



portion of his life, and for whom he worked with assiduity and at great self-sacrifice.

"The Committee learns with great pleasure and gratitude that, in spite of your retirement and age, you still take a keen and lively interest in Indian engineering, and specially irrigation. It has read, with great interest and respect, your able and recent note on '*Railways versus Irrigation*.' No one seems to be half as conscious and wide-awake as your worthy self as regards the many vast acres that are lying unused for want of irrigation. The whole of the recent terrible famine, which is still being felt in parts of this presidency, and which must be a recurring thing should irrigation be still neglected, would very probably have been a thing unknown, if one-half of the attention paid to railway extension had been paid to irrigation. The Godavari ryot, with all the canals and huge supply in the river, has still not enough of water, if perchance he has it at all, and not in the right season. Many thousands and hundreds of thousands of acres still lie unploughed. And why is this? The question is simply echoed without any answer. And yet the water tax rose from Rs. 2 to Rs. 3, Rs. 3 to Rs. 4, and now from Rs. 4 to Rs. 5. And heaven knows where it will stop! Drainage system has not been paid any adequate attention to, and yet higher taxation is proposed.

"Your experience of this country entitles your opinion to a great weight. We are a dumb and voiceless people, and we trust in the able advocacy of the people's friends, like you, living in England.

"The Committee will feel greatly obliged if you can kindly favour them with your opinion on the Memorials in question. Their anxiety is to put the ryot's case fairly, and yet accurately, and thus furnish the Government, which has the best of intentions, with an impartial, non-official, view of the question."

In employing water on land, or in conquering it when a part of the ocean, Sir Arthur Cotton was almost equally



happy. The chief official of the Godavari District (Mr. E. C. G. Thomas) in the late Seventies, was most anxious that the port of Vizagapatam should be made a protected harbour. Naturally, he turned to Sir Arthur Cotton for counsel, and, as naturally, received what he asked for. The project much interested him. But our space forbids further reference.

THE GANGES CANAL.

CONTROVERSY WITH SIR PROBY CAUTLEY, K.C.B.

The only occasion on which Sir Arthur visited India after his retirement from the service was in 1863, when, at the request of the Directors of the East India Irrigation Company, he investigated the great works then in progress under the management of Sir Proby Cautley, K.C.B. Sir Arthur's Report to the Directors was printed for private circulation, and a copy was placed in the hands of Sir Proby. This led to a most animated discussion.

In his Report Sir Arthur paid a tribute to the usefulness of the canal, even as it had been projected. Had it been carried to completion, instead of, as seems to have happened in *every* irrigation enterprise in India, been dawdled over, it would, before that period, have shown good direct returns. As it was, it had "already saved tens of thousands of lives, and an amount of property probably exceeding its cost, during the late famine." But there were great fundamental mistakes in its projection, and to these the successful engineer from the south directed his attention. Some of these fundamental mistakes, as he terms them, may be summarised thus :—

1. The head of the canal was placed too high, above a tract which had a great and inconvenient fall.
2. The whole canal had been cut so as to carry the water below the level of the surface, entailing a vast unnecessary excavation, and keeping the water below the level at which it was required for irrigation.
3. The whole of the masonry work was of brick, although



suitable stone for hydraulic works was procurable in the sub-Himalayas. (This, Sir Arthur declared, was "a most inexplicable mistake.")

4. The whole of the water was admitted at the head, and some of it, therefore, conveyed three hundred and fifty miles to the land it irrigates.

5. There was no permanent dam across the river at the head of the canal, "so as to secure the supply of water, but temporary works are thrown up after every monsoon, which are liable to be swept away, and have been swept away at the very time when they are most needed."

The mistakes, one to four, had increased the cost three-fold, and delayed the completion ten years, with a loss of twenty to thirty per cent. per annum during that period.

A large number of so-called minor mistakes were also pointed out, such as:—

a. The canal was stopped at Cawnpore, instead of being carried on to Allahabad, where the Ganges and the Jumna meet, and river navigation the year through was effective.

b. The slope was continued to Cawnpore, with a consequently large body of water flowing to waste into the river.

c. The bridges were so low as to prevent a fully-loaded boat passing under them.

d. The towing paths were not carried through the arches of the bridges, so that the towing line had to be thrown off at every bridge—that was at every three miles.

And many more of a similar character.¹

Each of the points raised was fully discussed and answered eagerly by the engineer assailed. It would be

¹ During his examination before the Select Committee on East India Finance in 1872, Sir Arthur Cotton was much pressed concerning the Ganges canal, and why it had not, up to that period, been a profitable enterprise. He told the story as it is described here, only with greater emphasis. "Not one of the bridges," he says, "would allow a fully-loaded boat to go under it; they are at this moment raising fifty bridges to allow the traffic to pass under; that is only one out of six essential mistakes in the construction, and, in spite of that, this traffic of one hundred thousand tons has sprung up."



unprofitable, as well as wearisome, to revive this old controversy. But upon one point, around which the differences raged most fiercely, that is, as to the advisability of building a dam across a river on a bed of sand, some few details may be given. Sir Proby Cautley was scornful concerning the possibility of this being done. It must not be forgotten that he and his colleagues, the Bengal irrigation engineers, were at a considerable disadvantage compared with Sir Arthur Cotton and his colleagues: the latter had done the very thing which the former declared impossible—had done it not once, but many times, and under more adverse circumstances than existed in the north. The arguments may be summarised thus:—

Bengal: We have never built weirs across large rivers with sandy beds; therefore they never can be built.

Madras: We have built weirs across rivers of from one thousand yards to four miles broad, with falls per mile of from one foot up to ten, all having beds of nothing but unfathomable loose sand. The weirs so constructed have stood ten, twenty, and thirty, years. Therefore the like can be done again.

Bengal, still unconvinced, again denies the possibility.

Madras: Why, there is in Tanjore such a work, built by the natives in the second century, as is supposed, which is in use to this day. There are nearly two thousand years of experience for you!

Bengal: The slope of the river below the confluence of the Solani is found to be at the lowest estimate one and a quarter feet per mile; it may be two or three feet at that point. So your Madras weirs would not do. Your suggestions are all "visionary."

Madras: Really! The upper anicut on the Cauveri is

They have raised about half of the bridges, and they are raising the others."

"Was that the fault of those who made the canals, or those who made the roads, insisting on low gradients?"

"I think the mistake was in the projection of the canals."



built where there is nothing but sand and a fall of three and a half feet per mile. Again, there is the Pallur anicut, where the bed is also sand, and the fall about ten feet per mile. The work that will stand in Madras in a river with a certain bed and a certain slope would most assuredly stand in the North-West Provinces in a river with the same bed and the same slope. Besides, there is the nearly two thousand years' object lesson!

Bengal: Well, as to another of your criticisms, we did try to establish the head of the canal in the Jumna thirty-six years ago, and abandoned the effort after the first year's work.

Madras: You may have had good reason in 1827 for what you did. But how many works have been completed since? How much has been learned since? Suppose men were to argue now that, because other men did not know how to construct first-class railways in 1827, *therefore* first-class railways cannot be constructed now!

And so it was on all the points of difference. Sir Arthur Cotton had little difficulty in showing, from experience, that his strictures were more than justified.

One more illustration, and this old controversy—of the highest importance to professional men, of minor interest to the general reader—may be passed over.

"I see no remark," says Sir Proby, "in Sir Arthur Cotton's Report tending to show that he looked upon large masses of water as affecting the project. So far from this, he proposes a depth of eighteen feet without the slightest hesitation, and without the most distant idea of having any difficulty in dealing with it."

Sir Arthur Cotton: "Sir Proby Cautley is quite right. I have not the slightest hesitation upon the matter, or the most distant idea of any difficulty in dealing with such masses of water as need to be controlled in order to place the Ganges canal in its proper state, or to ensure its full extent of usefulness. And really there is no particular difficulty in dealing with such a depth of water. The only thing is that, to retain the same current, if the depth is



greater the slope of the bed must be less. If we allow a current of three thousand yards for a depth of nine feet, the slope must be six inches. That is all the difference.

"In the Godavari we had to deal with a depth of thirty feet, and eighteen feet passes over the anicut. In the Kistna we have a depth of about thirty-seven feet, and more than twenty feet over the anicut."

Finally, Sir Arthur must close this reference to the controversy in his own words of scornful amazement. "There is to me," he says, "something very curious in hearing now, after thirty years of successful and most abundantly profitable operation of these very works, the self-same language with which I was met when I first urged the construction of the Cauveri or Coleroon anicut. 'An anicut across the Cauveri! What a "visionary" idea!' I thought at that time, 'If I can only get one of these anicuts built, there will be an end to all this; people will see that what was done by the natives hundreds of years ago, in the case of the "Grand Anicut" as it is called, on the Cauveri, with their little science and poor means, can also be done by us, and there will be an end of such exclamations.'

