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PLATE I.

THE WELL ROOM.



Photos. Amos & Amos, Dover.

PLATE II.

THE RECESS IN THE WELL ROOM.

Showing the holes which led to the discovery of the pipes.

THE NORMAN WATERWORKS IN THE KEEP OF DOVER CASTLE.

Based on the Report of

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and on Notes supplied by

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In the wall between the upper landing of the Grand Staircase and the Banqueting Hall of the Keep of Dover Castle there is a room (Plate I), measuring $16 \times 8\frac{1}{2}$ feet, the well in which has long been known as "Harold's Well." It is alleged to be the well that Harold swore to give up with the Castle to William of Normandy, and has been the subject of numerous other traditions, one of the most popular of which was that various underground passages led from it to distant places. It has also been called a "bolt-hole" for a beleaguered garrison, or a means of getting provisions secretly into the castle. It is at any rate likely that it dated from Saxon times, and that the builders of the Norman keep, which was raised in 1181 on the foundations of a Saxon predecessor, carried up the steening of the well to its present elevation, 41 feet above the ground level. It was used as a rubbish dump by the French Prisoners of War in the early years of the eighteenth century, after which it appears to have been sealed up with a brick superstructure. This was removed in 1811, when iron bars were placed over the top but there is no record of its having been surveyed or explored until now. The exploration has now been undertaken, having been strongly urged by Prof. Sir Charles Oman during the visit of the Royal Archæological Institute in 1929.

In this neighbourhood, natural springs flow out of the chalk cliffs into the sea at mean tide level, 400 feet below

the foot of the Castle, and a well would have to be sunk to that depth. Soundings showed that the present depth is 272 feet, and as the top is 41 feet above ground level there is apparently no less than 169 feet of rubbish. Some 30,000 people visit the Castle annually, and have done so for a good many years past, and a good deal of the rubbish must be the stones and remains of burnt oily rags, which the guide usually throws down to show them its depth.

Tests for the purity of the air at the bottom, by means of a lighted candle and white mice, being satisfactory in the opinion of a medical expert, Mr. S. A. Payn, of Dover, volunteered to descend the well at his own risk, and a proper well lowering outfit was hired. The descent took place on Sunday, 26th January, 1930, at 11.0 a.m., in the presence of Major Macpherson, a medical expert and one or two local antiquaries. The first descent was made to 172 feet, and Mr. Payn reported that the well kept a uniform width of 3 feet 3 inches to this depth, the whole of the steening being of Caen stone, beautifully pointed and in excellent condition. All the way down were the usual patlog holes used in the construction of a well, of the conventional wedge shape, 14 inches deep. As the air was none too good at this depth, Mr. Payn came up for a rest. On a second descent he was lowered to within 30 feet of the bottom, that is, to a depth of 242 feet. He reported that below 172 feet the well narrowed by about six inches, not abruptly but in a gentle slope of about 20 inches, thus reaching a diameter of 2 feet 9 inches, and was not lined in any way, but hewn out of the rough chalk and flint. The sides were hard and in good condition and the ancient tool marks were clearly visible. With his electric torch he could see the oily rags at the bottom distinctly. The air was very bad at this depth and he had to be hauled up after a few minutes. He was emphatic that no opening of any sort existed, and that there were no communicating galleries. There were no signs of bucket marks, even on the unfaced lower portion, but this might easily be explained by the fact that the Normans, and the Saxons for that matter, used buckets of raw hide, which would not

mark the walls. There were also other wells in and near the Castle, so that it may not have been frequently used.

Whether the lower portion of the well is of Saxon origin or not, it is difficult to say for certain. There is no masonry, and it is hard to draw any conclusions from rough-hewn chalk. If the Saxon well ended where the Norman steening begins, then there must be 131 feet of built-up soil underneath the present keep, which is admittedly a large amount. At the same time, the amount of soil cast up from the fosses and moats must have been considerable, and may well have been used to heighten the original contours. It is difficult to see why the Norman builders of the well carried the steening so far down, unless it was necessary because it was made-up soil, but further research has shown that the keep is built on the solid chalk. It may be noted that the blocks of Caen stone are of generous proportions and that considerable space would have been required to place them in position.

This interesting investigation was quickly followed up by the discovery of further details of the circulation system. On the 29th January, 1930, the Warder of the Keep happened to be clearing some rubbish away from a small recess (Plate II) in the eastern wall of the well room, originally the outer wall of the keep. The recess is about 3 feet from the lip of the opening of the well and 14 inches above its present top. The Warder noticed two small depressions in the bottom of the recess and, when he had cleaned them out, two circular holes ten inches apart were revealed. A further search brought to light the exposed ends of two lead pipes, $3\frac{1}{2}$ inches in diameter (Plate III), which were slightly flared.¹ At a depth of 4 inches these pipes curved outwards and downwards. Several buckets of water were then poured down each pipe, and a search was made to ascertain if water was appearing in any of the rooms of the Keep. By listening carefully, the trickling of water in the walls was traced to a mural chamber in the N.E. wall, 20 feet below the top of the well. In this room there is a recess in the wall 3 feet deep,

¹ An analysis of the lead showed that it contained three times as much silver as modern commercial lead; while nothing conclusive can be drawn from this, it is certainly evidence of its antiquity.

