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HYDROGRAPHY OF THE NILE.

SIR WILLIAM GARSTIN'S Report* on the Basin of the Upper Nile, which supplements, and in part supersedes, his previous Report—Egypt (No. 2), 1901—is perhaps the most sumptuous and attractive Blue Book ever issued from the Foreign Office, and is a highly creditable production of the Egyptian Ministry of Public Works. Invaluable to geographers, it constitutes the standard work on the hydrology of the Nile, whilst the chapter on river-discharges contains fuller information on this subject than has ever before been published. These Reports cover five years' consecutive observations on the Bahr el-Gebel; and although there are no levelled altitudes between the Victoria Nyanza and Khartum (the Upper Nile basin, properly so called, or region of tributaries, all of which are included with the exception of the Atbara, which is not a permanent stream), the barometric and hypsometric observations furnish an approximate determination of the relief of the country. Incidentally, a good deal of geographical information is admirably summarized, the most recent reports having been collated with the observations of the pioneer travellers—particularly with those of Dr. R. W. Felkin, whose work has not previously been adequately recognized. There is, however, the usual inconsistencies in the spelling of place-names; and this is to be regretted, no less than the absence of an index.

In regard to purely geographical questions, it is interesting to note that Sir William Garstin recognizes the river Kagera as the real source-stream of the Nile, if any of the feeders of the Victoria Nyanza be selected as such, but rightly insists that the lake-reservoir itself is the true source. As to whether the shrinkage of the Victoria Nyanza be due to natural causes (as in the Albertine lakes) or to a diminished rainfall, Sir William leaves this as more or less an open question, but hazards the suggestion that, if there be a permanent fall in the lake-level, "it can only be accounted for, either by a general reduction in the annual rainfall, or by a lowering of the bar at the Ripon Falls," although "a careful examination of the last-named site showed no sign of any degradation of this ridge" (p. 28). In fact, the water-action on this hard and compact barrier is very slow, and can in no wise account for the shrinkage of the lake within the last twenty to thirty years. "It is difficult, then," says Sir William Garstin, "not to arrive at the conclusion that this fall is not a permanent one, and will, should another period of heavy rainfall set in, disappear, and the lake rise to its former level" (p. 28). The maximum annual oscillation of the lake is from 1 to 3 feet.

The most interesting section of the Report, to which the reader will naturally turn first, is that dealing with irrigational projects in the basin of the Upper Nile, together with Mr. Dupuis' Report on Lake Tsana and the rivers of the Eastern Sudan. The observations of the pioneer travellers, even when collated by an hydraulic engineer, were, and are, wholly inadequate to throw light on the important question of the relations between the Equatorial lakes and the volume of the Upper Nile; but the systematic observations made since 1900–1901 have materially added to our knowledge of the hydrology of the river.

"The problems to be investigated," says Sir William Garstin, "have two main objects, namely, that of increasing the water-supply of Egypt in the summer, and

* 'Report upon the Basin of the Upper Nile, with proposals for the improvement of that river.' By Sir William Garstin, G.C.M.G., Under-Secretary of State for Public Works in Egypt. With Illustrations, Appendices, and Maps. Cairo: National Printing Department. 1904. [Issued also as a Blue Book: Egypt, No. 2, 1904.]

that of securing similar advantages to the Sudan during the same period. . . . The best way in which to secure the results aimed at would appear to be to reserve the waters of the Blue Nile for the improvement of the countries bordering that river, while Egypt and the area of the Nile lying to the north of Khartum shall derive their summer supply from the sister river" (p. 172). In the two months of low discharge, the Nile reservoirs are the sole sources of supply. "The objection to any proposals for augmenting the discharge from the Equatorial lakes is that, under present conditions, the increased volume would never reach the White Nile, but would be entirely wasted in the marshes through which the Bahr el-Gebel passes . . . Barely 50 per cent. of the water which now leaves the Albert lake in summer ever arrives at the White Nile, while in the flood the proportion of loss is very much greater. . . . Until, then, some means have been found whereby the water passing Lado during the dry season of the year can be brought down to Khartum in undiminished volume, it is needless to consider the question of any regulation of the Albert and the Victoria lakes" (p. 174). Thus it will be seen that it is important to preserve the regulating power of the marshes (Bahr el-Gebel) for the flood water, and at the same time to find some means of preventing the present wastage in the river during the dry season. It is therefore proposed, as an ideal of perfection, to construct an entirely new channel for the Bahr el-Gebel, which, if the levels and the country permit, would improve the river to a much greater extent than merely remodelling one or other of the existing channels. This artificial channel would not be much larger than one of the great canals in Egypt; and it would, if feasible, follow a north-and-south alignment from Bor to the Sobat confluence—a distance of 340 kilometres. Although the Bahr el-Zaraf (650 kilometres) is a better channel than that of the Bahr el-Gebel (710 kilometres) for delivering the summer supply, the direct route would be by far the best, and, in spite of the greater cost, it would be easier and quicker to construct, besides being a boon to navigation (unless the slope be too great) and cheaper to maintain. Moreover, it would be the true complement of the lake-reservoirs scheme.

