



large circle of friends, was that of a truly humble and consistent Christian, with deep and earnest religious convictions, which dominated his whole life, and which led him always to commit all his undertakings to God, in whom he believed and trusted. Utterly unselfish, and brimful of kindness to others, especially to the many young men who had the privilege of serving under him, ever considerate to the natives of India, who almost worshipped him for his self-denying labour in their behalf, and amongst whom he was known as 'The Sanyassee,' or devotee, he gained an influence over those brought in contact with him, which, with many, remained throughout their after life."

One stormy afternoon, when my father was returning from the beachworks—the wind was so boisterous he could hardly keep his feet—he saw a small native vessel being driven in against the rocks. The men on board were evidently helpless, and already a troop of wreckers had collected, and were watching for their prey. He hurried to the spot, and rushed on board the boat, with his stick driving back the greedy crowd, and defending the master and sailors. The vessel was loaded with cocoanuts, and many of these were stolen, but he managed to stand his ground till his sergeant came up, and the two men cleared the deck and delivered the overpowered crew from their foes. They also saved the little hoard of money, about two hundred rupees, which the wreckers would soon have found. He provided a shelter for them that night, and the next morning they all came up to the house, prostrated themselves and poured out evident thanks in a language which none of us understood.

Of Vizagapatam my father, in later years, at a time when he was planning a large project, nothing less than the making of that port one of the principal entrances to India, wrote thus:—

- 1st. Vizagapatam is the only place on the eastern coast of India, where there is no severe heat.
- 2nd. It has the best climate in India.



- 3rd. It is the natural point of outlet for all Northern India, by a direct railway to Allahabad, making it the cheapest and safest line from England to the North of India.
- 4th. It has *the* point of the eastern coast where, incomparably, the best harbour can be made by a single breakwater run out from the bold promontory of the Dolphin's Nose, south of the town.
- 5th. The adjoining territory provides an exceptional site for a first-class city.
- 6th. The whole tract from Vizagapatam to Ruripoor, three hundred miles, is the most fertile part of India. It rises to two thousand feet, and is suited to every kind of European enterprise—the planting of coffee, sugar, culture of the vine and fruit trees generally.
- 7th. There is hill country with a temperate climate, south of Ruripoor, and also the Central Provinces of India, rising to three thousand feet—a beautiful country, with a temperature down to frost in winter.
- 8th. Water communication can be completed with the Punjab, by the valley of the Ganges and the coast, to Vizagapatam; the same to the great navigations of the delta of the Godavari and Kistna; also to Madras; by the Godavari to Berar, uniting the Punjab, the Upper Brahmaputra, Nagpore, and Madras in a first-class navigation of at least ten thousand miles, providing all North and East India with transit at one-tenth the cost of railways. Three or four thousand miles of these canals are already in operation.
- 9th. The line between Ruripoor and Allahabad passes through a field containing the best coal in India.
- 10th. Inland of the town site is an extensive piece of



alluvial land, level with the sea, which can be cheaply made into an immense inner harbour.

The outer harbour can be formed by blocks of granite of any size, from the Dolphin's Nose, costing nothing but the powder, loading, carriage by boats a few hundred yards, and discharging.

This was a noble scheme. What would have been the result had my father been given a free hand and been backed up at headquarters, especially in the India Office! Arthur Cotton, had he had his own way, would have more than half-regenerated India.

It was while engaged in this reclamatory work at Vizagapatam that he first became acquainted with the great Godavari river, which afterwards was to be the scene of his most toilsome labours, his keenest anxieties, and his grandest success.



GORGE OF THE GODAVARI, LOOKING UP STREAM.



CHAPTER VI

The District of Godavari: Before and After
Arthur Cotton worked his Magical Change*Before*

WHEN Arthur Cotton was sent north to build a church and conserve a shore the Rajahmundry district was in distressful condition. He afterwards made wise use of the river, which ran through it, and, in recognition of what he had done, the district was no longer named after the town of Rajahmundry, but became a river-named region—the Godavari district. This district, whatever its name, contains some of the most beautiful scenery in India. Mr. Henry Morris, of the Madras Civil Service, at one time chief official in the district, writes :—¹

“The gorge through which the Godavari enters the plains forms one of the most beautiful pieces of scenery in Southern India. . . .

“I have seen the gorge at both seasons ; I have looked down on the river from the mountains which overhang it ; and I have passed through the winding stream as the early morning sun gradually lighted up hill after hill, leaving the water in shade, and as the setting sun gradually left the valley in gloom ; and I can confidently assert that I have never witnessed more exquisite scenery even on the Neilgherries or the Shevaroyes. As the steamer glides into the gorge, the low, broken hills, which had previously adorned

¹ *A Descriptive and Historical Account of the Godavari District in the Presidency of Madras*, p. 4. London : Trubner & Co., 1878.



the bank of the river, disappear, and the mountains close up to the water's edge, in one place the two sides approaching each other as near as two hundred yards, and the precipitous banks appearing near enough even to be touched. They then open out, and again approach each other, forming successively beautiful little lakes, resembling Highland lochs, from which there is apparently no outlet. Sir Charles Trevelyan compares the scenery to that of the Rhine between Coblenz and Bingen, but it lacks the signs of human life which adorn, and the historical antiquities which beautify, the European stream."

Mr. Walch, in his most interesting book on *Engineering Works on the Godavari Delta* (p. 1), says:—

"The Godavari takes rank amongst the great rivers of India after the Ganges and the Indus. Rising some seventy miles north-east of Bombay, and only fifty miles from the Arabian Sea, it runs in a generally south-eastern direction across the peninsula, till, after a course of nearly ninety-nine miles, it falls into the Bay of Bengal about two hundred and fifty miles north of Madras. It receives the drainage from one hundred and fifteen thousand square miles, an area greater than that of England and Scotland combined, and its maximum discharge is calculated to be one and a half millions of cubic feet per second, more than two hundred times that of the Thames at Staines, and about three times that of the Nile at Cairo.

"Shortly after, the Godavari begins to wind amongst the spurs of the Eastern Ghats, which gradually close in on it, till it has to force its way through a gorge, which for two miles is so narrow that along the greater part of the distance a stone may be thrown from either bank to the middle of the stream. The hills here rise to a height of between two thousand and three thousand feet with steep, though not precipitous, sides, and are clothed from water's edge to summit with luxuriant tropical vegetation.

"Through this beautiful gorge, the river in its low stages glides with but little disturbance, and is easily navigated even by small boats, but during the floods it foams past



its obstructions with a velocity and turbulence, which no craft that ever floated, could stem. So great is the action of the stream at such times, that the rocky bed has been scoured out to depths, popularly supposed to be unfathomable, but which, as the writer has himself ascertained, do really vary from one hundred to nearly two hundred feet. High floods rise quite fifty feet at the place, so that in the defile there is then a torrent from one hundred and fifty to two hundred and fifty feet in depth. For twenty miles beyond the gorge, the river winds in a succession of lake-like reaches amongst the eastern spurs of the hills, till near the village of Palaveram it emerges into the plains of the Eastern or Coromandel Coast. Small outlying hills, however, occur along its left bank for some twenty-five miles further; the last of these, which lies close to the river, is at Dowlaisweram, where the Godavery has attained a width of nearly four miles. It then divides into two branches and its delta begins.

"In its moderate freshes, the river brings down but little drift; when, however, it swells into a really high flood, its broad surface is plentifully strewn with floating *debris* of all kinds; giants of the forest, which have toppled into the water, whose roots and branches rise and fall with weird effect as they are rolled over and over in the stream; bamboos interlaced in wild confusion; jungle grasses and river rushes in tangled masses like floating islands, which the flood has deeply submerged or entirely washed away."

Of all the rivers in India, even the Ganges is hardly more sacred to the devout Hindu than is the Godavari. It is believed to flow from the same source as the Ganges, but underground, and it is frequently called by the same name. The eastern branch, after its division into several streams at Dowlaisweram, is called the Gautami, and, if possible, is looked on as more holy than the rest of the river. Once every twelve years a feast called Pushkaram is held on the banks of the river in turn with eleven other sacred streams of India, and pilgrims come from all parts of the land to bathe in its waters. At its source near Trimbak, in every



part of its downward course, especially at the pagoda a little north of Rajahmundry, and at Kotaphali on the left bank of the eastern stream, it is considered to be peculiarly sacred at these times, and every sin is washed away in those who bathe in it. Crowds gather on the river bank morning, noon, and night, and convert the most favoured resort into huge standing camps for the twelve days during which the festival lasts."

But, while Nature was thus so lavish of her beauties and the stream was so sacred, there was much suffering in the land.