"But, since then, eight such works have been constructed in the very worst situations, as respects foundations, etc., without one failure (not without many accidents), and with unprecedented profits; and now precisely the same cry is heard with respect to a river of one-eighth the volume of water of one of those which has already been mastered, and that not by a non-professional man, by one of our greatest engineers. It seems to me now, that it is as useless waiting till this sort of thing ceases, as it is to wait by the side of the Ganges at Allahabad till all the water runs off. We must be content to go on constructing these visionary works, which produce such uncommonly substantial results as we witness in Madras, and to live and die visionaries for our pains."

It is but fair to Sir Arthur's memory to say that, before entering into controversy on the Ganges canal, he put on



record his dislike for contention, and only defended his report on the ground "that the matter dealt with is not a mere personal question, but one of vital importance to India and to the whole British Empire."

On the question as to whether Sir Arthur Cotton's criticisms were relevant, and of service to the enterprise, I prefer myself not to speak; there is no need that I should. Another, an absolutely independent witness, whom I know only through his writings on irrigated India, the Hon. Alfred Deakin, ex-Minister of Lands for Victoria, Australia, has expressed his opinion on the controversy. Referring to the Ganges canal, Mr. Deakin says: "Sir Arthur Cotton, called in to criticise the original plan in 1863, had condemned it almost wholly, and recommended in its stead the construction of a new headwork for a new main canal much lower down the river. Ultimately this proposal of his was adopted in addition to, but not in substitution for, the existing plan." At the same time, Mr. Deakin, "considering that Sir Proby Cautley was the first to undertake the design and execution of a great river canal," and that "the errors in construction have proved to be less serious than was supposed in 1863-64," feels it to be his duty to state that "the general soundness of Sir Proby Cautley's judgment and the wisdom of his project must be conceded." I am glad to be able to close my references to the controversy between my father and the great Bengal engineer with the foregoing commendation of the latter's general design.



CHAPTER XVI

Work in England for India

THE late Sir James Stephen (sometime Law Member of the Viceroy's Council, and afterwards one of Her Majesty's Judges of the High Court, London) wrote a long letter to *The Times*, criticising Sir Arthur Cotton's views. He probably considered that his great forensic reputation, coupled with his five years' tenure of office in India, was sufficient to enable him to controvert statements deduced from accomplished facts and from experience gained during a lifetime's labours. As *The Times* did not print the reply sent to it by Sir Arthur, it is incumbent on his biographer to insert at least the main part in this narrative, so that the independent reader can form his own judgment as to which of the two men was likely to be right. The march of events, and the rapidly increasing prosperity of India in all the irrigated districts, have proved that the judge failed to apprehend the question which he undertook to criticise. The following portion of Sir Arthur's reply sufficiently exposes the weakness of his critic's attack :—

"He (Sir James) speaks as if irrigation were never used except when there was no rain. It is possible that he did not even know that there are some ten millions of acres in India that are watered every year, rain or no rain. He has heard of a single case where the ryots, ignorant of the difference between rain and river water, and acting upon the principle that a penny saved is a penny gained, have refused the water, excepting where they were actually compelled to use it from a total want of moisture. But what



has this to do with irrigation in general? Under the old tanks in Madras, four million acres; under the Godavari, seven hundred thousand acres; in Tanjore a million acres; under the Ganges Canal, near a million acres, are irrigated every year, and there are many million more acres in the same condition, whatever rain falls.

"But, further, there is not a single acre in India that would not be the better for rich river water at some period of the crop, even when rain is most abundant, and that not only for rice but for dry grain also.

"He speaks of well or rain water and river water, as if it were all the same,—as if there were no difference either in cost or quantity. A ryot raises well water by bullocks at an average cost of about three hundred yards for a rupee, and it will only moisten the land, whereas river water manures it also, entirely renews it, so that whole districts go on for hundreds of years bearing grain crops without manure.

"The Government deliver the river water on to the land at Rs. 4 for an acre of rice, which is at the rate of fifteen hundred cubic yards per rupee, or a quarter the cost of filtered well water, which is not half its value; and for wheat or ragi, it supplies at about Rs. 2½ an acre, or six hundred cubic yards per rupee.

"So about fever. I believe there are instances of fever accompanying irrigation, but I have lived all my life in the midst of irrigation, and never had a day's fever from it, nor ever knew an instance of it in any of the districts I have been in, though I have had fevers without number in un-irrigated districts. In the Godavari district, while the delta has very little fever, the moment you go into the upper tracts you encounter it continually.

"The question in these cases is not what men, entirely without means of knowing, think, but what men thoroughly experienced in such matters, and who have proved themselves to be practical men, think of them.

"If anybody asked me a question of law, I don't know what I would say, but I know what I ought to say. 'I



really know nothing about the matter. You should consult Sir James Stephen or some other approved lawyer.'

"I sometimes think we engineers are placed in extraordinary circumstances. No engineer ever thinks of writing a letter of three columns to *The Times* to tell all the world how a hospital ought to be managed, or what is the solution of some intricate and important question of law. The plain fact is, that the rulers of India have most grievously neglected this fundamental duty of rescuing India from famine, and the result we have before our eyes in this terrible disgrace to our rule, and this call upon England for half a million to supplement the millions paid out of the Treasury, and which, if it had only been paid for irrigation and navigation works, would certainly have prevented nine-tenths of the horrors of the famine.

"And what is more, but for the one million that has been spent on the Madras irrigation works, the famine would have been aggravated so fearfully that the Government would have been entirely overwhelmed. With these things staring them in the face, I have a good hope that the people of England will no longer be misled by the old India school, but will insist upon all these imaginary difficulties being forgotten, and the work of relieving India taken up earnestly. I must notice one or two other things in this curious letter. He says, that 'Lord Salisbury said that water will not run up-hill.' There is certainly one thing more extraordinary than this remark of his lordship, that another man can be found to repeat it. I always thought that rain fell on the tops of the hills as well as on the coast; and, consequently, that water could be obtained at any level that was wanted. One of the great tanks is seven thousand feet above the level of the sea, and water is obtainable at every level from that to the coast."

In February, 1875, Sir Arthur Cotton addressed to the Manchester Indian Association a reply to a speech at Manchester, made by the Marquis of Salisbury on the subject of irrigation in India :—



"A single million [of expenditure] has secured two districts and all the surrounding country permanently from famine in the case of Godavari and Kistna, and six and a half millions of expenditure, and perhaps as much more of losses, would have thus permanently secured a tract of some twenty millions of people, or the whole area of the late famine for ever, if the same means had been used. We have shown wisdom in effectually counteracting a famine when it occurred; surely we might go a step further and be wise enough to prevent famines. Most assuredly no other way of doing this has been discovered but by irrigation.

"Millions of acres irrigated, drained, and secured from river floods, the crops in them secured and tripled, hundreds of steamboat canals carrying at a nominal cost, swarming with innumerable boats, conveying a traffic almost wholly created by the canals, tens of millions of people secured from famine, raised from poverty and actual want to abundance and comfort, delivered from living in a sea of mud in the monsoon, and from drinking filthy or mineralised water in the dry season; exports of raw produce for England's manufactories increased ten-fold, and imports of her goods increased twenty-fold, the character of the Government in the eyes of the natives and of foreigners raised highly, millions poured into the Treasury, the greatest returns ever obtained from engineering works in the world—all these were nothing in forming a judgment on the great question whether water is to be given to India or not; the only points worth noticing are a patch or two of the land not yet effectively drained, a patch or two injured by 'reh,' two cases out of thousands in which, through the grossest mismanagement, the use of the water is delayed for a time; these are the things which are to settle the question. Suppose a commission of inquiry on railways in England were to report that, after a thorough investigation, they had concluded from the facts that one passenger in ten millions was killed, that some of the trains arrived after their due time, that one occasionally caught fire, etc., that the whole system ought to be given up.



"One of the things that I complain of in these Indian reports, when they are given, is that they speak only of the Government profit. It may be very necessary for finance purposes to have works which will pay the interest of the money, but the great question is what effect they have upon the country altogether. That is the question for statesmen. I give you the general results of these irrigation works. We have spent £20,000,000 upon them, and we are spending £10,000,000 more upon them now. And the general result is this—that the average cost of irrigation, draining, embanking, and supplying the land with navigation from great rivers has been £2 an acre, and the average increase of produce alone, due to irrigation, has been £1 10s. per acre—sixty-six per cent., besides securing the land from the river floods, carrying off the heavy local rains, and supplying them with carriage at a normal price, so that the works are certainly, on an average, at this moment yielding to the country one hundred per cent."

