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MADRAS RECORD OFFICE.

Government of Madras.

Public Works DEPARTMENT.

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*Proceedings of the Madras Government, Public Works Department,
12th April 1865.*

No. 229. Read the following letter from Colonel R. STRACHEY, R. E., Secretary to the Government of India, Public Works Department (Civil Works—Agricultural), to the Secretary to the Government of Madras, in the Public Works Department, dated Simla, 17th September 1864, No. 822 C.-4,570:—

SIR,

1. I am directed to forward the accompanying copy of a Resolution by the Government of India in this Department, on the Revenue Reports of Canals in the North-Western Provinces for the years 1861-62 and 1862-63, and to request that you will invite the attention of His Excellency the Governor in Council to the principles it lays down.

No. 656-8C—3,825, dated 15th August 1864.

2. The Governor General in Council would be glad if the Madras Government will consider to what extent a like general course can be adopted in furnishing Returns of the results of the Irrigation Works in that Presidency. His Excellency in Council is of opinion, that the experience obtained in all parts of India, on this very important subject may, with the greatest advantage to the Administration every where, be collated, and so made to help in the general progress of knowledge applied to this branch of Engineering science, and its economical application under varying circumstances.

3. The Governor General in Council is satisfied, that works of irrigation are of very great utility in most parts of India, and believes that no better method of leading to their extension can be adopted, than fully demonstrating their fiscal and general value. To do this effectually, a critical analysis of the whole of the elements of income and expenditure is necessary, and the co-operation of the Madras Government is invited in obtaining data which cannot fail to be most useful to the Officers of the Government charged with the construction and maintenance of Irrigation Works in all parts of India.

(Signed) E. C. S. WILLIAMS, Captain, R. E.,
Under Secy. to the Govt. of India.

Enclosure to Current Letters Nos. 822-3c—4,705 of 1864.

Nos. 656-8—3,825, dated 15th August 1864.

RESOLUTION,—By the Government of India, Public Works Department.

Read the following papers:—

Letter from Government, North-Western Provinces, No. 922A, dated 14th March 1864, submitting the Revenue Report of Canals for 1861-62.

Letter from Government, North-Western Provinces, No. 2,866A, dated 7th July 1864, submitting the Return for 1862-63.

RESOLUTION.—The Governor General in Council, in the first place, finds it necessary to remark upon the great delay which is habitually allowed to occur in the submission of these returns by Colonel Turnbull, the Superintendent General of Irrigation. This has been more than once commented on by the Government of India, and though there is some improvement in the present case, still there seems no reason whatever, why the first of these reports, now under consideration, should not have reached the Government of India, till nearly two years after the date to which it is brought up. Considering that the whole of the details are prepared by the Local Superintendents, the necessity for any lengthened delay in their compilation in the Office of the Superintendent General is not apparent; six months, it is

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considered, should suffice for the preparation of these reports, and henceforth the Revenue Report of each year should be despatched to the Government of India about the commencement of the following November.

2. Proper punctuality must be insisted upon, His Excellency in Council observes, from the highest to the lowest officer in the Department, and any officer neglecting to do his duty in this respect will incur the severe displeasure of the Government of India. In case of future delay, it is requested that the dates of the submission of the reports by the various officers concerned, may be specifically noticed, so that the responsibility may be properly brought home. The Governor General in Council, however, will, hereafter, look to the Government of the North-Western Provinces for taking whatever steps are needful to enforce complete regularity in the submission of these reports, and desires that the returns may be sent up in original, without any discussion or report from the Superintendent General of Irrigation, rather than that they should be delayed in the highly objectionable manner that has become customary of late years.

3. The Governor General in Council also has observed, with some surprise, that in forwarding the report for 1861-62, no notice has been taken by the Lieutenant Governor of the delay in its submission, or of its contents. In transmitting the report for 1862-63, the apology of the Superintendent General, Colonel Turnbull, for the great delay that has occurred in submitting it, is referred to without comment, and an observation is made as to a question of account. But here, again, the essential subject-matter of the report is not alluded to in any way.

4. The Governor General in Council next proceeds to remark on the operations of the Canal Department reviewed in detail in these two reports.

GANGES CANAL.

5. The progress of the irrigated area and the income have continued, though slowly, till the Rubbee of 1862-63, when a most serious and lamentable falling off has taken place, consequent on the stoppage of the canal caused by accidents to the falls.

6. The net return for 1861-62 is found to be one-sixth per cent. on the capital sunk, and out of seven lakhs of Rupees income, the irrigation produced six lakhs. The net profits are 32 per cent. of the gross income, and amount to about 2½ lakhs.

For the year 1862-63, there is a deficit, or excess of charge over income, of one lakh. There is a falling off of 1½ lakhs on the income, and an increase of 1½ lakhs on the charges, making a total decrease of 3½ lakhs as compared with the previous year.

7. It is at once observable from a comparison of the Ganges Canal Returns with those of the other irrigation canals of these Provinces, that the system of irrigation in the districts traversed by the Ganges Canal is still very immature. Thus, while one cubic foot of discharge per second on the Ganges Canal in 1861-62 irrigated on an average 77 acres, on the East Jumna Canal, it irrigated 236 acres, and on the West Jumna Canal 211 acres.

8. If the irrigation from the Ganges Canal were extended in the same proportion as in the two older canals, the gross income would probably increase, at existing rates, from 7 to not less than 20 lakhs* of Rupees, being about 10 per cent. on the capital sunk on the works. To obtain an estimate of the possible net income, the question of outlay must be considered. On the Eastern and Western Jumna Canals, the total expenditure seems to vary from Rupees 0.4 to Rupees 0.6 per acre, averaging say Rupees 0.5, but this does not include the charges for the maintenance of Rajbhuas, or main water-courses, which would increase the amount by about one-fourth, so that the actual cost may be

* 4,850 cubic feet per second, at 220 acres give 10,67,000 acres. This at Rs. 1.9 per acre, gives about 20 lakhs.

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taken at Rupees 0.625, or 10 annas an acre on the average. On the Ganges Canal (excluding 1863-64) the corresponding charge is from Rupees 1.2 to Rupees 1.3 per acre. This difference is of course mainly owing to the relative small acreage (about one-third of what it might be) under irrigation in the case of the Ganges Canal; but as there seems no special reason to suppose that when the irrigation is fully developed, the charges on the Ganges Canal should exceed the rate on the other canals, the charges might, in the event

supposed, increase from 4½ lakhs, the present expenditure, say to 6½ lakhs,† leaving the probable net income about 13½ lakhs, which is equivalent to 7 per cent. on 195 lakhs, the capital sunk at the end of 1861-62.

9. The object to be at present effected is the speedy extension of irrigation as far as practicable, and every effort should be made to accomplish this. The present condition of the canal, however, is no doubt most unfavourable to this extension, and it is observed that, owing to the accidents before referred to, the acreage for 1862-63 was only 2,06,000 acres against 3,72,000 acres in 1861-62. But this should lead to the outlay upon maintenance and repairs being very carefully scrutinized, to bring down the charges as much as possible. It will be long, His Excellency in Council fears, before this canal pays even 4 or 5 per cent. on the capital sunk.

10. Comparing the charges for 1861-62 with those of 1862-63, it is observed that the following is the result:—

	1861-62.	1862-63	MORE.	LESS.
	RS.	RS.	RS.	RS.
Establishment	2,35,614	2,52,288	16,674	
Contingencies	22,058	16,564		5,494
Repairs	2,05,249	3,44,129	1,38,880	
Plantations	16,240	10,888		5,352
Deductions from Revenue...		9,059	9,059	
Total ...	4,79,161	6,32,928	1,64,613	10,846
			1,53,767	

The sum entered as a deduction from Revenue should properly have been a charge under Establishment, being money paid away in connexion with the collections of water rate. There is, therefore, an increased charge for 1862-63, under the head of Establishment of Rupees 25,733, with a reduced acreage of irrigation, and a reduced income under every sub-head, aggregating Rupees 1,73,522. The large increase of charge under the head of Repairs, being over 1½ lakhs of Rupees, is no doubt mainly due to the accidents already referred to. But both of these increased charges call for special explanation.