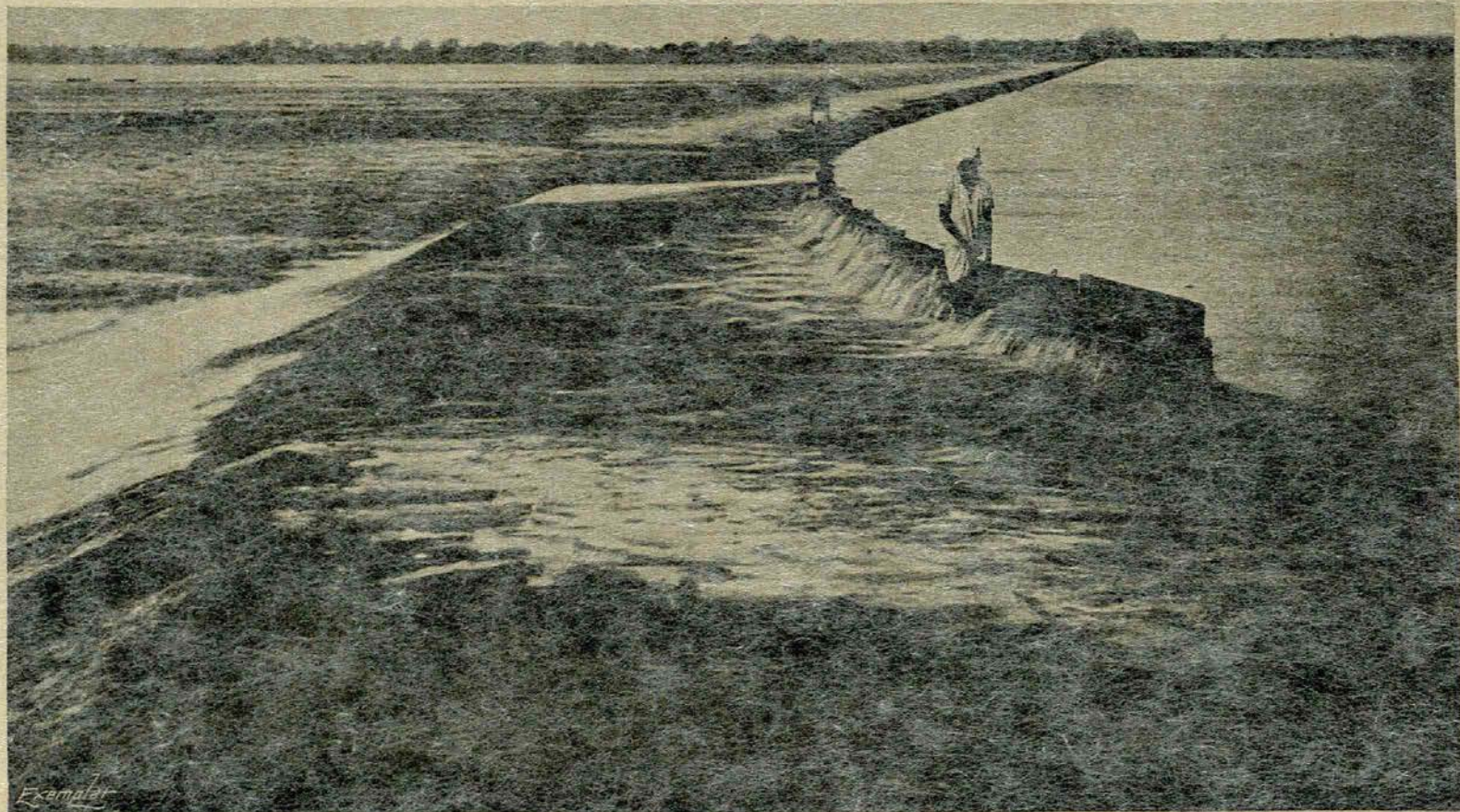
Factories for the manufacture of a special kind of cotton cloth, much in favour with the people, were, at a very early period, established by the East India Company. These, however, were discontinued as the Arkwright and other spinning and weaving inventions made use of by British manufacturers greatly cheapened the production of such fabrics and made the Indian cloth unprofitable. No other industry took their place, and there was much suffering among the people. Deterioration set in. There was nothing but the soil for the erstwhile spinners and weavers to turn to. Irregularities of rainfall—not unc customary, but specially felt and noted because of the prevailing industrial distress—occurred, and, in 1833, famine followed. It is still referred to as The Great Famine.

"I have frequently asked a man his age," says Mr. Morris, "and he has been unable to state it. But he was quite ready to answer the question, 'How old were you at the time of the Great Famine?'"¹

It was the old, too-familiar, story—not, necessarily, no rain, maybe too much of it falling at the wrong time, but—the life-sustaining water was not preserved against the day of need. In 1831 there was too much rain, in 1832 a cyclone caused serious damage to crops, in 1833 the supply was deficient.

The distress was terrible all over those northern districts. In the adjoining district of Guntoor, two out of five of all

¹ Morris's *Godavari*, p. 288.



Exemplar

DOWLAISWERAM ANICUT, FROM NEAR THE UNDER SLUICES.



the people died. Gunttoor had five hundred thousand inhabitants when the famine began: there were but three hundred thousand when it had passed away. In Godavari itself one out of four perished.

"The crushing misery which gradually came upon the people and slowly destroyed them was appalling.

"As it increased from day to day, thousands emigrated to Madras and to other more fortunate districts.

"A stream of pilgrims flowed night and day towards the south.

"Madras being the seat of government, thousands repaired thither with the remnants of their household possessions, and with the children and dependents who had not died upon the road.

"In many cases the famishing parents sold their little perishing daughters to men, who carried them off to Hyderabad.

"The great northern road became one long graveyard.

"It was often most difficult to distinguish between the dying and the dead.

"It was directed that no one should be relieved at the public expense without undergoing the ordeal of working for this relief.

"Many of the better castes considered this worse than death, and refused to undergo the indignity of digging tanks, the work which was usually selected.

"Others accepted with shame the relief which was accompanied by such terms; and tenderly-nurtured women and high-born men were seen working at this manual labour under the direction of native overseers, while some decided to starve rather than submit to such degradation.

"The pressure of hunger made men lose all regard for others and thought for the rights of property.

"It became impossible to transport grain without the protection of armed escorts.

"When they heard of the approach of grain merchants with a convoy of food, the villagers would turn out *en masse* and strive to obtain possession of the grain by force.



"The usual routine of village life was most melancholy.

"During the day men could be seen prowling about the streets picking up anything edible, even from the most defiled sources, and at night women would go to the village well, and watch the water drop slowly into their brazen vessels, every drop being carefully prized and cherished."

"'Deeds of violence,' writes one who was evidently an eye-witness of these sad scenes, 'could not be altogether suppressed; and yet on the whole it was marvellous with what patience and submission this long period of calamity was endured—such pining want, such personal anguish, cattle dying from thirst in the fields, the little heirlooms of jewels and silver and gold ornaments parted with, the wail of famishing children, and yet no jacquerie, no fanatical outbursts against their rulers, in whose truth they still trusted.'"¹

The two following seasons were fairly favourable but the region seemed cursed, for, in 1839, another cyclone burst. "which was more destructive than any that had occurred for nearly sixty years." The cyclone was accompanied by a tidal wave, which broke upon the shore, and caused an inundation at Cocanada and Coringa. "Ships were driven on land, some of the wrecked vessels were carried, it is said, four miles inland. The loss of life was very great. Very many of the native houses at Samulcotta were blown down; all the European houses except two were unroofed, and even in Rajahmundry some of the houses were nearly dismantled by the violence of the storm. The destruction of property was very great. The merchants' storehouses at Coringa and Ingaram were ruined, cattle and crops were destroyed, large tracts of land were rendered unfit for cultivation by the overflow of salt water, the tanks were filled and spoiled by the same cause, and the wells were filled with brackish and undrinkable water for some miles around."²

¹ From a letter to *The Times*, by E.L.K., in January, 1874, quoted in Morris's *Godavari*, pp. 289, 290.

² *Letters from Madras by a Lady*, p. 144. London: Murray.



Then defective rainfall and unfavourable seasons followed one another until terrible impoverishment resulted. But these things, rightly regarded, were no "curse." With all the variations of the seasons the means were there to ensure great prosperity. It seemed, of the officials, that "their eyes were holden so that they could not see."

In Madras an uneasy feeling had been aroused in the minds of the Governor and his Council, and Sir Henry Montgomery, Bart.,¹ then of the Madras Civil Service, was deputed "to make minute enquiries on the spot into the causes of the decline of the revenue and into the general condition of the people." A curious incident occurred. The Collector of the day, not unnaturally, in the uncriticised and unchecked manner in which Indian district administration was then carried on, imagined his work was to be called in question, and deeply resented Sir Henry's visit. He "did all that lay in his power to place obstacles in the way of the Commissioner obtaining information and prosecuting his inquiries."² The Collector was, of course, removed from the district and the Enquirer became Administrator as well.

What did Sir Henry Montgomery find? He found this distressing series of facts :—

1. The population at the end of twenty-one years, from 1821, was one-fourth less :—

1821-23	738,308
1842-43	561,041
	<hr/>
Decrease	177,267

But, under normal circumstances, there should have been an increase of one per cent. per annum. So regarded, the loss was, really, not 177,267 but 332,310. How the population increased when Arthur Cotton had done his work will appear.

