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# The Archaic Arch at Nippur.

BY

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## THE ARCHAIC ARCH AT NIPPUR.

In the fall of 1894 word was received from Dr. Haynes, then directing the field work at Nippur, of the discovery of an archaic arch (Pl. XXXVII). From its relation to the strata this proved to be far older than any previously known example. The interest which was aroused grew still greater when in successive letters he told of its gradual uncovering, with fuller details of the construction,

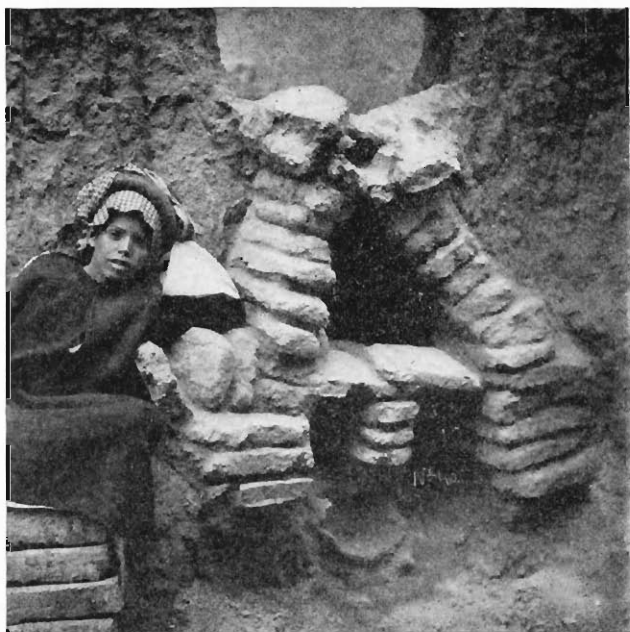


Fig. 1. Front of Arch A.

size of bricks, etc. While Dr. Haynes alone must be given the full credit for the discovery and for his patient work, we must remember—but by no means to his disparagement—that he was not an architect and did not have the special training necessary to describe his discovery fully and interpret its significance. The enthusiasm aroused in him by the unexpected and wonderful discovery of such a structure below the level of Naram-Sin, somewhat

blinded him to the many architectural shortcomings of his arch and led him to apply to it rather misleading architectural terms. Thus he called it "a perfect radiating arch with a keystone", when the arch really possessed not a single one of these features. This has given rise to a very erroneous impression of the arch, and as a result it has assumed a much higher value as evidence in architectural history than it deserves.

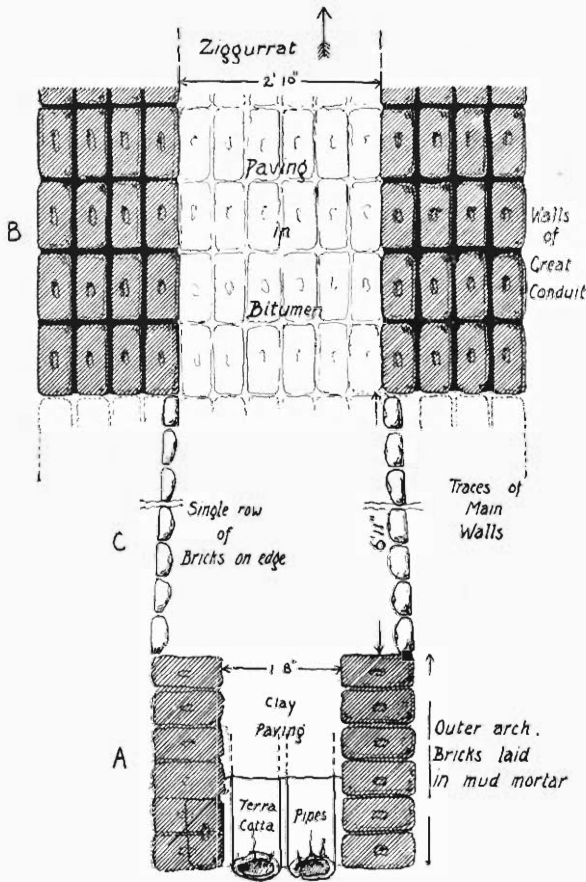


Fig. 2. Plan of Arch A and Drain B Behind It.