11. Acre for acre, the maintenance charges on this canal are rather more than double those of the Eastern Jumna Canal. There is, however, no proper classification of the charges, and it is not possible to make any close comparison. The Governor General in Council would wish to see introduced a regular classification both of the charges for maintenance, and also of revenue receipts for all irrigation canals, in the manner adopted in the Revenue Accounts of Railway Companies, from a comparison of which on the various canals, the relative economy of the management, and attention to the development of Revenue, could really be tested, which at present is hardly possible. The attention of the Superintendent General of Irrigation should at once be directed to this.

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12. Without desiring that it shall be followed as a precise model for this classification, the following will serve to illustrate more clearly what is meant:—

Revenue Account of the Ganges Canal for the year 1864-65.

[illegible]

Subsidiary to such a general account, there should be an analysis of the main items of charge and income, and a comparison with the results of former years' operations and an explanation of the causes of increase or decrease. By close attention to such calculations and the comparison of the results of one canal with another, the Irrigation Department will be in a position to exercise that thorough and intelligent control over its operations which is quite essential for a completely successful administration. The Governor General in Council cannot doubt that, had such comparisons of results been made habitually, the necessity for many modifications and improvements would have become apparent long since. In the absence of the needful details, no further comments of value can be made on the minor items of income, nor on any of the elements of charge.

13. But on one most important point, the Governor General in Council has no difficulty in arriving at a distinct conclusion, to which the attention of the Lieutenant Governor should at once be directed. This is, that there appears no doubt that the rates charged for water for irrigation on this and other canals in these Provinces, call for re-adjustment and general increase. The rates on the Ganges Canal are more nearly what seems reasonable than those on some of the other canals, but here too some addition seems called for at once. It is to be regretted that sufficient rates were not demanded at first, as it may not be so easy to introduce a proper system of rates now as it would have been at the outset. The Government of India is clearly of opinion, however, that such rates as are shown to be fairly chargeable, having regard to the just claims of the Government to a suitable return on the capital sunk on the works on the one hand, and to the known capabilities of the land on the other, should be adopted at once wherever practicable, and generally be introduced by degrees as occasion allows.

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14. The calculations of the probable income and return upon capital made in paragraph 8 of this Resolution, are based on the present discharge of 4,850 cubic feet per second. Assuming, however, with Colonel Turnbull, (vide his letter No. 741, dated 21st June 1862, and paragraphs 87 to 113 of the Report for 1862-63,) 5,500 cubic feet per second as the quantity likely to be utilised eventually, and taking the area irrigated at the reduced amount of 200 acres per cubic foot of discharge, or in all 1,100,000 acres; the present average water rate of Rupees 1·6 per acre would give an average income for Irrigation of, say, Rupees 17,60,000. The addition of miscellaneous receipts would bring up the total sum likely to be realised to 20 lakhs. Then taking Colonel Turnbull's estimate of the ultimate capital expended on the canal, 235 lakhs, and adding 40 lakhs for the cost of the remodelling of the bed, a total capital charge is obtained of 275 lakhs. Next, reckoning the charge for maintenance to be quite safe, at Rupees 0·75 per acre irrigated, or, on 1,100,000 acres, Rupees 8½ lakhs nearly, the net income may be estimated at about 11½ lakhs, being at the rate of something over 4½ per cent. on the capital.

15. To give a probable return of 10 per cent. on the capital, which the Governor General in Council considers may fairly be anticipated from works of this sort, the rate per acre should be increased from Rupees 1·6 to Rupees 3·02.*	
RS.	
33,25,000	
2,50,000	
<u>35,75,000</u>	
Total	...

	RS.
■ INCOME.	
1,100,000 acres at Rupees 3-02 =	33,25,000
Miscellaneous, say	2,50,000
Total	35,75,000

CHARGES.			
1,100,000 acres at Rupees 0.75 =	...	...	8,25,000
	Net	...	27,50,000

				Acres.
† 5,500 cubic feet at 250 acres =	...	...	13,75,000	

INCOME.			Rs.
13,75,000 acres, at Rupees 2-8 =	...	...	31,87,500
Miscellaneous, say	...	...	2,50,000
	Total	...	34,37,500

CHARGES.			
13,75,000 acres at Rupees 0·5 =	...	...	6,87,500
	Net	...	<u>27,50,000</u>

16. Supposing, however, that a cubic foot of water will irrigate as much as 250 acres, and that the charge for maintenance per acre can be reduced to Rupees 0·5, the minimum on the Eastern Jumna Canal, including Rajbuha maintenance, the rate of revenue to give 10 per cent. would be Rupees 2·3 per acre.† On the whole it may be assumed that the average rate should not be less than Rupees 2·8 per acre to ensure 10 per cent. net profit on the capital sunk.

17. The water rates charged at present on the Ganges Canal are stated to be—

	PER BEEGAH.	PER ACRE.
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					PER BEEGAH.	PER ACRE.
					RS. A. P.	RS. A. P.
For Sugar-cane	...	...	...	...	2 12 0	4 6 5
" Gardens, Rice	...	...	...	...	1 9 0	2 8 0
" Indigo, Cotton, &c.	...	...	...	...	1 0 0	1 10 8
" Other Grains	...	...	...	...	0 12 0	1 3 2½

On the Eastern Jumna Canal, the rates are—

				PER BEEGA. R.			PER ACRE.		
				RS.	A.	P.	RS.	A.	P.
For Sugar-cane	...	...	...	1	9	0	2	8	0
" Gardens, &c.	...	...	...	1	4	0	2	0	0
" Indigo, &c.	...	...	...	0	15	0	1	8	0
" Other Grains	...	...	...	0	8	4	0	13	4

The main difference between the rates on the two Canals is owing to the charge for the maintenance of the Rajbhuas or main water courses falling on the Government on the Ganges Canal and on the cultivators on the Eastern Jumna Canal. This accounts for a difference of 5 Annas per beegah, or 8 Annas per acre. The rate

for sugar-cane has purposely been fixed low on the Eastern Jumna Canal; but the exact reason is not stated, and it seems to be the consequence of former custom rather than any thing else; (vide Superintendent General of Irrigation, North Western Provinces, No. 990, dated 10th July 1863, and No. 1,796, dated 21st August 1863.)

18. This system of discriminating rates is, in the opinion of the Governor General in Council, altogether a mistake. There should be but one rate for all crops except sugar-cane, and this rate His Excellency in Council thinks might, for the present, be Rupees 2-4 per acre; for sugar-cane the rate might be fixed at Rupees 5, being somewhat more than double the former. This would almost amount to saying that there should be one rate for all crops which require one season to mature, and double for that crop which requires two seasons. The above rates refer to *Tor* irrigation, that is, by natural flow; for *Dal* irrigation, or for water raised artificially, the rate will be reduced as at present one-third, that is, to Rupees 1-8 and Rupees 3-4 per care.

19. From Colonel Turnbull's figures it would appear that the following is the approximate distribution of the classes of crop in 100 acres of irrigation :—

	RATE			ACRES.			
	RS.	A.	P.		RS.	A.	P.
1st Class Sugar-cane	4	6	5	12	52	13	0
2nd Class "	2	8	0	20	50	0	0
3rd Class "	1	10	8	51	85	0	0
4th Class "	1	3	2	17	20	6	0
				100	208	3	0
One-third Dal					69	6	0
On which deduct $\frac{1}{3}$ of rate					23	2	0
Net on 100 acres, say					185	0	0

At the rates now proposed, the figures would be as follows :—

Sugar-cane, 12 acres, at Rs. 5	RS.
Other crops, 88 " at " 2	60
	198

Total	258
Deduct for Dal $\frac{1}{3}$ th	29

Net on 100 acres ... 229

20. These rates, therefore, would give a return of about 10 per cent. on the suppositions named in paragraph 16, namely, on one cubic foot of water irrigates 250 acres, and that the charges do not exceed Rupees 0-5 per acre, which suppositions are not at all likely to be realized for many years, if ever. On the more likely supposition of one cubic foot of water giving irrigation to 200 acres, and the charges, amounting to Rupees 0-75 per acre, the net return would be only 7 per cent.*

21. For the encouragement of contracts for the irrigation of villages which is most desirable, a reduction of 20 per cent. might be allowed where a contract on fair terms, and for a term of not less than 10 years is taken up. A suitable reduction might be made in like manner for contracts for shorter periods.