¹ Afterwards Member of the Council of the Secretary of State for India.

² Morris's *Godavari*, p. 291.



2. Neglect of works of irrigation.
3. Inefficiency and corruption of the village revenue authorities.
4. Extravagance by the zemindars and their mismanagement of their estates.

This was the Godavari to which Arthur Cotton devoted his thought and some of the most fruitful years of his life in India.

After

"Taking all things into consideration, it may be questioned if there is a more beneficent or more profitable public work in the world." This is the deliberately-expressed verdict of the Hon. Alfred Deakin, M.L.A., of Victoria, Australia, after a most exhaustive enquiry in India into irrigation and its results.

I.—POPULATION.

Naturally, with prosperity everywhere in the district, the population largely increased, more and more land was taken up, until, according to the latest reports, the people number over two millions.¹

When the work was begun there were 561,041 inhabitants.	In 1891, the Census recorded 2,078,782 inhabitants.
Increase : 1,517,741, or, nearly 300 per cent.	

With growth of population there has been growth of wealth, as, in every well-governed country, there always is. So far as the irrigated districts of India are concerned there is no such thing as over-population.

2.—INCREASE OF REVENUE.

From all sources in 1843-44.	Land Revenue only in 1898.
Rs. 17,25,841.	Rs. 60,19,224.
Increase .	Rs. 42,93,383.

Nearly two and a half times greater. Two hundred and

¹ *Statistical Abstract of British India*, No. 33, p. 14.



fifty per cent. increase. The revenue from all sources is reckoned in the earlier period figures, while only land revenue is reckoned in the above comparison. Take in all the figures for 1894-95 (the latest available to me), and the increase is Rs. 70,95,481,¹ a fourfold increase.

In the former period terrible suffering and widespread poverty; now, and for more than fifty years, general prosperity, a contented people. The district, as a whole, from a revenual point of view, has leaped from the thirteenth place among the twenty-two districts of the Madras Presidency to the second place. The first place, nevertheless, is Arthur Cotton's: it is the Tanjore district. His districts are, respectively, first and second, unchallenged, unchallengeable.

3.—IMPORTS AND EXPORTS.

The year before the Anicut was commenced may, in this respect, be contrasted with the return for 1893-94, the latest available to me :—

1845-46.		1893-94.	
Imports.	Exports.	Imports.	Exports.
Rs. 3,88,749.	Rs. 9,07,774.	Rs. 37,06,953.	Rs. 1,54,59,084.
<i>Combined Totals.</i>			
1893-94	.	.	Rs. 1,91,66,037
1845-46	.	.	12,96,523
Increase			Rs. 1,78,69,514

An increase of nearly fourteen hundred per cent.

4.—ADDITIONAL PROSPERITY.

The statistics available whereby to estimate with reasonable care the additional wealth accruing to the district from its irrigational advantages relate only to the produce of the land. Even thus narrowly regarded, what is the result? The authorities reckon that the land revenue throughout India bears the proportion of one-twelfth² of

¹ Walch's *Godavari*, vol. i. p. 154.

² *Report of the Indian Famine Commissioners*, 1880, Part II., p. 112. This proportion is contested by Mr. Romesh Chunder Dutt, C.I.E.,



the gross value of the produce. On this assumption the land demand of the Godavari district being Rs. 6,019,224 p.a., this amount multiplied by twelve would represent total produce value of Rs. 72,230,688. Deduct from that sum one-twelfth to represent the land tax, there is left, in round figures, Rs. 66,000,000, say Rs. 60,000,000. In the same manner the dry crops (denied all irrigational facilities and subject to all fluctuations of the seasons) could not annually have been of more than Rs. 10,000,000 in value. There has, therefore, accrued as additional value ensured, with reasonable certainty, to the people, Rs. 50,000,000, or Rs. 25 per head per annum. No allowance is here made for receipts beyond those from the land, and Rs. 25 might, therefore, well be taken as representing the absolute additional benefit enjoyed by the people. But, for the purpose in view, under-statement rather than a full statement may be wisest. Consequently, I take Rs. 10 from the average amount and thus arrive at Rs. 15—a gold mohur, a coin employed in Indian currency for the past three centuries, though not now often seen in circulation. That is to say, during every year, on the average, each man, woman, and child in the Godavari district receives a gold mohur which would not have been theirs, but for Sir Arthur's work for the region in which they reside. This is one instance of admirable results following from British rule, and should make every one concerned in the government of India—that is, every British citizen—determine that other districts shall, so far as may be, share in the benefits which the Godavari district enjoys. Such great good could not occur in every instance, but everywhere some gain would be recorded.

5.—THE IMPROVED CONDITION OF THE PEOPLE.

"The inhabitants of the district in general, and especially the agricultural classes, are most prosperous.

and other authorities, but, as I am dealing with official figures throughout, I must perforce take this official calculation. A deduction has, however, been made, as will be seen later on in this section.



A STRANGER WHO SAW AND BELIEVED 87

"The condition of the ryots has decidedly improved since the great extension of irrigation consequent on the construction of the anicut and the canals dependent upon it.

"The prosperity of the ryots is evident to the most casual observer.

"The gradual substitution of tiled houses for thatched,

"the better dress which is being worn by the ryots,

"the more universal adoption of rice as an article of diet rather than Indian corn and other dry grains formerly in almost universal use,

"are all silent but certain indications of the improvement of the agricultural and even of the labouring classes."¹

6.—GENERAL BENEFIT AS NOTICED BY A STRANGER.

Mr. Deakin, whose exhaustive work on Indian Irrigation is frequently referred to by me in these pages, says of the anicut:—

"Before it was constructed there were but nineteen thousand acres imperfectly and irregularly watered from the river, and altogether sixty-nine thousand acres wetted from all sources; while now three hundred and sixty-four thousand acres have been added. There are three hundred and seventy miles of main canal, of which three hundred and thirty-nine are navigable, and eight hundred and forty-eight miles of distributaries. The accumulated surplus is over one million pounds, and the gross return sixteen per cent. on capital. The net revenue for 1888-89, after deducting interest and all charges, is £82,269, and the net profit 8·66 per cent. upon the investment. Need there be any further demonstration of the profitableness of irrigation in Madras?"

Again, Mr. Deakin remarks:—

"The maintenance occupies no less than two hundred and sixteen boats, including four steamers and eight steam dredges, the value of the floating part being £55,000, and

¹ Morris's *Godavari*, p. 87.



its annual cost £2,258. The reports every year note the construction of new works, whether as improvements, additions, or alterations. Very little Indian experience is required to show that a great irrigation scheme is essentially a living as well as reproductive work. It is never created at a blow, but invariably develops, and implies constant care, control, and amendment, as well as constant expenditure. Nevertheless it may not only pay such expenses, but leave a superb profit as well.”¹

7.—SUCCOUR TO DISTRESSED REGIONS.

“The grand system of canals in the Godavari district is approaching completion, but that of the Kistna is still backward. As the two deltas are, however, linked together by an admirable chain of navigable canals, not only are they thoroughly protected from a recurrence of such a famine as that by which they were decimated² in 1833, but they are able to contribute out of their abundance to the rest of India.”³

¹ *Irrigated India*, pp. 255, 256.

² So far as Godavari is concerned this is an inadequate statement. The population was more than doubly “decimated” on that occasion—twenty-five per cent. of the population perishing.

³ *Review of the Progress of Irrigation Schemes in relation to Famine Aspects*. By Col. (now General) F. H. Rundall, R.E., Inspector-General of Irrigation Works.



Appendix

THE TESTIMONY OF A NATIVE INDIAN
OFFICIAL.¹

CHANGES IN GODÁVARI DISTRICT SINCE THE CONSTRUCTION OF ANICUT.—*Noted by S. Nathamunni Mudaliar, Esq., Pensioned Tahsildar, Godávári.*

The construction of the anicut across the Godávári is a great boon to this part of the country. . . . In years of drought, famine was the inevitable lot of the people, and both men and cattle suffered. Since its construction, the district is intersected with canals, useful not only for purposes of agriculture, but also for navigation. There are two main canals in the Western delta—the Ellore and Narsápur canals. In the Central delta, there is one—the Amalapore canal. In the Eastern there are five—the Samalcottah, Cocanada, Coringa, Mandapeta and Bank canals. There is also a Bank canal in each of the other deltas. All these are navigable, and from these proceed a number of irrigation channels, and paddy transplantation has immensely increased. Sugar plantation, which was rare in this district, is now to be seen almost everywhere. The extent of cultivation is 794,829 acres as given in the jamabandi (revenue) report for 1887-88.

