district where the only failure of the Government irrigation works has occurred, as respects the use of the water, showing, even where it is refused, that the prosperity of the district has been amazingly promoted by the other benefits of the works. Again, in an official paper, dated June 18, 1878, the following account is given of the effects of the irrigated districts in Madras:—"The Godavari and Kistna works, besides supporting the population of their own districts, and a great crowd of hungry immigrants from the surrounding country, and besides exporting over country roads an amount of food grains, which the Collector of Godavari estimates at little less than the amount exported by sea," (viz., 140,000 tons), "supplied very nearly one-fifth of the food exported from places within the Madras Presidency itself for the supply of the famine demand during the same time. Tanjore and Trichinopoly also supported their own and all the immigrant population, besides exporting by road, as well as by sea and rail, etc. It seems to me that schemes for extending and developing the Godavari and Kistna works deserve the heartiest support of the Government of India." Again: "The gross value of the rice raised by the Godavari and Kistna canals during a year of famine, when, to judge from the condition of the neighbouring districts, there would not otherwise have been an acre ripened, *may be taken at £4,950,000, or four times the whole capital outlay to the end of the year.*"

Not a word of this is inserted, or alluded to, in the report, nor in any of the debates on the famine. Think of a report on what is to be done in future in this respect not saying a word about the completion of these works, and of an official statement being made to the House of Commons on the famine, in which not a word about these amazing effects of the Madras irrigation works is mentioned! It is thus that the British public have been utterly misled, and that their ideas about irrigation are utterly contrary to the truth.

With respect to the subject of transit there is no attempt in the report to go into the essential points of the case. The questions, What does India require in this respect? What quantity ought to be carried, and at what prices, in the circumstances of India, in order to give itself and other countries the full benefit of its productions? What means can effect this? Do the railways answer the purpose or do they not—that is, can they carry

the quantities, and at the prices that are absolutely necessary for the development of the country? Can canals do this? Are they practicable generally throughout India? etc. None of these, the fundamental points of the question, are touched upon. This is probably owing to not one of the members being conversant with the subject of transit; so that whether 100,000 tons or 5,000,000 require to be carried on a certain line, and whether it will answer the purpose if goods are carried at a penny a ton, or whether they require to be carried at a tenth or a twentieth of a penny, were points which never occurred to them to inquire into. The fact is, the whole subject of transit requires to be inquired into just as if no committee had been appointed. A railway is opened at an enormous expense, and the sole question asked is, Does it pay three or four per cent. *to Government*? as if the Government were a private company, and had nothing to do with the well-being of India. As if, whether it carried the whole quantity required, and at practicable prices, or whether it was little more than a make-believe, and carried a tenth part of what was wanted, and at prohibitory prices, were matters of no moment to the rulers of the country. *The real fact is that after sinking 170 millions on railways*[1] *the country is utterly paralysed for want of effective transit at this moment.* For instance, in the famine, tens of thousands of tons of goods were left to rot at numbers of stations because the comparatively small traffic in grain completely choked the roads. Nothing is more urgently required at this moment than a thorough investigation of this subject, *the very first essential for India.* What India wants is to have millions of tons and millions of passengers carried on all the main lines of the country. Take two instances of this. India is deprived of the market of England for her wheat and other grains and pulse, for want of communications that can carry sufficient quantities and sufficiently cheaply; and, with unlimited supplies of coal and wood, it is burning millions of tons of manure solely for want of the means of distributing the proper fuel at practicable rates. It is utterly in vain that God has been pleased to provide the land with unbounded stores of these invaluable productions, if we do not provide the means of distributing them. This He leaves for us to do. . . .

And now with respect to the point on which the Committee

[1] Including cost of land and minus interest charges, etc.

settle the question—that is, the returns to Government. And first of the irrigation. This is given thus :—Capital fifteen and a half millions, net returns £830,000, interest 5·3 per cent., or ·8 above the Government interest. They thus show upon their own statement that *the irrigation works are an actual gain to the Government even in ordinary years*; that they cost the Government nothing. In the first place, must be added to this (even supposing the saving of millions of lives were nothing to great statesmen), the enormous saving in actual money to the Treasury in famines, and in the years following, in consequence of the additional population compared with what would have survived. Thus, in the Madras famine, rice was grown by our irrigation works sufficient to preserve the lives of ten millions of people for six months. What would have been the loss of revenue for many years if these millions had perished? There cannot possibly be any doubt about this, that in one such famine there is a loss of revenue prevented in that and the following years far exceeding the whole cost of the works. Nothing is said about this in the report. Again, in this total expenditure of fifteen and a half millions is included no less than four and a half millions, the cost of the Agra, Lower Ganges, Sone, Mootah Moolla, and Sirhind Canals, and Ekrookh Tank, all of which were under construction and not in operation, being nearly a third of the capital charged. This reduces the capital to ten and a half millions, and raises the return to 7½ per cent. instead of 5¼. Thus there was in 1875–6 a clear profit to the treasury of £350,000, an ordinary year; and, further, this return is for 1875–76. In that year the irrigation was 150,000 acres in Bengal. Last official year the extent was 400,000 acres, so rapidly is it extending. Thus, with all our mistakes, mistakes which, of course, need not be repeated, the revenue has been considerably increased, even in ordinary years, by the Committee's own statement, upon a capital of only ten and a half millions; so that we have certain data for concluding that, when these works are completed, the revenue will be increased by a million a year, besides all the incalculable saving in famines and the years following them. Further, no account whatever is given of the causes of deficient returns in the works that were not remunerative in 1875–76. The cost of these works, viz., the Midnapur and Orissa Canals, was two and a quarter millions. Now, the case of these works was quite an especial

one. The failure of returns was not any essential defect in them, but was entirely owing to two removable causes—the first is the non-completion of the works, and the other is the refusal of the water by the ryots. With respect to the latter, it is already removed. It was simply the consequence of a most wretched state of revenue management. In an official report the case is thus stated :—"From his extreme poverty and state of indebtedness, the Midnapur ryot reaps but a questionable benefit even from a bumper crop. Be it a good one or a bad one, it is said that all, beyond a bare subsistence, for a limited time, is absorbed by the landlord's rent, and the claims of his far more exacting creditor, the village money-lender, in whose toils he is hopelessly entangled, and who charges him at the rate of thirty-nine per cent. per annum." What can an engineer do if, when he has executed such invaluable works as these, the country is so utterly neglected by the revenue authorities that the poor people are left in such a state of bondage as this? While the poor people are refusing the Government water, this is the state of demand for it in that very part of the country. General Haig says :—"There is not a single river, drainage watercourse, or channel of any kind, large or small, in the whole district that is not bunded across at frequent intervals from one end to the other for the purpose of storing the water; no pool, puddle, or waterhole that is not most jealously guarded. It is almost incredible the amount of labour and effort that is thus expended by the ryots (the zemindars, as a rule, do nothing) to secure as far as possible every drop of the precious element; and it strikingly illustrates the actual need that is felt for *more* water, for a more continuous supply, in a district where the natural supply might have been supposed to be sufficient." If this does not show some monstrous mismanagement, what could? All this desperate anxiety to procure more water too is expended to get the *poor rain water*, while the water brought to them by the canals is *rich river water*, worth three times as much.

This was allowed to go on for many years, but at length, under a more faithful Government, this difficulty seems to be pretty well got over. A Committee that lately reported on these works (Orissa) say :—"In 1876–77 the area irrigated was 26,000 acres; in 1877–78, 95,000; and this year, 1878–79, it is estimated that 130,000 acres will have taken water." But now, who could

imagine that the distributaries are wanting to conduct the water to the remaining area commanded? This is the way in which the whole of these irrigation works have been treated. If a railway were in hand, though it did not pay interest for twenty-five years—it did not signify how many millions it cost—there never was the slightest discussion about the money; but every water-work has been left unfinished. The one thing that has caused all the difficulty about these Orissa works was that the canal connecting them with Calcutta is not completed. The Committee before mentioned say:—"This canal forms an important link in the chain of communication between Cuttack and Calcutta, the completion of which, *first and before all things*, was urged by Colonel Haig in his exhaustive note of May 29, 1873." And the present Governor of Bengal says, as quoted by one ot the witnesses to the Committee of last year:—"I trust before long to obtain sanction for the commencement of this work" (the completion of the canal), "and I hope before leaving India to see Cuttack brought within two days' journey of Calcutta. If the work be carried out, it will, I am sure, bring this province into a *condition of prosperity which will not be surpassed in any part of India.*" The value of rice, as given in the Bengal report, is in Orissa Rs. 17 for the produce of an acre, 900 lb.; and in Calcutta Rs. 28. It could be carried by canal for R. 1, giving an increased value of Rs. 10 per acre to the rice alone, or seven times the water-rate. This will give some idea of what the effect of cheap transit is, and of what India is losing for want of it. The moment this canal is opened, it will give an entirely new value to everything in the district, many times the amount of the water-rate. There cannot be a question that, if this canal had been completed, the enormous increase in the value of produce would have in a moment swept away all the difficulties about the use of the water. And as with the navigation, so it is with the irrigation. Under the present weirs no less than 1,500,000 acres are commanded by the water, while only 640,000 are protected by embankments, and only 130,000 are supplied with water. In this way, of course, irrigation may be made to cost anything. If the whole project for the thorough protection, irrigation, and navigation of the whole delta were carried out, it would regulate the water for 2,000,000 acres, and in increased produce and increased value from cheap transit, the return would be fully Rs. 15

per acre, or a total of £3,000,000 a year, and the total cost of the works would certainly not exceed £4,000,000, giving 75 per cent. besides innumerable benefits in the way of sanitation, etc. There is not the smallest room for doubt that the result, as stated by the Lieut.-Governor of Bengal, would be that "the prosperity of the province would not be surpassed by any district in India." Had there been such governors in Bengal as this in previous years, it is certain that this would have been the present state of the region.

But let us now consider once more the expenditure of £500,000 on the coal railways in Nagpur in the upper basin of the Godavari. This, as I have shown, now yields 1¾ per cent., or a clear loss to the treasury of £14,000 a year. Had this sum been spent on the lower end of the Godavari in completing the delta works there, and in the Kistna district, it would have been ample for 500,000 acres, the water-rate alone on which would have been Rs. 4 per acre, forty per cent., or £200,000 a year, making the total profit on irrigation £550,000 on £11,000,000, or five per cent. above the Government interest, or half a million in all. Such would have been the return if this one sum had not been thus shamefully perverted. All this was expressly brought to the notice of the then Secretary of State personally at the time, and it was also given in evidence to the Committee. Yet not a word is said in the report about this waste of the public money. What is the object of these inquiries if it is not to point out such misapplication of the public funds, and other causes of the deficiency of the finances, and of the poverty of the people? This half million expended in watering as many acres would have afforded an increase of produce alone of a million a year to the ryots of Godavari, and this is only a small specimen of the enormous misappropriation of the public money. The fact is that the whole tendency of the report is to hush up and conceal the grievous abuses and mistakes that have been made in the public works, instead of exposing them, which was supposed to be the object of the Committee.