Special reference was made to the Tungabudra reservoir, which the Government refused; he added that from this, if it were made, there might be laid three or four lines of magnificent irrigating canals to convey the water to vast tracts of country and to a very large portion of the Madras Presidency. "Probably at least ten thousand tanks could be supplied from that one reservoir alone. Such works will cost more than the works already executed, for two reasons. One is, that the upper country is more undulating and rocky, and another is that the value of money has considerably altered. But there is something on the other side, which is this:—You must remember that all we have accomplished is the result of our apprenticeship. Yet even these works return seven and a half per cent. to the Government, and that includes all our mistakes and all our failures. Therefore, we may certainly expect that works executed in the future with all this vast experience must be in some respects cheaper than the old ones."

"With respect to the storing of water, you may imagine what is the quantity to be stored when I tell you that from



the Godavari alone five thousand millions of cubic yards flow into the sea in a day of a full river. Many suppose there is a lack of water in India, but there is only a lack of brains, not water. With respect to the storage of water, I have been fighting all my life to get such works executed. It is just fifty years since I pressed upon the Government the necessity for the construction of large reservoirs on the Neilgherries.

"In some of the speeches the subject of the opium revenue was mentioned. I should have wished to add a remark on that point.

"My position is this, that there is not the slightest excuse for our having recourse to such abominable means of balancing our finances.

"There is plenty of money to be made honestly and honourably in India. The revenue of the district of Godavari, in its former neglected state, was £220,000 a year, paid with the greatest difficulty and with positive impoverishment of the people, that is, a considerable proportion was paid out of capital. With the new works, still not completed, the revenue is £570,000 a year, an increase of £350,000, with a great and rapid increase of the wealth of the people. There are yet 300,000 acres to be irrigated; when this is done there will be an increase of water rate alone of £120,000 a year, and a total increase of at least £150,000, or in all, £500,000 a year. Now the net proceeds from opium are about £6,000,000, which, for the one hundred and sixty districts of India, would be about £40,000 per district, so that if all the other districts were improved by wise management only to the extent of one-ninth of the actual present increase in Godavari, and one-twelfth of that when the works are completed, it would fully replace the opium revenue. Now, who can estimate the difference between these two modes of balancing our finances? Which would be safest, as before God? Which would most promote our credit before other nations? Which most strengthen our hold upon the affections of the people of India? Which most tend to promote peace with



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China, and legitimate trade with her? And, which would be most in accordance with our own national conscience—of these two modes of making money?

“But while we are keeping the famine mainly in view, let us not for a moment lose sight of the general well-being of India and England; for one of my main fundamental points is that the well-being of the two parts of the British Empire is so bound up together that it is impossible to separate their interests. The one is exactly what the other wants. The one wants hundreds of millions of labourers and millions of tons of food and rough materials, with unlimited purchasers of her manufactures; and the other wants an unlimited market for her produce, and an unlimited supply of manufactured goods, for the one implies the other. An orderly, industrious, population of two hundred and fifty millions cannot be sellers without being purchasers. If they sell us, for instance, £20,000,000 worth of wheat they must have in return some £20,000,000 worth of some kind of goods; and so, also, while we have tens of thousands of young fellows fit for anything and willing for anything and hundreds of millions of unemployed capital (for both which we only require a field), they have an unbounded field for the employment of both. It is impossible that two countries could be connected which more exactly meet each other's wants.”

It was evidently felt by the Manchester men who heard him that Sir Arthur Cotton had satisfactorily answered Lord Salisbury. “Can we not,” asked Mr. Leese, “undertake an enquiry into the exact state of things for themselves? It was very desirable that either the Chamber of Commerce or the Indian Association should undertake such an enquiry. They had on one occasion sent out an agent, and there was no question of greater importance than irrigation. Lord Salisbury had startled them with his extraordinary statements that the matter ought to be enquired into.”

The enquiry, however, does not appear to have been made.



In December, 1877, Sir Arthur Cotton gave an address at a meeting of the Manchester Indian Association, and, two days later, a paper by him was read before the East India Association. In it he again describes the results of recently constructed schemes and the urgent need of further similar works, especially in the shape of those for navigation. These are only referred to here as exemplifying the earnestness with which he emphasized the prosecution of such works, which he was convinced were needful to secure the prevention of famine and to promote the prosperity of India. The point on which he most particularly insists is the advantage of cheap water carriage, as follows: "I must say a few words on the necessary connection of steamboat canals with irrigation. To irrigate a million acres of rice requires a canal two hundred yards broad by three feet deep, with a current of one and a half miles an hour, so that when we come to irrigate on this scale, we actually make the finest highways that could possibly be constructed. Thus the Godavari district has three main canals, each sixty yards broad; the Tungabudra main canal is sixty yards broad; the Sirhind canal is one hundred yards broad; so that nothing is wanted but locks, where the slope of the country is greater than can be allowed in the canal, in order to make the navigation. The locks now constructed are one hundred and fifty feet by twenty, and capable of being filled and emptied in one or two minutes, so that they form very small obstructions. With six feet of water they will admit boats of two hundred and fifty tons, and they may, of course, be worked at any speed that may be required for the traffic to be carried."

On several occasions Sir Arthur found the East India Association a convenient and useful medium for the expression of his views. Always there was discussion which, with much regret, must be passed over so far as these pages are concerned. Of one of these meetings he writes: "There are certainly indications of some change here. We had an adjourned discussion at the East India



Association on railways. There were two indications for good ; one was that Danvers and another India Office man, and Andrews, the Sind Railway man, were present ; they have felt so much pressure that they thought it necessary to abandon their old part of dignified silence and come out and meet me. This gave me a grand opportunity, if I had but had wit enough to take advantage of it. The other was that three or four spoke openly on my side, also quite a new feature. The secretary of the Association (Dadabhai Naoroji, now, in fact, the Association ; how curious that an Indian should have the whole affair in his hands!) has written to me twice for additional copies of my paper, besides three hundred he had distributed. . . . I showed M. one of your letters, and talked to him several times. He is not equal to making a decided stand against the Secretary of State and the whole Council, though he made a good fight about irrigation and gained his point. But this land and water communication touches the very apple of their eye, and they would be frantic if one stood up honestly and boldly on the right side. I don't know exactly what part F. plays in this respect, though I believe he does enough to make himself obnoxious. I sent you some copies of my paper, if you can kindly find means of distributing them. I am sorry to say I have got into a sad scrape. In one of your letters which I cannot now find, though how it can be missing I can't think, I understood you to say that the traffic in the Nuddea river was one million nine hundred thousand tons, and I laid great stress upon this ; but, by the papers you now send, I find the average is only five hundred thousand tons. I shall have to acknowledge this. Of course I have not made any allusion to you. It still shows the greater part of the traffic going by the rivers, but there is a great difference between half a million and two millions. I can't think how the mistake has arisen ; whether I read your letter wrongly or not, though I read it several times. I have the accounts of the cost of working the Brahmaputra steamers and they give under three-eighths of a penny per ton per mile,



and the Director told me that they used to send their cargoes from Kushtea by rail at twenty per cent. under their regular charges, but they found it so much cheaper to carry them themselves four hundred miles by the Sunderbunds than to send them one hundred and ten by rail, that they gave up their contract with the railway.

"M. says he approves of my last paper on the Godavari Navigation, if I had only left out one or two paragraphs; no doubt the very ones upon which the whole depends. What I want to make them understand is that I am convinced they are essentially wrong, and this is the advantage of having a man out of office, that he can speak out in a way that perhaps a man in office ought not to do. The Oriyas must certainly be the most degraded race in India. I couldn't have believed that they would not even use the canals.¹ I have hope, however, now that the traffic, with the assistance of McKinnon's steamers, is fairly established."

In 1878, Sir Arthur Cotton gave an address at the Edinburgh Literary Institute in reply to one from Lord Napier of Ettrick, who had been Governor of Madras. The Governor and the engineer did certainly not see eye to eye. The engineer pointed out wherein the difference chiefly lay. He said:—

"I beg now to bring the matter before you in a strong light by contrasting my conclusions with those of your late lecturer, Lord Napier, who certainly had the right to offer his opinions, from his having been the Governor of Madras for several years so lately. I may premise that the first point of all, which constitutes the essential difference between us, is his entire indifference to cheap and effective transit. He makes no mention of this whatever; whereas,

¹ Since the above was written, the canals are being largely used for irrigation and navigation. Concerning them, Mr. Deakin says, in his book (p. 288): "Taking into account the circumstances of India and the character of its people, the Orissa canals cannot be denominated failures, though constructed with a view to the profit of private persons, and now being finished at the public expense as a means of preserving life."



in my opinion, it is most distinctly the very first point in the material improvement of India, and in dealing with those famines, even to be attended to in preference to irrigation itself, if considered as distinct, though it is quite true that the two things are so intimately connected, that in general you find you cannot work separately for the two ends."