2. . . . The introduction of coasting steamers in addition to navigable canals afforded easy passage for transhipment of goods. The wealthier classes were much benefited and the condition of the ryots was so much improved by the general high prices that, instead of being in the hands of the sowcars, they were sowcars themselves. Even now, the majority of them are not in their hands. They have enough to pay for Government

¹ "Progress in the Madras Presidency during the past Forty Years," by S. Srinavasa Raghava Iyengar, C.I.E., now Dewan to H.H. the Maharaj-Gaikwa of Baroda, G.C.S.I., pp. ccxi, ccxii.



dues. The rich ryots lend money largely on inam¹ lands, taking them on long leases. The inamdars in general, being poor Brahmins, are not capable of cultivating the lands themselves, while the ryots have means enough of cattle, ploughs, and labourers. The famine of 1876 and 1877 brought in a considerable number of poor people from the neighbouring districts of Vizagapatam and Ganjam, who found employment here in various ways. They engaged themselves as field labourers, coolies, palanquin bearers and domestic servants. This rendered labour cheap. Most of them have remained here permanently, and some are so far improved in their condition as to become farmers themselves.

3. The vast increase in agriculture by irrigation has very materially improved the condition of ryots. They have learnt to build substantial and fashionable houses, and upstairs buildings unlike their former thatched and slovenly ones. There has been considerable improvement in the manufacture of jaggery. Iron mills for extracting juice from sugar-cane are in general use now in the place of wooden ones, which are not so effective in getting out all the juice. There have not been any improvements in the implements of tilling. The ploughs of old are still in use, which do not furrow the land deep. Some years back, the Swedish plough was brought into this district and several experiments were made, but this was found too heavy for the ordinary bullocks here and the attempt to introduce it failed. Even the richer ryots found no use for it, for the land here requires no great tilling; it is flooded with canal water for some time before tilling and the land is easily turned up and transplanted. A second crop is also raised, but it is of inferior quality. It is only of three months' growth from February to April, and is chiefly used by the labouring classes. The land has become very valuable. An acre of lands sells from £10 to £30.

4. Prior to the anicut, the joint-rent system was in use. Each village was rented out jointly to the ryots of the village, and the leading men and men of substance were held responsible for the payment of Government dues. On account of paucity of product owing to failure of rain, the amarakam, as the leasing out was called, was a matter of very great difficulty. Nobody used to

¹ "Inam": a gift, especially a grant of land.



"MORE COMFORTS, BETTER CLOTHES" 91

come forward to take up the village or a portion of it, and the tahsildars used to force it on some men of substance. It was really a painful sight. Now, the land has acquired so much value by irrigation that almost every inch of land is taken up and the Government dues easily paid. There is great competition among ryots to secure a right to the land. They come forward with darkhasts,¹ even at the end of the fasli, offering to pay assessment for the whole year, though they could derive no benefit in that year. The renting system has entirely disappeared except in the hill tracts, and the ryotwari has taken its place. By this system, each ryot deals directly with the Government and reaps all the benefit of his labour. He commands more respect now, enjoys more comforts, wears better clothes, and lives in a more comfortable way.

5. The Local Funds Acts have greatly added to the convenience of the people everywhere. Roads have multiplied; the indigenous schools considerably improved and their number increased; sanitation attended to; tanks and wells dug even in remote places. The number of village schools has so considerably increased that there are now four deputy-inspectors (sub-assistants) and one assistant-inspector for the whole district, in the place of one deputy-inspector some seven or eight years ago. There is besides an inspecting schoolmaster for each taluk. The sub-assistant inspectors are stationed, one at Narsapur, another at Ellore, a third at Rajamundry, and a fourth at Cocanada. The district is considerably in advance in this respect also.

6. The improvements in all directions, which have been the source of happiness to the people, have also been the source of great litigation. Much of the people's money goes to swell the revenue of civil courts and to fill the pleader's purse. People are more reckless in their proceedings and squander away their money, caring only to win their cause, good or bad. The country is in every way in a prosperous condition and it is quite unlike what it was prior to the construction of the anicut. Sir Arthur Cotton, to whose genius this gigantic work owes its existence, seems to have estimated the land revenue of the district at £220,000, and expected to realize £500,000 or £600,000 when the whole project was complete. Now, from the report for 1887-88, the land revenue appears to be £380,000 and odd. Other cesses,

¹ "Darkhast": an application to take up land for cultivation.



peishcush¹ from zemindari estates, quit-rent on inam and inam villages, come up to £140,000 and odd. Salt, abkari, opium, ferry fund and income-tax amount to upwards of £60,000. The grand total of the revenue of the district from all sources reaches nearly that amount which the great benefactor, Sir Arthur Cotton, roughly estimated some forty years ago.

¹ "Peishcush": the quit-rent taken for lands which for any reason are exempt from full assessment.



CHAPTER VII

PART I

The most "Beneficent and Profitable Irrigation"¹
Work in the World : its Inception, its
Construction, its Success

"The Godavari anicut is, perhaps, the noblest feat of engineering skill which has yet been accomplished in British India. It is a gigantic barrier thrown across the river from island to island, in order to arrest the unprofitable progress of its waters to the sea, and to spread them over the surface of the country on either side, thus irrigating copiously land which has hitherto been dependent on tanks or on the fitful supply of water from the river. Large tracts of land, which had hitherto been left arid and desolate and waste, were thus reached and fertilized by innumerable streams and channels."—*Morris's Godavari*, p. 109.

THE Godavari district and its inhabitants had good reason, more than sixty years ago, for congratulation in the gentleman selected as Commissioner to inquire into the causes of the most serious retrogression. Sir Henry Montgomery, the Commissioner selected, had been Collector of Tanjore. He had seen the blessings bestowed on that district by the intelligent use of the river Cauveri, and the astonishing improvement which had followed the building of the Coleroon anicuts in 1835. He, therefore, when dealing with the remedial measures required for the "Rajahmundry" district, as the region was then called, strongly urged the thorough examination of the Godavari

¹ *Irrigated India*, by the Hon. A. Deakin, p. 255.



delta by an experienced engineer with a view to the development of its irrigation resources.

In the meantime my father had not himself been idle. Church erection and groyne-building were all very well in themselves, but they could not engross all his time. He, too, had had his thoughts directed to the distressful condition of the once prosperous district a little to the south of the scene of his labours.

As early as May, 1844, he addressed to the Board of Revenue a report on the Irrigation of the Delta of the Godavari, in connection with Sugar Cultivation in the Northern Circars.¹ He alludes to the loss of the export trade in cotton cloths, and the consequent impoverishment of a large part of the population; he then suggests the cultivation of sugar for export, believing this would be a promising substitute.

"An export trade," he wrote, "to other and richer countries has the most powerful tendency in every way to keep a population in a state of activity and industry. The effect of the failure of the export trade is already severely felt in these districts, and it must inevitably continue to decline, if some substitute for the cloth trade is not discovered. Happily sugar cultivation is calculated not only to fill this void, but to offer the fairest prospect of much more than compensation for the former trade. I have lately obtained what information I could on this subject, especially from Mr. Mackenzie, who has both cultivated the cane, and has also had a vacuum pan for manufacturing sugar."

Proceeding with his argument as to the fostering of an export trade being necessary, Captain Cotton continues—in observations which show how acutely he had studied the deeper aspects of matters which came before him—to say :—

"There are two ways in which diminution of price may

¹ This term, and that of the Ceded Districts, not infrequently occur. They refer to certain districts ceded to the British Government soon after the overthrow of the Mahrattas and in connection with the consolidation of the dominions of the Nizam of Hyderabad.



be produced, either by an increased produce of the article purchased, or by a diminished supply of the bullion with which it is purchased ; now, which of these two causes it has arisen from makes the whole difference. It is quite evident that while the revenue is collected in bullion, if a country is without the means of obtaining a constant supply from abroad, the quantity must rapidly diminish and its value increase, or, in other words, prices must fall ; and the diminution of the produce would be a poor remedy for this state of things ; it would only deprive the people of a part of their food, but in no degree improve the revenue, though it would certainly raise the price of grain. The only effectual remedy is to find an article of produce which can be exported to foreign countries, whence bullion can be obtained."

"The cultivation of sugar," he further remarks, "affects irrigation essentially, inasmuch as the same extent of land will not require, certainly, one-fourth of the quantity of water that paddy does, so that every acre of paddy land converted into land for the culture of sugar, will tend to relieve the other nunjah lands ; further, the water flowing down the river in the months of April and May, which is at present made no use of whatever, will be most valuable when applied to the sugar cane.

"The value of this cultivation may be shown in another way besides those mentioned. The produce of an acre is estimated to be worth about £15, while that of an acre of paddy is only £1 2s. So small an extent of cultivation as ten thousand acres would produce an export trade of £150,000 a year, taken at its cost of production ; and, as the small pan at Bimlipatam is capable of manufacturing one thousand five hundred tons a year, or about £30,000 in value, a single sugar factory containing five large pans would be sufficient for the manufacture of the above quantity. The general introduction of this new source of wealth is, therefore, calculated to make these districts the richest, as they are now the poorest,¹ in the Presidency,

¹ A prophecy fully verified by facts. Truly my father brought



and the revenue at present paid, would then be scarcely felt by the people.

"I trust the Board will excuse my thus attempting to bring this subject before them, distinctly with reference to the irrigation question. I have been, as it were, compelled to it from finding that the whole plan of my proceeding in the management of it must be fundamentally affected by the prospects of the foreign trade of the district; with a rapidly increasing produce of an article of foreign consumption, a much more bold system of improvement should be followed than would be advisable if the district was likely to remain in its present state."