2½ feet wide and 4½ feet high, and the water was observed to be flowing out of a small lead pipe in one of the sides. This pipe was of one inch (internal) diameter, and the lead was ¼ inch thick and finished flush with the Norman wall. The lead pipe at the intake end, which Mr. Amos calls the left-hand pipe, was ½ inch thick and, as stated, flared to 3½ inches diameter, but quickly narrowed below.

Further traces of water were discovered on the same level, in a room under the Banqueting Hall, seeping through some stone steps. These steps are clearly not Norman, and were probably built over the original steps in 1700, when a good deal of reconstruction was carried out in order to house the French Prisoners of War, whose names and other inscriptions are carved all around the walls. By pouring water first into one hole at the well head and then into the other, their respective exits were linked up.

Part of these steps were removed and, as expected, the severed ends of a lead pipe were exposed (Plate IV). The piping was round in section, about 3½ inches in diameter and varying in thickness from ¼ to ⅝ inch, and lay in a conduit about a foot square. The seaming of the pipe lay uppermost and appears to be a simple butt-ended joint, over which molten lead was poured and roughly wiped. In view of the comparative weakness of construction, the wisdom of laying them for protection in a conduit is obvious. The conduit had a layer of mortar to bed the pipe on, which indicates that it is contemporary with the wall, and that the pipe was laid before the conduit was arched over—i.e. in 1181. The pipe apparently crossed the line of steps in a downward direction at an angle of about 60°. In order to get further indication of its general run, a drain cleaning rod was inserted for about 20 feet, and it was ascertained that it went downwards underneath the window steps of a basement room, and then outwards, but search at the time failed to reveal the exit. Mr. Amos, however, reports that it has since been found. A fire hose was put down it and turned on for half an hour, delivering about one hundred gallons a minute, and the water was traced to a niche

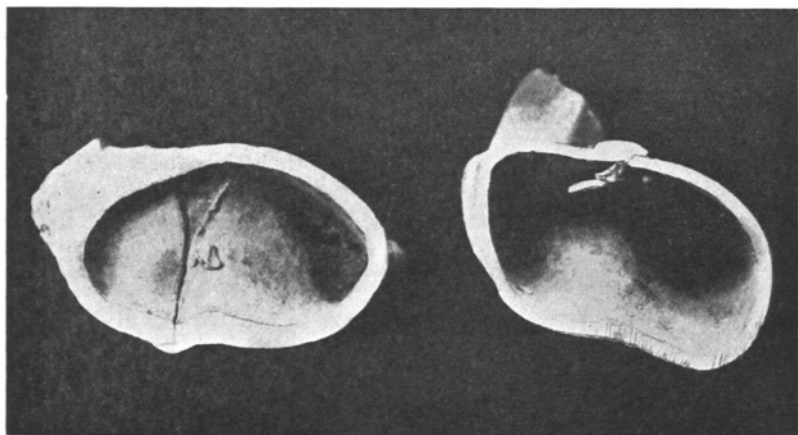


PLATE III. THE FLARED END OF THE LEAD PIPES.



PLATE IV. THE PIPE IN THE CONDUIT UNDER THE STEPS.

Photographs by Amos & Amos, Dover.

near the bottom of the south turret stairs, where there was probably a tap.

It is interesting to note that the intake pipe is $3\frac{1}{2}$ inches in diameter, whereas the outlet in the recess in the mural chamber is only one inch ; moreover only about a third of the water poured into the intake appears in the recess. Probably therefore there is only a branch line to the mural chamber, and the main supply goes elsewhere, possibly to the Constable's Tower, 70 yards away.

Another circular shaft, which has often been referred to as a well, to the right of the top of the staircase, was explored at about the same time. It proved to be only 2 feet deep, and to be lined with Caen stone and to have a floor of 6 inch blocks of the same material. Part of this floor was removed, and underneath was a loose rubbish "fill," with traces of an unlined descending shaft. On removing the exterior face of the wall, Norman jambs were found, indicating an earlier opening from this shaft. It seems unlikely that this has anything to do with the main water system ; it was probably a "garde-robe" shaft, afterwards converted into a tank, perhaps as a reservoir for drinking water for the men-at-arms.

The publication in *The Times* of a brief report of these discoveries elicited a letter (21st March, 1930) from Mr. T. Wake, of the Castle at Newcastle on-Tyne, calling attention to a remarkably similar system there, where the Keep was completed in 1177, four years earlier than Dover's, by the same engineer, whose name was Maurice. He writes : "The well-chamber at Newcastle is in the north-east angle of the building, and is entered from the great hall, which is on the third storey. The well is 99 feet deep, and has a depth of water of 46 feet. On both the outer and the inner walls of the chamber, near the top of the wall, is a recess hollowed in the form of a bowl, and with a lead pipe to carry the water to the rooms below. Water poured into these recesses found its way to a tank over the outer stairs, probably to supply the kitchens, and from the centre pier of the ground-floor chamber. It is possible that further investigations may

reveal other outlets which have become choked or covered over."

Similar water systems existed in other mediæval castles, notably Carnarvon and Goodrich, but these are of rather later date. Of greater relevance is the famous system of the Monastery of Christ Church, Canterbury, known in detail from the contemporary drawing (1165) and so admirably explained by Willis in *Archæologia Cantiana*, Vol. VII. It is impossible to resist the conclusion that Maurice must have been influenced, if not at Newcastle then at least at Dover, by this magnificent installation of twenty years earlier.