It is somewhat amusing to note that he who was now an antagonist of the ex-Governor, hailed the latter's going to Madras with joy. Writing to a friend, he gave the information that Lord Napier of Ettrick, "who has hitherto been in the diplomatic line," was appointed to Madras. "Nassau Jocelyn, Lord Roden's son, says he's a very able and a very practical man. I must say I am heartily glad to hear of a Scotch nobleman going there, and not an old Indian. 'Blessed art thou, O land! when thy king is a son of nobles.'"

Perhaps not the least practical of all the addresses given by Sir Arthur Cotton, during his retirement, were the three which he delivered in Chatham. They constitute, for the space they occupy, the most lucid and informing description of irrigation works in India which is to be found anywhere. Apparently, he bestowed special pains on the preparation of these addresses. In previous chapters, it will be remembered, considerable use has been made of them.

During the latter years of his life he wrote memoranda on—

The Salt Tax : The Poor Man's Income Tax,
The Tungabudra Works,
English Internal Transit,
Communication with the Soudan by the Congo,
Public Works in Madras,
The Opium Revenue (chiefly addressed to the
Anti-Opium Society, which he supported very
warmly),
Study of Living Languages,
Indian Finance,



Prevention of Famines,
Points for the Consideration of the International
Congress at Manchester,
Replies to Sir Walter Trevelyan's Minutes, Lord
Napier of Ettrick, Sir Proby Cautley (Ganges
Canal),
The Navigation of the Kareen River (Teheran),
and many others.

TAXATION ON SALT.

The heavy taxation on salt, and, consequently, the small quantity consumed by human beings and cattle, was always a source of anxiety to him. He wrote a pamphlet on the subject, entitled *The Poor Man's Income Tax*. Only a few passages can be quoted from a brochure of more than ordinary interest and value.

At the time when the late Mr. Laing was sent out, as Finance Minister to India, there was considerable anxiety as to the deficiency in the revenue, and consequent discussion as to the direction in which additional revenue could be raised, and it was finally unfortunately determined to impose an increased duty on salt. "Now salt is an indispensable condiment for a population whose principal diet is that of cereals or vegetables, especially to Hindus, by whom meat is rarely consumed as food. The manufacture of salt was a Government monopoly, and to so great an extent was the price of it raised, that salt from Cheshire could actually be landed at Calcutta and sold more cheaply than it could be purchased from the Government salt pans. To still further raise the price was to inflict a hardship on the population in the interior. On those on the coast it did not fall so severely, but, of course, when the cost of carriage to the interior came to be added to the Government price, it became a serious burden. The measure was a good deal discussed in the public prints at the time. . .

"In England there was formerly a duty of fifteen shillings per hundredweight on salt, or about three half-



pence per pound, but, after the fullest inquiry into the subject, the nation came to the conclusion, chiefly on the opinions of the medical body, that salt was so essential to health, even among a population who used animal food extensively, that nothing could justify a tax on that article; though it yielded between one and two millions sterling, and was one of the most easily collected of taxes, it was, by general consent, given up. Whatever new taxes have since been imposed, this has never been again resorted to. It is well known that animal food is, in a measure, a compensation for salt, but the demand of the human system for this condiment, where vegetable food only is used, is more urgent than for anything except for food itself.

“Now, that a portion of the population is deprived of salt is fully proved by two things. First, by the fact mentioned by Mr. Laing, that the consumption is increasing. Men don't use salt as they do liquors,—that is, sometimes in excess; and, therefore, if the consumption increases, it is conclusive that the population had not enough before. And, secondly, the data as to the consumption afforded by Mr. Laing's paper. The total duty levied last year was £3,500,000 sterling. The average cannot be far from Rs. 2½ per maund, or £6 6s. per ton, and, consequently, a total duty of £3,500,000 gives a total consumption of 560,000 tons, which, for a population of one hundred and eighty millions, is seven lb. per head.

“Now, it has been well ascertained that, where the price is low, the consumption is not less than eighteen lb. a head, and it is said that in some parts it is proved to be as high as twenty-two lb.; whatsoever the actual consumption is at present, in any one place, for the reason before given, it ought to be at least that all over India; it might very probably be more; it could not be less. Indeed, there is strong ground to believe that it has never yet reached its proper height in any part of India.

“Now, supposing the labouring man in India to earn two annas a day, and his family one anna, his income is about



seventy rupees a year,¹ and the salt duty is a poor man's income tax of

6 per cent. in Bengal,
2½ per cent. in Madras,
5½ per cent. in Bombay,

so that the average of the poor man's income tax is much above that of the rich man.

"Yet the financier lays this on without discovering that he is actually doing the very thing he professes to abhor; he cannot discern the difference between words and things. What does it signify that one is called an income tax and the other a salt tax, and that, in the one case, the payer receives a receipt, and in the other salt, for which he at the same time pays the cost of manufacture, of carriage, and of dealer's profit besides? It is thus that superficial men are misled by their own words. . . . Now, in England, a man pays for a hundred lb. of salt tenpence, and earns, at two shillings a day and one shilling for his family, fifty pounds a year, so that his salt costs him one twelve-hundredth part of his income, and the poor Indian, with his vegetable diet, would have to pay from one to two hundred times as much, in proportion to his income, of course; the result is, as shown by the small amount of revenue raised, that one hundred millions of the people are almost or quite without this necessary of life. Even before the duty of fifteen per cent. in England was taken off, the English labourer only paid fourteen and sixpence a year, or one-seventieth of his income, and this was, by the voice of the whole country, declared to be so intolerable that a tax between one and two millions was given up to relieve him, while in India, it does not appear that one voice was raised against the atrocious proposal of a large increase of this tax.

¹ Unhappily, the average income of an Indian is nothing like Rs. 70 per year, save in the Cottonian districts. Lord Cromer's investigation in 1882 made it only just two-fifths per head of Rs. 70; the reader will note the effect of this reduction on Sir Arthur's contentions.



"Yet in this same paper the writer dares to quote the Holy Scriptures and say, 'Every enlightened Hindu and Mahomedan, as well as every enlightened Englishman, may cordially unite with us and join us in praying, in the words of the Psalmist, that "our works may be so done in truth and equity as to stand fast for ever and ever."' We do most heartily pray that Mr. Laing's works may not stand for this one year."

Throughout these years, India's needs, and the remedies for those needs, were my father's constant thought. Growing deafness kept him more and more to that privacy which, though a great hindrance to his intercourse with friends, was never allowed to be a hindrance to his literary activity. Much of his conversation was carried on by slips of paper, on which the converser stated his point and Sir Arthur replied *viva voce*. Quite a number of these "conversation" slips are in existence, many of them in the handwriting of Mr. Robert Scott, of *The Christian*, who spent several hours every week with Sir Arthur during the last two years of his life. One of these one-sided records—reminding one of a telephonic conversation heard by a bystander—the answers to which can often readily be imagined, though they cannot be heard, may be given. The "writer" was Bishop Thoburn, a most experienced Indian missionary; the speaker, "whose words are silence," was Sir Arthur.

NOTES OF A CONVERSATION BETWEEN BISHOP THOBURN AND SIR ARTHUR COTTON.

Bishop: We have a mission at Sironcha, and one at Ingdampur in Bastar. Both are new. We wish to open mission work at other points.

I am in my thirty-ninth year of service in India.

It is given out that Lord Cromer cannot leave Egypt this year.

And a strong man is needed as Governor-General.

The whole Godavari country is looking up. We have planned for a mission with stations at Raipur, Ingdampur, Sironcha, and



possibly two other stations in Bastar. We have three thousand famine orphans, and intend to settle many of them there.

I have not been nearer than Jellandu coal-field—two years ago.

General Haig used to worship with us in Calcutta, and held meetings constantly among the seamen. For several years he and I were constantly associated together. He often told me of his work on the Godavari. Some of his mission work is now in our hands.

I superintend our missions all over India. The work has spread down to the Straits, where there are now many Chinese colonists. We are now preaching in twenty-four different languages and districts. We have one hundred and ten thousand Christians of all ages, and two thousand native preachers of all grades. The work extends very rapidly among the lower castes. We are greatly straitened for means, owing to reductions in the grants from home, and the rapid extension of the work. But for this we might succeed to almost any extent.

A Commissioner in North India said some years ago, in his official report, that if our work among the Chumars went on, it would lead to a revolution. He feared for the result. In every direction the lower castes are waking up.

Many of the Hyderabad officials are friendly to our work. They aid us in many ways.

They will take up irrigation again before many years. The Nurbadda could have saved the valley in the recent famine. In all sub-mountain regions irrigation could be introduced by forming reservoirs among the hills. Sir Henry Ramsay did this with perfect success in Kumaon.

Ours is an American mission. I came out in 1859, when twenty-three years of age. Most of our missionaries are Americans, but we have some representing England, Scotland, Ireland, Wales, Germany, and Scandinavia. Our foreign force is not increasing. We aim to give increased responsibility to Indians, and this gradually puts responsibility upon them.