But, further, this return from the irrigation and navigation, as reported by the Committee, entirely leaves out of sight all the indirect return from these works. Can the wealth of the people be increased without increasing the general taxes? The Committee credits the works in Godavari with £127,000 a year; then

where does the rest of the increase of the revenue of the district come from? The revenue was before the works £220,000. It is now £570,000, an increase of no less than £350,000. Nothing is said about this difference in the report. The fact is that about £300,000 of this is due directly or indirectly to the works, and so with all the great works. On the six millions[1] of acres now watered by them, there is an increase of income to the people of at least £10,000,000 a year, and it is impossible thus to enrich the people without a considerable portion of it coming to the Treasury. Of the total income of the country about ten per cent. is paid as taxes, so that this additional income must add about one million to the finances. And, even merely in respect of the returns to the finances, if this were the sole question, the report is utterly false. The actual returns of the irrigation works alone, direct and indirect, are at this moment probably £2,000,000 a year instead of £130,000 as stated by the report. And with respect to the *prospects* of the works, even as they are, without their being carried out effectively, the gross revenue of those in Bengal, which is stated in the report as £23,000 for 1875–76, was last year £107,000, or five times as great, and there is absolute certainty that they will in a short time return above the Government interest. In that year the area irrigated was 150,000 acres; last official year it was 400,000; the Sone works are now very nearly completed to the extent to which they are now restricted, and they will water 800,000 acres. Not a word of this is stated, but the remarks in the report imply that these works were doing all they could or were ever likely to do. Only think of this sum of £23,000 a year being mentioned as the return of the Bengal works, without adding: "But the four millions of capital here given includes one and a half millions, the cost of the Sone works now approaching completion, but not in operation, which will return £250,000 a year, besides the Orissa and Midnapur works, which will water at least 500,000 acres under the main canals already cut, and yield £100,000 as soon as these difficulties about the acceptance of the water are overcome, and that they are already in fact overcome

[1] The six millions are now (1900) at least fifteen millions. If Sir Arthur's calculations still hold good, the direct contribution to the wealth of the country of the Government works alone is at least £25,000,000 a year. Probably, it is much more.

under the present vigorous government is evident from the fact that 150,000 acres are now irrigated."

Further, in this report nothing is said about this mode of obtaining water from the *rivers*. Was this nothing, and a matter of no question whatever? Might not a laborious investigation have properly included such a fundamental essential point as this? It is continually said, it has been repeated in a late paper on India, "I prefer obtaining water from wells." Now what is right? Who could imagine that the simple answer to this is not alluded to in the report? The case is this. Well water costs, to raise it by bullocks, about R. 1 for 300 cubic yards, while rich river water, full of all the food that plants require, worth three times as much, is brought on the fields at a cost of from 1,000 to 2,000 cubic yards per rupee. The Sone works, for instance, will distribute 3,500 million cubic yards per annum, and cost, at seven per cent. on £2,700,000, £190,000, or 20,000 cubic yards per £1. One would suppose that such a plain calculation as this would set at rest this question. Neither rain nor well water will restore the soil, while the river water does this so effectually that land has been so cultivated for thousands of years without other manure. Even where there is abundance of rain, river water is just as much required. The fields should be emptied of the rain water as soon as possible and refilled from the river. It is, of course, very difficult to get people to believe the violence of the bias of the real old Indian against the use of this invaluable river water. But surely the following fact will prove this unmistakably. A gentleman [1] was lately sent out from England expressly to investigate the terrible famine question as a member of the Committee appointed in India. He went to India and passed throughout the length and breadth of the land, and, one can only suppose, under the influence of the old India atmosphere in which he was immersed, scrupulously avoided seeing what water could do for India. He not only avoided Orissa, where he might have informed himself that, in spite of great difficulties, the district had made considerable progress in rising from its abject state of poverty and despondency, as stated by the Lieut.-Governor of Bengal; but he actually touched at Cocanada, the port of Godavari, where the water works had had their almost full effect and had

[1] The late Sir James Caird, who was a member of the Famine Commission of 1879.

raised a district from below the lowest of the districts to the state of the very highest prosperity in all India, raising the revenue to £570,000 a year, two and a half times that of the districts generally, and he left the port without landing. In the same way he passed by the Kistna district, and in the south went to Trichinopoly, on the confines of Tanjore, the other thoroughly prosperous district paying a revenue of £750,000 a year, and avoided seeing that district also, so that he has returned without seeing what water can do for India. It will seem incredible, of course, that such things could be, but there is the fact. The only districts that have been fully and effectually delivered from famine, and that yield a revenue to Government, which, if it extended throughout India, would make the receipts of the Treasury one hundred millions instead of thirty-five, and that are really a credit to our rule such as no other districts afford, were carefully avoided; and if this gentleman is asked, "But, what conclusion did you come to respecting the difficulties that have been met with in Orissa and the reported complete success of the well-irrigated districts in Madras, both in respect of the famines, and of finance, and the prosperity of the people?" he must say, "I have no personal knowledge of these districts." What are we to think of these things? Were these no questions? What has made these districts the head districts of India? And how far are the means, which have here produced such astonishing effects, applicable to other parts of India?—districts which, in the midst of the most awful famine, which left every surrounding district, even in spite of a million being spent on each in railways, strewed with hundreds of thousands of dead who have perished in this awful manner, both yielded full revenue to the Treasury, sold a full crop at famine prices, kept their own population in plenty—a population of five millions—and fed ten millions of the adjoining districts.

I must advert also to one assertion of the Committee with respect to my evidence. They state that Sir Arthur Cotton's scheme for the irrigation of India was based upon his personal experience, "mainly derived from the working of the irrigation works in the deltas." My objection to this is that it is pure invention. There is not a shadow of ground for it. My words were, "I take the whole cost of irrigation up to this time wherever it has been carried out," and so on. Throughout my exami-

nation there is not one word which showed that my calculations were based upon the cost of the works in Godavari. I stated everywhere what was the cost of irrigation in the various parts of India, and the increase of produce due to it. What are we to think of a Committee that can thus recklessly make assertions directly contrary to the fact, when they know that the person of whom they speak will have no opportunity of refuting them?

CHAPTER XI

Railways *v.* Irrigation and Navigation Canals

IRRIGATION "pays the Hindu everywhere, for without it millions could not live at all, and millions more would be decimated by famine every few years. Reckoning its influence upon railways, commerce, and the good government of the country, its value is simply inestimable."—HON. A. DEAKIN, M.L.A., *Victoria.*

THE real point considered in the last chapter, and, indeed, had it done its duty, the real point of the whole enquiry of the Select Committee, was as to the remedy for famine, frequently and certain-recurring famine in India, which is what has now to be faced. Though partly veiled, the actual issue was: "Do railways, or do irrigation and navigation canals, best preserve the country from famine?" Further involved in it was the additional question: "Granting railways are necessary for transport of passengers, goods, and produce, save in respect to certain trunk lines, would not properly-constructed canals serve the full purposes of such a country as India?"

To these questions Sir Arthur had but one answer. To the first he always said, unhesitatingly, and with abundant proof, that railways in India could not possibly compare, or, with fair treatment, compete, with irrigation and navigation canals as a preservative against famine. To the second, he was, all through his life, of the same mind as the late Lord Derby, one of the sanest and most far-seeing of British statesmen, that a multiplicity of railways was not needed in India, while upon irrigation and navigation canals the very existence of India depended.

The official answer ought to have been the same in each

instance as was Sir Arthur Cotton's. What is the record of the authorities in this respect? Their record is, that their own Famine Commission of 1879-80, which made enquiries in India in 1878 and in England in 1879, plainly laid down what was the FIRST DUTY of the Indian Government. At page 150 of part ii. of the Commission's Report, this most significant statement, and this remarkable recommendation (remarkable in view of the balancing and moderate terms in which a Commission usually makes a suggestion) was submitted:—

> "Among the means that may be adopted for giving India *direct protection from famine arising from drought, the* FIRST PLACE *must unquestionably be assigned to works of irrigation.*[1] It has been too much the custom, in discussions as to the policy of constructing such works, to measure their value by their financial success, considered only with reference to the net return to Government on the capital invested in them. The true value of irrigation works is to be judged very differently. First, must be reckoned the direct protection afforded by them in years of drought, by the saving of human life, by the avoidance of loss of revenue remitted, and of the outlay incurred in costly measures of relief. But it is not only in years of drought that they are of value. In seasons of average rainfall they are of great service and a great source of wealth, giving certainty to all agricultural operations, increasing the out-turn per acre of the crops, and enabling more valuable description of crops to be grown. From the Punjab in the north, to Tinnevelly at the southern extremity of the peninsula, wherever irrigation is practised, such results are manifest; and we may see rice, sugar-cane, or wheat taking the place of millet or barley, and broad stretches of indigo growing at a season when unwatered lands must lie absolutely unproductive."

But, on value according to financial success, that is the

[1] The italics are mine in all cases where the contrary is not stated.

payment of a reasonable dividend (and, it ought, but is not, to be the rule to provide a sinking fund also), the same Commission reported emphatically in words which leave the India Office no excuse whatsoever if they refrain even now from taking most energetic steps to carry out Sir Arthur's plans. Their neglect in the past arouses feelings of indignation which I may not express. Two pages after that mentioned above, namely on page 152 of the Commission's Report, it is stated :—

"LOOKING AT THE PRESENT POSITION OF INDIA IN RESPECT TO IRRIGATION, IT WOULD BE HARD TO FIND ANY SYSTEM OF WORKS THAT IS NOT WORTH TO THE COUNTRY THE MONEY THAT HAS BEEN SPENT ON IT; and where the reverse seems to be the case by reason of an unfavourable direct money return on the capital outlay, it will be generally found that it is due to the backwardness of the cultivators in adopting the great change in their customary system of agriculture, which necessarily follows on the introduction of irrigation, or to defects of design, or errors of management which should not have occurred, and which may be remedied more or less completely. *Only where the population is so sparse that use could not be made of irrigation if it were offered, or where the necessary cost of the works would be so exceptionally great, that it would be cheaper to accept the likelihood of expenditure on famine relief than to incur the cost of canals,*

CAN THERE BE ANY DOUBT AS TO THE ADVANTAGE OF IRRIGATION,

or as to the expediency of extending it within the limits which the general financial position of the State imposes on its outlay on such undertakings."