22. Cultivators refusing to accept these rates, should not obtain any water at all.

23. It may be remarked that the above rates are based on an acreage. Should the system of charging by the volume of water hereafter be found practicable, which however, seems still very problematical, a corresponding adjustment of the rates could of course be readily made. It is believed that, in fact, the progress of events will be from a payment on an acreage by measurement to a payment of a lump sum on the ascertained average acreage for a series of years. A fixed area of irrigating opening may be found to suffice for this acreage, and the known discharge in cubic feet, from this opening may then be taken as a new basis for calculating the rate of the lump sum payment for purposes of comparison. It seems very doubtful whether a system of payment by volume can ever take root excepting in this manner. The great object in all cases, however, should be to get rid of all detailed measurements of land or crops, as the basis of the charge for water rate, and the introduction of lump sum payments.

24. The obvious advantages of a system such as is here described, would be that a minimum of detailed supervision and interference would be attainable, while the establishments and charges of collection, and at the same time the chances or opportunities for abuse of power, would be reduced as much as possible. Combined with this, there would be a direct encouragement of the growth of the more valuable crops.

25. It is the desire of the Governor General in Council that measures shall at once be taken for the introduction of the two rates of Rupees 2-4, and 5 per acre above noticed, and that no time should be lost in preliminary discussions on the subject. His Excellency in Council is well aware that much has been said, and may still be said, on the subject of these water rates, and he appreciates fully the anxious desire exhibited by the officers of the Irrigation Department to limit to the utmost the burdens placed on the cultivators using canal water. But the experience of the older canals in these very provinces, and of the results of all irrigation in India generally, leaves no doubt on the mind of the Governor General in Council that the present rates on the Ganges Canal are far too low, and that the rates proposed will not be in excess of the reasonable capabilities of the cultivators to pay, nor of the just claims of the Government to receive. Any representations that the Lieutenant-Governor may desire to make on this subject will be attentively considered, but meanwhile immediate steps should be taken for carrying out the increase of rates as now directed.

26. The Governor General in Council further desires that it shall be plainly understood, that the Government gives no pledge that the rates now fixed shall be maintained for any determined or lengthened period. On the contrary, the Government will reserve to itself the right of increasing the rates whenever the fair value of the water may warrant it. It is the first duty of the Government to endeavour to adjust the burdens on the country in an equitable manner, and it is only by carefully husbanding the resources of the State and firmly requiring a fair contribution from all classes in accordance with their means, that the advantages which have now been provided to the cultivators of the districts irrigated by this canal at the expense of the country at large, can be extended to other parts of India which are less favored by nature, and have, if possible, still stronger claims on the Government.

27. Before leaving this subject, it is further necessary to refer to a question on which His Excellency in Council is aware that there has been much discussion from time to time, namely, the connection between the charges made as water rate, and those made as Land Revenue. In theory His Excellency in Council considers that the best plan would be to assess the land simply with reference to its natural productive powers and capabilities, without regard to artificial irrigation, levying a

water rate to be fixed with reference to the additional fertilising properties of the canal water. But in practice, by now following this course where the assessment has already been enhanced on account of the advantages given to land by the introduction of canal irrigation, a portion of the present Land Revenue might very possibly be lost without recovering the amount in the shape of water rent. The Land Revenue, therefore, where now virtually composed in part of water rent, should not be reduced, but credit to a corresponding extent should be allowed to the cultivator in reckoning his water rates, and this portion of the Land Revenue should henceforth be credited as Canal Revenue. There might, under such circumstances, be two scales for the price of water, one for villages so assessed at the higher rate and one for those on which no part of the Revenue consisted of water rent. These views have already been briefly enunciated in Home Department, Despatch No. 544, dated 4th June 1864, regarding the Permanent Settlement in the North Western Provinces, paragraph 24.

28. In the districts watered from the Ganges Canal, the Governor General in Council believes that there has been no increase to the Land Revenue since the opening of the Canal, and if that be the case, these remarks have no application to this canal, and the rates before mentioned of Rupees 2-4 and Rupees 5 per acre respectively, should be introduced everywhere along it.

29. Where it is found, however, after proper investigation, that the Land Revenue rates have been enhanced so as virtually to include a portion of the charge for canal water, the rates above noted (which the Government of India intends to be applicable to all the Irrigation Canals of the North-Western Provinces without exception) may be reduced in a corresponding degree. But such reduction of the facts, and should only be allowed to follow a strict examination and Canal Officers, who will be jointly responsible that the interests of the Government are carefully guarded.

Eastern Jumna Canal.

30. The results of the two years' operations on this canal are very satisfactory. The net income gives a return of more than 10 per cent. for 1861-62, and 9½ per cent. for 1862-63 on the capital sunk, (now amounting to Rupees 14,34,000) irrespective of the enhanced Land Revenue. The following statement of the net income of this canal since 1858-59 is interesting :—

	RS.
1858-59	96,308
1859-60	1,68,053
1860-61	1,71,937
1861-62	1,47,142
1862-63	1,38,321

The year 1860-61 was exceptional. The gradual increase of the revenue is seen to be directly dependent on the increase in the number of acres irrigated by the same quantity of water brought into the canal. One cubic foot of water in 1861-62 supplied water to 235 acres which in 1858-59 supplied only 148 acres. It is to be regretted that the acreage has not been given for 1862-63.

31. The Governor General in Council is gratified to observe the extensive introduction of the contract system on this canal, and Major Brownlow's efforts to this end are entitled to much praise. It would have been better if the sum realized under contract had been mentioned, as distinguished from that paid on measurement of the crops. This should be attended to hereafter.

32. The miscellaneous collections continue nearly stationary. As compared with 1858-59, there has, however, been a considerable falling off. The reason of

this should be explained. His Excellency in Council is of opinion that, if more attention were paid to the plantations and to the development of produce from the land in the occupation of the canal, a steadily increasing income should be obtained. The Canal Officers should be invited to consider this point. The increased utilization of the motive power of the canal water should also receive attention.

33. As already noticed, the returns for this canal, which have been submitted for the year 1862-63, give no statement of the area irrigated, owing, it is said, to the introduction of the contract system. It is, however, most desirable, that these figures should continue to be given for statistical purposes, and His Excellency in Council considers that there should be no difficulty in obtaining, at all events, a fairly approximate account of the acreage irrigated, without causing interference with the cultivators. The Putwaris might be bound to furnish statements of the irrigation to the Canal Officers, and these could readily be checked so as to ascertain their substantial correctness by the ordinary Canal Establishments.

34. Colonel Turnbull should, therefore, be instructed to arrange for the supply of this information for the future, and to take care that proper attention is paid to the regular record of all the main facts that form useful standards of comparison in the operations of all the canals under his charge.

35. Amongst these points, the volume of discharge calls for particular attention. The quantity of water brought into the canal head, and the quantity thrown off by escapes, being regularly recorded; the quantity actually utilized (subject to loss by absorption and evaporation) can be ascertained with fair accuracy. All the registers of the canals should, as early as possible, be brought under an uniform system, as to this record, and in future years, these facts should be distinctly stated. The comparison of the quantity of water utilized, with that brought into the canal, and of the acreage irrigated per cubic foot utilized, and of the income and charge per acre and per cubic foot utilized, will form the main tests of the efficiency of the administration and the practical utility of the works.

36. Another very important point, a knowledge of which is quite necessary to admit of a complete estimate of the value of the canal operations, is the character of the rains. So long as the payment for irrigation on any canal is mainly based on detailed measurements of crops, the greater or less abundant supply of rain will seriously affect the extent to which the cultivators take the canal water. It is known that registers of rain-fall are kept at many points along the canals in the North-Western Provinces and by the Revenue District Officers. A more systematic review of this important matter, should form a prominent point in all future reports of this nature.

