THE COTTON GROTTO,

AN ANCIENT QUARRY IN JERUSALEM,

WITH A NOTE ON THE STONES USED FOR THE ALTAR.

WHILE in Jerusalem, in April, 1891, I became interested in the great subterranean structure known to travellers as the Quarries of Solomon, and to the Arabs as the Cotton Grotto. The entrance to this structure is about 100 paces east of the Damascus Gate, and some 19 feet below the wall[1].

I visited this place several times, making such examination as was possible by the light from the torches of the servants of the American Consul, and of some members of the so-called "American Colony," who kindly placed their time at my disposal[2].

Note was made at the time to the effect that the quarry proceeded 1000 feet, and was about 150 feet in depth. The depth was obtained by the reading of a carefully compensated aneroid barometer, but the length was estimated.

Various measurements have been given at different times. Dr. Barclay states that the cavern "varies in width from 20 to 100 or 200 yards, and extends about 220 yards in the direction of the Serai (barracks), terminating in a deep pit." In another place he asserts that the quarry from the entrance to the termination in a nearly direct line measures

[1] These are the figures given in Baedeker's *Palestine and Syria*, 1894, p. 136.

[2] The "American Colony" is a party of religious enthusiasts who have given up worldly goods and cares, and await the second advent. They visit the Mount of Olives every morning at daybreak.

250 yards. Still another estimate fixes "the length of the quarry to be rather more than a quarter of a mile, and its greatest breadth less than half the distance." The latest edition of Baedeker describes the quarry as "stretching 213 yards in a straight line below the level of the City, and sloping down considerably on the south" (p. 106). From this diversity it may be inferred that a series of accurate measurements would not be wholly superfluous. Possibly an idea of the size of the quarry may be obtained from the statement that it is "sufficiently large to have supplied much more stone than is apparent in all the ancient buildings of Jerusalem, gigantic though these are[1]."

The roof is supported by huge pillars. These are, according to Sir William Dawson, in such good condition that the quarry might be re-opened at any time with very little expense. Bits of pottery were found cemented to the rock by the action of water. Two large chambers unlike the rest of the quarry, which was comparatively free from débris, were filled with small stone chippings. The conclusion seemed inevitable that in these places the stone had been dressed[2], giving the clue to the meaning of the Biblical passage which is referred to later on.

It was assumed that if the workmen actually dressed the stone here, they must have dropped some tools or other objects; and after picking about among the chippings with such rude implements as were at hand, some objects were actually found. Dr. Herbert Friedenwald, who was of the party, picked up a lamp plainly of Jewish pattern, being one of a few recorded, and the only one found in this place, as far as is known.

One foot below the surface of the chippings I found

[1] "By-Paths of Bible Knowledge," VI, *Egypt and Syria. Their physical features in relation to Bible History*, by Sir J. William Dawson. Third edition, London, 1892, p. 95.

[2] All observers seem to agree on this point. See Geikie, *The Holy Land and the Bible*, vol. II, pp. 16-19, New York, 1888.

many fragments of pottery. One lot of these fragments has been restored at the United States National Museum, but with the rest nothing could be done. Some were unglazed and undecorated, on others the glazing and decoration was still intact. The greater portion of the fragments discovered were left with Mr. Baurath Shick, of Jerusalem, in the hope that they might be useful to some future investigator. There is no record of pottery having been found there before, nor had Mr. Shick, the chief local archaeologist, knowledge of any such finds. One foot below the surface of the chambers, charcoal was found, indicating that the workmen had lighted a fire.

The stone from this underground quarry was chosen in preference to that of Zion Hill or of the Mount of Olives, because it offers "a thick bed of the pure white 'Malake' (stone), compact in quality, and durable, yet easily worked. This is a finely granular stone, and under the microscope is seen to be composed of grains of fine calcareous sand and organic fragments cemented together. It is not, like some of the limestones of the region, an actual chalk, composed of foraminiferal shells, but is really a fine-grained white marble[1]." There is a trickling spring on the right side, but the water is unpleasant to the taste.

The history of this quarry is uncertain, and though there is no good ground for doubting the tradition that it was used by Solomon, still no evidence on this point has thus far been discovered. It was no doubt in existence in the time of Herod, and is perhaps referred to by Josephus under the name of the Royal Caverns situated on the north side of the City[2]. Its first mention in modern times is contained in the work of Mujr ed Dîn, who wrote his *Uns al Jalîl* in 1496[3].