Even this does not exhaust the advice given by the Commissioners. Yet two pages further, and there is this triumphant official vindication—triumphant on the narrow official lines, more than triumphant if all the conditions are taken into account—of all Sir Arthur Cotton's contentions. "But," say the Commissioners, "although we have thus referred to the possible *temporary* ill-success of irriga-

tion works in some cases, *more particularly in the early stages of their development*, we must again repeat THAT THE ACTUAL EXPERIENCE OF INDIA IS ALTOGETHER OPPOSED TO THE VIEW THAT THE EXISTING WORKS OF THIS CLASS, TAKEN AS A WHOLE, ARE OTHERWISE THAN POSITIVELY REMUNERATIVE TO AN EXTENT WHICH COMPLETELY JUSTIFIES THE MEASURES WHICH THE GOVERNMENT OF INDIA HAS CARRIED OUT FOR THEIR EXTENSION DURING THE LAST TWENTY YEARS OR MORE."

". . . The net income of the whole of the works in operation was, in the year 1879–80, £1,165,800, which amounts within a very small fraction to six per cent. on the whole capital outlay, including about £3,250,000 spent on works not yet brought into operation. If this part of the outlay be excluded, the income is found to be more than seven per cent. on the capital actually utilised."

More astounding still, in view of the comparative neglect which afterwards followed, of irrigation extension and the great extension of railways, are the following statements, statements which more than justify Sir Arthur Cotton's unanswerable position. The Commissioners report :—

To show how greatly the wealth and resources of India have been increased by her works of irrigation, the following instances may be quoted from the mass of evidence to the same effect before the Commission.

In the Punjab.

2. The outlay on completed canals in the Punjab up to the close of 1877–78 had been £2,260,000. The total area irrigated by them was 1,324,000 acres. The weight and value of the food grains raised at the high prices which ruled during that year of drought on the two principal canals were calculated as follows :—

	Tons.	Value.
West Jumna Canal .	158,000	£1,147,000
Bari Doab Canal .	141,400	789,000
	299,400	1,936,000

The value of other crops grown on these two canals (sugar-cane, cotton, dyes, oils, vegetables, etc.) was estimated at £940,000. It may, without exaggeration, be reckoned that one-half of these crops would have perished if unwatered, or would not have been raised at all if the canals had been absent. So that altogether in that one year, the wealth of the Punjab was increased by these two canals by £1,438,000, an amount equal to about two-thirds of the cost of the works; and, but for the protection they afforded, Government would have lost heavily from the necessity of remitting revenue, and providing for famine relief. The net canal revenue for the year in the Punjab was, however, only £119,000, being about five and a half per cent. on the capital outlay on works in operation, a result which obviously supplies a wholly inadequate test of their value to the country.

In the North-west Provinces.

3. Up to the end of 1877–78 the capital outlay on completed canals in the North-west Provinces had been £4,346,000. The area irrigated that year was 1,461,000 acres, the value of the crops raised on which was estimated at £6,020,000. Half the irrigated area was occupied by autumn crops, which, but for irrigation, must have been wholly lost; and it may be safely said that the wealth of these provinces was consequently increased by £3,000,000; so that three-fourths of the entire first cost of the works was thus repaid to the country in that single year. The net revenue to Government from irrigation in these provinces was £315,600, or about seven and a quarter per cent. on the whole capital outlay on five and three-quarter millions of which one and a quarter millions were still unproductive.

In Bengal.

4. The results of irrigation are not so favourable in Bengal and Behar as in the North-west Provinces and Punjab; but here, too, there is abundant evidence of its value, and the receipts have at length exceeded the working expenses. Up to the end of 1878 the

In Behar.

outlay on the Sone canals had been £1,908,000, of which probably twenty per cent. is due to

the elaborate provisions made for navigation. In the drought of 1873–74, these canals were very incomplete, and water was rudely poured over the fields through cuts in the banks. The result was that 159,500 acres of rice were saved, worth not less than £600,000. Were a similar season of drought to occur again, 1,000,000 acres might be watered, the value of which would approach £4,000,000 sterling, or about double the cost of the works. It may still be long before a return is obtained equal to the interest at four and a half per cent. on the £3,110,000 spent, or remaining to be spent, in order to complete the canals of Orissa; but should another famine occur after they are completed, their value would be incalculable. In 1865–66, about a million and a half sterling was spent on famine relief in this province; yet about a million persons perished from starvation, and the province was enriched by no single public work to put against the money spent.

In Orissa.

5. From the hilly character of the Deccan, the contracted form and broken surface of the valleys, and the absence of large works, irrigation has been more difficult and more costly in Bombay than in other parts of India; but tank irrigation is common, and some of the works by which the waters of the minor streams are utilized, though on a small scale, are extremely productive, and the value of watered crops is, in ordinary years, not less than four times that of others.

In the Deccan.

6. In Sindh we find a large province in which, without irrigation, agriculture and population would be alike impossible, but the province, which, with this protection has 1,800,000 acres of cultivated land, has reached a fair condition of prosperity, and gives complete evidence of far greater capacities for progress in the future.

Sindh.

7. The three great deltaic systems of irrigation in Madras, the Godavari, the Kistna, and the Cauveri, yield direct returns of 8·7, 6·5, and 31·7 per cent. respectively on the capital spent on them. During 1876–77, a year when every unirrigated district

In Madras.

was importing the food of a large portion of its population, the value of rice produced in the deltas of the Godavari and Kistna is calculated, at the prices then prevailing, to have been not less than £5,000,000 sterling. The quantity exported by sea from Cocanada, the port of the Godavari delta, was valued at £870,000, while an equal quantity is believed to have been exported by land.

Effect of irrigation on crops

8. Over the greater part of India sugar-cane and rice can only be grown with the help of artificial irrigation, and even in Midnapur, in Bengal, with an average rainfall of fifty-five inches, it has been found that the produce of irrigated rice is forty per cent. in excess of that grown on unirrigated lands.

And on rental.

9. The ordinary rental of land in Northern India is doubled by irrigation, while in eleven districts of Madras the average rental rises from Rs. 1.4.0 to Rs. 5.4.0 per acre when supplied with water. In Tinnevelly the increase is nearly tenfold. In the eight years preceding 1875–76, the average selling price of irrigated lands in the Cauveri valley in Mysore was £35 per acre. The best dry land at the same time did not fetch above £2 to £2 10*s*.

The grounds which justify the extension of irrigation.

10. It would indeed be a great error to rest the value of irrigation works on their direct revenue alone. It should be considered rather whether any particular tract is liable to frequent or serious drought, and whether, in the event of famine, the population is such that large outlay would be necessary for its relief, and large loss of revenue would be incurred. If these questions are answered in the affirmative, and if, at the same time, it is possible to introduce irrigation from a source which can be relied on in years of drought, without any excessive cost, Government might usually embark on the enterprise without hesitation. The certain result will be an increase of the prosperity and of the general well-being and productive power of the population, and the development of every

indirect source from which the wealth of the country springs.

When dealing with Mysore, the Commissioners use almost minatory language with regard to the upkeep and extension of irrigation works in the Feudatory States. "With the evidence before us," they say, "of the terrible misery wrought by the recent famine, we would urge, in the strongest manner possible, that some practical system be devised to ensure the efficient maintenance of the works of irrigation, and that, if possible, it should be placed beyond the risk of being subverted, however weak might be the Government or capricious the ruler." Will the British public repeat this advice to the Indian authorities themselves, concerning the British Provinces? *And, having given the advice,* WILL THEY SEE IT IS ACTED UPON?

This, perhaps, is the best place in which to direct attention to a phase of the irrigation question which is seldom considered, and yet it is of vast importance. Under our rule great neglect has marked our action towards the ancient tanks which are to be found in almost every part of the Carnatic. *The Hindu* newspaper[1] of the 10th of May 1900, describes this neglect in the following striking terms: "The tanks and lakes to be found in the country are too few, and for want of occasional digging up and cleansing are often found silted up and too shallow to hold any large quantities of water. Nor is any attention paid to improving the facilities for gathering rain water falling over large areas of land into existing tanks and reservoirs. Owing to this state of things, the occurrence of famine in years when monsoons fail is almost inevitable, and this contingency is in no small measure accelerated by the tendency of avaricious and miscalculating landholders to convert every available piece of land into *nunja*. Small tanks and pools owned by private individuals have been allowed

[1] A daily newspaper, edited, owned, and published in Madras, wholly by Hindus—a strikingly moderate journal.

to be silted up that they might with small labour and outlay be converted into *nunja* lands. Within recent years, the tanks in many of the villages in several districts have become considerably narrowed in their dimensions by the aggression of owners of lands bordering on them, and the quantity of water they hold is too small to leave any surplus available for agricultural purposes after their use for purposes of drinking, bathing, or washing."

There can be no doubt that an immense accession to the present irrigable area in Madras could be obtained were adequate attention given to this matter. After more than a hundred years' administration, the authorities ought to be in a position to deal directly with every acre of water-catchment in the Presidency.

The Hindu, in another part of the same article, declares "the only well-calculated measure against the possibility of the occurrence of famines is the storing up of large quantities of water in spacious and deep reservoirs." How such a pronouncement, coming from an Indian source, would have rejoiced Sir Arthur Cotton!

Those who have studied irrigation and canal navigation under Sir Arthur's guidance, and who have as closely followed the arguments of opponents like Sir George Campbell and others, as they have Sir Arthur's printed works, have taken the line in conversation that, having received from the Commission of their own appointment so distinct and unmistakable a pronouncement as to irrigation being the FIRST, and (so far as any official recommendations have gone) the *only sure preventative of famine*, the authorities were not competent, were greatly failing in their duty, in not following out to the utmost a bold and far-reaching irrigation policy. On that point there was no mistaking the emphasis with which they argued. If the recommendations of a Commission of Enquiry are such as, if carried out, would serve the public good, the authorities may not disregard such recommendation. What was done in this particular instance?

The Famine Commissioners reported in 1880. They said then that, to the date of their enquiry, even on the bare commercial aspect of the undertaking, and leaving everything else out of consideration, irrigation had been fully justified. This was the case, though, as Sir Arthur never tired of pointing out, some most expensive works were never provided with transit outlets, and, for all practical purposes, were left in a desert. Unless navigation were provided as well as irrigation, there was often no temptation to the cultivator to provide capital and additional energy in preparing his land for the richly-nurturing river water. If the cultivator could not easily export the additional produce when he had raised it, where was the return —the hope of gain—to come from which he looked for, and which alone, in such circumstances, will stimulate enterprise ?

Have irrigation works continued to deserve so good a word in their financial favour as was pronounced by the Famine Commissioners of 1880 ? The answer is that twenty years later, they more than justify all that was aforetime said concerning them. The witnesses cited in justification are the administration reports for the various presidencies, provinces, and chief commissionerships for the year 1898–99. They were available in London only in May of this year (1900) and, therefore, are as up-to-date as it is possible for Indian statistical statements to be. Madras, as the oldest presidency and the most important irrigationally, may lead the way in this array of evidence.

STATEMENT CONCERNING ALL IRRIGATION WORKS IN THE MADRAS PRESIDENCY, 1898-99.[1]

SURPLUS REVENUE.