Fortunately this enthusiasm of Dr. Haynes resulted in his taking a series of excellent photographs of the arch from different sides. The value of these has been increased by the subsequent collapse of the arch, as we now, having only the two lower side walls remaining *in situ*, must depend upon them for most of our study.



These photographs show the external structure of the arch as actually excavated by Dr. Haynes nearly as well as the original could have done, but of course do not give us any information about the arrangement of the courses of brickwork inside. Strangely enough, several of the best of these views showing the real character of the arch have never been published, except-

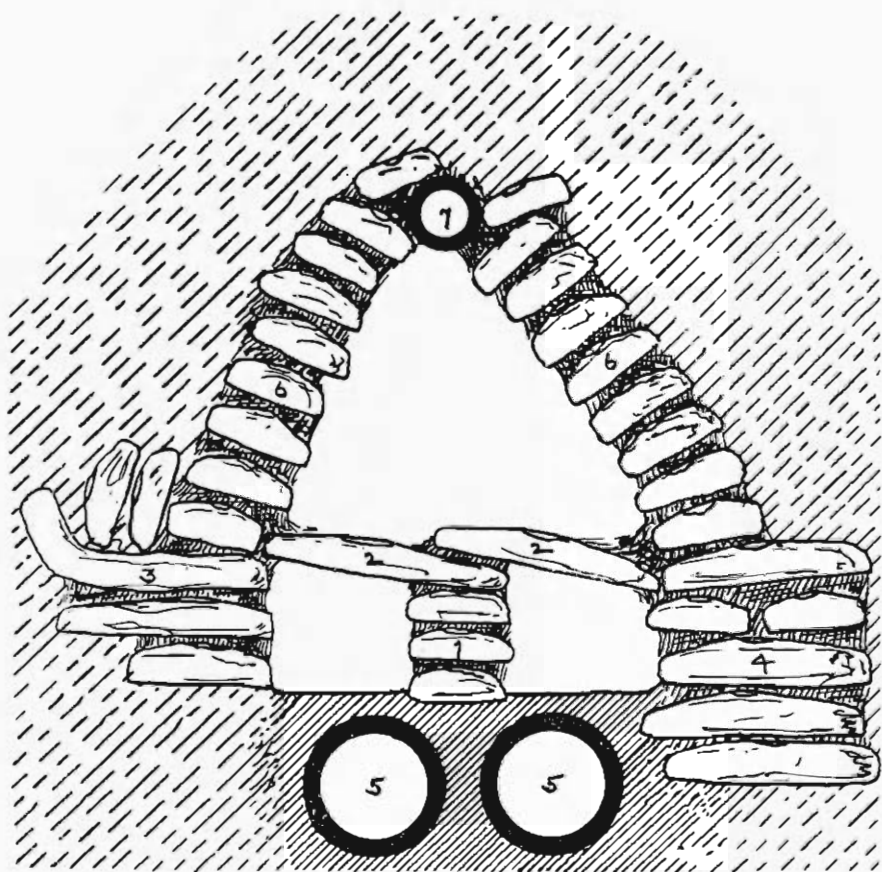


Fig. 3. Elevation of Outer Face of Arch A.

ing some sketches made in 1895, from rough blue prints sent home by Dr. Haynes, and illustrating an article on the arch by Dr. Peters, in the *American Journal of Archaeology*.

The arch was in a ruined condition when I reached Nippur in 1899, just five years after its discovery. But by taking a number of measurements of the existing parts and working them up on the basis of Dr. Haynes' photographs,

I was able to reach some new facts about the arch and also a very probable reason for its construction. These differ in many particulars from those already published, but they can readily be established, with the aid of the plans and views.