37. The Governor General in Council believes that the fluctuations in the revenue of this canal during the last few years have been almost entirely due to the variations of the seasons, and he observes with satisfaction that there has been so small a reduction in the net income consequent on what are termed by the Superintendent two unusually wet seasons. As the value of irrigation becomes better known and the system of contracts extends, the cultivators will arrange their agricultural operations with less close dependence on the natural seasons and increased reliance on the artificial water supply. The permanent advance made in the extent of irrigation on this canal subsequent to the last famine year, is most striking. A like result is known to have occurred on the Western Jumna Canal after the famine of 1837-38.

38. Having reference to the observations contained in paragraphs 27 to 29 of this Resolution, His Excellency in Council desires that enquiry be at once made as to the extent to which the ordinary Land Revenue has been enhanced in the districts watered from this canal, consequent on the introduction of canal water, and that the result of this enquiry may be communicated at an early date in as complete a form as possible. The regulation of the rates to be charged on this canal, in conformity

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to the orders above given, will be made to depend on the result of these investigations. The sum by which the ordinary revenue may be found to be enhanced will henceforth be made to appear as an addition to the canal revenues, and will be brought forward in the public accounts as such. The Lieutenant Governor will see that the best approximation possible is made in this adjustment. Great precision will perhaps not be possible; but such a fair estimate of the increase of revenue should be made as will suffice to effect the adjustment of the water rates in the manner already explained.

39. The Governor General in Council has observed with satisfaction, the successful operations of the officers on this canal in draining swamps in its vicinity. His Excellency trusts that increased attention will continue to be paid to this most important subject. It would be satisfactory to the Government of India to hear whether the Sultanpoor swamp and other similar swamps lately operated on were originally caused by the canal.

40. His Excellency in Council considers some explanation to be called for as to the increase of the establishment charges from Rupees 43,500 in 1858-59 to Rupees 57,000 in 1861-62, amounting to Rupees 13,500. If this increase has been wholly for Revenue Establishments, it will not be out of proportion to the increase of area irrigated, but no details are given in respect to it, and it is requested that these may be furnished.

41. As to the repairs on this canal they at first appear to stand at a very low amount as compared to those on the Ganges Canal. But on the Eastern Jumna Canal, the original cost and the repairs of the main water-courses are charged directly to the cultivators. No clear details of the results of these operations are given, but on the one hand it appears that the annual charge for repairs of this class amount to a sum varying from Rupees 34,000 to nearly Rupees 40,000, which is nearly as much as the whole sum expended on the repairs of the main canal. Also it is observed that very large sums have been realized as re-payments of Tuccavy advances, varying from Rupees 80,000 to Rupees 1,10,000 in a year. It is presumed that the main cause of the great difference between the charges for maintenance and the re-payments, is that the latter include re-payments for the original cost of the water-courses.

42. These annual reports should give clear statements of all such subsidiary accounts and transactions. It is plain that the actual ultimate charge falls on the cultivator equally, whether paid in the shape of a refund of Tuccavy or as a water-rate, and that the actual original charge falls on the Government equally whether disbursements for such works appear as imperial works or Tuccavy advances.

43. But it seems to the Governor General in Council that this complicated system of advances and re-payments should not be allowed to continue. On the Ganges Canal, the whole of the main water-courses are constructed and maintained at the cost of the Government, and this obviously seems the proper course to adopt on all Government Canals. There should be one account of all Government expenditure and one account of all receipts. The present system is most cumbersome, and, though sanctioned by custom, seems to have very little that can be advanced in its favor. The Governor General in Council desires that steps may be taken for substituting the more simple procedure of the Ganges Canal on the Eastern Jumna Canal now, (supposing all arrears of claims fairly made from year to year under the original arrangements,) have given the Government a reasonable return for their advances or direct disbursements for maintenance; hence the Government can without objection waive all claims to further reimbursements. Hereafter the increased water rate will cover all these charges. On the other hand it may fairly be said that the very low rates of charge till now levied by the Government will justify the arrangement by which the cultivators have hitherto been made to pay the cost of all main

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water-courses. With the introduction of the higher rates, the Government will for the future undertake the construction and maintenance of all Rajbuhas at its own cost, and all existing works of this class should now be transferred.

44. The extent to which the complications of this system of Tuccavy have gone is shown by the following figures:—

	DIRECT REVENUE.		TUCCAVY REFUNDS.		TOTAL.	
	Amount. RS.	Per Cent.	Amount. RS.	Per Cent.	Amount. RS.	Per Cent.
1858-59	1,37,000	63	81,000	37	2,18,000	
1859-60	2,08,000	70	89,000	30	2,97,000	
1860-61	2,91,000	62	1,13,000	28	4,04,000	100
1861-62	2,51,000	73	95,000	27	3,46,000	
1862-63	2,56,000	75	86,000	25	3,42,000	

Hence the indirect payments of the cultivators for their water-courses have never been less than one-fourth, and have at times been upwards of one-third of their direct payments. Colonel Turnbull, (paragraph 6 of his No. 990, dated 10th July 1863,) when discussing the water rates on the Eastern Jumna Canals, states that on an average for the last eight years, the following had been charges:—

	RS.
Water-rate	1,57,444
Rajbuha clearances	49,201

showing that the extra charge for water-courses had been nearly one-third of the direct charge levied as water rate. The practical result of this may be thus stated with reference to the returns of 1861-62. The actual rate paid per acre would be Rupees 1.37 instead of 1.08; per cubic foot of water the receipts would be Rupees 324 instead of Rupees 255. The charges also would be increased from 0.45 to 0.57 per acre, and from Rupees 105 to Rupees 134 per cubic foot of discharge.

45. Referring next to the condition of the works on this canal it seems to the Governor General in Council necessary, with reference to the effect of floods as set forth in the reports, to enquire whether a permanent head dam should not be constructed. Such a work would give the Engineers a complete command over the River Jumna, and by means of it the Jumna floods might be kept entirely out of this and the Western Jumna Canals; in the latter of which most serious injury is known to arise by reason of them. There is ground for believing that such a work would neither be seriously difficult to construct nor very costly, and it is requested that the subject may be duly considered.

46. The only other point calling for remark, is the system of reckoning the interest on the capital sunk on the works referred to in paragraph 32 of the report for 1862-63. It has been ruled by the Government of India that the surplus of income may be set off against the gross capital charge to the extent of any supposed deterioration in the works and no more, so that the works shall always be chargeable with interest on what may be regarded as the present value of the block (vide Appendix Public Works Code, pages 43-44.)

Doon Canals.

47. The general results of these canals in a financial point of view, His Excellency in Council regrets to be obliged to consider altogether unsatisfactory. The Doon Canals continue to be worked at an absolute loss amounting in each of the last two years to about Rupees 5 or 6,000, independently of the interest on the capital which is 4 lakhs or more.

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48. The following are the results of the last three years :—

YEAR.	GROSS REVENUE.	TOTAL CHARGE.	DEFICIT.
1860-61	RS. 14,922	RS. 15,351	RS. 429
1861-62	16,011	22,543	6,532
1862-63	15,649	20,979	5,330

The revenue is almost stationary, and the charges appear to be increasing.

49. The acreage irrigated per cubic foot of water is, on an average of three years, somewhat more than on the Ganges Canal, being about 84 acres for the year. The maintenance charges per acre irrigated, have varied from Rupees 2 to Rupees 2.6 in the last three years. Per cubic foot of water they have been from Rupees 167 to Rupees 235. The corresponding figures for the Eastern Jumna Canal are per acre Rupees 0.45 and per cubic foot of water Rupees 80 to Rupees 105 not including the charges on main water-courses which would increase the above figures to Rupees 0.57 and Rupees 134.

50. The gross income per acre appears to have been about the same as on the Ganges Canal, Rupees 1.9. Per cubic foot of water it varied from Rupees 141 to Rupees 167, which is rather in excess of the Ganges Canal. This comparison, however, gives a very incomplete idea of the actual facts, for one-half the total income of these canals being derived from mills (Rupees 23,322 out of Rupees 46,582 in three years), the above rates of income are more than double what is in fact realized for irrigation.