	During 1898-99.	To end of 1898-99.
	Rs.[2]	Rs.[2]
1. GODAVARI DELTA SYSTEM. "The net revenue from the system during the year, after paying the interest charges, was 15.02 per cent. on the capital outlay 'Direct and Indirect,' against 15.75 per cent. on the previous year. The anticipated ultimate return was 9.4 per cent. per annum on the capital outlay. . . . The receipts from navigation rose from Rs. 76,581 to Rs. 89,663."	19,62,473	3,70,98,763
2. KISTNA DELTA SYSTEM. "The net return, after paying interest charges, was Rs. 11.32 per cent. on the total capital outlay against 9.49 per cent. in the previous year. The navigation receipts amounted to Rs. 50,857."	15,17,007	2,02,11,515
3. PENNÉRU ANICUT SYSTEM. "The net return, after paying interest charges, was 4.76 per cent. on the capital outlay against 4.12 per cent. in the previous year."	90,492	12,01,401

[1] *Madras Administration Report*, 1898-99, pp. 130-164.

[2] Although it was intended that all money figures should be stated in sterling rather than in rupees, it has been considered wiser, where the statements cover a long series of years, that the figures, exactly as they stand in the official records, should be reproduced here. For rough and ready purposes the reader has only to divide the amounts by 15 to arrive at the present value of the rupee to the £ sterling. In regard to many of the Madras works, and some of those in the North-West Provinces and the Punjab, profits were realized when ten rupees went to the £1.

	During 1898-99.	To end of 1898-99.
	Rs.	Rs.
4. SANGAM ANICUT SYSTEM . . "The net return, after paying interest charges, was Rs. 29,900 against Rs. 16,234 in the previous year. The area irrigated during the year under first crop is the highest on record."	29,900	—5,61,993
5. CAUVERI DELTA SYSTEM . . "The net return, after paying interest charges, was 37.91 per cent. on the capital outlay against 41.26 in the previous year."	8,00,867	2,35,38,320
6 SRIVAIKUNTAM ANICUT SYSTEM "The net return, after paying interest charges, was 1.82 per cent. on the capital outlay against 1.73 in the previous year. "The area irrigated under first crop is only 406 acres less than the highest on record, while that under second crop is the highest limit yet attained. Under this system the area of second crop irrigation bears a much higher proportion to the first crop irrigation than elsewhere."	26,981	77,711
7. GANJAM MINOR RIVERS SYSTEM "The actual return was 8.69 per cent. on the capital outlay."	7,290	4,44,455
8. CUMBUM TANK SYSTEM . . "The actual return was 17.39 per cent. on the capital outlay."	11 204	1,18,838
9. THADAPALLI CHANNEL SYSTEM. "The actual return was 15.94 per cent. on the capital outlay."	20,030	5,20,859
10. ARKENKOTA CHANNEL SYSTEM. "The actual return was 3.78 per cent. on the capital outlay."	3,898	2,566

	During 1898-99.	To end of 1898-99.
	Rs.	Rs.
11. KALINGARAYAN CHANNEL SYSTEM. "The actual return was 12.72 per cent. on the capital outlay."	10,175	—55,673
12. PALAR ANICUT SYSTEM . . "The actual return was 5.92 per cent. on the capital outlay."	1,23,049	16,37,386
13. POINAY ANICUT SYSTEM . . "The actual return was 19.95 per cent. on the capital outlay"	46,204	7,24,044
14. CHEYARU ANICUT SYSTEM . . "The actual return was 7.60 per cent. on the capital outlay."	30,831	3,59,208
15. CHEMBRAMBÁKAM TANK . . "The actual return was 4.16 per cent. on the capital outlay."	31,086	6,63,703
16. MADRAS WATER SUPPLY AND IRRIGATION SYSTEM. "The actual return was 1.21 per cent. on the capital outlay."	21,121	—12,367
17. VALLURU ANICUT SYSTEM . . "The actual return was 5.39 per cent. on the capital outlay."	3,533	39,090
18. TIRUKKOYILUR ANICUT SYSTEM "The actual return was 6.22 per cent. on the capital outlay."	15,826	3,82,514
19. MEHMATTUR ANICUT SYSTEM . "The actual return was 3.50 per cent. on the capital outlay."	2,489	72,183
20. VRIDDHACHALAM ANICUT SYSTEM. "The actual return was 25.46 per cent. on the capital outlay."	12,665	2,08,708

	During 1898–99.	To end of 1898–99.
	Rs.	Rs.
21. SHATIATOPE ANICUT SYSTEM . "The actual return was 40.73 per cent. on the capital outlay."	93,112	21,27,674
22. PELANDORAI ANICUT SYSTEM . "The actual return was 3.28 per cent. on the capital outlay."	19,224	—1,73,668
23. LOWER COLEROON ANICUT SYSTEM. "The actual return was 27.26 per cent. on the capital outlay."	2,56,032	94,10,951
24. MARUDUR ANICUT SYSTEM . "The actual return was 114.32 per cent. on the capital outlay."	51,220	13,65,465
25. PROVINCIAL MINOR WORKS AND NAVIGATION. "Minor works for which neither capital nor revenue accounts are kept, but for which continuous records of expenditure and revenue are maintained individually, shew a nett revenue of Rs. 69,85,309."	69,85,309	
Totals . . . Rs.	1,20,72,018	9,94,01,653

Works showing DEFICIT *Revenue.*

	During 1898–99.	To end of 1898–99.
	Rs.	Rs.
1. KURNOOL-CUDDAPAH CANAL .	8,24,352	1,49,49,034
2. BARUR TANK SYSTEM . .	8,577	1,74,321
3. PERIVAR PROJECT . . . "The project is only partly completed and at work."	1,92,396	Figures showing results to end of 1898–99, are not yet available.
4. MAJOR PROTECTIVE WORKS: RUSHIKULYA PROJECT. "The irrigated area both under first and second crops is steadily increasing."	1,27,522	12,18,198
5. NANDYAR CHANNEL . . . "The working expenses exceeded the revenue by Rs. 775."	775	6,139
6. BUCKINGHAM CANAL (NAVIGATION). "The financial result of the year was a deficit of Rs. 8,736. There was a considerable diminution of traffic owing to a fall in the imports of salt, indigo, and coal, and to the Bezwada-Madras Railway having come into working."	8,736	80,949
Totals . . . Rs.	11,62,358	1,64,28,641

Summary.

	No.	Surplus. Rs.
Works recording profit in 1898–99 . .	25 .	1,20,72,018
Works recording deficit in 1898–99 . .	6 .	11,62,358
Net surplus profit		Rs. 1,09,09,660

Works under Construction.

1. MUNÉRU PROJECT . . .

2. DONDAPAD PROJECT . . .

3. SAGILERU UPPER PROJECT . . .
"The results of the year show that the financial aspect of the project is fairly promising. . . . There should be a further increase of revenue."

[No particulars furnished.]

4. CHOPAUD PROJECT . . .

The great Australian authority alludes to the Madras works in flattering terms.

The reports of the Madras Irrigation Department, he says, are in some respects the best in India, for though all the provinces publish admirable records of their work, these are exceptionally lucid and well-arranged. A glance at the map prefacing the annual report indicates at once the position and character of the great state undertakings for water supply. At the extreme north, where the east coast curves eastwards to Orissa, is the Ganjam and Gopalpur tidal canal, undertaken as a famine relief work, the estimate for which is £50,000. Southwards, two important rivers—the Godavari and Kistna—pour their streams over two large tracts, which unite to form a great irrigated area. A long, narrow strip in the mountains indicates the one private enterprise, the Madras Company's land, while the Pennar river, to which it leads, has at its mouth its own deltaic scheme. There are three smaller patches near Madras, and one in the interior at the Barur tank. Then come the great delta of Tanjore, watered by the Cauveri; at the extreme south, another delta below Tuticorin, and between the two, inland, the plain of Madura, to be commanded by the great Periyar project, now in course of construction. The five great schemes are deltaic, and similar in character, repeating here, as in Bengal, the likeness and lessons of the country below Cairo. If Egypt is the gift of

the Nile, certainly Bengal is the gift of the Ganges ; while the Godavari, Kistna, Pennar, Cauveri, and Tambragani have endowed the Coromandel coast with stretches of remarkable fertility, which have enabled its millions to be certain of their harvests year by year.

The water supply expenditure in Madras is dealt with under several heads, distinguishing works which were undertaken as reproductive investments of capital, from those which were executed to protect the country against famine, and from those which were expected to yield some return incidentally, but were not commenced solely with that end. Under the first head, "major productive works," the Presidency has invested £5,300,000 up to the end of 1889–90 ; upon "protective works," £160,000 ; and upon "minor works and navigation," £1,200,000. After allowing for interest upon capital, the first class show a profit to the State for the year of £275,000 on five schemes, and a loss of £102,000 on four, or a total net gain of £173,000. The net revenue, after deducting interest charges, is seven per cent., and would be twelve per cent. if the department were responsible only for the works designed and executed by its own officers. Nearly six million acres were watered during the year, of which two million three hundred thousand were under major works. The direct revenue derived from water rates was over £1,750,000, even after deducting remissions to the extent of £100,000. Many of the areas now commanded by State works were irrigated prior to their construction, and in each case the value of the work done in those days appears upon the accounts. Nor is the result in any sense unfavourable to the administration, for by means of the new works, areas in which there were but one million acres irrigated have now nearly two million two hundred and fifty thousand acres, while the revenue they yield has risen from £90,000 to over £500,000. The official estimate of the value of the crops in the one-third of the whole irrigated area, which is supplied by major works, is just short of £5,500,000, and if the remaining two-thirds be only taken at the same sum, this means security

for £11,000,000 a year. Such figures should convey to the mind of the Australian the magnitude of the system of irrigation executed in this one presidency—which is, after all, only half the size of New South Wales and not twice the size of Victoria.[1]

None of the other Administration Reports give details in such fulness as does the Madras report. Hence, in those which follow only total results can be given.

THE PUNJAB.[2]

	Rs.
Receipts from all irrigation works . .	1,27,36,719
Expenditure upon all irrigation works . .	76,90,644
Profit	Rs. 50,46,075

NORTH-WESTERN PROVINCES AND OUDH,[3]

1898–99.

	Protective Works.	Productive Works.	Minor Works.	Total.
	Rs.	Rs.	Rs.	Rs.
Receipts . .	1,10,246	85,82,963	3,28,508	90,21,717
Charges . .	1,09,769	28,54,713	1,82,828	31,47,310
Nett Revenue .	477	57,28,250	1,45,680	58,74,407
Interest Charges	1,63,324	30,37,403	——	32,00,727
Profit or Loss .	−1,62,847	+26,90,847	+1,45,680	+26,73,680

"The Betwa canal is the only *protective* work in these provinces. The receipts have for a second time just exceeded the direct and indirect charges of the year, but by Rs. 477 only, and were Rs. 1,62,847 short of the interest charges. *Productive* works show a net revenue of Rs. 57,28,250, representing a return of 7.27 per cent. on the capital outlay

[1] *Irrigated India*, pp. 252–254. [2] *Administration Report*, p. 202.
[3] *Administration Report*, p. 118.

to the end of the year on works in operation, and of seven per cent. on the total expenditure on productive works.