Men love to do as they did in ancient times—follow “the traditions of man.”

I am much pleased to find that you have read a brief account of my work, and it greatly encourages me to know you approve my method in baptism. I was *led* into it, and after finding this



path I discovered that it is the very way the New Testament deals with the question.

They were left to the development of Providence.

Only the simplest elements of a system of government are found in the church of Pentecost. The situation was new. We are on the threshold of a *new era*.

How many years did you spend in India?—Forty-five years. I shall quote that freely when I go back to India.

You quite believe in a system of great reservoirs, do you not?

There has been a revolution in medical treatment even since I came out. They told me I *must* drink brandy-pāni. For thirty-six years I have abstained, and now I feel that I am still a young man. We have now three thousand orphans under our care in India. Most of them are survivors of the late famine. It is a great delight to me to have this interview with you. It will interest people in India intensely to hear of your welfare. You are truly "a wonder unto many."



CHAPTER XVII

Life in England—Letters from Florence Nightingale, Sir Bartle Frere, Sir Colin Scott-Moncrieff, R.E., and others

WHEN my father went to India, after his retirement, and on special irrigation business, we removed from Devonshire to Tunbridge Wells, where we awaited his return. When he rejoined us there, later on, it was his last home-coming; though sundry schemes were on foot in after years, and he had thoughts and opportunities of returning, he did not again leave England. Instead, he endeavoured to serve India in this country, by trying to gain the support of those who had power to carry out his great schemes.

He longed for quiet and freedom from too much social intercourse, and often sighed during the few weeks after his return for a real country life. His resources were endless, and he had never known, perhaps for one moment, the meaning of the word *ennui*; he did not like his time broken up by constant visiting.

While at Tunbridge Wells he thus wrote to a friend: "I find they have been making a great mistake all this time in examining the wrong branch of the Tungabudra for sites for tanks; they have reached the Eastern, which is the one with the great fall. I could not understand what they told me about the site having so great a fall; it never occurred to me as possible that they could be wasting their time on the wrong branch. I forget whether I sent you Fife's letter; if not, I will send it. He was



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hoping to begin soon upon a tank of three hundred million cubic yards. This is the grand thing; if once the storing of water upon a large scale is begun the battle is won. It is curious how both Calveley and Haig have been baffled on this point for so many years. Rundall has a most noble site, on the Tel, which drains the western slopes of the Eastern Ghauts, when the rains are so excessive, two hundred inches at Jeypore. They plan a tank of two thousand millions with a bund of one hundred feet. I have nothing yet from Calcutta. The India Office Engineers are going to make another desperate effort; they think, I suppose, that C. had not made the most of it."

It was at this juncture that he was summoned, with a party of other engineers, to examine into the cause of the disaster that took place at Sheffield, when the embankment of a reservoir suddenly burst in the middle of the night, and a great portion of the city was flooded. He received a telegram early one morning while we were at breakfast, requesting him to proceed to the spot to aid in investigating the cause. His portmanteau was at once packed, and we went by the next train; I say "we," for he would have me go with him to see the wonderful sight. He suggested our going on to Ireland, that we might pay a visit to Lord Roden, who had married a connection of ours, and had most cordially invited us to stay at his place in County Down.

No sooner said than done. Two hours had not elapsed before we were on our way to Sheffield, and, during our long train journey, I had to listen to the discussions of the five engineers, who were travelling together to inspect this important work.

When we arrived at our hotel the scene was an unparalleled one. Confusion reigned in every street, and the sight that met our eyes was indeed strange. The water was pouring in a vast volume down the river bed and far beyond it on either side, carrying with it houses, haystacks, boats, farming implements, and every other imaginable species of wreckage in conglomerated heaps.



Amongst these strange piles were many bodies of unfortunate people, who had been swept away from their houses by the rising water and drowned, whilst men lined the sides of the river, dragging out the bodies, and laying them on the higher ground. It was altogether a terrible sight, but fortunately lasted only a short time as the torrent naturally soon subsided.

Our two days at Sheffield interested my father greatly, as it lay so entirely in his own line of work. We also visited some of the great steel and iron works, and saw the huge plates for the sides of iron-clad vessels prepared, as well as the delicate manipulation of a dainty pair of scissors.

On our journey from Sheffield, the engine broke down, and for two hours the passengers were delayed. My father devoted the period to a study of the engine and the cause of our misfortune. He soon was master of the whole subject, and when some one commiserated us at the end of the journey on our loss of time through this accident, his reply was, "Loss of time, do you call it? I thought it the most interesting and useful two hours of the whole journey."

We soon arrived in Ireland, and after a long drive of about eighteen miles from the station, we were rewarded by the interest of driving up to the great gates of Tollymore Park: he was perfectly entranced with the view; mountains rising over mountains, all tipped with snow, and also the hills richly wooded, ending abruptly in a delicious ravine, through which a bubbling, rushing stream-torrent flowed, sometimes tumbling over the rocks in waterfalls and cascades. The house stood amongst the woods, surrounded by shrubs, and fronted on the west side by an immense bed of rhododendrons just in flower. But it was the mountain view that so enchanted him. From the house we could see the sea, only two miles off,—a glorious view it was! Mountain, sea, and woods combined! He felt in a moment that this was the air, and this was the scene, that would be the greatest refreshment to him now,



wearied as he was in mind and body. And when, in the course of the day, Lord Roden drove him down to see a charming house that he had recently put in order, with a gate that opened into the park, and offered it to him for a few months, he could not resist the temptation of making this his home for a time at least. The climate and scenery were everything to him, and he felt that he could use the one power left now—his pen—in this quiet retreat, better than he could in any more frequented place.

In a very short time we all moved to Bryansford, the pretty village into which the gates of Tollymore opened. And there we remained for three years. He wrote incessantly, morning and evening, and drove in the afternoon through the beautiful scenery of the neighbourhood, or made expeditions to the mountains on foot. He was singularly active and fond of walking, and, however weary he might feel, it always seemed to refresh and invigorate him. He would visit the lonely farms scattered through the mountains, his pockets filled with books, with which he would endeavour to cheer the solitude of these lonely people, who were always grateful and pleased to see, as well as cordial in their welcome of, a visitor. They loved him truly, and many a one would offer their rooms for a little reading or prayer, when he would open his Bible and tell them of the Water of Life, which flows so freely from the Throne of Grace, and can satisfy the most needy heart.

Lord Roden's daughter, the Countess of Gainsborough, one of the Queen's ladies-in-waiting, used often to come to Tollymore to stay with her father;—a most charming woman, with handsome features and queenly presence; none that ever knew her could forget her exquisite manners and delightful conversation. Lord and Lady Dufferin, Lord and Lady Lurgan, Sir Arthur Blackwood, and many other friends used to be the guests of that hospitable home. Miss Marsh, the authoress of *Hedley Vicars*, was one of his favourite visitors; and Mr. Richard Nugent, with his wife and daughters, often came to Tollymore.