51. From a table given in the report for 1862-63, it is seen that the water rates per acre are as follow :—

1st Class	2nd Class	3rd Class	RS.	A.	P.
...	...	...	1	4	0
...	...	...	0	10	0
...	...	...	0	8	0

These charges are most incommensurate with the value of the water. At the rates named, as those which the Governor General in Council desires to be adopted generally, the income would be increased on the present acreage by about Rupees 20,000, leaving a net income of Rupees 15,200. This is something under 3½ per cent. on the capital sunk, a return which is still very unsatisfactory.

52. The position of these canals therefore calls for special consideration, both as to increase of rates and reduction of expenses, and the Governor General in Council requests that the rates for irrigation shall at once be revised, so that the lands irrigated be made to pay a fair revenue on the average of years. The Lieutenant Governor is requested to take the necessary steps for arranging the rates in a manner suitable to the special conditions of the cultivation in the Doon, and especially the rapidly extending tea cultivation, on the general basis explained in the former part of this Resolution. If the rates there named are not sufficient to reimburse the Government for its outlay on these works, a still higher rate must be charged, but the charge should at all events at once be increased to those rates.

53. The Governor General in Council cannot acquiesce in the proposals made in paragraph 8, page 44 of the report, to reduce the charge for interest on that part of the capital sunk in these canals which represents the value of the works as giving a supply of drinking water to the Town of Dehra. On the contrary, the Lieutenant Governor should consider what special charge should be made against the towns of Rajpoot and Dehra for the use of the canal water for drinking purposes. These towns are now wealthy enough to be able to bear a proper share in the expenses of

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the works by which they are supplied with this necessary of life, and there seems no reason why they should not be required to make a moderate payment on this ground. The local officers should consider how such a charge may best be levied. Perhaps a contribution from the municipal funds would be the simplest way of adjusting the matter.

Rohilkhand Canals.

54. In these returns the Nugeena Canal is not included. It is requested that information may be given how the accounts of income and expenditure of this canal are treated. Even though it be thought desirable to continue the management of this canal under the District Civil Officers it seems the proper course to deal with its financial results, in connection with other similar works, and it is requested that this may be done henceforth, or that the Government of India may be satisfied that there is sufficient reason for not doing it.

55. The irrigation works under the Canal Department seem to pay nearly 7 per cent. on the capital expended on the completed portions. The charges for maintenance are very moderate, but the lowness of the rate charged for the water, 3 Annas 9 Pie per beegah, or 6 Annas an acre, is remarkable, and calls for explanation.

56. The results of the operations of the last three years are as follow :—

	GROSS INCOME.	TOTAL CHARGES.	NET REVENUE.
	RS.	RS.	RS.
1860-61	36,674	29,053	7,621
1861-62	35,633	25,489	10,144
1862-63	33,218	21,627	11,591

The returns for 1860-61 and 1861-62 do not show the detailed charges in a form that admits of proper comparison with 1862-63, but the reduction of charge appears to have arisen from economy in establishments, which is satisfactory. Some part of the saving has arisen from making the collections more completely through the District Revenue Officers. The variation in the income is not important.

57. The acreage irrigated per cubic foot of discharge seems satisfactory, being something under that on the Eastern Jumna and Western Jumna Canals. The expenses compared with the acreage irrigated, are but little more than one-half of those of the Eastern and Western Jumna Canals, and one-fourth of the Ganges Canal. Compared with the discharge, the results are equally in favor of the Rohilkund Canal, and Mr. Battie's management of these works seems to call for special commendation. The attention of Colonel Turnbull should be directed to these points.

58. Unless some satisfactory reason can be given for adopting a contrary course, the Governor General in Council will expect the water-rates to be gradually raised on these canals to the general extent already ordered for the Ganges Canal.

59. The very profitable results obtained from these works show the importance of hastening the completion of the Kylas Canal which still continues unfinished. The explanation given in the report of the cause of this is not satisfactory. The further development of irrigation from the minor streams of Rohilkund seems most desirable in the light of these reports, and the attention of the Lieutenant Governor is requested to the matter. The improvement of the Nugeena Canal would probably be found financially expedient. The whole subject is one calling for early and careful consideration; as there seems every reason to think that with water-rates

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properly adjusted, an important increase of revenue might be obtained from the steady maintenance and extension of a series of small works, such as the Rohilkund Canals.

Agra Irrigation Works.

60. The financial condition of these works is not clearly explained. During the year 1861-62, an increase of capital appears of Rupees 36,000, increasing the amount invested by nearly one-half. A still larger outlay took place in 1862-63, viz., Rupees 42,100, what this money has done is not explained distinctly. Excluding this charge, the profits for 1861-62 would have been 1½ per cent., while in 1858-59, they were as high as 5 per cent. In 1862-63 there is a deficit of Rupees 750.

61. The following are the main features of the results of these works:—

	CAPITAL SUNK.	TOTAL INCOME.	TOTAL CHARGES.
	RS.	RS.	RS.
1860-61	89,000	8,800	
1861-62	1,25,000	12,700	11,600
1862-63	1,67,000	14,100	14,900

This is far from satisfactory at first sight. The attention of the officers in charge of these works must at once be directed to the necessity for so arranging matters that no further outlay takes place, for which some sufficient return is not secured. If this has in fact been done by the operations already carried out, a more clear explanation of the circumstances should be given. The Governor General in Council trusts to see some decided advantage from the late arrangements by which these works have been placed under a scientific officer.

62. The income seems to be derived in part from irrigation properly so called, and in part from land submerged by the action of the embankments. The acreage irrigated is stated to be 31,513 acres for 1861-62, and 34,960 acres for 1862-63, giving a return of Rupees 12,600 and 14,000 respectively. This is a trifle less than 4 Annas per acre. Whether this can be considered a fair rate, depends on the extent of the benefit obtained from the works, and in regard to this, nothing can be ascertained from the report. His Excellency in Council will be glad to have the exact circumstances considered as early as possible, and the results of the enquiries submitted for further orders. In these works, as in all others of this class, it is quite essential that the Government shall be fairly remunerated for their outlay, provided the land can, at the same time, be fairly made to bear the additional burden.

GENERAL RESULTS.

63. The following is a general review of the position of the irrigation works in the North-Western Provinces as they stood at the end of the year 1862-63.

	CAPITAL SUNK.	
	RS.	
Ganges Canal	2,00,63,399	
Eastern Jumna Canal	14,34,490	
Doon Canal	4,75,874	
Rohilkund Canal	2,23,881	
Agra Irrigation Works	1,67,103	
Say 2½ millions sterling. Total	2,23,64,747	

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INCOME AND CHARGES FOR 1862-63.

	GROSS INCOME.	MAINTENANCE.	GENERAL DIRECTION.	TOTAL OUTLAY.	PROFIT.	LOSS.
	RS.	RS.	RS.	RS.	RS.	RS.
Ganges Canal	5,32,278	6,32,928	77,957	7,10,885	...	1,78,607
Eastern Jumna Canal	2,15,574	77,253	19,607	96,860	1,18,714	
Doon Canal	15,649	20,979	2,476	23,455	...	7,806
Rohilkund Canal	33,219	21,627	3,681	25,308	7,911	
Agra Irrigation Works	14,112	14,866	1,940	16,806	...	2,694
Total	8,10,832	7,67,653	1,05,661	8,73,314	1,26,625	1,89,107

Net loss ... 62,482

64. From these figures it may be calculated that the following are the percentages of income and charge:—

PER-CENTAGE OF GROSS INCOME ON CAPITAL.

Ganges Canal	2½ per cent.
Eastern Jumna Canal	15 "
Doon Canal	34 "
Rohilkund Canal	15 "
Agra Works	8½ "

PER-CENTAGE OF TOTAL OUTLAY ON INCOME.

Ganges Canal	133 per cent.
Eastern Jumna Canal	45 "
Doon Canal	149 "
Rohilkund Canal	75 "
Agra Works	120 "

These results are plainly far from satisfactory as a whole, though they give reasonable grounds for expecting that these works may be made fairly remunerative if proper attention be paid to them. It may be added that these figures include the charges for general direction, which are not taken into account in the detailed statements of the several works.