"The net revenue, after deducting the interest charges of the year (Rs. 30,37,403, including interest on the expenditure on the Fatehpur division), shows a clear gain of Rs. 26,90,847.

"*Minor* works give a net revenue of Rs. 1,45,680, which is more than forty-five per cent. above the average, and gives a return of 5.17 per cent. on the capital invested in the canals in operation.

"After meeting the total interest charges, the receipts from all the works show a clear profit of Rs. 26,73,680."

	Rs.
Productive works, net revenue . . .	26,90,847
Minor works, net revenue	1,45,680
Profit (less Rs. 1,62,847 Protective) .	Rs. 26,73,680

CENTRAL PROVINCES.[1]

	Acres.
(*a*) Government canals	—
(*b*) Private canals	8,291
(*c*) Tanks	462,598
(*d*) Wells	75,959
(*e*) Other sources	15,780
Total .	562,628

No statistics in rupees available.

BENGAL.[2]

Major Irrigation Works.

	Rs.
Receipts	19,02,205
Expenditure	13,66,707
Profit	Rs. 5,35,498

[1] *Central Provinces: Stat. Tables*, 1897-98.
[2] *Bengal Administration Report*, 1896-97, p. 214.

Minor Irrigation Works.

	Rs.
Receipts	6,60,942
Expenditure	5,76,226
Profit	Rs. 84,716

BOMBAY.

The Bombay Administration Report for 1898-99 gives very meagre figures, and they are not lucid or easily to be understood.

RECEIPTS.

	Rs.
Major Works:	
Protective works	1,63,465
Productive works	4,96,985
Minor Works:	
Imperial	2,52,253
Provincial	31,197
Total	Rs. 9,43,500

EXPENDITURE.

	Rs.
Works	18,62,085
Repairs	14,11,304
Establishment	8,99,594
Tools and plant	35,040
Total	42,08,023
Less suspense account	11,593
	Rs. 41,96,430

IRRIGATION WORKS THROUGHOUT INDIA.

GOVERNMENT OF INDIA: PUBLIC WORKS DEPARTMENT.

(Compiled from statements showing the financial results of irrigation operations throughout India, for, and to the end of, the year 1898–99

No.	Mileage in Operation: Main Canals.	Distributaries.	Area Irrigated: Old Works.	New Works.
	BALUCHISTAN :—	Miles.	Miles.	Acres.	Acres.
2.	—	4	41½	5,653	—
	RAJPUTANA :—				
3.	—	—	—	—	25,560
	BURMA :—				
1.	Major Works . . .	—	—	—	—
6.	Minor Works . . .	—	—	—	—
	BENGAL :—				
4.	Major Works (productive).	729	2,644	—	713,443
3.	Minor Works . . .	887,08	—	—	—
	NORTH-WEST PROVINCES AND OUDH :—				
5.	Major Works (productive).	1,439	9,965	—	2,112,778
1.	Protective and Navigation Works	168	424	—	39,500
5.	Minor Works . . .	—	618	1,653	101,464
	PUNJAB :—				
7.	Major Works . . .	1,598	7,596	—	3,320,000
1.	Protective and Navigation Works	22	182	—	139,759
6.	Minor Works . . .	1,813	319	—	664,213
	MADRAS :—				
9.	Major Works . . .	2,024½	5,708⅛	1,200,171	2,092,817
1.	Protective Works . .	80	120	47,309	35,566
27.	Minor Works . . .	1,365⅜	1,184⅛	315,487	248,110
	Navigation Works . .	304½	—	—	—
	BOMBAY :—				
15.	Major Works . . .	999	165⅜	21,910	694,130
6.	Protective Works . .	156¼	166½	—	40,461
34.	Minor and Navigation Works	2,092	228½	295,848	512,374
		13,671¾	29,574	2,085,351	10,650,175

SUMMARY.

Main Canals	13,671¾ miles
Distributaries	29,574 „
Old Works	2,085,351 acres
New Works	10,650,175 „
Total	12,725,526 „

CHARACTER OF WORKS.

	Major Works.		Minor Works and Navigation.
	Productive.	Protective.	
Baluchistan	2	—	—
Rajputana	3	—	—
Burma	1	—	6
Bengal	4	—	3
North-West Provinces and Oudh	5	1	5
Punjab	7	1	6
Madras	9	1	27
Bombay	15	6	34
	46	9	81

DETAILS OF WORKING AND AREA IRRIGATED.

Irrigation Works.	Gross Receipts.	Working Expenses.	Surplus Revenue after charging interest.	Area Irrigated.	Percentage of working expenses in Rx.
Major Works, Productive :—	Rx.	Rx.	Rx.	Acres.	
Bengal . .	176,564	137,744	−200,756	713,442	78·01
N.-W. Provinces and Oudh . . .	858,295	285,470	+269,084	2,112,778	33·26
Punjab . . .	1,195,245	344,358	+525,718	3,320,000	28·81
Madras . . .	777,992	189,042	+340,402	2,692,817	24·30
Bombay . . .	167,942	51,877	+16,045	716,040	30·89
Navigation :—					
Bengal . . .	7,431	5,003	−7,779	—	67·32
Protective :—					
N.-W. Provinces and Oudh . . .	11,025	10,977	−16,284	39,560	99·56
Punjab . . .	45,465	10,793	+19,194	139,759	23·74
Madras . . .	8,782	4,407	−12,753	82,965	50·18
Bombay . . .	16,359	7,732	−23,524	40,461	47·26
Total . . .	3,265,100	1,047,403	+905,003	9,857,823	32·07
Minor Works and Navigation. Irrigation :—					
Baluchistan . .	5,407	2,084	−3,033	5,653	38·55
Rajputana . .	11,908	5,304	−2,901	25,560	44·54
Burma . . .	88,529	23,473	+51,765	—	26·51
Bengal . . .	499	60	−2,278	—	12·02
N.-W. Provinces and Oudh . . .	32,851	18,283	+4,264	103,117	55·65
Punjab . . .	133,122	79,854	+43,221	664,213	59·99
Madras . . .	104,194	27,564	+43,109	563,597	26·45
Bombay . . .	125,754	47,710	+36,740	806,222	37·93
Total . .	502,264	204,332	+170,887	2,168,362	40·68
Navigation Works :—					
Bengal . . .	48,237	36,296	−31,079	—	75·24
Madras . . .	10,550	11,787	−36,318	—	111·72
Total . .	58,757	48,083	−67,397	—	81·79
Total: M. W. and N.	561,051	252,415	+103,490	—	44·99
		COMBINED TOTALS:—			
Major Works, all Kinds . . .	3,265,100	1,047,403	+905,003	9,857,823	
Minor Works, all Kinds . . .	561,051	252,415	+103,490	2,168,362	
	3,826,151	1,299,818	+1,008,490	12,026,185	

More striking confirmation of the financial success of great public works could not be desired.[1] That being so, it is desirable to observe to what extent the recommendations of the Famine Commissioners of 1880 have been acted upon in regard to occupying the "FIRST PLACE" with irrigation works as against railways, the only other public works of any magnitude carried out in India being buildings and roads, necessary at all times. Each year from 1882-83 to 1897-98 (the latest available) may be taken. I select 1882-83, and not an earlier year, so as to give the authorities two years in which to make the necessary arrangements for carrying out the policy which was described as of "first" importance. The figures are significant. They are more than significant. They suggest the very pointed enquiry as to how far the authorities may be held blameless for their neglect to carry out such plain and obvious reforms. If the responsible officials at the India Office—men of the past who are still living (Lord Salisbury not the least of a large number) as well as of the present—dare consider the preventible suffering now being endured in India, as the consequence of their want of foresight and effort, perhaps they will change their policy.

[1] Reviewing the foregoing works as a whole ten years previously, Mr. Deakin places this judgment on record: "The works as a whole are remunerative. In Madras, the North-West Provinces, the Punjab, and Sind, they yield handsome profits; in Bombay they are likely to pay for themselves, and in Bengal, they are, after all, the cheapest and best means of fighting famine, and saving the public treasury from ruinous drafts in bad seasons. On the merits of the investment, therefore, the stock would be entitled to rank high, apart from the guarantee."—*Irrigated India*, p. 233.

STATEMENT AS TO EXPENDITURE FROM REVENUE IN INDIA AND ENGLAND ON RAILWAYS AND IRRIGATION, 1882-83 TO 1897-98.

(Abstracted from Nos. 27 and 33 of the "Statistical Abstract for British India.")

Year.	Expenditure in India.		Expenditure in England.	Grand Total.	
		Rx.	Rx.	Rx.	
1882-83	Railways . .	6,520,738	6,105,946	12,626,684	
	Irrigation. .	2,480,912	32,386	2,513,298	Rx.
					In favour of Rys.
		4,039,826	6,073,560		10,113,386
1883-84	Railways . .	6,808,186	5,929,836	12,738,022	
	Irrigation. .	2,440,963	2,039	2,443,002	
		4,367,223	5,927,797		10,295,020
1884-85	Railways . .	8,158,667	6,000,597	14,159,264	
	Irrigation. .	2,501,949	81	2,502,030	
		5,656,718	6,000,516		11,657,234
1885-86	Railways . .	8,975,159	6,661,693	15,636,852	
	Irrigation. .	2,489,964	590	2,490,554	
		6,485,195	6,661,103		13,146,298
1886-87	Railways . .	8,777,884	7,271,620	16,049,504	
	Irrigation. .	2,416,712	1,921	2,418,633	
		6,361,172	7,269,699		13,630,871
1887-88	Railways . .	9,068,422	7,668,269	16,736,691	
	Irrigation. .	2,552,619	33	2,552,652	
		6,515,803	7,668,236		14,184,039
1888-89	Railways . .	9,494,359	8,282,130	17,776,489	
	Irrigation. .	2,692,950	551	2,693,501	
		6,801,409	8,281,579		15,082,988
1889-90	Railways . .	10,336,538	8,126,638	18,463,176	
	Irrigation. .	2,723,146	1,018	2,724,164	
		7,613,392	8,125,620		15,739,012

Year.	Expenditure in India.		Expenditure in England.	Grand Total.	
		Rx.			
1890–91	Railways .	10,353,049	7,565,408	17,918,457	
	Irrigation.	2,813,622	2,898	2,816,520	
		8,539,427	7,562,510		15,101,937
1891–92	Railways .	12,793,700	8,108,138	20,901,938	
	Irrigation.	3,020,347	2,603	3,022,950	
		9,773,353	8,105,535		17,878,988
1892–93	Railways .	13,081,225	9,166,886	22,248,111	
	Irrigation.	2,994,606	6,666	3,001,272	
		10,086,619	9,160,220		19,246,839
1893–94	Railways .	13,489,992	9,477,341	22,967,333	
	Irrigation.	2,917,024	1,894	2,918,918	
		10,572,968	9,475,447		20,048,415
1894–95	Railways .	13,655,371	10,483,754	24,169,125	
	Irrigation.	2,992,928	2,962	2,995,890	
		10,662,443	10,480,792		21,173,235
1895–96	Railways .	13,902,214	10,114,771	24,016,985	
	Irrigation.	3,013,153	1,475	3,014,628	
		10,889,061	10,113,296		21,002,357
1896–97	Railways .	13,353,383	9,617,168	22,970,551	
	Irrigation.	3,295,191	2,648	3,297,839	
		10,058,192	9,614,520		19,672,712
1897–98	Railways .	13,561,896	9,131,606	22,693,502	
	Irrigation.	3,142,339	1,746	3,144,085	
		10,419,557	9,129,860		19,549,417
				Rx.	257,522,748

EXPENDITURE ON STATE RAILWAYS AND IRRIGATION WORKS IN INDIA.

