondence and reported discussions on this subject which have appeared in your Journal, and in which the action and views of this Company are so misrepresented that I feel it incumbent on me to furnish you with the following facts. The subject was, as you are aware, originated by the Institute, which, like myself and many others, considered the common practice of providing for the payment of architects' services to clients in the reinstatement of insured buildings by tacking a sum on to the builders' account was detrimental to the character and position of the architect. To remedy this, the Council of the Royal Institute addressed themselves to the Associated Fire Offices, with the result that the Fire Offices pointed out that whilst they were unable to admit or enforce the rights of an associated body, or any of its members, to payment for services arising out of a contract between the Insurance Company and its insured, they recognised the equity and common-sense of the position taken, viz. that the amount payable to a policy-holder for the destruction of or damage to a building, if limited to the actual cost of the builders' materials and labour, was not a full discharge of the insurer's liability, because, ordinarily, no layman could attain a reconstructed or repaired building by the outlay of that amount, unless he employed, and was paid the cost of, an architect whose services were a necessary adjunct; and so far from "the Insurance Offices" having decided or issued circulars intimating "that they would not permit the architects' commission to be paid by the Fire Insurance Offices" they determined and announced the exact contrary. It has been also decided that this equitable liability of insurers to their insured would be admitted, irrespective of a specific insurance of architects'