65. The Governor General in Council cannot conclude this review of the operations of this highly important branch of the Administration without stating the conviction left on his mind, by a consideration of all the facts that have been now before him, that a closer attention to the financial scope of the operations of the Irrigation Department has become necessary. His Excellency in Council has much satisfaction in looking back to the continued activity and intelligence that has characterized the operations of many of the officers of the Canal Department of the North-Western Provinces, and he is happy to be able to add his testimony to the important services that have been rendered to the country through their instrumentality. But the progress that has thus far characterized the operations of the Canal Department must be still further advanced, and the knowledge derived from the experience of the past must be applied to improve to the utmost all branches of its Administration.

66. The Governor General in Council desires to impress on the Government of the North-Western Provinces the increasing importance of watching with close attention the development of irrigation in the Districts of Upper India. The high value to the cultivators of works designed for this object, is too well known to call for special comment. But to admit of the Government extending them to all parts of the country as fully as may be desired, it is quite essential that it should be shown that they may, as a rule, be made remunerative to the State. The outlay required for the development of this class of works can only be legitimately incurred so far as the increased income to be realized from them is shown to be able to compensate

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for the original charges. Apart from the general great importance of obtaining an increased revenue, without which all material and social progress becomes difficult, the special necessity for an ample return being secured on the outlay of public money on irrigation works, is thus strongly made apparent. The Government of India anxiously desires to do what may be practicable in the way of extending the benefits of irrigation to all Districts of India. But it will obviously be a necessary preliminary, before any extraordinary outlay on such works can be sanctioned, or recommended for sanction to Her Majesty's Government, that decisive proof shall be given, that there is reasonable ground for expecting that no financial embarrassment or loss shall arise from such outlay.

67. His Excellency in Council feels quite satisfied that irrigation works carefully designed, executed, and maintained, may be made highly profitable to the State, and at the same time to the cultivators, and he must require that renewed attention shall be given to that most important part of the duties of the officers charged with the direction of the Canal Department, which is concerned with the financial results of these works.

68. The superior officers of the Irrigation Department must not be content to leave the administration of the canals in the position in which they find it. They must earnestly apply themselves to placing the financial results of all of these operations, without exception, on a thoroughly sound basis. In doing this, they will receive every support from the Governor General in Council. But all officers of this department must understand that the Government of India will henceforth except that every one of them constantly keeps in view the primary importance of making the works in his charge productive of a fair money return to the State. They must make themselves acquainted with the practical result of the agricultural operations with which their duties are so much involved, and watch carefully the interests of the Government by seeing that fair rates are charged for the water, neither in excess of the capabilities of the land to pay nor short of the equitable return that may be expected from the capital sunk on the works. A close economy in all work and establishment charges must be maintained, and an intelligent comparison of the results obtained under various systems or individuals constantly kept up. It is thus only that this most useful branch of the administration can be placed on the footing of efficiency at which the officers of the department should steadily aim, and which the Governor General in Council hopes they may soon attain in the management of all the important works under them. Some of these works have already been brought into a highly satisfactory condition, and His Excellency in Council trusts that all exceptions to this rule may soon cease.

ORDER.—Ordered, that a copy of the above Resolution be forwarded to the Government, North-Western Provinces, for early attention.

Also to the Home Department and to the Government of Punjab for information.

Also that a copy of the Resolution with the North-Western Provinces' Canal Returns for 1861-62 and 1862-63, be forwarded to Her Majesty's Secretary of State.

No. 230.

ORDER THEREON, 12th April 1865, No. 1,005.

CIVIL WORKS, No. 44.

Ordered that the following letter be sent:—

(Here enter No. 1,006, dated 12th April 1865.)
(True Extract.)

(Signed) CHARLES A. ORR, Colonel, R. E.,
Secretary to Government.

Exd. S. T. Augustin.

PUBLIC WORKS DEPARTMENT.
FORT SAINT GEORGE,
12th April 1865.

No. 1,006.

No. 231.

From

COLONEL C. A. ORR, R. E.,
Secretary to the Government of Fort Saint George, P.W.D.,

To

The Secretary to the Government of India, Public Works Department.

Sir,

CIVIL WORKS, No. 45.

* No. 823 C—4,570.
+ „ 658 8C—3,825.

† Statement of Remunerative Works.
That for 1863-64 was forwarded with letter No. 554, dated
27th February 1865.

Government are fully alive to the importance of accurately registering the results of the great irrigation works in this Presidency, and that a return,† embodying these results, has been regularly prepared and forwarded to the Government of India.

2. I am to explain that in giving the financial results of irrigation works, it is not possible, in this Presidency, to enter into such detail as has been done in the Canal reports of the North Western Provinces. The revenue system which prevails here, and the difficulty of separating the water rates from the land rental, together with the non-restriction of the quantity of water allowed for irrigation, render it impossible to do more than show the general financial result of the outlay upon each irrigation work. In the return in question, this result is exhibited by crediting each work with the gross revenue derived from it, and by debiting it with the entire cost of maintenance and repairs, as well as with interest at the rate of 4 per cent. upon the original capital sunk.

I have the honor to be,

Sir,

Your most obedient servant,

(Signed) CHARLES A. ORR, Colonel, R. E.,
Secretary to Government.

Exd. S. T. Augustin.

9. The object to be at present effected is the speedy extension of irrigation as far as practicable, and every effort should be made to accomplish this. The present condition of the canal, however, is no doubt most unfavourable to this extension, and it is observed that, owing to the accidents before referred to, the acreage for 1862-63 was only 206,000 acres against 3,72,000 acres in 1861-62. But this should lead to the outlay upon maintenance and repairs being very carefully scrutinized, to bring down the charges as much as possible. It will be long, His Excellency in Council fears, before this canal pays even 4 or 5 per cent. on the capital sunk.

10. Comparing the charges for 1861-62 with those of 1862-63, it is observed that the following is the result:—

	1861-62.	1862-63.	MORE.	LESS.
	Rs.	Rs.	Rs.	Rs.
Establishment	2,35,614	2,52,288	16,674	
Contingencies	22,058	16,564	...	5,494
Repairs	2,05,249	3,44,129	1,38,880	
Plantations	16,240	10,888	...	5,352
Deductions from Revenue		9,059	9,059	
Total	4,79,161	6,32,928	1,64,613	10,846
			1,53,767	

The sum entered as a deduction from Revenue should properly have been a charge under Establishment, being money paid away in connexion with the collections of water rate. There is, therefore, an increased charge for 1862-63 under the head of Establishment of Rs. 25,733, with a reduced acreage of irrigation, and a reduced income under every sub-head, aggregating Rs. 1,73,522. The large increase of charge under the head of Repairs, being over 1½ lakhs of Rupees, is no doubt mainly due to the accidents already referred to. But both of these increased charges call for special explanation.

11. Acre for acre, the maintenance charges on this canal are rather more than double those of the Eastern Jumna Canal. There is, however, no proper classification of the charges, and it is not possible to make any close comparison. The Governor General in Council would wish to see introduced a regular classification both of charges for maintenance, and also of revenue receipts for all irrigation canals, in the manner adopted in the Revenue Accounts of Railway Companies, from a comparison of which on the various canals, the relative economy of the management, and attention to the development of Revenue, could really be tested, which at present is hardly possible. The attention of the Superintendent General of Irrigation should at once be directed to this.

12. Without desiring that it shall be followed as a precise model for this classification, the following will serve to illustrate more clearly what is meant :—

Revenue Account of the Ganges Canal for the year 1861-63.