CHARGEABLE TO CAPITAL.

Year.	Object.		In favour of Irrigation.	In favour of Railways.
		Rx.	Rx.	Rx.
1882	Railways . .	3,931,543		
	Irrigation. .	701,820		
				3,229,723
1883	Railways . .	2,710,894		
	Irrigation. .	2,994,229[1]		
			283,335	
1884	Railways . .	4,419,114		
	Irrigation. .	1,010,797[1]		
				3,408,317
1885	Railways . .	6,050,856		
	Irrigation. .	953,507		
				5,097,349
1886	Railways . .	7,019,928		
	Irrigation. .	760,810		
				6,259,118
1887	Railways . .	5,853,479		
	Irrigation. .	664,835		
				5,188,644
1887–88	Railways . .	2,332,721		
	Irrigation. .	626,849		
				1,705,872
1888–89	Railways . .	1,236,594		
	Irrigation. .	539,418		
				697,176

[1] This large expenditure does not represent new works; during these years the authorities purchased the Madras Irrigation Company's works in Kurnool, around which, the reader will remember, so much sharp questioning occurred before the Select Committee of 1878.

Year.	Object.		In favour of Irrigation.	In favour of Railways.
		Rx.	Rx.	Rx
1889-90	Railways . .	2,799,432		
	Irrigation. .	498,802		
				2,300,630
1890-91	Railways . .	2,876,971		
	Irrigation. .	610,484		
				2,266,487
1891-92	Railways . .	3,418,364		
	Irrigation. .	808,108		
				2,610,256
1892-93	Railways . .	4,779,049		
	Irrigation. .	602,394		
				4,176,655
1893-94	Railways . .	4,086,848		
	Irrigation. .	761,389		
				3,325,459
1894-95	Railways . .	4,487,551		
	Irrigation. .	658,918		
				3,828,633
1895-96	Railways . .	3,945,011		
	Irrigation. .	757,918		
				3,187,093
1896-97	Railways . .	4,257,017		
	Irrigation. .	795,818		
				3,461,199
1897-98	Railways . .	3,635,797		
	Irrigation. .	742,663		
				2,893,134

Total expenditure on Irrigation . Rx. 14,488,759

Total expenditure on Railways . Rx. 67,841,169

The tables relating to revenue and capital, have been compiled from the *Statistical Abstract*:—No. 27, pp. 107-109; No. 33, pp. 114-116; No. 21, pp. 118, 119; No. 22, p. 119; No. 27, pp. 128, 129; No. 33, pp. 132, 133.

Summarized, the position, as shown in the foregoing tables, stands thus (Rs. 15 to the £1) :—

Expenditure from REVENUE:	£
Railways	201,381,789
Irrigation	29,699,872
Balance *against* IRRIGATION .	£171,681,917

Expenditure from CAPITAL:	£
Railways	45,227,446
Irrigation	9,659,173
Balance *against* IRRIGATION .	£35,568,273

The combined Totals show :—

Expenditure from REVENUE and CAPITAL :

	£
Railways	246,609,235
Irrigation	39,359,045
Balance *against* IRRIGATION .	£207,250,190

Thus was the emphatic recommendation of the Famine Commission, in 1880, to put irrigation "first" carried out by the authorities! Of what use is an enquiry by Royal Commission, when its most important recommendation concerning protection against famine is thus treated?

However, taking the figures given into consideration, what is there to be said for the irrigation that was undertaken? Fortunately, there is official testimony to fall back upon. The "Report of the Famine Commission, 1898," deals exhaustively with the subject, and does so in terms that would have rejoiced the heart of Sir Arthur Cotton could he have seen them. First, this comparison, based on "Productive" irrigation works, is given :

Area protected in 1878–79: 5,171,497 acres. Area protected in 1896–97: 9,448,692 acres.

Increase: 4,277,195 acres.

"Although the capital outlay on productive irrigation works has been increased by over fifty per cent. since the

report of the Famine Commissioners [in 1880], an average return of about six per cent. is still realised; the new projects and extensions undertaken since 1879–80 have been financially as profitable as the works constructed before that date, in spite of the fact that the outlay subsequent to 1879–80 includes the purchase from the Madras Irrigation Company of the Kurnool Cuddapah canal, which, with a capital account of Rx. 2,171,349, barely pays its working expenses."

Sir James Lyall, the President of the Commission of 1898, and his colleagues proceed to remark: "The remunerativeness of these works may be shown in another way. Taking them as a whole, including the works which are never likely to be remunerative and those not yet opened or in full operation, the surplus revenue realised to the end of 1896–97, after paying all interest charges and working expenses, amounted to Rx. 4,829,917, the surplus for the year 1896–97 itself being Rx. 809,173. The interest charges are calculated throughout at four per cent."[1]

This pæan of success is not enough. A few pages farther on in their report, the Commissioners remark that "the result has been

A GREAT ADVANTAGE TO THE STATE,

regarded merely from the direct financial return on the money invested, and apart from their value in increasing the wealth of the country in ordinary years, and in preventing or mitigating famine in years of drought."[2]

What is the position in India which makes a discussion of this nature necessary at the present moment?

It is this: Famine has now become chronic. There are few safe spots outside the irrigation-protected districts.

To what extent has India become chronically subject to famine?

Take the last half of this century, and note the following record of famines compiled from Part III., *Famine Histories*, published in 1881, and the Report of the Indian

[1] *Famine Commission's Report*, p. 334. [2] *Ibid.*, p. 338.

Famine Commission, 1898 ("Narratives of Famines which have occurred since the Famine Commission's Report, 1880").

YEAR.	REGION AFFECTED.
1853	Bombay.
1857–58	Upper India.
1854	Madras.
1860–61	North-West Provinces and Punjab.
1865–66	Orissa.
	Behar and North Bengal.
	Madras.
1868–69	Rajputana.
	North-West Provinces.
	Punjab.
	Central Provinces.
	Bombay.
1873–74	Bengal and Behar.
	North-West Provinces and Oudh.
1876–77	Bombay.
	Hyderabad.
1877–78	North-West Provinces and Oudh.
1876–78	Madras.
	Mysore.
1884	Punjab.
1884–85	Lower Bengal.
	Madras.
1886–87	Central Provinces.
1888–89	Behar.
1889	Orissa (Tributary States).
1888–89	Madras (Ganjam).
1890	Kumaun and Garwhal.
1892	Kumaun and Dehra Doon.
1891–92	Madras.
	Bombay (Deccan).
	Bengal and Behar.
	Upper Burma.
1890–92	Ajmere Merwara.
1897–98	Madras and Bombay.
	Central Provinces.
	North-West Provinces.
	Central India.
1899–1900	Bombay.
	Punjab.
	Central Provinces.
	Rajputana.
	Central India.
	Hyderabad, Deccan.
	Berar.

Was ever before such a terrible record presented to an over-ruling Power? Forty-six regions affected in forty-seven years!

Yet, to combat the latest famines, and to PREVENT them, as was promised, there have been constructed 12,652 miles of railways, all of which are now working. In 1880, when the Famine Commission reported, the mileage was 9,308; in 1898, it was 21,960. It was indubitably stated that railways were to prevent famines. The advocates never wearied of asserting this. If Sir Arthur Cotton's works, and irrigation works generally, had presented even one-hundredth part of such ignominy and failure, after like confident, almost boastful, prophecy, could words scornful enough have been found for his proposals? "Scornful enough," I ask, because in the draft report of the Select Committee, before which he attended in 1878, there are expressions used concerning his suggestions which were scornful and ill-timed; in the light of the facts of to-day, they stamp their authors as deficient in insight and almost in common sense, altogether lacking in farsightedness and statesmanship.

When, in 1884, a Select Committee of the House of Commons inquired into the desirability of largely extending railways, there was no plea so frequently urged as that the railways would protect the people from famine, and greatly advance the prosperity of the country. For example, on the latter point the late Sir William Hunter, one of the witnesses, had the hardihood to remark[1]:—

"I think that the increase of the prosperity of the country from the railway system which the Government proposes, will be so great that the Government is not only justified, but is bound to face the contingency of a large fall in exchange with reference to the interest payable on these railways. I believe that any probable fall in exchange will be more than counterbalanced by the increase in prosperity which railways produce."

Mr. Dalrymple asked: "I am right in thinking, then,

[1] Q. 7,184, *Minutes of Evidence*, p. 462.

that a greater extension of railways is asked for, especially as a protection against famine?"

"*That*," the same witness answered, "*is the basis of our proposals*; but it is only the basis. The Government fully recognises the commercial aspects of the line, as well as their famine and protective aspects."[1]

In reply to the next question asked of him, the witness added: "The Government of India would have been glad to recommend more railways as a protection at present."

The fundamental error in regard to railways is the assumption by the authorities that if "the problem of *famine relief*" be "nearly solved," that is enough. A confusion of ideas in regard to "relief" and "prevention" vitiates nearly all that even so clever a man as was the late Sir William Hunter wrote or said on this subject. As he, so all the others. But even he more than once got near the truth, as, for example, when it was asked[2]:—

"You made use of a very strong remark when you said that in time of famine the narrow gauge leads to delay and death. Could you give us an instance where the narrow gauge has led to death?"

"No," was the reply; "I am not prepared to give instances, because I do not know of instances in which this has occurred. I was referring to the proposal to make the Jhansi-Manikpur line on the narrow gauge."