In response to this report, and to the recommendation of Sir Henry Montgomery, the Board of Revenue, on August 5, 1844, requested Captain Cotton to "furnish a general report on the actual state of the irrigation of the first division, and its capabilities of improvement, more especially as connected with the Godavari and other rivers, which flow through it."

He, accordingly, submitted an elaborate report on the Delta of the Godavari, and added that "as respects soil, climate, and capabilities of irrigation, it can scarcely be surpassed by any part of the world." The requirements for an effective system of irrigation he stated to be:—

1st. The embankment of the rivers, to secure the crops from destruction by the river floods.

2nd. Dams, with channels of irrigation leading from the river, to bring its water from the level of its bed to that of the surface of the land.

3rd. Surplus channels, to lead off the floods caused by the local rains from the flat lands to the sea.

4th. Raised roads and bridges, to allow of the conveyance of produce to the markets, and to the coast, through a country which is otherwise, from its nature, impassable during the rains.

In describing the area to be affected, he says:—

the Godavari district from being the poorest to nearly the richest in the Presidency.



"After deducting sandy tracts, and sites of villages, besides channels of rivers, there remain one million acres of land fit for the cultivation of paddy, or sugar," which he shows could be utilized by a system of irrigation. He continues: "We have in this case all that the most timid could desire to encourage us to prosecute this undertaking."

His chief problem was how to deal with the river and bring it under control. In one sentence his determination may be given. He decided to build a masonry dam or anicut, twelve feet high, upwards of two and a quarter miles long, across the river bed, with embankments on the islands, of a total length of 7,365 feet.

This gigantic work needed not only the skill of a master mind, but the courage of one who was absolutely confident of the correctness of his plans; both for its commencement and for its final completion it had the absolute devotion of its originator. My father always felt, and acknowledged gratefully, that he owed in great measure the success of his schemes to the sympathy and powerful support given to them by the Marquis of Tweeddale, who was then Governor of Madras, and who ever remained one of his warmest friends. It was to the Governor's good offices that he owed the supplies, liberally granted though often very long in coming, for his Godavari projects.

He strongly recommended raised roads and bridges, so as to allow of the conveyance of produce to the markets and to the coast; many of these communications he was permitted to carry out. No detail was omitted in these deeply thought-out schemes.

Of the district itself, he writes: "I have no doubt that a complete system of irrigation here would increase the produce of lands now cultivated, by one-half, and that, with greatly diminished labour, so that food could be produced at one-half the cost that it now is."

It is interesting, too, to note, that the new roads and bridges were immediately utilised. In Tanjore, on one of the raised roads, the number of male travellers was



found to be no less than twelve hundred in one day, and about one hundred tons of goods.

It cannot be wondered that, in his burning enthusiasm and his ceaseless desire for progress, he should write :—

“Would it not be unworthy of the Government of a civilized nation, after having had possession of a district for a long series of years, merely to put in repair old, partial, and radically defective, works, executed by the native governments under immense disadvantages, and suffered by us to go to ruin, when we have it in our power to construct a complete and general system of works, which will bring the last drop of water in the river to the surface of the lands, and put it all under complete control? One of the most striking facts in the whole of the proceedings of Europeans in India is the proneness, which there has been in past times, to lower ourselves to the level of the natives, and their modes of proceeding, when they had not the knowledge and science of the Western nations, instead of diligently applying the means which God has placed in our hands for the benefit of the countries He has given us charge of.

“In nothing has this been more shown than in irrigation, with this aggravation, however, that we have been far behind the native governments in keeping the works, such as they were, in order.”

The real inwardness of the situation at this fateful time can be rightly explained only by him in whose mind the work, from start to finish, was already clear. Such an exposition is to be found in a letter that my father wrote to his brother, which, fortunately, is available for quotation.

RAJAHMUNDRY,

January 18, 1845.

MY DEAR FRED,—

We were greatly delighted to get your letter, and to hear such good accounts of your health. Sim writes that you are making yourself very useful. I was also pleased



THE GODAVARI TO EARN A LIVELIHOOD 99

to hear you complain of not having heard of what I am doing, as all my acquaintances in these parts are tired of hearing about my plans, and I sadly want somebody to listen to me.

On taking charge of the Division, I made a run through Rajahmundry, and could not help seeing what it wanted, which was simply everything. So magnificent a country in such a state of ruin was the greatest disgrace to a civilized Government.

I immediately wrote a report recommending an anicut, channels, embankments, and roads, which I estimated roughly at £165,000. I then compared the results of forty years' gross neglect in this Delta, with those of forty years' attention in Tanjore. A few days after I had despatched this, I got a letter from the Board, calling upon me for projects for the improvement of all my districts, and especially the Godavari Delta (the latter would satisfy a moderate man for ten years), and relieving me from the ordinary duties of the Director. This looked well. I asked them for six officers, six or eight sappers, and others, telling them that I was done up, and could do nothing myself but look on. In answer to this I got one young hand to teach and two apprentice surveyors! With scarcely strength to ride ten miles, I started on this expedition to turn the Godavari out of its bed, and make it do something for its livelihood, a river only seven times the breadth of the Mississippi at a spot where I am now pitched! However, there were many helpful symptoms, too: the Court had expressly ordered something to be done for these unhappy Districts. Montgomery had been up here, was very well appreciated by the Marquis, and had strongly urged that I should be sent to try and do something with the river; a new Collector had just been appointed, who seemed both able and willing. As soon as ever I could get clear of my works at Vizagapatam, I put a sergeant in charge of them, and pitched on the bank of the Godavari. The more I worked the stronger I became, which was well, for I had to take, or help in, every line of level that was



made, not having got one single level from my surveyors that wasn't altogether false.

One day I travelled ten miles, that is, one evening and morning, from which you may judge how I have recovered my strength.

I have now examined the river from the hills to the sea, and ascertained the levels all the way down, and also all others that are essential, and have satisfied myself as to the site of an anicut, and all the points necessary for preparing an estimate for it, and for the locks, sluices, etc., connected with it; and I am now preparing the papers as fast as I can, hoping to send them in, or take them myself, in a few weeks. Nothing can turn out better than this investigation. I find a site where an anicut twelve feet high will more than command the whole delta, and the land is level with the top of it within four miles on one side and two on the other, though the river is now twenty-eight feet deep in the floods, the country having a slope directly away from the river bank of from four to eight feet in a mile.

The banks of the river have a slope towards the sea of from one foot and a half near the hills to one foot (per mile) near the mouth. The bed has a very irregular fall, varying from four inches to three feet per mile, and averaging eight inches, the rise and fall being thirty-eight feet at the hills, and the banks there eighty feet above the sea. The site I have fixed upon is at the head of the delta, four miles below Rajahmundry. It commands two thousand square miles of the richest alluvial land, certainly about nine hundred thousand acres net, capable of yielding as paddy land £5,000,000 very easily; when the river is full, thirty-one feet deep on a standard at Rajahmundry, it contains ninety times as much water as could be used in the Delta, and enough for the whole of the lands when there is five and a half feet on the standard.

The river is here six thousand yards wide, including islands. The anicut would be five thousand yards; there is the finest hill of stone easily worked, and yet hard



enough, on the spot, and first-rate hydraulic lime close at hand. My estimate for the anicut and its dependencies is £35,000, entirely of stone, the upper part all built of cut stone. I expect the anicut will abundantly pay by throwing water into the present petty channels, and that the return will be immediate. I do not propose sending estimates for any extent of new channels this year.

I also propose sending in an estimate to complete the embankment on the south side of the river, from the hills to the sea, this year.

B—— wrote me a note which made me sick, from which I gather the pains which the Board of Revenue have taken to throw cold water, not on the district, but on the plans. He says I ought not to write in my report what I, or even he, thinks would be best, but what I think the Government would consider advisable, which is certainly a good way of confirming them in a system which has ruined the district. However, I hear that the Marquis is more inclined to do something. I do not, however, really expect to be called to Madras.

Believe me,

Ever yours most affectionately,

ARTHUR.

Throughout this laborious period of his life one of his strongest characteristics was conspicuously exhibited. It ran through his whole career. That was his determination to minimise difficulties when obstacles arose to the fulfilment of any great purpose he had in view. He always tried to make little of them, and then never rested till they were overcome.

His praises of the Godavari district where he was working, showing his shrewd, prophetic instincts, may profitably be recorded here:—

“What this district may become if this matter be taken in hand, with only a small part of the energy it deserves, it is not easy to conceive. The unfailing river, an immense expanse of the richest soil, a safe and accessible port, a



complete internal water communication, with teak forests, a climate and soil perfectly suited for sugar, and abundance of labour at only three-halfpence a day, form such a combination of advantages as, I suppose, cannot be found in the world, and certainly not under such a Government as ours. The climate being quite healthy, and free from excessive heat all along the sea-board, also opens it fully to the establishment of sugar works under European superintendence. Its situation, too, between the two great ports of Madras and Calcutta, makes it very convenient for commercial undertakings."