The best site for a regulator to the Albert lake is at the fifteenth kilometre downstream of the outlet, where high land borders the river-channel on both sides; and the natural site for a regulating work at the outlet of the Victoria lake is, of course, at the Ripon Falls. Apart from remoteness and consequent cost, there would be no difficulty in constructing either of these works, the engineering obstacles being less than at Aswan. It is interesting, too, in this connection to note that Sir William Garstin endorses Sir W. Willcocks' suggestion, that the best plan would be to cut down or lower the crest of the Ripon Falls instead of attempting to raise the lake-surface; but, he adds, this would involve embanking the river (*thalweg*) in its course through Lake Chogo (80 kilometres). On the other hand, the effect of closing the Ripon Falls by a regulator, and thus possibly raising the level of the lake, would be that the supply would be entirely cut off during at least three years, which, it is estimated, would be needful to raise the lake-level by one metre.

The ideal project of constructing a regulator at the outlet of Lake Tsana, whereby this lake would be converted into a storage reservoir of adequate capacity, must be dismissed for political reasons. If this natural reservoir could be used, it would be necessary only to construct a system of weirs in the river-bed of the Blue Nile between Rosaires and Khartum, with canals taking off above them on either side, in order to ensure the water-supply for *Seft* cultivation in the Ghezira and Eastern provinces. Outside of Abyssinian territory, a site might be found between Famaka and Rosaires for a dam and reservoir of moderate storage capacity, which would supplement the winter-supply in the Blue Nile. During the winter months the

supply of water for Egypt is ample, and the Blue Nile could be safely drawn upon for local needs. The construction of a reservoir, though of limited storage capacity, south of Rosaires, would materially assist in augmenting the winter discharge of the Blue Nile; and a beginning might be made in the irrigation of the northern portion of the Ghezira, particularly to the north of Wad Medani. But the projects of constructing a barrage on the Blue Nile, for controlling the river Gash, and for obtaining additional supplies from the rivers Dinder, Rahad, Settit, and Atbara, have yet to be studied, and a series of levels run, before any definite schemes can be formulated.

In Appendix I. Sir William Garstin enumerates the following works, which deserve special attention :—

- (1) The remodelling of the Bahr el-Gebel.
- (2) The construction of a barrage in the Blue Nile.
- (3) A canal system in the Ghezira in connection with this barrage.
- (4) The regulation of the river Gash.
- (5) The construction of a storage reservoir somewhere in Sudan territory, south of Rosaires.
- (6) The regulation of the Victoria and Albert lakes.

"Of these," he says, "the first and last will be undertaken more in the interests of Egypt than of the Sudan, except as regards the Nile valley north of Khartum. The others are designed for the benefit of the Sudan alone." From Khartum to Berber the conditions are quite different to those on the Blue Nile, and resemble those of Upper Egypt and Dongola. In regard to Egypt, more particularly, none of these schemes are of extreme urgency except the provision of escape power for the Nile during an exceptional flood. Sir William Willcocks' suggestions and proposals in this respect are dealt with in Appendix I. under the following heads: (1) the raising of the Aswan dam; (2) the utilization of the Wadi Rayan depression as a secondary reservoir; and (3) the remodelling of the Rosetta branch of the Nile. The combination of the first two schemes, making the one the complement of the other, is an entirely novel idea, and a striking instance of the high capacity of its author; but space precludes our dealing with these technical matters, as well as with the indeterminable question of cost.

A. S. W.

THE FRENCH CONQUEST OF THE CANARIES IN 1402-6, AND THE AUTHORITY FOR THE SAME.

By C. RAYMOND BEAZLEY, M.A.

THE French conquest of the Canaries, at the beginning of the fifteenth century, that first chapter of modern colonial history, has long been considered to rest upon an authority ('Le Canarien') of exceptional value, being not only a contemporary witness, but written by men who were present at, and took part in, the events here recorded with such a wealth of life-like and picturesque detail. And in many respects this view is correct enough. For the *Livre de la Conquête et Conversion des Canariens . . . en 1402 . . . par Jean de Béthencourt . . . composé par Pierre Bontier* (sic), *moine de St. Jouin de Marnes, el Jehan le Verrier, prestre séculier, chapelains du dix seigneur*, printed by Pierre Bergeron in 1630, collated by d'Avezac with the Mont Ruffet manuscript of c. A.D. 1482 (from which Bergeron seems to have worked, and which Charton used for his 'Voyageurs anciens et modernes' of 1855), is, after all, one form of the original record of this Norman conquest in the Atlantic. It is also, combined with the results of d'Avezac's collation of the