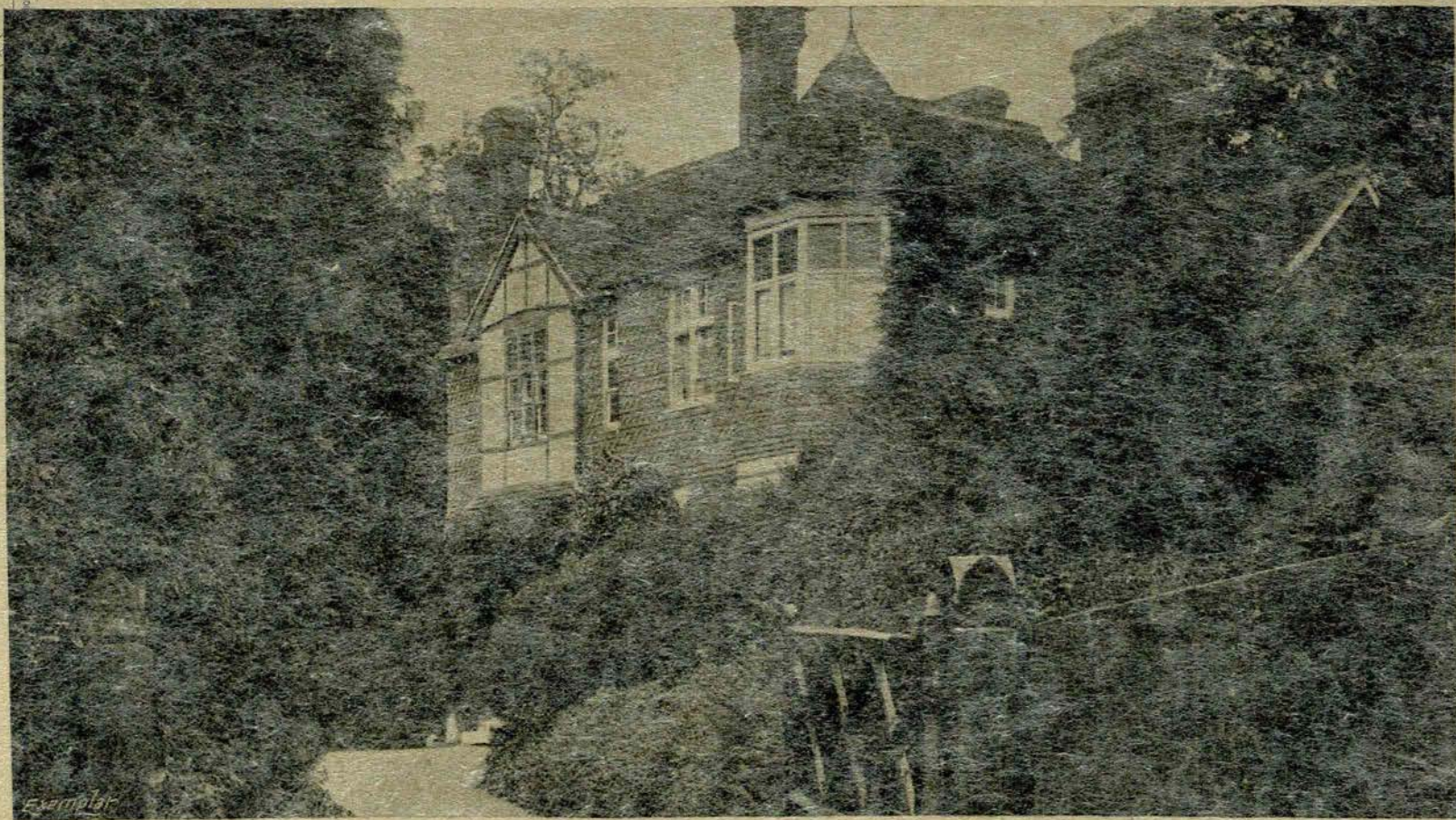
We often visited Lord Annesley's beautiful place, Castle Wellan, with its remarkable pinetum and far-reaching lake. The house stood in an exquisite position, looking down on the undulating park, with the water shining between the trees.

Lady Annesley's house at Newcastle, Donard Lodge, was another delightful place in the neighbourhood. It was a real enjoyment to my father to walk on the terraces overlooking the sea, and then to wander in the woods, and watch the splendid waterfalls, which, in winter and after rain, were a sight which people would drive miles to see.

One day when my father was driving with Lord Roden, beside the river that ran through the park, he was pointing to the bridges which crossed it, each of which had its history and its own special character, and greatly added to the charm of the grounds. He pointed to one particular turn of the stream, and said, "We have always wanted a bridge there, but have never put one up." My father immediately said, "You can easily have a wooden chain bridge, swinging across from bank to bank; it would be very ornamental, and exceedingly useful for foot passengers, though it would be too light for carriage traffic." They drove together to the carpenter's shop—always a great scene of interest—attached to the saw mills, where busy work was constantly going on. After a little conversation with the man in charge, it was decided that my father should draw out a plan for the construction of this bridge. This was soon done, and to this day the bridge may be seen, a specimen of light, strong, work, useful for its purpose and picturesque as well.

On the recovery of my father's health, he desired opportunities to extend the irrigation interests of India. For this reason he determined to leave Ireland, and take up his residence within easy reach of London; he finally settled at Dorking in Surrey.

He was on the Committees of the Church Missionary Society, the Bible Society, and the Irish Church Mission. He continued his connection with these Societies for



WOODCOT, DORKING.



many years, his attendance only being prevented afterwards by increasing deafness. He was devoted to active exercise, and used to take very long walks, enjoying the sight of fresh views or new country. His activity was wonderful. After the severe illnesses that he had passed through, and the zeal and labour of his life in India, with its many privations, exposures, and difficulties of a thousand kinds, at the age of sixty-seven years he thought nothing of walking thirteen or fourteen miles in a day.

One day we were crossing some fields, and were obliged to pass a large herd of cattle. Some of them looked rather fierce, and one made a dead set at us with its horns down. I immediately ran to a stile that was near, and got out of the way. When my father joined me he was smiling.

"You are just like a woman," he said; "all women are the same."

"What have I done now," I asked, "to merit such a rebuke?"

His reply was: "A woman runs away when there is no danger; but, when there is danger, she is as brave as a lion and knows no fear!"

When he was walking, or driving, he was often so absorbed in calculations on a gigantic scale, millions of rupees, or miles, or measurements of some kind, that he did not utter a word; and, if he was addressed, he did not appear to be conscious that any one had spoken to him. He could often preserve this abstraction in a crowded room, with people talking all around him; he would busily write out his notes or jot down his figures, carrying out his own line of thought at the time.

We did not reside very long in the cottage that we had rented at first at Dorking; my mother's brothers were anxious to build her a house, and they asked my father to choose the kind of house they both would like. A charming spot was selected—a sunny slope, crowned with a wood, and having a pleasant view. My father had said several times that he would have liked very much to have a house built on the plan of one he had seen on the island



of Guernsey, belonging to Colonel de Haviland—an old friend of Indian days who had died a few years previously. The coincidence, which now occurred, is interesting. A new curate had come to the parish; my father met him. In the course of conversation it came out that this clergyman's family belonged to Guernsey.

"Oh," said my father, "that is a very curious thing; I should like to ask if you ever knew General de Haviland, who lived there a few years ago. When I was a young man I stayed at his house, and shall never forget its picturesque inner hall with a gallery round it. I have often said I should like, if ever I had a house built for myself, to have it arranged on that plan."

The curate answered, "Strangely enough an uncle of mine has taken rooms for a few days in this town. He lives in that very house in Guernsey, having rented it since the General's death"; adding, "If you will call upon him, he will be delighted to see you, and perhaps can give you some information about it."

My father walked over to pay this visit and found the gentleman at home. When the inquiries were made, the reply was: "I have here in my desk the actual plans of the house."

Sir Arthur begged the loan of the plans, showed them to an architect, and a house was built which was in accordance with his earliest wish.

My brother was at this time in Northern India, having left Sandhurst with flying colours. He arrived at Woodcote one Saturday afternoon as usual, for he always spent Sunday with us; and, as he came into the room, he greeted my father with the words: "What would you say if I were to tell you that I have won the first prize for fencing?" So saying, he exhibited a very handsome pair of fencing-sticks to our joy and pride. Then he added: "Look at this!" and put into his father's hands a sword; "it is the Good Conduct Sword!" Out of eight hundred young men his son had received this honour! My father's delight and surprise were indeed very great. Soon, however,



my brother had to leave to join his regiment; there were sad hearts at Woodcot, for he had always been a devoted son.

From his own correspondence a few excerpts are made to indicate the character of the letters he wrote, and the unceasing interest which he took in everything appertaining to the advantage of India, or the greatness of England.

(1) "*The Daily Telegraph* editor wrote to me that Sir Bartle Frere had told him to apply to me for a series of letters on the famine, which I am now writing; two have appeared, and I have sent a third, and should like to write one or two more. It is a great opportunity, as the *Telegraph* has an enormous circulation.

"Frere seems quite to support me. Sir Lewis Mallet also wrote to me, protesting against spending money on works not suited to India, railways, but seems to think it useless to attempt to oppose the system, only resisting individual works.

"I wrote to call his attention to your translation of the French Commission paper, which he thanks me for and says he has got it. Mr. Waterfield, of the India Office, writes to me, saying that you and I say that goods can be carried by water at one-tenth of a penny, and asks for our authority for it. I told him we both give our authority in the papers, and I repeated it in my answer. This shows that the India Office cannot any longer resist the pressure, but is compelled at last to look into the matter. The fact is they must hear of it now. I said to him what a pity they had not asked the difference between the cost of land and water carriage before they spent one hundred and thirty millions on the former.

"I highly approve of your memo., and have no doubt it will have effect. But all the pressure that can possibly be brought to bear upon the matter in England will be required. There is to be a discussion on it to-night at the Society of Arts, under Sir B. Frere, but I cannot go as I have a cough. Another is to be held by the East India Association next week—a paper by W. Tayler, who

asked me to give him a memo. on the subject. I have written two letters to Sir George Campbell, urging the execution of the Navigation canal to Jessore, and the pushing on of the different parts of the main line of canal up the Ganges. I have also written two letters to *The Times*, especially insisting upon this—that one crop in a famine would pay the whole cost of the most expensive irrigation works twice over. It would pay the whole cost of the Orissa works, with accumulations of interest, if not an acre was watered nor a boat passed along the canal for ten years. I am very glad the canal is open to Midnapur. It's also a grand point that you are able to water so much land from the Sone, putting in the strongest light the effect of such works in a famine.