EXPENDITURE.	PER CENT.	RECEIPTS.	PER CENT.
<i>Establishment.</i>		<i>Irrigation.</i>	
Proportion of general charges Rs. 30,000	4.7	350,000 acres Rs. 4,51,362	81.9
Engineering 2,00,000	32.3	Navigation 46,833	9.0
Revenue 61,396	9.0	Mill rents 12,916	2.2
Contingencies 16,564	2.5	Sale of produce 14,473	2.7
	48.5	Miscellaneous 6,661	1.2
<i>Works.</i>			
<i>Main Canal and Branches.</i>			
Masonry Works			
Banks and Channels			
Head Supply		5,32,278	100.0
<i>Rajbhas and Water-courses.</i>			
Masonry			
Earth-work			
	49.9		
Plantations 10,888	1.6		
Total 6,32,928	100.0	Balance, loss .. 1,00,650	

Subsidiary to such a general account, there should be an analysis of the main items of charge and income, and a comparison with the results of former years' operations and an explanation of the causes of increase or decrease. By close attention to such calculations and the comparison of the results of one canal with another, the Irrigation Department will be in a position to exercise that thorough and intelligent control over its operations which is quite essential for a completely successful administration. The Governor General in Council cannot doubt that, had such comparisons of results been made habitually, the necessity for many modifications and improvements would have become apparent long since. In the absence of the needful details, no further comments of value can be made on the minor items of income, nor on any of the elements of charge.

13. But on one most important point, the Governor General in Council has no difficulty in arriving at a distinct conclusion, to which the attention of the Lieutenant Governor should at once be directed. This is, that there appears no doubt that the rates charged for water for irriga-

Enclosure to Current Letters Nos. ⁸²²⁻⁸⁰/₄₇₀₅ of 1864.

Nos. ⁶⁵⁶⁻⁸/₃₈₂₅, dated 15th August, 1864.

RESOLUTION,—By the Government of India, P. W. Dept.

Read the following papers :—

Letter from Government, North Western Provinces, No. 922 A, dated 14th March 1864, submitting the Revenue Report of Canals for 1861-62.

Letter from Government, North Western Provinces, No. 2866 A, dated 7th July 1864, submitting the Return for 1862-63.

RESOLUTION.—The Governor General in Council, in the first place, finds it necessary to remark upon the great delay which is habitually allowed to occur in the submission of these returns by Colonel Turnbull, the Superintendent General of Irrigation. This has been more than once commented on by the Government of India, and though there is some improvement in the present case, still there seems no reason whatever, why the first of these reports, now under consideration, should not have reached the Government of India, till nearly two years after the date to which it is brought up. Considering that the whole of the details are prepared by the Local Superintendents, the necessity for any lengthened delay in their compilation in the Office of the Superintendent General is not apparent; six months, it is considered, should suffice for the preparation of these reports, and henceforth the Revenue Report of each year should be despatched to the Government of India about the commencement of the following November.

2. Proper punctuality must be insisted upon, His Excellency in Council observes, from the highest to the lowest officer in the Department, and any officer neglecting to do his duty in this respect will incur the severe displeasure of the Government of India. In case of future delay, it is requested that the dates of the submission of the reports by the various officers concerned, may be specifically noticed, so that the responsibility may be properly brought home. The Governor General in Council, however, will, hereafter, look to the Government of the North Western Provinces for taking whatever steps are needful to enforce complete regularity in the submission of these reports, and desires that the returns may be sent up in original, without any discussion or report from the Superintendent General of Irrigation, rather than that they should be delayed in the highly objectionable manner that has become customary of late years.

3. The Governor General in Council also has observed, with some surprise, that in forwarding the report for 1861-62, no notice has been taken by the Lieutenant Governor of the delay in its submission, or of its contents. In transmitting the report for 1862-63, the apology of the Superintendent

General, Colonel Turnbull, for the great delay that has occurred in submitting it, is referred to without comment, and an observation is made as to a question of account. But here, again, the essential subject-matter of the report is not alluded to in any way.

4. The Governor General in Council next proceeds to remark on the operations of the Canal Department reviewed in detail in these two reports.

GANGES CANAL.

5. The progress of the irrigated area and the income have continued, though slowly, till the Rubbee of 1862-63, when a most serious and lamentable falling off has taken place, consequent on the stoppage of the canal caused by accidents to the falls.

6. The net return for 1861-62 is found to be one-sixth per cent. on the capital sunk, and out of seven lakhs of Rupees income, the irrigation produced six lakhs. The net profits are 32 per cent. of the gross income, and amount to about 2½ lakhs.

For the year 1862-63, there is a deficit, or excess of charge over income, of one lakh. There is a falling off of 1½ lakhs on the income, and an increase of 1½ lakhs on the charges, making a total decrease of 3½ lakhs as compared with the previous year.

7. It is at once observable from a comparison of the Ganges Canal Returns with those of the other irrigation canals of these Provinces, that the system of irrigation in the districts traversed by the Ganges Canal is still very immature. Thus, while one cubic foot of discharge per second on the Ganges Canal in 1861-62 irrigated on an average 77 acres, on the East Jumna Canal, it irrigated 236 acres, and on the West Jumna Canal 211 acres.

8. If the irrigation from the Ganges Canal were extended in the same proportion as in the two older canals, the gross income would probably increase, at existing rates, from 7 to not less than 20 lakhs* of Rupees, being about 10 per cent. on the capital sunk on the works. To obtain an estimate of the possible net income, the question of outlay must be considered. On the Eastern and Western Jumna Canals, the total expenditure seems to vary from Rs. 0.4 to Rs. 0.6 per acre, averaging say Rs. 0.5, but this does not include the charges for the maintenance of Rajbuhas, or main water-courses, which would increase the amount by about one-fourth, so that the actual cost may be taken at Rs. 0.625, or 10 annas an acre on the average. On the Ganges Canal (excluding 1863-64) the corresponding charge is from Rs. 1.2 to Rs. 1.3 per acre. This difference is of course mainly owing to the relative small acreage (about one-third of what it might be) under irrigation in the case of the Ganges Canal; but as there seems no special reason to suppose that when the irrigation is fully developed, the charges on the Ganges Canal should exceed the rate on the other canals, the charges might, in the event supposed, increase

* 4,850 cubic feet per second, at 220 acres give 10,67,000 acres. This at Rs. 1.9 per acre, gives about 20 lakhs.

from 4½ lakhs, the present expenditure, say to 6½ lakhs,* leaving the probable net income about 13½ lakhs, which is equivalent to 7 per cent. on 195 lakhs, the capital sunk at the end of 1861-62.

tion on this and other canals in these Provinces, call for re-adjustment and general increase. The rates on the Ganges Canal are more nearly what seems reasonable than those on some of the other canals, but here too some addition seems called for at once. It is to be regretted that sufficient rates were not demanded at first, as it may not be so easy to introduce a proper system of rates now as it would have been at the outset. The Government of India is clearly of opinion, however, that such rates as are shown to be fairly chargeable, having regard to the just claims of the Government to a suitable return on the capital sunk on the works on the one hand and to the known capabilities of the land on the other should be adopted at once wherever practicable, and generally be introduced by degrees as occasion allows.

14. The calculations of the probable income and return upon capital made in para. 8 of this resolution, are based on the present discharge of 4,850 cubic feet per second. Assuming, however, with Colonel Turnbull, (vide his letter No. 741, dated 21st June 1862, and paras. 87 to 113 of the Report for 1862-63,) 5,500 cubic feet per second as the quantity likely to be utilised eventually, and taking the area irrigated at the reduced amount of 200 acres per cubic foot of discharge, or in all 1,100,000 acres; the present average water rate of Rs. 1.6 per acre would give an average income for irrigation, of say Rs. 17,60,000. The addition of miscellaneous receipts would bring up the total sum likely to be realised to 20 lakhs. Then taking Colonel Turnbull's estimate of the ultimate capital expended on the canal, 235 lakhs, and adding 40 lakhs for the cost of the remodelling of the bed, a total capital charge is obtained of 275 lakhs. Next, reckoning the charge for maintenance, to be quite safe, at Rs. 0.75 per acre irrigated, or, on 1,100,000 acres, Rs. 8¼ lakhs nearly, the net income may be estimated at about 11½ lakhs, being at the rate of something over 4½ per cent. on the capital.

15. To give a probable return of 10 per cent. on the capital, which the Governor General in Council considers may fairly be anticipated from works of this sort, the rate per acre should be increased from Rs. 1.6 to Rs. 3.02*.

