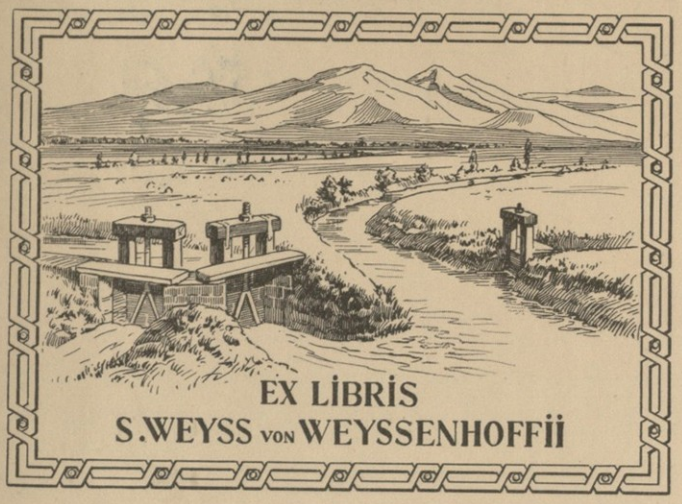
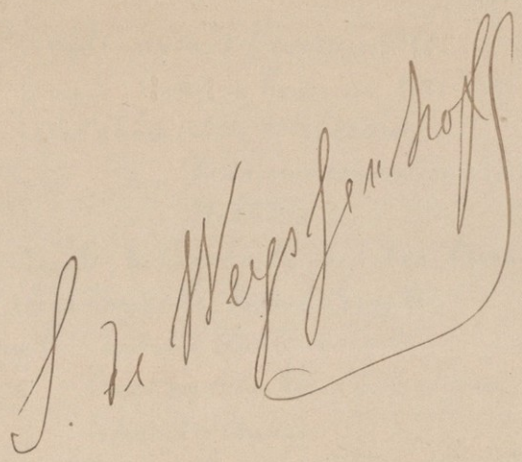
Les irrigations en Égypte

Documents.

1

1885





Les irrigations en Egypte.

Documents.

1885-a

Table des Matières.

1885.

Provinces	Ingenieurs en Chefs			Ingenieurs adjoints				Totaux
	1re Classe	2e Classe	3e Classe	1 Classe	2 Classe	3 Classe	4 Classe	
	360	300	240	180	144	108	60 à 96	
1ère Inspection				1			2 = 96	372
Galioubiah		1			3	1	1 = "	936
Charkieh		1		1	3	3	1 = "	1332
Dakahlieh		1		2	2	2	2 = "	1356
Canal Ismailia	1			3		1	2 = "	1200
2e Inspection				2		1	1 = 96	564
Menoufieh	1				5	2	(2=96)(1=72)	1560
Gharbieh		1	1	2	4	4	3=96 (1=84)	2280
3e Inspection				2			3=96 (1=72)	720
Beheira Mahmoodia		1		2	4	4	....	1668
Gizeh			1		2	2	....	744
Fayoum			1		1	3	....	708
4 Inspection				1		1	....	288
Beny Souef			1		2	2	1=96 „ 1=60	900
Minieh			1	1	2	2	....	924
Assiout	1			4	4	3	4=96 „ 1=60	2424
Girgeh		1			2	3	1=96	1008
5e Inspection				1	1			324
Keneh		1		1	2	2	1=96	1080
Esnah			1	1	2		1=96 „ 1=72	876
	3	7	6	24	39	36	31	
	1080	2100	1440	4320	5616	3888	2820	21264

5 Inspecteurs à 1000 fr.

Report on the Remodelling of the Nile Barrages

by

the Inspector of Irrigation 2nd Circle.

Report on the remodelling of the Nile Barrages.

1. The Nile Barrages. The Nile Barrages are open dams thrown across the heads of the Rosetta & Damietta branches of the Nile at the apex of the delta. The Rosetta barrage is 438 metres between the flanks, & the Damietta 518 metres. They are separated by a revetment wall 1000 metres in length, in the middle of which is situated the head of the Delta Canal.