“I think the high level canal I proposed to Jessore and the main Ganges of the greatest importance, as opening the communications for the whole year, at the least possible expense of time and money. F. says he wrote a memo. on it and that he would send it to me, but I have not got it yet. I wish you could get it put in hand now.”

(2) “I am anxious to hear, first, what effect upon the whole you think the famine will have upon your project as a speculation—whether you think the depopulation and impoverishment of the district will materially delay the use of the water. That it must seriously affect the traffic there seems no room for doubt. Surely it will fully account for what you say of the small traffic in your last letter.

“Next, what effect will this advance of funds by the Government have upon your works?

“I see they offer £20,000 a month, and that B. has accepted it. Will you be able to make use of it, and find labour enough, and what will it do for you this season?

“I should be very much obliged to you for your opinion of the prospects of the project now. They seem to be now doing everything that they ought to have done fourteen months ago. I should suppose that in your present posi-



tion, with some of the heavy works finished, the money ought to go far in the distribution.

"I should be glad to see any Indian papers that comment on the Ganges canal controversy. The report was an extraordinary failure. I am so glad they didn't call you in, or anybody on my side. I have the Godavari report, too, quite as complete a failure, though free from bias.

"I wrote to Frere and asked him to help in seeing that the matter received a fair hearing in the India Office.

"I wrote also to Sir Stafford, and begged him to read the papers himself, which he promised to do. They have lately printed for the House of Commons papers about irrigation—a most melancholy affair—papers by almost everybody, but not one single thing *done*, even by Lord Cranbourne. Buckle says most truly that this is the characteristic of the age—everybody writes and says, but nobody *does*.

"And nothing will be done while the Council is the executive in public works ; they are an incompetent body, and there is no hope till we have a separate Board of Works, who have time to make themselves acquainted with their business, and to acquire an interest in it, and to have nothing else to attend to.

"They are going on just the same with the Upper Godavari works. Sir Charles Wood told J. B. Smith that the last thing he did before he left the India Office was to order the vigorous prosecution of the Godavari works at all the Barriers ; but to this time the Indian Government have not issued the orders, and another season is lost.

"I have some idea of trying to make a move by seeing Frere, Sir Stafford, and others, this month. Frere is a man whose deeds do not belie his words, and perhaps he may effect something. I am writing an answer to the Upper Godavari report. But they now talk of millions as they used to talk of thousands. There never was such an opening in respect of capital ; the rogueries of last year have left the public afraid of all private enterprise and the



accumulation is prodigious. I suppose any amount could be obtained by Government.

"I am in hopes I may hear from you soon. The majority which the Government have just obtained will probably set Sir Stafford at liberty to attend to his own business; but I see no signs whatever, yet, of anything effective being done about public works, though I am in hopes it may still creep on as it has done of late.

"They have sent another officer, Forbes, down to the Godavari, showing that while they affect to ignore these works, they find them too hard a nut to crack; they will find all sorts of faults with them, quite forgetting that all they say against them will only strengthen my arguments, for if, with all the mistakes, the works have produced such results, it only confirms the more all I say about the profits of irrigation.

"God has favoured us with a termination to the Abyssinian Expedition beyond all our hopes, though I must say it's a terrible disappointment to me, too, for I could not help hoping that we should be inextricably entangled in the country, and be compelled to inaugurate a state of peace and order there and in the surrounding countries.

"I have had some conversation with a Mr. Vesey Fitzgerald, a man of property in Ireland, who takes a great interest in India, and made a tour in it some years ago. He is a literary man and, I believe, a man of some influence; he is a Liberal, but a member of the National Club. He sent for me, and is trying if he cannot do something to force on works in India. In this way there is now a very considerable undercurrent working, but it may yet take long before anything is done.

"If you see the Rajah of Benares, tell him I have just been to see his well, within a few inches of where I was born, in Oxfordshire. It is three hundred and fifty-eight feet deep. It was in beautiful order, and the water was delicious, an invaluable gift to that neighbourhood."

(3) "How astonishing it seems that navigation must



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never be mentioned at the India Office or in the House of Commons. I am happy to say the Lower Ganges works, begun at the very spot where C. wrote a book to prove it was the greatest nonsense to talk of an anicut being built, are completely successful; and the Sirhind seems to be going on very well, but the Sone hangs fire still—why I have no idea, for not a word is said on this one fundamental point in the reports; the same with the Tungabudra.

"I had a talk with Mr. Bourke [M.P. for King's Lynn, then appointed Governor of Madras and created Lord Connemara], who seems a very efficient man, and I am in great hopes will do something to restore Madras. I pressed upon him the putting of an able man at the head of the Public Works Department, and taking up earnestly the works on which about three millions sterling have been spent without any result as yet, entirely from want of competent men. I alluded to the harbour, the Coast canal, the Tungabudra works, and the Godavari navigation.

"You see they are taking up in good earnest the North-Western Frontier, so far as advanced posts are concerned; but nothing is being done to prepare the ground base, the Indus, as you advise. This is quite beyond present men, though it is *the* point above all. But we have not a single master mind at present, unless G. expands now that he is brought to the front. I am rejoiced that F. has at last got into work worthy of his talents and of his deep Godliness. We last heard from him at Aden, he having visited all the ports of the Red Sea, and he is to go to Muscat and Bagdad and Damascus, and up the Nile. A more able man to lay the foundation of a great mission around Arabia could not be found. He is sent by the Church Missionary Society. What a grievous thing it is to think how such a man has been thrown away hitherto!

"I must acknowledge that it's a great satisfaction to me that this most able paper was prepared by you, and circulated, for I cannot but hope that it may yet help to resuscitate this most vital subject of irrigation, against which the whole Indian official body, almost, have so entirely set themselves.



"Indeed, a friend of mine, an ex-C.E., has lately written to me that he finds the India Office rather inclined to return to the subject. And I have lately found out that the Punjab Government are really heartily in earnest in the matter, in spite of the superior authorities. They have irrigated three million acres, have another great project in hand, and a further one almost ready for execution.

"But, curiously enough, I have now before me a vast railway project about which I should like greatly to have your advice. It includes such a number of first-class objects that it would quite affect all India, though the line itself is only three hundred miles long. It is from Vizagapatam to Raipur, and has been long talked of, and I rather think is actually begun, but without their the least perceiving the main point, that it is the natural and proper outlet of the whole Upper Gangetic country. I am preparing a memo., which I will submit for your remarks. What I wonder at is that I never perceived the state of the case."

One of his favourite correspondents was Miss Florence Nightingale. On the subject of Indian irrigation she was keenly interested. With a view of drawing the attention of a newly-appointed Governor to this subject and the importance of pushing forward certain works, she wrote:—

"If you could write me one of your most interesting and impressive letters, I might be able to do something with it. Will you give me the latest figures and information of the state of things in this year?"

With regard to the irrigation map that was then being prepared, and which, brought up to date, is published with this memoir, Miss Nightingale writes: "I have had but few copies made, because I hope that every year we shall have to make additions to this map; and that every year it will require correction!"

She alludes to Sir Richard Temple's minute on the famine of 1877-78:—

"He bore testimony to the tanks, as famine relief



works (in the Bombay Presidency), and to their permanent value for the people. I always think of *you*—their father—when I read any of these passages. The more one hears of this famine, the more one feels that such a hideous record of human suffering and destruction the world has never seen before.

"I am very sorry to hear so poor an account of yourself, but there is a good time coming yet. India is forcing her way to the front. You must live for that."

Sir Arthur Cotton writes to another friend with reference to the making of railways instead of canals:—

"What an inconceivable mistake they have made in forcing on the railways in India. After trying land carriage in England for sixty years, they have decided that it is necessary to spend seven millions in water transit by the side of the rails for thirty-five miles (referring to the Manchester Canal). What a decisive judgment this is as to land carriage in India, where there are lines of one thousand miles in length! The ludicrous part of the matter is that they are working the rails generally at from eight and a half to twelve miles an hour, with only the exception of one or two lines at twenty to twenty-five miles, while canals would certainly have been worked generally at fifteen or twenty miles for whatever required it."

No wonder he adds:—

"The works suggested would secure such a supply of cheap building materials, fuel, salt, etc., as would alter the whole domestic state of the people. The works also provide for about five million acres of irrigation scattered through the whole peninsula, yielding an increased produce of ten millions per annum. This, in addition to the present five million acres in Madras (besides all in Mysore, Hyderabad, and Bombay), would secure food for twenty-five millions of people, and would effectually provide against famine in connection with the abundant means of transport of food throughout the whole peninsula, at a charge which would add very little to its cost. But what



would be the prodigious stimulus that this means of intercourse would give to the people, certainly putting new life into the community beyond all we can imagine! Besides the new irrigation, these works, by a more certain supply to the tanks in ordinary years (and that the superior river water), would greatly improve the produce and value of the present irrigation.