Generally when the arch has been described some mention has been made of a drain or water conduit behind the arch and between it and a crude brick structure ascribed to Naram-Sin lying directly below the southeast façade of the later ziggurat. Under this runs the water course, making a slight angle with its face. One reason why this portion of the conduit failed to receive closer attention was that it was supposed to be an integral part or continuation of the arch. A much clearer understanding of the drain will be reached if we abandon this idea of unity—for as we easily can see it is incorrect—and consider the structure as divided into three parts. We can designate the outer arch itself A, the inner conduit B, and the space which separates them C. (cf. Fig. 2.)

The arch A (Fig. 1), is built clumsily and irregularly, as is shown in the unsymmetrical appearance of the upper part and the different construction of the two sides of the lower part. These are neither of equal depth nor heaviness. The one on the right (4, Fig 3,) is fairly well built of five courses of brick work, four of which are laid as headers and one, the fourth course (counting from the bottom), as stretchers.<sup>1</sup> The left wall (3) is quite different in construction. The lowest of the three courses is a single row of stretchers 6 inches wide. A second row, of headers, increased the thickness to 12 inches. The third can scarcely be considered a course at all in the strict meaning of

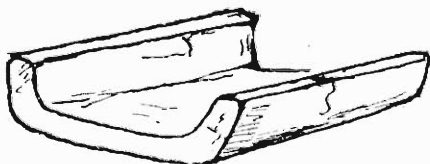


Fig. 4. Section of Moulded Terra Cotta Conduits (Pre-Sargonic).

the term, for it is formed of large fragments of thick pottery (3), seemingly broken sections of moulded drain tiles, such as are found so extensively in this and in earlier strata in many parts of the Temple area. (cf. Fig. 4.) Above these two straight sides rise the curved portion of the arch (6). It is here

that the real character of the structure is most clearly shown. In a true, *i. e.* regular, arch there must be an equal number of parts regularly spaced on both sides of a central axis, with either an extra one at the top as a keystone, or a vertical joint at that point. In our arch we find that while each side contains nine bricks,<sup>2</sup> the joints and varying size of the bricks had made the right side

<sup>1</sup>A header is a brick laid lengthwise across the thickness of a wall, so that only the smaller end is visible on the face, while a stretcher is one laid lengthwise of the wall, with its long side showing.

<sup>2</sup>Including two evidently misplaced by the dropping of the small pipe 7, at the top.

considerably longer than the left. There is neither a joint at the top nor a keystone, but instead a small section of terra cotta pipe (7) which ran originally the whole length of the arched portion. The result is that the arch has a leaning toward the left side, a peculiarity which can hardly be explained as due to subsequent distortion because any side pressure would scarcely have been uniform throughout the whole length, yet I found that both the outer and inner ends had exactly the same shape.

At the outer end was a curious T-shaped structure which at a first cursory glance suggests a support to the sides of the arch. After Dr. Haynes had examined it carefully he reached the conclusion that it was put in as a barrier of some sort, possibly to keep animals from taking refuge in the drain. This view, however imaginative, seems not impossible because as we shall see, the T is surely not constructional. If the builders had any intention of strengthening their arch by any such support, they would have had understanding enough to build it the entire length of the tunnel, as otherwise it would have been ineffectual. We know that Dr. Haynes found no trace of such a continuous support, but only the single slight feature at the outer end as shown in the photograph. (Fig. 1.) There is a far more serious objection to such a view, however. The vertical portion of the T is made up of three small pieces—fragments of large bricks—with a width of not quite six inches and a depth of about the same (Fig. 3.1). On top of this little pier were laid two bricks, each having an end resting on a slight projection at the top of the straight side wall and the other end resting on the pier. These bricks were of the single thumb marked type and thinner than the majority of the bricks used in the structure, but of the same length, *i. e.* 12 inches. The inside width of the arch was 20 inches, making it necessary that these two bricks overlapped 4 inches. Such an arrangement would not have been of the slightest value in supporting the arch because pressure sufficient to produce any movement of the side walls would have caused the two top bricks to slide on each other at once, without holding against the pressure. The very flimsiness of the structure and the way it was built into the sides or rather against the sides of the arch, prove that it was placed there after the completion of the latter. For what reason this was done we may never be able to say, although I incline to Dr. Haynes' idea that it served in some way as a barrier; no doubt a somewhat indefinite conclusion, but one not at all affecting our contention.<sup>1</sup> The arch was so crudely built that it depended

<sup>1</sup> Dr. Haynes first mentioned the arch in a letter dated October 13, 1894, and he completely uncovered it by October 27, 1894. His photographs could not be taken until sometime in November because his plates did not reach him until November 2, 1894. The first photographs sent home to the committee accompanied a letter dated March 2, 1895.