[1] Dawson, p. 92.

[2] *Wars*, IV, 2, cited in the *Survey of Western Palestine: Jerusalem.* London, 1884, p. 6.

[3] See von Hammer, *Fundgruben des Orients*, cited by Edward Robinson, *Later Biblical Researches*, Boston, 1856, p. 191. *Palestine under the Moslems*, by

Robinson states that the quarry was open for a short time in the days of Ibrahim Pasha, about 1844, and rumour affirmed, he says, "that his soldiers entered and found water within. A year or two since it was again opened, and Mr. Weber, a Prussian Consul at Beirut, with the Mussulman whom we visited on Zion, and another, went in and followed the passage a long way; but as they had neither lights nor compass they could not be sure of the direction nor of the distance. A few days afterwards, when they attempted to repeat the visit with lights, they found the entrance walled up. The Mutsellim had learned that Franks had entered the grotto. This account was afterwards confirmed to me at Beirut by Mr. Weber himself." The discovery of the quarry in modern times is due to Dr. J. T. Barclay, who accidentally found the entrance in 1854[1]. The origin of the name, "Cotton Grotto" (*magharet el Kettan*) or rather linen grotto, is uncertain.

All the signs of quarrying remain, including the niches for the lamps necessary for lighting the subterranean work-place and the soot from the lamps themselves[2]. The method of quarrying was as follows: the rock was blocked out with a metal tool[3] all around; it was then detached by the insertion of small wooden wedges which when swelled with water split the rock apart. The traces of all these processes are perfectly plain. It may be useful to quote the words of an engineer in describing this process[4]: "The methods adopted for the horizontal quarrying

Guy le Strange, p. 12. Compare also *Itinéraires de la Terre Sainte. . . .* par E. Carmoly, Bruxelles, 1847, p. 419; H. Sauvaire, *Histoire de Jérusalem et d'Hébron*, Paris, 1876.

[1] *The City of the Great King, or Jerusalem as it was, as it is, and as it is to be,* by J. T. Barclay, M.D., Philadelphia, 1858, pp. 456-468.

[2] See Sir William Dawson, p. 95

[3] See "Chisel Marks in the Cotton Grotto at Jerusalem," by Baurath Shick, and "Note" on the same subject, by W. M. Flinders Petrie, *Quarterly Statement of the Palestine Exploration Fund*, January, 1892, pp. 24-27.

[4] *Quarrying Methods of the Ancients,* by W. F. Durfee, M.AM.Soc.M.E. *The Engineer's Magazine*, July, 1894, vol. VII, No. 4, pp. 474-491.

of the granite blocks of ordinary size was to cut a narrow groove two or three inches deep, parallel with a vertical face of rock, at such distance as the width of the desired stone required; in the bottom of this groove rectangular holes were made, about two inches long. one inch wide, and two inches deep; these were usually placed about four inches apart; dry wooden plugs were then driven tightly into these holes, and the spaces between them in the groove first mentioned, filled with water; and the expansion of the plugs as they absorbed the water split the stone in the lines of the holes. No more uniform and simple application of sufficient force for the purpose could possibly have been desired." Ample evidence exists of the use of this method of quarrying in ancient times, and its survival even to modern times is attested. That this method was, and is still, practised in Egypt is affirmed by Professor Erman, the best authority on ancient Egypt, who states that "the procedure by which the old Egyptian stonemasons extricated the blocks can be distinctly recognized. At distances, generally of about six inches, they chiselled holes in the rock, in the case of the larger blocks, at any rate, to the depth of six inches. Wooden wedges were forcibly driven into these holes; these wedges were made to swell by being moistened, and the rock was thus made to split. The same process is still much employed at the present day [1]."