With an earnestly devoted mind, and strong common sense, he put these theories into practice; and his brother notices truly "the courage" with which he carried out these bold schemes, for they were unique in both conception and construction.

The four anicuts he built across the Godavari are not solid masses of masonry, but surface coatings of stone over the sand of the river bed. The idea was taken evidently from the so-called "Grand Anicut," which carried the surplus water of the Cauveri river into the Coleroon. This low weir—which is of unknown age—from its importance to Tanjore has always been carefully watched. Every year some small sum has been expended in restoring any breakage of its plastered surface; and it was well this attention was paid to it, for on its being cut into where sluices were opened, it was found that this "Grand Anicut" work was hardly more than a mass of rubbish, mud, stones, and logs of wood, the safety of which depended solely on its thin plastered surface.

The general reader is asked to pardon the somewhat long extracts which follow, and on no account to pass them by as of little moment. The distressful state of many parts of India during past and present years imposes upon the English public a deep responsibility. Keenest individual suffering, utter household ruin, distress almost inconceivable in this favoured land of ours,



where now famine never comes (but once it was experienced here, as in India), all these are now ever present in India, and must all be remedied. Our Christian faith, our common humanity, our title to even ordinary respect among contemporary nations, to say nothing of the responsibility we owe to God, and our duty to those almost myriad millions committed to our care, impose upon us obligations which we may not, which we dare not, avoid. In saying that there is nothing—truly and literally nothing—within the wide scope of Indian statesmanship which, for remedial purposes, can even approach judiciously conceived and ably carried out irrigation works, I must not be considered as being unduly influenced by the deep affection I cherish for my father's views. I have been assured by men of ripe experience in, and prolonged study of, Indian questions, before whom the teachings of Sir Arthur Cotton have come, and by whom they have been considered, that while, before prosperity can be fully restored to India, many great enterprises will need to be undertaken, first and foremost comes—

THE WIDE EXTENSION OF IRRIGATION,

the carrying out of many, if not of all of my father's great projects.

Extension of irrigation must, in the near future, become a matter of searching discussion, maybe of keen controversy; they, I venture to submit, will be the most competent to deal with this question, who study it most closely. What my father wrote concerning the Godavari works will be helpful to this end. Therefore, I crave such patience on the part of the reader as may be necessary, though, for my own part, I am inclined to think the particulars will be entertaining enough in themselves to enchain interest.

As already stated, Major Cotton (in due course he had received a step in rank) finally decided to build the anicut at the head of the Delta, just below the village, at Dowlaisweram. The breadth of the Godavari at this place is, from bank to bank, rather over three and four-fifths miles, but



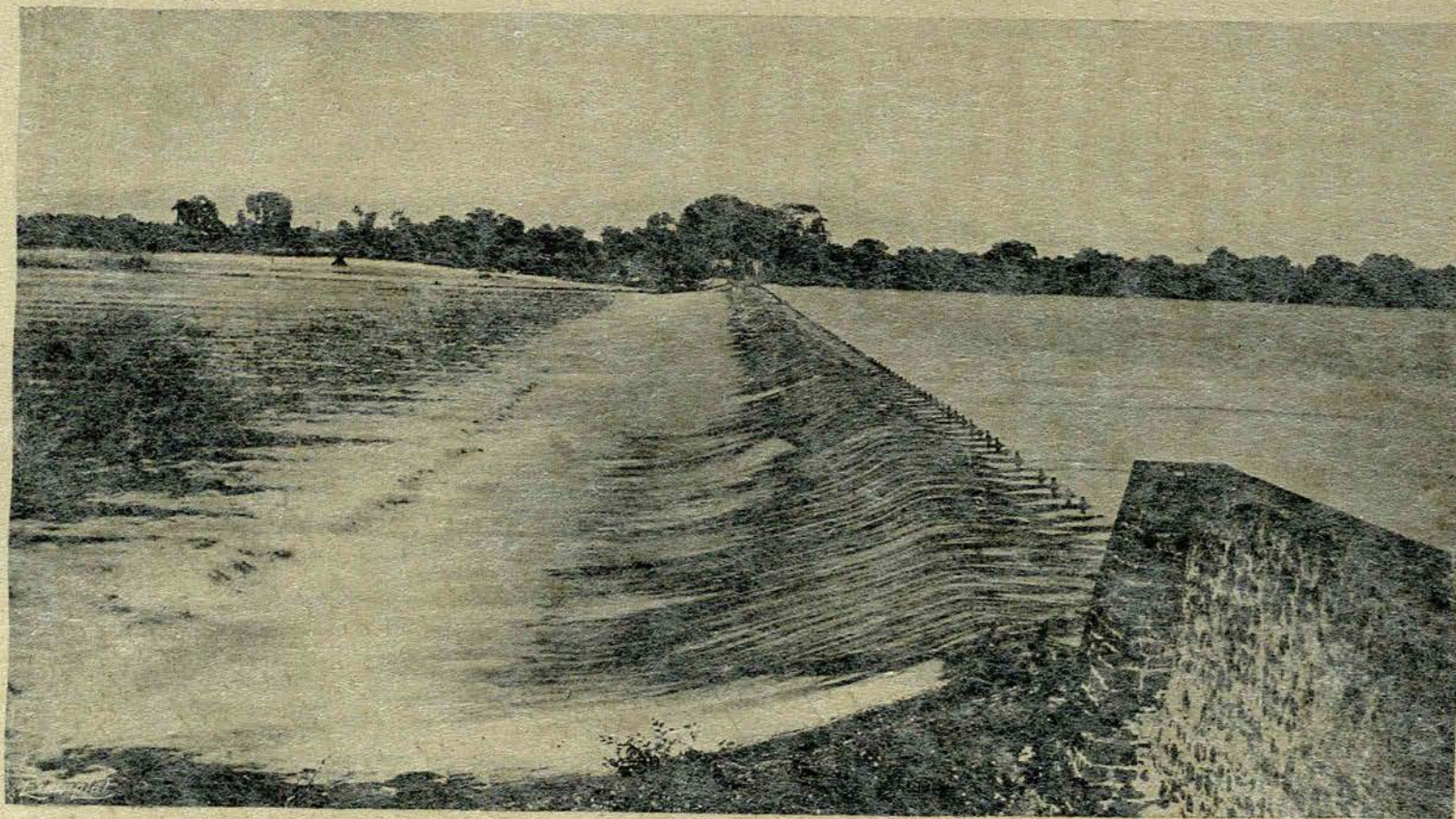
of this more than a third is occupied by three islands and the head of the Central Delta, which separates the river into four channels.

The river bed was of pure sand, and the islands merely thin alluvial deposits over it, whilst floods, upwards of twenty-five feet in depth, swept one and a half millions of cubic feet of water per second past the spot. The problem, therefore, which the Engineer had before him, of how at such a site to deal with the river, and so bring it under control that even in its low stages it would be made to command almost all the deltaic lands, was no easy one. He decided to solve it by building a masonry dam, of dimensions which have already been described.

The execution of the proposed work would, he saw, be facilitated by the great regularity of the Indian seasons, which assured with almost absolute certainty a "working season" of some six months in each year, during which the discharge of the river would be no greater than could be diverted to any one or two of the branches, so that, in the others, work could go on untroubled by surface water. But the project was a bold one. The proposed work was without a prototype, except the anicut on a much smaller scale, which he himself had built in the Tanjore district, and it was to be carried out, where no engineering works of any size had ever been constructed, by means of rude Indian labour, and with apparatus, which was generally of quite a primitive character. The greatness of the task, and the difficulties which surrounded its execution, in no way daunted him. He never, for a moment, entertained the slightest misgiving as to the success of his scheme.

A COURAGEOUS NEW DEPARTURE: ECONOMY IN DAM CONSTRUCTION.

Owing to the difficulty of starting such a work in a region where neither appliances nor skilled workmen existed, Major Cotton, in a remark which indicated his readiness of resource in presence of a difficulty, applied for sanction to a change in mode of construction.



MADDUR BRANCH OF ANICUT.
Water about 7 ft. 6 in. over crest.



"I find," he wrote, "that the great quantity of cut-stone proposed will require so many more masons than the district can supply, so as to complete the work within a moderate time, that it would be very desirable, if possible, to give the work a form that will require less of this material. The facility of construction, involving the question of time is, next to security, the most important point. The delay of a year would, no doubt, cause a loss of ten or twenty thousand pounds, and much more some years hence. I find, from my late trials in the quarry, that it would probably take about one thousand stone-hewers and stone-cutters two years to prepare the requisite quantity of cut-stone; and from what I have yet been able to learn, I am afraid that nothing like this number could be procured. The section I now forward, therefore, is such as, by avoiding an overfall, excepting where the under-sluices occur, will admit of the principal part of the surface of the work being made of rubble work, pointed with concrete and finished with a surface of smoothed chunam, such as the sluices and other works are finished with in Tanjore, when not lined or covered with cut-stone. The principal part of the work will thus consist of loose stone, of which there is an unbounded supply, the greater part ready broken, and which can be brought to the work very rapidly by railroads.