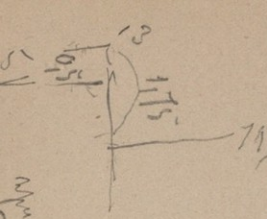
2. The Rosetta Barrage. The Rosetta Barrage is pierced by 61 openings of 5 metres each, a 12 metre lock on the left flank, & a 15 metre one on the right. Of the piers between the openings, 57 are 2 metres broad while 3 are 3.50 metres each, their height is 8.50 metres they support arches carrying a roadway and a system of fortifications. The two locks are provided with draw-bridges and fortifications. The barrage platform is flush with the river's bed. Its transberse width is 46 metres, of this measurement the upper 34 metres is 3½ metres deep & composed of concrete overlaid with brick on edge; the lower 12 metres is 3 metres deep & composed of concrete & rubble. Downstream of the platform is a talus of rubble varying from 50 to 10 metres in width & from 15 to 2 in depth. The platform of the left lock & 35 adjacent openings is built on loose sand; that of the right lock and 26 adjacent openings on a barrier of rubble pitching overlying the sand. This stone barrier is about 10 metres deep & 60 metres wide at the deepest part, tapering off to zero at the ends. It closes the original deep channel of the river, and as the stones composing it are cemented together with fine Nile deposits, it is now perfectly watertight.

20 [illegible]

The concrete of the platform is generally in [illegible] while that in the 10 openings from 49 to 59 (from the right) is bad. The floor here has settled some 10 centimetres & produced a decided deflexion in the superstructure both horizontally & vertically - These two openings are protected by a double row of wooden coffer-dams filled with rubble, each 5 metres high & 2 metres broad - Of the 61 openings, 47 are regulated by means of iron gates 5 metres broad & 6 meters high, worked by powerful crabs - The remaining 14 openings are regulated by vertical wooden needles resting against horizontal timbers - The iron gates and wooden needles do not reach the floor of the barrage, they rest on iron gratings 30 centimetres high, fixed into the piers just above the platform - These gratings allow of a free passage of the water when the gates are down - It is currently reported that men have passed through the foundations of the barrage; it would be more correct to say that they have been drawn through these iron gratings -

3- The Damietta Barrage - The Damietta Barrage has 10 openings of 5 metres each more than the Rosetta - The platform is similar to that of the other barrage. There is no talus beyond what has been put in this year - No records exist of the exact state of the foundations, but Mougel Bey, the builder, states that the work here is superior to that in the other barrage - All the openings are regulated by wooden needles resting against horizontal timbers The 15 metres lock is unprovided with gates -

4- Regulation previous to 1884 - Previous to 1884 the Barrages were regulated in the following manner - When the gauge stood at 12.50 metres, which happened generally in March, the Rosetta Barrage gates & needles were lowered to their full extent - This raised the upstream gauge



to 13.00, while the downstream one fell to 11.25. So that with a difference in water surface of 1.75 metres (13.00 – 11.25) there was a gain of only 0,50 metres (13.00 – 12.50) - This was due to the fact that the Damietta barrage remained open - Of the supply which escaped through the Rosetta barrage, nearly the whole found its way through the gratings - These gratings with a head of 1.75 metres are capable of discharging 200 cubic metres per second - The river kept falling through April, May & June, and during the whole of this time the Damietta barrage was open as well as the gratings of the other barrage. There was not enough of water in the river to allow of a 1.75 metres head on the latter, & it fell to 1.00 or 1.20 metres. Towards the end of June the up & downstream gauges were roughly 11.90 and 10.75 metres. When the Nile began to rise in July and the upstream gauge read 13.00, the gates were raised as quickly as possible and regulation for the year was at an end. If the Rosetta barrage had failed in June the loss of head in the river would have been 30 centimetres -

5- Regulation during 1884-

After an inspection of the Barrages during January, and a comparison of previous gauges, it was determined to maintain a gauge of 13.00 metres above the Barrages. About the end of January the River fell to this gauge. From this date the gates were gladually and uniformly lowered in the Rosetta barrage so as to maintain a gauge of 13.00 - When the gates reached the gratings, the gratings themselves were closed - Eventually the up & downstream gauges stood at 12.91 and 10.71 metres. The Damietta barrage was closed in May, & its gauges read 12.92 and 11.99 metres; it was not closed any further as there are a number of canal heads in this branch of the Nile, below the barrage - On the 7th of July

the Nile began to rise, on the 13th the Damietta Barrage was opened & the Rosetta between the 18th & 20th. The broad result of the year's working was that about 1 metre more water was held up during May & June than had been previously held up for a corresponding discharge. About 12.000 cubic metres of pitching were utilised to strengthen the talus. There was one accident per week to the regulating apparatus, which needs complete renewal. There was no accident to the foundation, as all serious cracks in the superstructure were filled with Portland cement, examined weekly & showed no traces of settlement.