"But, further, the improved condition of the people would lead to a vast extension of the ordinary dry cultivation, and by the abundance of fodder, the difficulty for providing for the cattle, in consequence of the diminished area of jungle, would be completely met. The model farms have proved fully that, with a very small supply of water, fodder may be grown for cattle at a very small cost. This is one of the many things that it is necessary to put the people in the way of providing, by European instructors.

"Who, for instance, can estimate the effects of such a state of the people in respect of all necessary things, in enabling them to educate themselves? The change in Godavari in this respect, as certified in one of the Indian papers, will give some idea of this.

"Those only who have seen a famine district can judge of the change in the district of Godavari. In a country where, within living memory, men have died of famine by tens of thousands, and population has been checked by contingent consequences of famine, we now see a teeming population of stout, cheerful, well-proportioned men, women and children that will compare with any in the world for intelligence.

"In the Godavari there is scarcely a symptom of solid prosperity and rational enjoyment that is not displayed.

"Lower down the river and in the delta, the rush for education is incredible, though there are a few instances of apparent reaction."

Once more :—

"According to Whittaker, the present return on irrigation works executed by Government is 4'3 per cent., while money is borrowed at 3 per cent., 'apart from the ad-



vantages to cultivators and protection against famine'; and, he should have added, the additional revenue paid in a district, besides the water rate. Thus in Godavari, the water rate is Rs. 5 per acre—on 700,000 acres, Rs. 35,00,000—but the increase of revenue has been Rs. 75,00,000, or double the rates, almost the whole of which is due to the irrigation.

"Thus from water rates alone there is now a clear gain to Government of one and a third per cent. on irrigation expenditure.

"And this is without reckoning the actual saving at this moment to Government in respect of famine relief.

"With respect to water carriage, Mr. L.'s evidence is of inestimable importance, as of a man whose prejudices would necessarily be entirely against canals.

"Surely such a principle could not be allowed in the common business of life,—a contractor having completed his contract, presents his written agreement, and demands a hundred thousand pounds, and he is met by the statement that he is foolish to suppose that it is to be taken literally, that the hundred thousand is a mistake, and that he will receive only a thousand."

He complains that estimates are asked for, and then rejected. And that no notice is taken, when considering the famine, of the results obtained from providing a water supply :—

"A crop was raised that year (1878) worth five millions, where not an acre would have been raised without irrigation (the works having cost £1,500,000), and not only over the population of Godavari, Kistna, and Tanjore, about five millions saved, but enough was exported to save four or five millions in other districts. Not a word has been said about the effect of these works on the famine."

Alluding to the Kurnool Canal, he says :—

"It has proved itself a perfect God-send in this year of drought, and in the direct and indirect benefits it has secured to man and beast within its influence, it has fully justified its existence.



"There can be no doubt whatever that, as years go on, the area irrigated will increase, and eventually be very extensive; provided that the canal is maintained in good order, and every effort made to encourage irrigation, and to give the ryots confidence in the canal's ability to meet all their demands."

From amongst the correspondence which he received during these years are a few letters which may profitably be reproduced.

From Sir Bartle E. Frere, G.C.S.I., Governor of Cape Colony and High Commissioner for South Africa.

GOVERNMENT HOUSE, CAPE TOWN,

March 27, 1880.

MY DEAR SIR ARTHUR,—

I have been getting from the India Office and other sources, all the papers that I can regarding irrigation, for which there is an enormous and almost unlimited field in every part of South Africa, and for every description of water storage and irrigational work. I have got a mass of works and reports of various kinds, but nothing that satisfies me as a really complete and comprehensive description of the cost and results of your great Madras works, and I find it impossible to make time to go through Blue Books and draw up, from scattered materials, such a precis as would show my friends here, how vast were the prospects, how economically executed, and how great the financial results of your more important irrigational works.

If you could get for me a summary of a kind which would make a good review article, or, as it were, a kind of index to larger and more detailed reports, it would greatly help us. I hope we are now, in South Africa, at the beginning of a period of active irrigational works. They will not go so fast here as they did with you in Madras, for we have to depend much more upon private enterprise and private money. But the Orange and the Vaal rivers are both sources of water supply on which engineers of your school would very soon persuade the people of South Africa



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to spend at least as many millions as they are spending on railways with the certainty of larger results ; for the soil is everywhere good and everywhere very sparsely inhabited and almost uncultivated.

I wish a few of the disciples of your school would take South Africa in the course of their search for health, or for a home after they have been used up in India. It is a country where old Indians find they have ten or twelve more years' work in them than when they retire exhausted from India ; and where men, who cannot live at all in India or in a cold climate, thrive amazingly. I know you will not mind trouble in such a cause, and with kindest regards, in which Lady Frere and my daughters join,

I am, my dear Sir Arthur,

Very faithfully yours,

H. B. E. FRERE.

General Sir Arthur Cotton, K.C.B.,

Dorking.

From Sir Colin (then Colonel) Scott-Moncrieff, R.E.

I.

CAIRO, Nov. 14, 1885.

MY DEAR SIR ARTHUR,—

I thank you very sincerely for your most kind letter of the 31st. The approval and sympathy of such a veteran as yourself is very gratifying. I am sending you the report on which *The Times* formed their article. Do not for a moment think we have made the Barrage a sound job for twenty-five thousand pounds. Far from it. But we succeeded in holding up three metres head of water at the time of lowest Nile, when the demand for cotton and rice irrigation was at its highest. I cannot say we were quite easy about it. I insisted on a good young English engineer being always there in case of accidents, and there was a sigh of relief when the river began to rise and we could open the gates. I daresay in the old days, when you were curbing the Cauveri with that wonderful light anicut, and were battling for every rupee with an inappreciative Government, you had your anxious moments too.



Now I have got a million of money to spend, which, although not much, will help a great deal, and I have some right good officers from India to help me to spend it. We are quite a little English corps here now. Ten of us from India, and three capital young Englishmen I picked up here. And, though I say it who shouldn't, I think with God's blessing we shall leave some mark for good in Egypt. I never before thought so highly of the Indian school of training. The pashas here stand aghast at the unsparing way in which my officers knock about and work in the hot weather; and, after all, it is no more than dozens are doing daily in India, and without whom India would never have been what it is. We have almost decided to make a second weir over the Damietta branch of the Nile, a few miles north of Benha, where the railway crosses the river. This will cost, I fear, two hundred and fifty thousand pounds, and we shall spend, I fear, quite two hundred thousand pounds on making the existing Barrage quite sound. One work I have near my heart is the abolition of the *corvée*. When I came here I found an army of one hundred and twenty thousand men, employed annually for six months, without pay or food—a horrid, disorganised, rabble—and a system that gave the fullest play to all the corruption and rascality that flourish here.

No pasha ever sent a man to the *corvée*. The whole burden fell on the poor. By only a little common sense and arrangement we have shown them that for about two-thirds of the former silt clearances the same quantity of water can be obtained. And now we are battling the system altogether, I have got dredgers in to do a lot of the work. Nubar Pasha is helping us with all his influence, and though, perhaps, I am too sanguine, I am in hopes to leave Egypt two years hence without a forced or unpaid workman. But there are endless little worries and hindrances. French jealousy, palace intrigues, the lowest sense of honour on the part of the employees. In India the path was much clearer. Here we are for ever hoping to arrive at daylight through the political haze, but it seems as thick



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as ever. Mr. Gladstone seems determined, if he gets the chance, to clear us all out. I disbelieve utterly in a Mohammedan country reforming itself. I know if we were to go they would fall back to their old corrupt, unrighteous, ways, and really did I not believe that somehow, in spite of Mr Gladstone and all the Radicals, we are not going to leave Egypt, I should have little heart to work here.

I have to thank you for kind words of sympathy in my domestic desolation. This is a subject on which I cannot write. Submission to the great Captain's orders is surely the good soldier's duty. Hard work is a great solace, and no one ever had more kind friends than I. Forgive this long letter, and

Believe me,

Yours very sincerely,

C. C. SCOTT-MONCRIEFF.

II.

CAIRO, Sept. 7, 1890.

It is true, as you say, that patching and reforming is often harder than originating. On the other hand we in Egypt have had an enormous advantage over what you had in the delta days, in nearness to Europe, and consequent facilities in procuring materials, machinery, and skilled labour. A dozen more steam pumps could be got in a few weeks. Our electric light gave no trouble, and made night work far pleasanter than day during the heat. The best of stone could be got from Trieste; Portland cement as much as we required from England; a light railway carried our materials about cheaply and easily; and then we had the benefit of your old experience to help us. You hadn't that! I think Egypt is really doing well under English guidance. I only regret that the Government at home does not speak out honestly, and say once for all we are *not* going to leave the country. Till we do that and face the opposition it must call forth, I think we are sure to have trouble with the French. It would be more honest on our part, I think. The French