Six years before Sir William thus expressed himself, the actual facts in India had proved themselves to be:—

Railway-served Districts.	Irrigated Districts.
A much higher mortality; money loss and human suffering more than in (not irrigated districts, but) non-railway traversed districts in which there are no irrigation	"During this most awful season of famine, the worst probably ever known in India, when the districts of this Presidency, through which the railways run, lost over eighty-five per cent. of

[1] Q. 7,222, *Minutes of Evidence*, p. 466.
[2] Q. 7,409, *Minutes of Evidence*, p. 477.

works, or, as in Kurnool, where success is denied to them through the system to which they belong being left unfinished, as a railway would never be similarly left.

their revenues, two-thirds of the population, and the whole of their products, for not an acre of land can be made to yield any products by a railway when the rains fail; the Godavari district, by means of its canals, paid double the revenues it had ever yielded in the most prosperous years before these works were constructed, carried on a trade nearly forty-fold in value to what it was when these works were undertaken, and came out of the trial strengthened in all its resources; whilst India has been brought to bankruptcy in spite of all endeavours to bolster up the railway system. If the condition of industry in India had been at all considered and compared with that existing at home, this waste of money, and time, and life would never have been allowed, but now I fear it will be long before India recovers, if she ever does at all, for it is appalling to see the state of these districts."[1]

No argument could be more unsound, more out of accord with facts, than that which contends that railways prevent famines.

[1] Letter to Select Committee, 1878, from Colonel Fischer, R.E.

During the 1876–78 famine in Madras, nine districts were directly affected. Seven of these had a first-class railway, on either the broad or the narrow gauge, running through them; some were served by two such railways. It has been thought well to compare the decrease of the population, through famine, in certain Bombay and Madras districts served by railways and other districts not served by railways. This is how the comparison works out :—

DISTRICTS TRAVERSED BY RAILWAYS.

DISTRICT.	DECREASE. (1881 compared with 1872, and allowing for increase of one per cent. per annum.)[1]	PERCENTAGE OF DECREASE.
Bellary	481,430	26½
Coimbatore	364,275	19
Cuddapah	351,764	24
North Arcot	378,839	17
Sholapore	201,632	27
	Average	22⅝

DISTRICTS NOT TRAVERSED BY RAILWAYS.

DISTRICT.	DECREASE. (1881 compared with 1872, and allowing for increase of one per cent. per annum.)[1]	PERCENTAGE OF DECREASE.
Kurnool	336,800	32
Kaladgi	251,245	29½
Belgaum	166,020	16½
Dharwar	195,835	18
Sattara	95,392	8¼
	Average	20⅜

[1] The Government of India (p. 567, *Report of Select Committee on*

On the ten districts selected the average indicates a difference of two per cent. against railways, *i.e.* the population decreased more rapidly where the districts were served by railways than where there were no railways. This is a protection against famine entirely in the wrong direction. The particular gain from railways is, however, seen by comparing Kurnool with Bellary; but if Kaladgi be put by the side of Sholapore, the gain to the latter, through the railway, is only two and a half per cent. The Bombay districts mentioned are those selected by the Government of Bombay for a test census, while the Madras district (Kurnool) cited in the first-quoted table was by far the worse affected of the districts not served by railways. It will, therefore, be seen that the facts, as the India Office Blue Books furnish them, have been fairly dealt with. North Arcot is a Madras district traversed by *two broad gauge railways*, yet, according to the late Sir William Hunter, in the *Gazetteer of India*, the utmost efforts of Government had to be put forth to prevent the district being depopulated in 1877–78.

The pointed query follows naturally: "Railways having, by official statement, failed to protect the country against famine in the past, what reason is there to suppose that there would be a different result in the future?" The efficacy of railways *during famine* all must admit. As the result of observations in Southern India and Mysore in 1877–79, the present writer is of the opinion that while, with railways, we lost five millions of lives, without them we should have lost ten millions.

At first sight it may appear a hard saying to remark that it is owing to *our* mode of administration in India that famines are now so frequent and so deadly. The Govern-

East India Railway Communication) puts the normal increase at one and a half per cent. per annum. Had the same figures been used, the case against railways, as protectors from famine, would have been of a stronger character than has been stated. The one and a half per cent., as a standard of increase, could not, however, be used; the Indian census returns do not justify it.

ment of India, with Lord Lytton as viceroy, announced this fact, in effect, though it was not put in that way, by introducing a new feature in Indian finance—a Famine Insurance Fund—because, as was stated, famines must henceforth be looked upon as a regular feature in Indian affairs. The effect of our system is to bring sixty millions of people at a time within the scope of death by famine and by our railways to save five or ten. The mischief lies in the circumstance that the sixty millions need not be famine-stricken at all.

Again, consider what all this would have meant had Sir Arthur Cotton's enterprises shown such deplorable results. He, and all who advocated the views he enunciated, would have been hounded out of argumentative existence; their proposals would have been ridiculed; no place would have been found for them even in our varied public life. But, railways being concerned, railway construction being a matter which interested all the steel and iron works, the locomotive builders, and the carriage and truck makers, as well as the very large proportion of the English public who had invested in Indian railways, I verily believe, without conscious knowledge on the part of any one that not good but harm was all the time resulting to the whole interests of India—every official's eyes became blinded, and each one saw not the condition of things as it actually existed, but as he supposed it must necessarily be. All this was good for the trade of England; it has helped to spell ruin to millions of Indian homes, and has done its part in causing more acute physical suffering and mental pain among British subjects than have all the wars waged throughout the world since the nineteenth century dawned.[1] Had half the money thus spent on railways been expended in the construction of navigation and irrigation works, there would have been great prosperity

[1] "The wars of ninety years, down to 1880, involved . . . the loss of 4,470,000 lives."—MULHALL, *Dictionary of Statistics*, p. 586, ed. 1892.

and the avoidance of much, if not of all, of the famine suffering.

What could irrigation engineers do in the face of such determination that their enterprises should not receive fair consideration, as is shown in a statement, gleefully made by Sir George Campbell, as to what he had done to checkmate those too-enthusiastic Water Apostles?

"We calculated in Midnapur,"[1] he says, "that supposing the whole of the water to be taken up which the canal supplies, and a reasonable rate to be paid for it, still the canal would not pay. That calculation was made by Colonel Haig, a man who is honourable and impartial, but who is certainly not prejudiced against canals, and therefore the conclusion we came to was that the Midnapur canal could never pay, although it was so far successful that the people were quite willing to take the water."

Was ever a worse instance known of the civilian blinded by prejudice? The only thing in connection with irrigation which this exceptionally clever civilian could see was the interest on capital expenditure. He did not feel *quite sure* that four or five per cent. would be realised. No calculation was made for navigation returns, no account was taken of the enormous increase in produce, which would give the cultivator more to eat, more clothing to wear, more money (no, not *more* money, but some money perhaps for the first time in his life), to spend on taxable articles which would benefit the Government revenue; above all, a certain insurance against famine. "The people were *quite willing* to take the water." But, Sir George Campbell was not willing they should.

Some day, in the Providence of God, by rebuke and suffering to us here in England, if we will not move of our own motion, adequate attention will be drawn to the famine suffering, and what is, perhaps, worse, the ordinary suffering caused in India by the adoption of the wrong methods of dealing with the condition of things existing

[1] Q. 1721, Select Committee, 1878, p. 123.

there.[1] India is not in its present deplorable condition because of any lack of the essentials to reasonable and fairly happy life. The land is not cursed of God; it is, however, neglected of man, and that man is the representative of a nation favoured above all other nations of the earth.

That nation has sons possessing insight and energy which enable them, the world over, and nowhere more conspicuously than in India, to subdue kingdoms, work righteousness, overcome natural difficulties, wrest from the hard rock-ribs of the world the treasures lying hidden in subterraneous depths, abolish cruel and ghastly ceremonies and punishments, instil into alien or vacant minds a reverence for law and right-dealing, cherish a high ideal for individuals and communities, and laugh at the huge army of obstacles which bar the way to the attainment of desired ends. More than that; by dint of much self-denial the sons and daughters of that nation are to be found in

[1] For example, the increase of deaths from "Fever" (one of the official Indian medical reports speaks of fever as a euphemism for innutrition and insufficient clothing) is terribly alarming :—

Administration.	1888.	1897.	+
Bengal	1,095,300	1,679,132	583,832
N.-W. Provinces and Oudh	1,053,753	1,463,716	409,963
Punjab	379,893	422,826	42,933
Lower Burma	36,391	51,752	15,361
Central Provinces	158,195	389,335	231,140
Assam	71,825	144,307	72,482
Coorg	2,730	7,182	4,452
Madras	204,561	292,292	87,731
Bombay	304,449	452,596	148,147
Berar	29,979	65,611	35,632
Mysore	37,609	47,093	9,484
	3,374,685	5,015,842	+1,641,157

That is to say, from "Fevers" only there were, in 1897, more than one and a half million more deaths than ten years previously. It is within the mark to say 1,500,000 died, practically, from starvation. The ratio per 1,000 population of total Fever deaths is from 9·0 in Madras to 23·62 in Bengal, 31·21 in North-West Provinces, Central Provinces 40·98, Coorg 41·50, 24·59 in Bombay, and 23 in Berar. (Pp. 298–301, *Statistical Abstract of British India*, 1888–89 to 1897–98.)

all parts of the world devotedly labouring for wholly intangible results, for consequences which cannot be put into any currency, even the spiritual welfare and eternal salvation of the souls of mankind. It is before such a nation the stupendous task lies of obliterating even the footprints of famine in a land where there need no more be famine than there is famine in our own country. Is that nation equal to the performance of its duty?

The means required for the transformation of India are at hand. Amongst the more important of them is a sufficiency of water to furnish liquid and manurial nourishment to the crops which, with the assistance of soil and sun, will always grow; this sufficiency is to be found every year in India. What is needed is the knowledge to use it rightly.

There is no mineral of which we know anything—neither gold nor copper—which, in value, can be compared with water. Twenty-six years have passed since the following comparison was made between the respective values of gold and water; he who made the comparison was the hero of these pages, Sir Arthur Cotton.

"The importance of any subject of investigation," he said, "is measured by the difference between the cost of obtaining it and its value when obtained, that is, in the case of material things. The question is not what is the value of a pound or a ton of anything. If a pound of gold costs more to obtain than its value, we must leave it alone; and if a pound of iron, when obtained, is worth double the cost of mining and smelting it, it is a highly profitable operation. If a thousand cubic yards of water can be made use of at a cost of sixpence, and if its value, so applied, is ten shillings, there is no gold mine in the world that can be compared to an irrigation work. At present it is stated that the average result of gold mining in Victoria is that it merely affords rather high wages to the men actually employed upon it. If so, it is nothing to the results of conducting water to the land in India. If a million a year

is spent in gold-mining, and it gives six shillings a day to the miners, who could otherwise be only gaining four shillings, there is a net profit of £330,000 a year; and if a million a year is spent, as the interest at seven per cent. on a capital of £14,000,000, in irrigating ten million acres, yielding in increase of produce and in other things twenty millions a year, it is sixty times as profitable as gold-mining in Victoria."

Allowing for the difference in the cost of labour since 1874, the argument is as good now as then. As are Tanjore, Godavari, and Kistna districts in the Madras Presidency, so, with modifications, might become the greater part of India, and, if such a change be not made, the responsibility rests upon the British people.