Professor Hilprecht (cf. *Explor. Bible Lands*, p. 400) sees in the T structure "a strengthening pillar," and quotes from Dr. Haynes' notes in support of this contention. He says that "a few months after Haynes had removed the brick structure with its two arms, he

in a great measure upon the rigidity of the mass of earth around and above it, to keep it in position after it was once erected, and in a smaller degree upon the mud mortar forming its joints. Once let the rain wash out the latter and cause the earth, which in excavating had been cut away considerably, to loosen its hold upon the sides and there was no further support for the arch.

The portion of the drain, A, was 20 inches wide, 30 inches high and about 3 feet in length from front to back, all inside measurements. There is absolutely no trace of its extension inward toward the face of the ziggurat, and from the finish on the other end, we know that this was its limit in that direction.

Two parallel lines of terra cotta pipes (5, Fig. 3) were laid along the bottom of the arch and thoroughly embedded in a thick coating of worked clay. These pipes were tapered, the smaller end of one pipe fitting into the larger end of the next one. When filled in with mud mortar a fairly tight joint resulted. These pipes do not extend beyond the limits of the arch at the inner end, and since there is no indication of a continuation of the arch to the rear, the pipes must have conveyed the water through the latter only. They most likely did connect outside the arch with another drain now destroyed.

The second structure, B, lies 6' 11" behind the arch, between it and the Ziggurat. See Fig. 2 and Pl. XXXVIII. It extended under the latter for a distance of 6' 0" beyond which point owing to the enormous mass of the several Ziggurats above it, further excavation was impracticable. As at present opened up it has a length of 21' 0", 15' 2" of which therefore project out from the plane of the face of the structure, the bottom of which is just above the top of the walls of the conduit (B). This structure is identified as Naram-Sin's, as it is composed of unbaked bricks having the standard Naram-Sin size and shape, identical with those in the enclosing wall of the inner city built by that ruler about 3750 B. C.

This inner conduit is 2' 10" wide and the walls on both sides of it are 2' 0" thick.<sup>1</sup> The bricks used are uniform, of the slightly plano-convex type,

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reported suddenly that the arch had been "forced out of its shape, probably from the unequal pressure of the settling mass above it which had been drenched with rain water., Truly the original purpose of these simple means which had secured the preservation of the arch for 6,000 years, could not have been demonstrated more forcibly." Dr. Haynes enclosed a number of photographs with his letter and describes them in order:

"Photograph No. 40 shows the outward side of the arch with the same bright lad sitting beside it. The arch here is forced out of shape. It would seem to have been done from the unequal pressure of the settling mass above it, when it was drenched perhaps with percolating rain water from above. The arch would readily yield to unequal pressure especially as these bricks are convex on one side." This picture, No. 40, is the one given here as Fig. 1. It was made before Dr. Haynes had removed the T.

<sup>1</sup>Compared with the twenty inches of the outer arch, with its walls ranging from six to twelve inches thick.



with a single deep thumb mark on the upper rounded face, characteristic of the earlier forms of the Pre-Sargonic bricks. Their uniformity indicates that they were all made at one time, the period in which the conduit was built. Furthermore, we find them all laid in bitumen. Along the bottom, between the walls, a single horizontal layer of these bricks forms a paving to the conduit and this is also coated with bitumen.