"This is the mode of construction originally used at the ancient native work called the grand anicut, which has stood for so many centuries. Part of it has, indeed, been raised and covered with cut-stone, but a few years ago part of it was still without that protection. On cutting through the work to make the under sluices, the mass was found to consist of nothing but loose stone in mud, with the upper course only laid in chunam, and plastered with concrete. It has never required anything more than occasional renewals of the concrete, and has never been in any danger, or given cause for alarm.

"Here, where material is abundant on the spot, and skilled labour scanty, it is worth considering whether such



a rude mode of construction may not be adopted with advantage. In my first report I proposed this kind of work, but I afterwards thought the employment of so vast a mass of materials would involve more delay than a more scientific construction.

"Since I sent in that report I have had much more opportunity of investigating the subject, and my main objection to the use of rude materials has been removed. I find that round timber, straight, hard, and durable, and perfectly suited for rails without sawing, can be obtained in great quantities at a most trifling cost. Such timber, from six to seven inches diameter, and twenty feet long, is procurable at from £2 to £2 10s. per hundred logs; so that sufficient for a mile of single railway, including cross pieces, that is, twenty thousand feet lineal, will cost from £20 to £25. Such rails added to a level on the surface, with flat two-inch iron screwed down upon it, makes an excellent temporary railroad at so moderate a cost that any length of it may be laid without an excessive expenditure; and by thus having several lines of railway a great mass of materials may be conveyed in a short time without confusion.

THE ANICUT MADE TO SERVE AS A BRIDGE.

"The section shows, however, another material alteration that I propose; and this is, to give the whole work a breadth of eighteen feet in the clear at the top, so as to provide both an ample roadway during the time that the river is low, that is during eight months in the year, and also to allow of a bridge being carried along it without altering the original work. It seems to me that, if this can be accomplished without exceeding the estimate, a very important point will be gained. To make the anicut fully answer the purpose of a bridge, while the river is low, I propose also to make the broad surface of the anicut two feet lower than the crown of the work; building a wall two feet high on the upper side, to keep the roadway dry and prevent accidents. It is to be observed that, as the under sluices



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will be of great capacity, they will discharge a large body of water, so that none will go over the work excepting while the freshes are high; and as during that time there is but little traffic in the country, the anicut will thus almost answer the whole purpose of a bridge."

From the report which convinced the Madras authorities, and afterwards the East India Directors in Leadenhall Street, that the work might well be taken in hand on Major Cotton's recommendation, the following paragraphs are taken:—

ESTIMATE FOR THE RIVER WORKS.

"The estimate for the works now proposed, viz. an anicut, the head sluices for two main irrigating channels, viz., one on the west side of the river and one at the head of the central tract (the upper part of which is called the Rallee estate), locks at each end for passing boats round the anicut, and those for carrying them past the head sluices into the irrigating channels, and the partial clearing of the present channels (which is all that is included in the present estimate), amounts to:—

	£	s.	d.
Anicut with six sets of forty under sluices	38,800	8	3
Five locks	1,841	19	3
Two head sluices	1,314	16	0
Excavations	1,400	0	0
Superintendence	1,200	0	0
Contingencies, etc.	3,000	0	0
Total	£ 47,557	3	6

"This sum is very small, whether the magnitude of the work or that of the expected results is considered. The length of the anicut will be four thousand two hundred yards; and it will be seen by the plans, that I propose to build it on a substantial and permanent plan, so as to be nearly independent of periodical repairs.

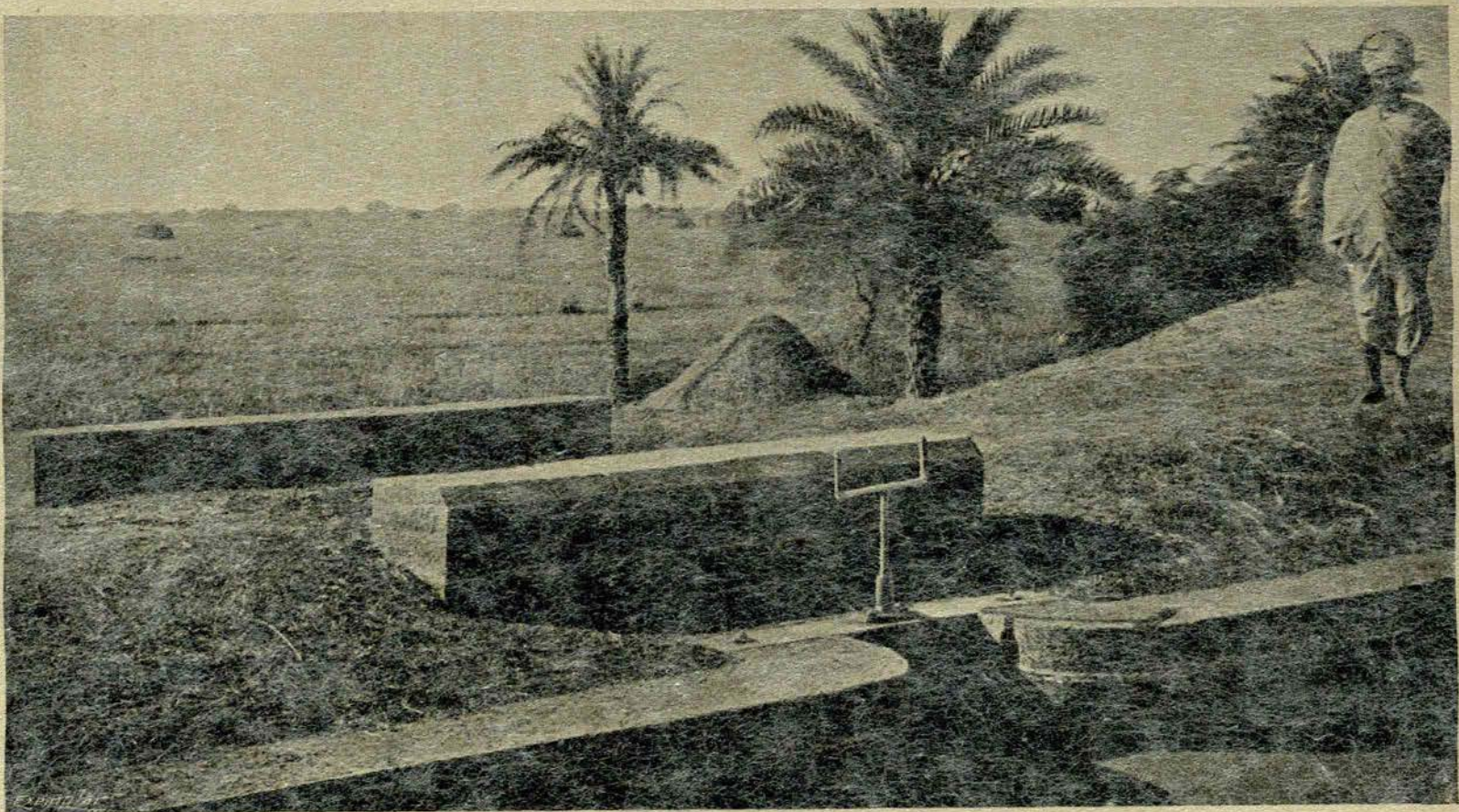
"The extraordinary advantages of the site will enable us to execute the work at a moderate cost. There is a hill of coarse, strong sandstone close to the spot. This stone is of



a degree of hardness exactly suited to the case, neither too hard to be expensive in working, nor yet soft enough to be unfit for the purpose. There are also several hundred thousand tons of broken stone, the accumulation of ages from former quarryings, which will exactly suit for rubble work. All this latter material, therefore, will cost nothing but the carriage, and it is within eight hundred yards of the end of the anicut. As if everything should concur to facilitate the work, we have further in the immediate neighbourhood abundance of first-rate hydraulic limestone. There is also teak to be had in any quantity and of excellent quality, at about 1s. 3d. per cubic foot, including carpentering, for the lock and sluice gates. The cost of the masonry work, omitting the carriage, I have estimated at the rate at which it can be executed at present; but there is every reason to believe that, on a large scale and under European superintendence, the cost of every part of the operations may be considerably reduced. This part of the country is nearly without masonry works of any description, so that the natives are far behind those of the southern districts in all their modes of executing them. For instance, they burn their lime in heaps on the open ground, not even using a kiln of any kind. In such a state of things, it is not to be supposed that under European superintendence the cost cannot be diminished. For the carriage of materials I propose to use rails, as I have done with such good results in the execution of the bulwark at Vizagapatam, even though nothing but wood was used, with wooden wheels to the waggons.

THE PROBABLE LARGE PROFITS.