Adequate storage of water is the greatest need of India. Immense quantities may be stored at a "cost of £200 per million cubic yards of contents, or £140 per million supplied, and at a cost in interest and repairs at six per cent. of eighty thousand cubic yards per £1, besides the cost of distribution. Some vast sites have been examined and estimated, one to contain two thousand million cubic yards, five hundred times the capacity of the Sheffield reservoir that burst some years ago." [1]

Again, as to the amount of water available in India.

"What quantity of water have we in India," asks Sir Arthur in one of his lectures, "that is at present totally lost, or worse than lost, and, from want of controlling and directing works, is allowed to destroy instead of refresh and fertilize? When the Godavari is full, for instance, it contains about one hundred and eighty millions of cubic yards per hour, or more than four thousand millions a day. This, at two thousand cubic yards per £1, is worth £2,000,000 a day. It is, however, seldom full—perhaps only once in four or five years, and then from one to ten days; but the

[1] "Three Lectures on Irrigation Works in India before the School of Military Engineers," delivered at Chatham in 1875 by Sir Arthur Cotton, p. 22.

total volume flowing into the sea in the year from this one river is enormous. The average fall of rain in its basin is about forty inches, so far as I can judge, and of this, perhaps, one half flows by the river, which would be two hundred thousand million cubic yards, worth, if it could be all used, £100,000,000 sterling a year. This river drains one-tenth of the area of India.

"Leaving out the rainless tract, if an average of one yard of rain falls throughout India it would supply seven thousand five hundred cubic yards, sufficient for one crop of rice and one of other grain on an acre for two-thirds of the whole area, perhaps nearly all that is fit for cultivation. Land so irrigated would produce not much under a ton of food grains per acre, or sufficient for a population of one thousand five hundred per square mile, or six times the present population, and allowing one-third of the area for other things, there would be food for four times the present population. This is sufficient to show the main point, viz., that we have an unlimited supply of this material as far as any present prospects are concerned. We have, therefore, not only a mine of incalculably more value than any gold mine to work upon, but one of unlimited extent. We have in the case of the Godavari added to the income of the people by this means £1 per head or £5 per family, and when the works are completed there will be half as much more, making £7 10*s*. The average income of a family throughout India is, I believe, about £5 a year,[1] at which rate the income in Godavari has been already doubled, and will be eventually increased still more. There are in India fifty million families, so that if the same blessing were extended to the whole of the country it would add £375,000,000 a year to its income, or nine times the amount of the taxes now paid, besides all the incalculable benefits of health, comfort,

[1] This is an under-estimate; the average annual income in India is under £2 per head. When Sir Arthur made his statement the Cromer-Barbour inquiry of 1882 had not been made; this inquiry put the average annual income at Rs. 27, or, at Rs. 15 to the £, 33*s*. 9*d*. per head.

security, freedom from famine, satisfaction of the people under our rule, free intercourse of goods, passengers, etc., and this would be only with the present population, which is rapidly increasing."[1]

Once more the profitableness of water use in India may be mentioned. Iteration and reiteration will be useful in impressing it on the mind. In the third of his Chatham series of lectures, Sir Arthur asked, "If a gold mine could be found in which it would cost £2 to obtain a pound weight of gold, what would be thought of it? Or, a silver mine that would cost three-halfpence to produce an ounce of silver worth four shillings?" How every newspaper would be full of it, but, because these very results are obtained by water, they are not thought worthy of a moment's notice. "That the Godavari works are, at this moment, costing £42,000 a year, producing £1,500,000 from six hundred thousand acres of irrigation, and about five hundred miles of navigation, is as simple and as palpable a fact as could possibly be brought before us. And so with the Sone works this year; before any part of them is finished they have watered one hundred and sixty thousand acres, producing £500,000 worth of grain, in the midst of a famine—about the whole cost of the works up to that time."

The vast storage tanks needed can be economically constructed. Not the least amazing of the great engineer's efforts was the cheapness with which he could make his enormous bunds. That point need not be laboured here, as it has been already dealt with in the description (chap. vii.) of the construction of the Dowlaisweram anicut. But, it must never be lost sight of in the discussion of estimates prepared by hydraulic engineers, who know naught of other than the accepted heavy stone masonry which is in favour generally.

One important feature in regard to irrigation must not

[1] "Three Lectures on Irrigation Works," pp. 29-30.

be overlooked, and that is, even without large rivers, or even any rivers, much may be done to protect crops. Here in Jaipur State the famine is less severe than it is in Marwar, and in many districts there has been a fair supply of fodder. Moreover, there are appreciable stretches of country where irrigation works have enabled the people to hold out longer than they would otherwise have done. True, the water this year has been scanty, and now, at the end of April, the canals and tanks are giving out; but there is no doubt that the jealous care with which the scanty rainfall has been husbanded and utilised has done much to add to the staying power of Jaipur. The good work done in this direction is due to the man who, for thirty-three years, has given the whole of his energies to the advancement of Jaipur. Under Colonel Jacob's direction more than a hundred and fifty irrigation works have been carried through, and this in

A COUNTRY WITHOUT RIVERS,

and presenting as hostile a face to schemes of watering as, I suppose, any district in India. The usual plan adopted has been to select the best spots for catching and storing the floods which come with the rains, and then, by means of canals, to lead the water to as many village tanks or reservoirs as possible. Besides replenishing the tanks, the wells for a long way round have the leakage from the tanks to draw upon, so that the water is thoroughly well spread. Irrigation direct from canal to field—the common fashion in India—is also used. The accounts of the Public Works Department show what a splendid investment irrigation has been for Jaipur. On an outlay of five and a quarter millions of rupees there is an annual return of more than three hundred thousand rupees, and although the chief expenditure on capital account took place in the Eighties, the whole outlay since the beginning in 1868, will be recovered in another three years. The benefit to the people themselves may be imagined by those who know what the value of water means in India. I am told that

when Colonel Jacob goes about the country, the people of the unirrigated districts surround him as if he were the god of water, and beseech him to give them canals."[1]

RIVER *VERSUS* RAILWAY—TO TAP CENTRAL INDIA.

When the Central Provinces and the Deccan were yet undeveloped by railway communication, Sir Arthur Cotton made most earnest efforts to turn the Godavari to account. Unfortunately, he laboured in India at the most crucial moment, and it is not in India that a decision is taken on such momentous matters. If only he had been in England, and had been able to secure the active (he had the passive) support of the late Earl of Derby (then Lord Stanley, M.P.), it is quite possible he would have succeeded in tapping the cotton country and in opening up the Central Provinces, by way of an Eastern India port. Had only Sir Arthur Cotton's counsel been followed, the Central Provinces would have been saved from four most terrible famines,[2] each succeeding one being more destructive than its predecessor, while the prosperity of the whole of Southern India would have been enhanced.

What Sir Arthur Cotton wrote on this point must be reproduced. Even though the extracts will fill several pages, it is due to his farsightedness, nearly half a century ago, that they should be put upon record, and note taken by all concerned what India would have become by way of credit and legitimate profit to Britain could he have prevailed. There is no sadder "might-have-been" in recent English history than the retrospect of what India, Britain, and humanity have lost because the forces against which Sir Arthur Cotton had to contend were too strong for him.

[1] The *Manchester Guardian* Famine Correspondent, May 25, 1900.

[2] The famines of 1868-69, 1886-87, 1897-98, and 1899-1900.

Here is his own story (written before 1860) of what would have been could he have prevailed :—

What we have now to do is to discover means whereby the cost of transit may be reduced materially, so as to give a real relief to the country, and enable it to compete with other countries. Till this is accomplished nothing is done. All our immense advantages of soil, and climate, and cheapness, and abundance of labour, are lost, or at least the greater part of them. This is well shown in the case of the Berar cotton trade. It is stated by those who have the best means of knowing, that cotton is actually grown and sold at one penny farthing the pound; to this about three farthings is added in bringing it into the great cotton marts of the district where it is cultivated. Fully one penny is added in conveying it to Bombay, and more in taking it to Calcutta; another penny is added to it in bringing it into the English markets, and thus it arrives at Manchester at a cost which only puts it on a par with American cotton grown by slave labour at an enormous expense. At least three-halfpence per lb. could be taken off this cost by improved communications, and by throwing open the country, where so favourable a climate and soil are found for its growth. It is not merely for want of cheap transit a direct charge of one penny or more is added to the cost of the cotton, but for the same reason food, salt, etc., are three or four times the price they need to be. This is only one of many ways that the price of the cotton is indirectly augmented. At present the purchasing of the cotton from the cultivators is entirely in the hands of the ignorant, short-sighted, oppressive, native merchants. The natives begin to be very sensible of the advantage that it would be to deal with the European; but nothing can deliver them from the present system without an open communication with the ports, giving Europeans free access to the districts, and gradually removing the absurd fancies that mercantile men have about living in the interior of the peninsula, as if they could not do it without great risk to their lives.

In the present great question of the cotton supply, there seems to be scarcely any point more worth investigation than this opening of the fine cotton countries of Nagpur to the coast. No doubt the cultivation would extend rapidly along the whole line of the Godavari. It seems now to be generally acknowledged that

Berar is naturally the most suitable climate for cotton for the English market, and that, therefore, we should make it our grand effort to open a cheap line of communication with it, and it is certain that no other line can possibly compare with that of the Godavari for bringing this cotton to the coast. Captain Fenwick tells me that during the three years Palmer's house [1] brought their capital to bear on this tract, the cultivation of cotton and the general welfare of the people increased surprisingly. There is thus a line of five hundred miles of the cheapest communication, leading into the very heart of the country, to be had almost for nothing; even if fifty thousand pounds were spent in improving it, it would still only cost a hundred pounds a mile.

In the paper on the Berar cotton, by Mr. Ashburner, read before the Asiatic Society, in 1837, the importance of the subject is shown on the very best authority. He states that cotton can be cultivated at three pounds for a Bombay candy (less than one penny a pound), and that the only obstacle to its unlimited production is the cost of transport: that it is sent to Bombay on bullocks at two pounds eight shillings a candy (less than three farthings a pound), taking seventy days on the journey; that large quantities cannot reach Bombay before the monsoon, which is consequently liable to be damaged or destroyed; that there was at that time a traffic of twenty thousand tons a year in salt and Berar cotton; that a good carriage road there would be a saving of one hundred and sixty thousand pounds a year. He then goes on to say: "It may be as well, however, to show the productive powers of the country more clearly, to instance the increase which has lately taken place in the amount of cotton exported from Bombay. From 1828 to 1835 the exports averaged one hundred and seventy-eight thousand bales a year, and remained nearly stationary. But the high prices of the latter year lead to more extensive cultivation, and, notwithstanding numerous obstacles to production, the Presidency of Bombay last year produced and exported no less than two hundred and ninety thousand bales of cotton, being an increase of one hundred and twelve thousand

[1] A well-known, and at one time extremely influential, family, the members of which, at Hyderabad, Deccan, transacted the business affairs alike of the Nizam and of the Europeans in the Nizam's Dominions.