Unlike the part A, this inner conduit must have held the water within itself, for such a careful water-proofing of all the parts leads us to no other conclusion. There was no need for pipes, and we find none below the floor. The side walls have a height of 3' 0" remaining, or more than the entire height of the arch A, and are composed of eleven courses laid as shown in Fig. 5. Both sides are built exactly alike, the

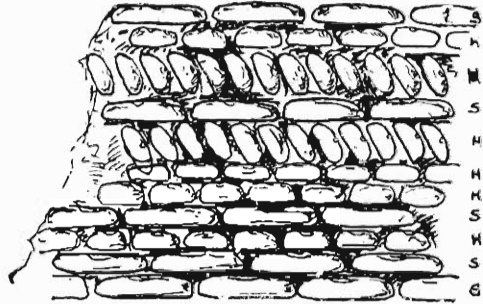


Fig. 5. Arrangement of bricks in the inner conduit walls in Drain B. H, Headers; S, Stretchers.

slant courses in each case inclined towards the arch A. The courses in which headers were laid over stretchers were naturally bonded by the brickwork, but where two similar rows were placed one above the other, the bitumen between them supplied the only bond. As I have said, these two parallel walls run under the brick work above for several feet and have the same height throughout the length thus far exposed. Toward A, their ends are broken away, but there are several brick fragments embedded in the debris showing that both walls originally extended further out from the line of the ziggurat. But on examining them I found that both sides had been intentionally removed, leaving a space 6' 11" between them and the inner end of the arch, for some purpose with which the fragments in the line of the wall did not interfere, since they were not removed. It is this place I have chosen to consider as a distinct part of the structure (C), for the following reason: on either side of this space of nearly seven feet between A and B, is a single row of thumb marked bricks set up on their shorter edges and inclined slightly backward. (cf. Pls. XXXVII and XXXVIII.) There is no construction behind them with the exception of the fragments of wall and loose bricks mentioned above.

We need scarcely stop to consider these three parts as being of the same period of building. The careful construction of B, with bitumen joints throughout and its uniform type of bricks, contrasted with the careless erection of A out of a mixed assortment of bricks laid in mud mortar; and the curious little lines of bricks at C, replacing a part of the massive wall of B, are sufficient evidence to the contrary. What does more nearly concern us is the order in

which they were built. In the first place it is improbable that the builders of such a fine conduit as B, extending under the ziggurat would have placed so crude an arch as A at the end of their work, at the point where it either discharged its contents outside the limits of the Temple court as then existing, or into another open surface drain. That the inner conduit was built after A is equally improbable. If the builders of B were merely restoring an older conduit, of which they had a part A complete, the workmen who were capable of such work as we have in B, would have rebuilt the arch in their own superior way rather than leave it as a facing to their own work.

The part B, must therefore have been built first, the parts A and C later. The large conduit B was built before there was any heavy mass of the Temple at this particular spot, and was then merely an open water course, the court of the Temple being approximately on a level with the top of the side walls as we now have them, *i. e.* three feet above the bottom of the conduit.<sup>1</sup> This ultimately fell into disuse, gradually filling up with refuse and debris from the surrounding walls and buildings and raising the level of the courtyard higher and higher until it was nearly 10 feet above the original bottom of the drain. At this level we now find certain boundaries of the inner sanctuary established by means of a low wall or facing of a terrace, running nearly parallel to the face of the subsequent ziggurat. (See Pl. XXXVIII.)

Now this wall, which still belonged to the Pre-Sargonic period, runs directly over the arch A, the top of which is 6' 6" below it. It seems to me that we have here the explanation for the erection of the arch. The water from the inner court of the Temple naturally seeking the easiest means of egress, would work its way through its old channel, now hidden below the surface. Having once collected between its water tight walls it had to force its way out at the end. This in time affected the compactness of the surrounding earth and caused the wall above to sink. Seeking the source of this subsidence the workmen came upon the old channel with the water trickling through it. Since it was useless to try and stop the flow of water they adopted the simple expedient of arching over the dangerous spot to support the earth above and prevent any further collapse. As this arch was to be buried in the earth, and would be supported by the weight around and above it, they did not take much pains with its construction, but put it together hastily—haste under the circumstances being necessary—from material at hand. Portions of the outer end of the old conduit supplied most of this material and to it was

