Air Photography in Archæology

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different parts of the world from 40 feet to less than 4 feet ; so that an error would not matter as much in the one case as in the other. I take it it is really the percentage one has to work upon. The passage over a sandbank at the very moment of high tide to escape a submarine reminds me of a piece of navigation I witnessed in one of the Norwegian fiords. The vessel was a 10,000-ton steamer, and the pilot knew his depth of water so exactly that he ventured to take us across a bank, knowing that we should touch pretty heavily. He knew by the rocks on either side the depth of water within half an inch, and the problem was different to what you get in the open sea. The vessel touched so heavily as to set everything rolling, but we slid over the sandbank.

Mr. HINKS : Is the Favé tide gauge one that pumps out compressed air ?

Commander WARBURG : No. We used that at one time. It was a German invention, and I do not think there is any doubt that it will be given up in favour of the Favé, which does not require a ship to remain at anchor. We have the Favé working in the Channel at the present moment. It is practically the same in principle as the barograph. It is enclosed in a steel case and lowered to the bottom, and simply registers changes in pressure. It has to be buoyed.

The CHAIRMAN : It only remains for me to ask you to pass a vote of thanks to Commander Warburg for his paper.

AIR PHOTOGRAPHY IN ARCHÆOLOGY

Lieut.-Colonel G. A. Beazeley, R.E., Survey of India

SURVEYS of areas for archæological research can in the future be greatly assisted by air photography, and I give a few interesting examples that I came across in connection with my survey work in Mesopotamia. When it was decided to carry out a 6-inch survey of the area round Samarra, Colonel Gunter, R.E., in charge of mapping G.H.Q., recommended the following procedure : first to photograph the whole area from the air ; then to reproduce 6-inch scale blue prints, transfer them to the plane-table ; and carry out supplementary ground survey. This was carried out, with the result that the remains of an ancient city were disclosed which would not otherwise have been discovered, in all probability. It was some 20 miles long and anything up to 2½ miles in width, and must have supported a population of about four millions.

The city was well planned, with wide main streets or boulevards, from which wide roads branched off, so that chariots could pass each other everywhere. Fig. 1 is a small section of the northern part of the city, in plan very like a modern American city ; and Fig. 2 shows the central portion with its public gardens in the form of four double circles tangential to each other, with a fine pavilion in the centre.

Had I not been in possession of these air photographs the city would probably have been merely shown by meaningless low mounds scattered here and there, for much of the detail was not recognizable on the ground

but was well shown up in the photographs, as the slight difference in the colour of the soil came out with marked effect on the sensitive film, and the larger properties of the nobles and rich merchants could be plainly made out along the banks of the Tigris.

The epoch at which the city was built was still in doubt when I was in Mesopotamia, but from the remains discovered, such as gold coins

The ruined city on the Tigris around Samarra

and ornaments, pottery and "tear" bottles, it appears to have been before the birth of Christ, and may quite possibly have been passed by Xenophon in his retreat.

When riding as a passenger in an aeroplane *en route* for survey over enemy territory, I could clearly see on the desert area the outline of a series of detached forts shaped as in Fig. 3, whereas when walking over

Fig. 1.—Ruined City of Eski Baghdad: part of the northern quarter

Fig. 2.—Central quarter of the City with Public Gardens

them on the ground no trace was visible. Another interesting thing I could plainly see in my flights was the outline of an ancient scientific irrigation system, such as has been introduced in the Punjab only in com-

Fig. 3.—Plan of detached forts

Fig. 4.—Plan of ancient irrigation system

paratively recent years. Unfortunately I was shot down and captured before being able to make a detailed survey of the system during a lull in the military operations; but on the sketch from memory in Fig. 4 the general scheme is clearly shown. We have first of all the main canal

AA running along the highest ridge of the plain, and its main distributaries B, B running down the spurs. From these the smaller distributaries C, C, C branched off, and from them the irrigation cuts ran. Lastly come the small field cuts. All surplus water was led off along the depressions F, F and back to the canals again, so that there was no waste of water. Each tiller of the soil had his own field channel and nobody could rob him of his water. One could plainly see the main through route I I passing through the site of a village H and over the main canal by a

Fig. 5.—Regulator of the Nahrwan Canal

bridge G. I had the good fortune to go over the same ground in an armoured car and came across bricks at G, showing plainly that there had been a bridge there.

Fig. 5 shows one of the main regulators on the ancient Nahrwan canal. I just had time to survey and examine this personally before I was called off for duty elsewhere. I found there the remains of brick sluices and regulators, showing clearly that every channel had its regulator to control the supply. The Arabs had destroyed the masonry and carried the stones and bricks away.