6. River training. The training of the river on to the Barrages is a delicate and difficult operation for the Nile has abandoned the old channel of the Damietta branch and scoured out a new one, which acts simply as a spill channel to the Rosetta branch. A plan of the River has been made and compared with similar plans made 24 & 9 years ago. There has been a very considerable change for the worse. After a careful examination of the River during flood, it has been decided to open up again the old head of the Damietta branch. This head is being widened & deepened considerably, while massive stone spurs and a long line of sunken trees & crib bars is being thrown across the existing deep channel of the Rosetta branch. Above this again training works are in hand to throw the main current on to the apex of the Delta. These operations are as necessary as the strengthening of the barrages, for discharges & velocity observations have disclosed that the Damietta branch, in which are situated most of the Canal Heads in the Delta, carries 1/6 less than half the water of the Rosetta branch, while its bed has silted up some 2 metres

above its floor. In addition to this, it has been found that the water surface of the Damietta branch below the barrages is 75 centimetres higher than that in the other branch, in spite of the channel being equally wide, & the other having more than twice the wat The flood velocities, also, along the entire reach below the Damietta barrage are 60 centimetres per second against a velocity varying from 1 metre to 75 centimetres in the other branch. Sixty centimetres per second is not a sufficient velocity to prevent mud deposits in a river like the Nile during flood; these deposits therefore are being steadily increased, &, if something is not done promptly, Sir Charles Hartley's prophecy of 1877 about the Damietta branch silting up altogether will certainly be fulfilled.

The first step towards remedying these defects has been taken in a determined effort to force the Nile to leave the left bank and come straight on to the apex; while the next step of closing part of the Damietta branch, except as a flood spill channel & compelling the confined water to scour out a deep channel in the remaining part will be put in hand as soon as the talus is completed sufficiently to secure the platform.

7. Causes of the partial failure of the Barrage.

The Barrages were designed to hold up 4.50 metres of water & maintain a gauge of 14.00 metres during the Summer. In their present condition they can be strengthened & made to hold up 2.50 metres i.e a 13.00 metre gauge; beyond this is unsafe because the platform is in parts only 3 metres deep, with a submerged weight equal to that of a similar height of water. The causes which have led to this partial failure are detailed below:-

(1) The depth of foundation is insufficient by 1.50 if it is intended to hold up 4.50 metres of water.

(2) The platform under 10 openings in the Rosetta barrage where Mougel Bey was compelled to hurry the work, is very weak, & the floor here has sunk 10 centimetres while the piers & arches have been badly cracked.

(3) The piers have been carried up above maximum summer level and thus needlessly contract the flood water of the river. This is far more serious than what it seems at first sight, because all the damage done to the Rosetta barrage has occurred during floods, owing to unnecessary contraction of waterway unaccompanied with massive foundations.

(4) Along the whole of the Damietta barrage, and along half the Rosetta barrage there is no talus I speak of.

(5) The openings are 5 metres wide & unprovided with safety grooves. Their great size renders them unmanageable.

(6) The regulating apparatus of the Rosetta barrage closes the openings from above & forces the water along the floor with dangerous velocity.

8. Project for remodelling the Barrages.

Barrages, generally speaking, may be of two kinds:- (1)- with deep narrow sections, & (2)- with broad shallow ones. Both are equally efficient. The section itself is determined by the quantity and value of the material available. Where rubble is plentiful & cheap the 2nd form is the more economical & therefore the better. As there is an unlimited supply of good cheap rubble available at the barrages, the 2nd form naturally suggests itself, and is the one recommended for adoption.

9- Remodelling the Rosetta Barrage.

It is proposed to remodel the Rosetta Barrage as follows:-

(1)- Remove all the unnecessary parts of the works which contract the waterway during flood, i.e. everything above R.L 14.00 metres, except the Lock walls which are needed for flood navigation. By this means we shall gain 436 square metres of waterway when the flood level is 17.50 metres & 561 square metres when the flood level is 18.50 metres- It is only when the floods are between 17.50 & 18.50 metres that there is any danger to the Nile Embankments-

(2)- The R.Ls. of the existing barrage openings are 8.30- 8.80- 9.00- 10.60 and 13.20 metres. Raise the floor uniformly to R.L. 10.00 metres with good Portland Cement concrete and thus obtain the necessary depth of platform to hold up 4.50 metres of water. The waterway in high floods will not be affected as there will be 2933 and 3390 square metres at flood levels of 17.50 & 18.50 metres respectively, against existing waterways of 2759 & 3192 square metres. The fact that the talus will be raised in the new remodelling & so contract the waterway of the "take off" from 4600 square metres to 4160 square metres will be counterbalanced by the flood water passing over the platform in one sheet 4.5 metres above the tops of the piers, instead of, as at present, divided into 61 shoots with friction at every pier.