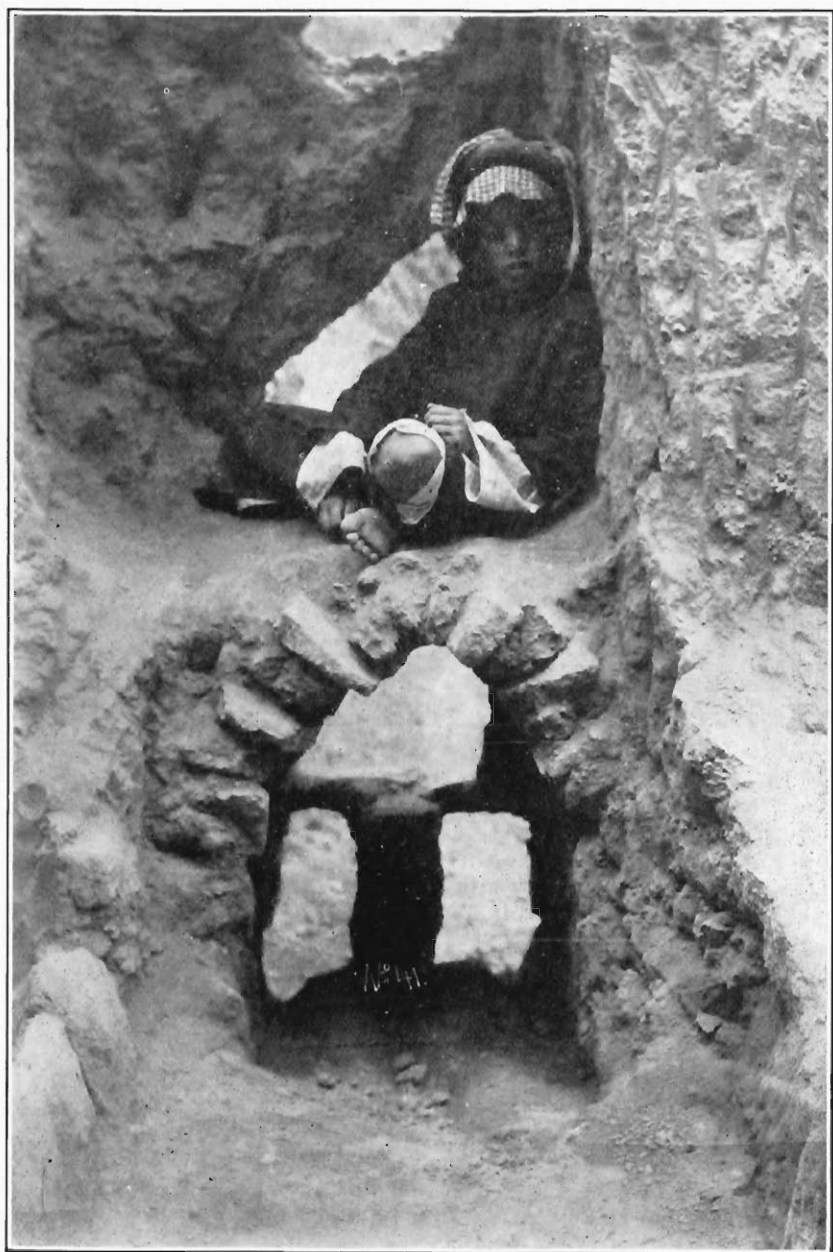
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<sup>1</sup> Against the theory that B was arched, we have the following important facts: 1. No debris of such a vaulting was found by Dr. Haynes inside the drain. 2. The foundations of Naram-Sin rests directly upon the top of the walls of the drain, and there is no trace of vaulting underneath his work. 3. The walls are perpendicular and show no signs of curving in to form an arch.

added their own bricks and odd fragments of jars, etc. The arch, with its mud joints, would not have stood the constant percolation of water very long, so they laid two pipes along the bottom, covering them with a thick layer of clay. A little basin was made by connecting the broken end of the old drain with the new arch, preventing the water from spreading around the sides and forcing it to run off through the two pipes. The arch really did not serve as a conduit, but only as a support of the structure above. Later, in Naram-Sin's time, the heavy foundations of his Temple were carried to the old level, and then doubtless the old drain was completely blocked up and the flow of water entirely prevented.