"Taking the cost at £47,500, we ought to consider that if there be a fair prospect of a return of thirty per cent., or £14,250 in direct revenue, besides the benefits to be derived by the inhabitants, there is more than ample ground to justify the construction of the works. One-third of this would be considered most abundant in England, and if it yielded only five per cent., or £2,375, it would



IRRIGATED LANDS, AFTER HARVEST.



pay the Indian interest of the cost, and the benefits obtained by the ryots would be a clear advantage.

"The results of the anicut may be properly divided into two heads, viz., first, the ultimate results, when by means of additional channels of irrigation, drainage, etc., etc., the water is led to the whole of the lands commanded by the anicut; and second, the immediate results of the works now estimated for throwing water into the present channels, which will probably be realised to a great extent in the first year.

"First. We are to examine into the probable ultimate effects of the anicut.

"It is evident that, as the crown of that work will command the whole delta, there can be no possible reason why every acre of it should not be perfectly irrigated for one crop, that is, during the four months the freshes continue, and that all the best lands, to the extent that the Godavari can supply water, may be irrigated all the year round. The water from the anicut may, of course, be conveyed all the way to the Kistna, and it must necessarily affect all the country below the Colair lake, but it does not seem necessary here for me to go beyond the part of the delta lying in Rajahmundry.

"The following is a statement of the extent, revenue, etc., of these lands :—

DELTA.		
	Sq. miles.	Acres.
Total extent of land in Rajahmundry	1,700 or 1,088,000	
Deduct on account of sandy tracts, channels, roads, sites of villages, etc., one quarter		272,000
Remaining cultivable land		816,000
Or pooties at eight acres to the pooty		102,000
Or pooties at ten acres to the pooty		81,600

"The real measurement of the pooty is eight acres, but from the inquiries I have made it seems certain that, on an average the pooty, as entered in the village accounts, really contains about one pooty and a quarter or ten acres. I gather that the quantity of uncultivable land cannot



exceed one-fourth of the whole, from the following returns of the contents of a large portion of the delta, taken from the village accounts :—

	Pooties.
Gross extent of land	12,583
Cultivable land in the same village	9,878
Uncultivable land, being about one-fifth of the whole	2,705

“As no portion of the bed of the Godavari is included in these returns, the average of the whole of the delta to be deducted for waste must rather exceed the proportion of one-fifth, but can scarcely be so much as one-fourth.

“The total permanent assessment on these lands is as follows :—

	£	£
Peshcush of the villages now in the hands of Zemindars and Proprietors		13,000
Peshcush of villages under Government management	43,700	
Permanent assessment of Government villages	72,300	
	<hr/>	<hr/>
		116,000
Total		£129,000

“We have thus, in a most palpable shape, a fair opening for an increase of revenue to the extent of £20,000, and of produce to the extent of £1,200,000, in the lands only that are in the hands of Government. If it be asked how is this great sum of money to be obtained, the answer is, Simply by converting the water of the Godavari into money instead of letting it run into the sea. At this moment, water is paid for by the sugar growers at about two shillings for eight hundred cubic yards, the cost of raising it by picottahs.¹ There are now about four hundred and twenty thousand cubic yards of water per hour flowing into the sea, worth, at the rate at which it is now actually and profitably purchased, £50 per hour or £1,200 per day, which for two hundred and forty days (the proportion

¹ Picottah : a kind of pump used for raising water for irrigation.



ROUGH ESTIMATE OF WHOLE WORK 111

of the year in which the district is not supplied at all) gives £288,000. This water, if applied to the land, would be worth to the cultivators full £500,000. The whole of this is at present lost. Through the remainder of the year, that is, during the cultivation of the great crop, about four times this quantity, or one and three-quarter million cubic yards per hour, are allowed to flow into the sea, that might be profitably applied to the land, and in this way it may be understood by anybody how easily £1,000,000 a year may be lost. That some such amount is actually lost, just for a want of proper care of the district, is shown in such a way that the conclusion is inevitable, by the actual state of Tanjore. The only question is, what expenditure is required to give us the full benefit of our natural advantages? I have before estimated it roughly at £165,000, and the further examination of the district that I have since made has given me a more favourable view of the case than I had before. It has several facilities that I had not calculated upon, especially in respect to the site of the anicut, which I thought would be twenty miles further up the river. The site now proposed, being at the head of the delta, will save the conveyance of the water for twenty miles, and the construction of an aqueduct to carry the water to the central tract.

“My rough estimate for the whole of the works required to put the delta in good order is now as follows:—

	£
Present estimate for the Anicut with its locks, sluices, etc.	50,000
Embankments to the river	10,000
Irrigation channels	20,000
Drainage works	10,000
Sluices, locks, and other small works of masonry	10,000
Roads and bridges	20,000
Total	<u>£ 120,000</u>

“This expenditure may appear as absurdly small, as the estimate of the capabilities of the district appear large; but



it is also very well supported by the case of Tanjore, if the circumstances of the two districts are considered. In my former report I calculated the total expenditure on improvements in Tanjore at £160,000 in forty years, during which time the revenue had risen £160,000; but here we have, in the first place, the prodigious advantages of the experience gained from all that has been done in Tanjore; and, secondly, what has been done there has been done piecemeal, while here we can make the improvements on one complete plan, which will make a very great difference. The cost of labour is also lower here, and materials are much cheaper."

THE APPROVAL OF "YOUR LOVING FRIENDS" OF
LEADENHALL STREET.

Of course, absolutely final sanction had to come from the Honourable Company in London. This sanction seemed quite certain, and it was. So admirably is the whole position summarised by the précis writer that, although there may be some repetition, the whole communication may be quoted. In the quaint phraseology of "John Company's" communications with his subordinates in India, it was signed "We are, your loving friends," J. W. Hogg, and twelve other directors.

"Upon the whole, therefore, we may consider the anicut as :—

"First. Laying the foundation for the complete irrigation, for a rice crop, of the whole delta of the Godavari and part of that of the Kistna, in all three thousand square miles, or nearly two millions of acres.

"Second. Providing for leading out on the land of every drop of water of the Godavari, in the low freshes, and thus making use of what is now totally lost.

"Third. Opening the way for the conversion of the delta from a mere grain district to a sugar plantation.

"Fourth. Thus the produce of this tract, which at present probably does not exceed £300,000, would, when



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full advantage is taken of the water thus distributed over it, be increased to at least £2,000,000.

"Fifth. This tract, which now pays with great difficulty about £220,000, would then, with great ease, pay £500,000 or £600,000.

"Sixth. A complete system of internal navigation, intersecting the whole delta, would be established throughout the year.

"Seventh. Every village would be furnished with a stream of pure water for the people and cattle at all seasons.

"Eighth. The present estimate provides for the full irrigation of all the tracts at present partially irrigated by the principal channels of the Godavari.

"Ninth. It will give us at once the use of a large portion (about one-third) of the water of the low freshes during the whole summer, thus providing for sugar cultivation to the extent of about thirty thousand acres.

"Tenth. It will give a constant supply of water to those tracts which, like Tanuku taluk, are situated near the present channels, but which receive no benefit from them at all.

"Eleventh. It will put a famine in this or the neighbouring districts out of the range of probability.

"Twelfth. It will provide immediately two or three most important lines of water communications from Rajahmundry through the heart of the delta to the sea, available at all seasons.

"Thirteenth. It will have the important effect of showing to the people what can be done for them. At present they have no idea of the water being thrown into the channels during the summer; and, from the first moment that water is seen passing through any villages in the low freshes, the whole people of the delta will be awakened to its great capabilities, and will be prepared to welcome the opening of channels throughout the whole tract, and to extend the cultivation of sugar and other things which are at present limited by the want of water.



"Fourteenth. It may be estimated to yield £10,000, or twenty per cent. on the outlay in the first year, and at least £50,000, or cent. per cent. within ten years. This is much less than the new works in Tanjore yielded under circumstances which did not offer anything like the advantages that the state and capabilities of this district hold out.

"Fifteenth. But it seems to us that the most important point of all, in the present state of this district, is its capabilities as a sugar plantation; and the anicut will immediately provide for the most unlimited extension of that culture. When this work is executed there will not remain a single obstacle to this most valuable plant becoming the main produce of this district. Water would be provided for at least three thousand pooties, producing, with the Indian cane, sugar of the value of £130 per pooty, and with Mauritius cane, if we are rightly informed, double that sum, while grain produce is worth only £12 per pooty.

"The investigations of Major Cotton, the Civil Engineer of the Division, as detailed in his able and interesting Report of the 17th April, 1845, have shown the practicability of turning the waters of that river to the most profitable account by the construction of an anicut of such a height as to command the whole of the delta of the Godavari, and to supply to the rich alluvial soil of which that tract is composed, the means of constant irrigation.

"The work, which would be of a similar character to those already constructed in Tanjore, although considerably more extensive, appears to present fewer natural difficulties, and, in the immediate neighbourhood of the spot, abundance of stone fitted for building and for the manufacture of lime is to be found. The cost is estimated by Major Cotton at £47,575, although he is at the same time of opinion that the actual outlay will fall somewhat below this sum.

"Major Cotton's experience in the construction and results of similar works in Tanjore adds great weight to his opinion on this subject. We are, therefore, willing to