As the highest flood discharge of the Nile at Cairo is 9750 cubic metres per second, the Rosetta branch may be credited with 6500 cubic metres per second or $\frac{2}{3}$ the supply- The waterway over the platform is 3390 square metres, and over the talus 4160 square metres. The maximum velocities therefore over the platform & talus will be 1.90 and 1.60 metres per second respectively. Rubble pitching can stand, with safety, a

velocity of 2.25 metres per second, which will give a discharge of 9360 cubic metres per second in the Rosetta branch -

(3) - Remove the present regulating apparatus & supply its place with wooden verticals resting against horizontal girders. This latter system is a perfect one where the rise & fall of the river is as gentle as it is in the Nile. The vertical timbers divide the stream into a number of films, which reach the downstream floor deprived of all scouring power -

(4) - Make the rubble talus everywhere 60 metres broad & 3 metres deep -

The cost of the above will be as follows: -

(1) & (4) Removing superstructure & laying it down as talus 28.000 cubic metres @ 40 P.T.	P.T. 1.120.000	
Large blocks for talus 20.000 @ 50 "	1.000.000	
(2) - Raising floor with cement concrete within cofferdams 8.200 cubic metres @ 500/-	4.000.000	
(3) - New regulating apparatus 400 girders @ 500/-	200.000	
Total P.T:		6.420.000
Contingencies 10/0		642.000
Grand Total P.T.		7.062.000.

A good ferry boat will supply the place of the bridge without inconvenience, as the traffic is inconsiderable compared with Mansurah, Zifta, & a hundred other places where ferries exist at present. The proposal to take a railway over the barrage is untenable as 10 of the arches are mere wrecks, there being cracks of 10 centimetres in the piers; while on any ground it would not be advisable to run trains across a work of this kind, strained severely with water pressure & in consequence requiring perfect quiet in the foundations, since the opening out of the smallest cracks might subject the floor to dangerous hydraulic forces -

10. Remodelling the Damietta Barrage -

The Damietta Barrage should have its floor raised to 10.00 metres along its entire length. The floor has already silted up to this height, as there is more water than what is required it will not be necessary to remove the superstructure, though advisable in order to give a free passage to the high floods which will help to scour out the bed. It should be supplied with a talus of pitching similar to that of the other barrage.

The cost of the above will be as follows :-

(1)- Removing superstructure	30.000 à 40 f	P: 1.200.00
Large blocks of talus	20.000 à 50 f	" 1.000.00
(2)- Raising floor with concrete	9000 à 50 f	" 4.500.00
(3)- Regulating apparatus exist		
Total P.E.		6.700.000
Contingencies à 10 f		670.000
Grand Total P.E.		7.370.00

Total Rosetta Barrage £: 70.620
" Damietta -"- " 73.700
Total £: 144.320 - Cost of both Barrages

11. Alternative Project for the Damietta Barrage.

The completion of the present Damietta Barrage would necessitate the connexion of the Canals taking out of the Damietta branch with the heads above the Barrage. This could not be done under a sum of £ 400.000 - It would therefore be advisable to build a new subsidiary barrage near Benha & utilise the existing Canals. In this case the present barrage would hold up 2 metres of water & the Benha 3½ metres. The latter would cost £: 185.000 - It proposed to construct it as follows :-

The barrage will be an open dam 457 metres between the flanks. It will be pierced by a 12 metres bays, 8 openings of 3 metres and a flood spill channel 100 metres long - The piers will be 1.25 metres broad & 4.50 metres

The tops of the piers will coincide with the [illegible] the spill channel, which will be the level of the water held up during the summer. The platform of the Barrage will be flash with the river's bed. It will be 10 metres wide and 3.50 metres deep composed of cement concrete overlaid with brick masonry. The piers masonry generally will consist of bricks laid in cement mortar. Upstream of the platform will be a belt of rubble 10 metres wide & 3.50 metres deep, downstream of the platform will be a talus of rubble 60 metres wide & 3.50 metres deep. The flank walls will rise to a height of 2 metres above high flood mark. The lock will be 80 metres long & 12 metres wide. The regulation of the barrage will be performed by vertical wooden needles resting against horizontal girders.

By completing the talus in one year, all chance of scour will be prevented, as the present deep channel of the river at the barrage site is now here below the bed level of the platform.

12. Alternative Project for the Rosetta Barrage.

In case there is a strong prejudice against dismantling the unnecessary parts of the existing barrages, it will be necessary to build a new barrage in the Rosetta branch, similar to the one proposed for the Damietta branch at Benha. The cost will be the same, viz £: 185.000.

Signed: W. Willcocks
Inspector of Irrigation 2nd Circle.
Cairo.