The use of the expansive power of wedges when soaked with water, is not, however, confined in modern times to Egypt. It is still employed at Mardin in Asiatic Turkey, although gunpowder has been in use there for four centuries. The quarries at Mardin, like those in Jerusalem, are underground, and the dressing of the stone is largely carried on within the quarry. Professor George P. Merrill, of the United States Natural Museum, has pointed out that this process either survived, or was rediscovered, in the last

[1] *Life in Ancient Egypt*, described by Adolf Erman, translated by H. M. Ferard. Macmillan, 1894, p. 471.

century in New England [1]. Dr. Daniel G. Brinton informs me that the quarries of Westchester County, Pennsylvania, which have been in existence for about 140 years, are worked by the same method. Quarrying by fire is employed in India and Peru, and the use of the expansive force of the wooden wedge was common in Mexico and Peru.

Professor Graetz sums up what is known from Biblical sources of the quarrying work done for the Temple in these words: "Eighty thousand of these unhappy beings worked in the stone quarries day and night by the light of lamps. They were under the direction of a man from Biblos (Giblem), who understood the art of hewing heavy blocks from rocks, and of giving the edges the necessary shape for dove-tailing. Twenty thousand slaves removed the heavy blocks from the mouth of the quarry, and carried them to the building site [2]."

The Biblical statement is as follows: "And the king commanded, and they hewed out (brought away) great stones, costly stones, to lay the foundation of the house with wrought stone; and Solomon's builders and Hiram's builders and the Gebalites did fashion them, and prepared the timber and the stones to build the house [3]."

The only place in which the word quarry actually occurs in the Old Testament is 1 Kings vi. 7: "And the house, when it was in building, was built of stone made ready at the quarry: and there was neither hammer nor axe nor any tool of iron heard in the house, while it was in building [4]."

It is true that the Authorized Version renders פְּסִילִים in Judges iii. 19 and 26 by quarries, but this is altered in the Revised Version, and the former rendering is no doubt

[1] *Stones for Buildings and Decoration*, p. 325.

[2] *History of the Jews*, by Professor H. Graetz, vol. I (Philadelphia, The Jewish Publication Society of America, 1891).

[3] 1 Kings v. 17 and 18; cf. also 1 Chron. xxii. 2 and 15.

[4] The Hebrew word translated quarry is מַצֵּבָה.

incorrect; the term apparently means either stone images (its usual use) or localities where there was an especial cult of such images[1].

The passage in Kings, just cited, is fully explained by the situation of the quarry and the undoubted fact that the stones were quarried underground. The sound of the tool could certainly not be heard on the Temple Hill from the underground chambers at the Damascus Gate, and probably not in any part of the City.

It might seem at first sight that the underground quarrying by wedges or fire would offer an explanation of the statement concerning the stones to be used for the altar. In Exod. xx. 25 (R.V.), we read, "And if thou make me an altar of stone, thou shalt not build it of hewn stones: for if thou lift up thy tool upon it, thou hast polluted it."

Further considerations, however, show that this is not possible, and indicate that the stones referred to must have been boulders. This view is amply confirmed by an historical account in the Talmud, kindly pointed out by Mr. S. Schechter, of Cambridge.

In tract Midoth 36 a, it is stated that the stones for the altar were from the valley of Beth-Kerem, that they dug down to the virgin soil (or unbroken ground), and that they were perfect stones not touched by iron.

The Beth-Kerem (house of the vineyard) mentioned here does not seem to have been identified by the geographers. One naturally thinks of the passage in Jer. vi. 1, "Raise up a signal on Beth-hakerem" (cf. also Neh. iii. 14). This place is usually identified with the so-called Frank mountain near Jerusalem, but it is more likely that it is the same as the modern Ain Karem (spring of the vineyard). On the ridge above Ain Karem are cairns which may have been used as beacons of old. One is 40 feet high and

[1] The authority of the Targum is, however, in favour of quarries; still as it refers to a place in the neighbourhood of Gilgal, it is not especially significant in the present connexion. The verb פסל in a number of Targumic passages means to quarry.

130 feet in diameter, with a flat top measuring 40 feet across [1].

The late Professor Robertson Smith fully demonstrated the significance of cairns in connexion with the altar among Syrian tribes[2], while in America some of the North Coast Indians set up cairns in place of the ordinary totem-posts.

CYRUS ADLER.

[1] *Quarterly Statement Palestine Exploration Fund*, 1881, p. 271 ; *Palestine*, by Rev. Archibald Henderson, Edinburgh, 1893, p. 190.

[2] *Fundamental Institutes of Semitic Religions*, pp. 183 and 185 ff.