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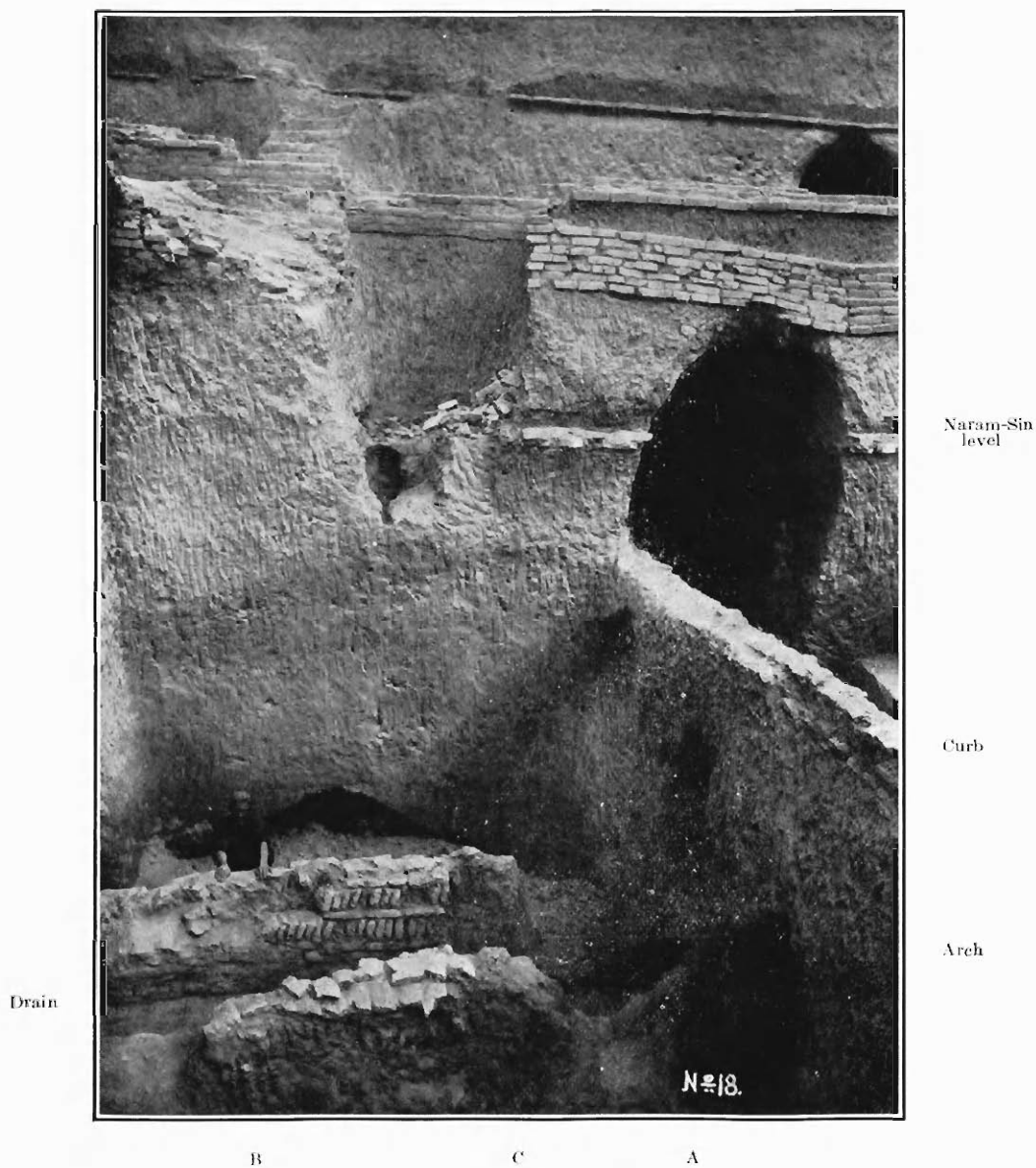


INSIDE FACE OF ARCH A









SIDE VIEW OF ARCH AND DRAIN.