Income	Rs.
1,100,000 acres at Rs. 3.02 =	33,25,000
Miscellaneous, say	2,50,000
Total...	35,75,000
Charges	
1,100,000 acres at Rs. 0.75 =	8,25,000
Net	27,50,000

16. Supposing, however, that a cubic foot of water will irrigate as much as 250 acres, and that the rate reduced to Rs. 0.5, the minimum on the Eastern Jumna Canal, including Rajbuha maintenance, the rate of revenue to give 10 per cent. would be Rs. 2.3 per acre.† On the whole it may be assumed that the average rate should not be less than Rs. 2.8 per acre to ensure 10 per cent. net profit on the capital sunk.

17. The water rates charged at present on the Ganges Canal are stated to be—

	PER BEEGAH.	PER ACRE.
	Rs. A. P.	Rs. A. P.
For Sugar-cane	2.12 0	4 6 5
" Gardens, Rice	1 9 0	2 8 0
" Indigo, Cotton, &c.	1 0 0	1 10 8
" Other Grains	0 12 0	1 3 2½

On the Eastern Jumna Canal, the rates are—

	PER BEEGAH.			PER ACRE.		
	Rs.	A.	P.	Rs.	A.	P.
For Sugar-cane	...	...	1 9 0	2	8	0
„ Gardens, &c.	...	...	1 4 0	2	0	0
„ Indigo, &c.	...	...	0 15 0	1	8	0
„ Other Grains	...	...	0 8 4	0	13	4

The main difference between the rates on the two Canals is owing to the charge for the maintenance of the Rajbhas or main water courses falling on the Government on the Ganges Canal and on the cultivators on the Eastern Jumna Canal. This accounts for a difference of 5 annas per beegah, or 8 annas per acre. The rate for sugar-cane has purposely been fixed low on the Eastern Jumna Canal; but the exact reason is not stated, and it seems to be the consequence of former custom rather than any thing else; (vide Superintendent General of Irrigation, North Western Provinces, No. 990, dated 10th July 1863, and No. 1796, dated 21st August 1863.)

18. This system of discriminating rates is in the opinion of the Governor General in Council altogether a mistake. There should be but one rate for all crops except sugar-cane, and this rate His Excellency in Council thinks might, for the present, be Rs. 2-4 per acre; for sugar-cane the rate might be fixed at Rs. 5 being somewhat more than double the former. This would almost amount to saying that there should be one rate for all crops which require one season to mature, and double for that crop which requires two seasons. The above rates refer to *Tor* irrigation, that is, by natural flow; for *Dal* irrigation, or for water raised artificially, the rate will be reduced as at present one-third, that is, to Rs. 1-8 and Rs. 3-4 per acre.

19. From Colonel Turnbull's figures it would appear that the following is the approximate distribution of the classes of crop in 100 acres of irrigation:—

	RATE.			ACRES.	Rs. A. P.		
	Rs.	A.	P.		Rs.	A.	P.
1st Class Sugar-cane	...	...	4 6 5	12	52	13	0
2nd Class	...	...	2 8 0	20	50	0	0
3rd Class	...	...	1 10 8	51	85	0	0
4th Class	...	...	1 3 2	17	20	6	0
				100	208	3	0
One-third Dal	...	...	...	...	69	6	0
On which deduct $\frac{1}{3}$ of rate	...	...	...	...	23	2	0
Net on 100 acres, say	...	...	...	...	185	0	0

At the rates now proposed, the figures would be as follows:—

	Rs.
Sugar-cane, 12 acres, at Rs. 5	60
Other crops, 88 „ at „ 2-4	198
Total	258
Deduct for Dal $\frac{1}{3}$ th	29
Net on 100 acres	229

20. These rates, therefore, would give a return of about 10 per cent. on the suppositions named in paragraph 16, namely, that one cubic foot of water irrigates 250 acres, and that the charges do not exceed Rs. 0-5 per acre, which suppositions are not at all likely to be realized for many years, if ever. On the more likely supposition of 1 cubic foot of water giving irrigation to 200 acres, and the charges, amounting to Rs. 0-75 per acre, the net return would be only 7 per cent.*

21. For the encouragement of contracts for the irrigation of villages which is most desirable, a reduction of 20 per cent. might be allowed where a contract on fair terms, and for a term of not less than 10 years is taken up. A suitable reduction might be made in like manner for contracts for shorter periods.

22. Cultivators refusing to accept these rates, should not obtain any water at all.

23. It may be remarked that the above rates are based on an acreage. Should the system of charging by the volume of water hereafter be found practicable, which however, seems still very problematical, a corresponding adjustment of the rates could of course be readily made. It is believed that, in fact, the progress of events will be from a payment on an acreage by measurement to a payment of a lump sum on the ascertained average acreage for a series of years. A fixed area of irrigating opening, may be found to suffice for this acreage, and the known discharge in cubic feet, from this opening may then be taken as a new basis for calculating the rate of the lump sum payment for purposes of comparison. It seems very doubtful whether a system of payment by volume can ever take root excepting in this manner. The great object in all cases, however, should be to get rid of all detailed measurements of land or crops, as the basis of the charge for water rate, and the introduction of lump sum payments.

24. The obvious advantages of a system such, as is here described, would be, that a minimum of detailed supervision, and interference would be attainable, while the establishments and charges of collection, and at the same time the chances or opportunities for abuse of power, would be reduced as much as possible. Combined with this, there would be a direct encouragement of the growth of the more valuable crops.

25. It is the desire of the Governor General in Council that measures shall at once be taken for the introduction of the two rates of Rs. 2-4, and 5 per acre above noticed, and that no time should be lost in preliminary discussions on the subject. His Excellency in Council is well aware that much has been said, and may still be said, on the subject of these water rates, and he appreciates fully the anxious desire exhibited by the officers

On the Eastern Jumna Canal, the rates are—

	PER BEEGAH.			PER ACRE.		
	Rs.	A.	P.	Rs.	A.	P.
For Sugar-cane	...	...	1 9 0	2 8 0		
„ Gardens, &c.	...	...	1 4 0	2 0 0		
„ Indigo, &c.	...	...	0 15 0	1 8 0		
„ Other Grains	...	...	0 8 4	0 13 4		

The main difference between the rates on the two Canals is owing to the charge for the maintenance of the Rajbhas or main water courses falling on the Government on the Ganges Canal and on the cultivators on the Eastern Jumna Canal. This accounts for a difference of 5 annas per beegah, or 8 annas per acre. The rate for sugar-cane has purposely been fixed low on the Eastern Jumna Canal; but the exact reason is not stated, and it seems to be the consequence of former custom rather than any thing else; (vide Superintendent General of Irrigation, North Western Provinces, No. 990, dated 10th July 1863, and No. 1796, dated 21st August 1863.)

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One-third Dal	...	...	...	...	69	6	0
On which deduct $\frac{1}{3}$ of rate	...	...	...	...	23	2	0
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21. For the encouragement of contracts for the irrigation of villages which is most desirable, a reduction of 20 per cent. might be allowed where a contract on fair terms, and for a term of not less than 10 years is taken up. A suitable reduction might be made in like manner for contracts for shorter periods.

22. Cultivators refusing to accept these rates, should not obtain any water at all.

23. It may be remarked that the above rates are based on an acreage. Should the system of charging by the volume of water hereafter be found practicable, which however, seems still very problematical, a corresponding adjustment of the rates could of course be readily made. It is believed that, in fact, the progress of events will be from a payment on an acreage by measurement to a payment of a lump sum on the ascertained average acreage for a series of years. A fixed area of irrigating opening, may be found to suffice for this acreage, and the known discharge in cubic feet, from this opening may then be taken as a new basis for calculating the rate of the lump sum payment for purposes of comparison. It seems very doubtful whether a system of payment by volume can ever take root excepting in this manner. The great object in all cases, however, should be to get rid of all detailed measurements of land or crops, as the basis of the charge for water rate, and the introduction of lump sum payments.

24. The obvious advantages of a system such, as is here described, would be, that a minimum of detailed supervision, and interference would be attainable, while the establishments and charges of collection, and at the same time the chances or opportunities for abuse of power, would be reduced as much as possible. Combined with this, there would be a direct encouragement of the growth of the more valuable crops.

25. It is the desire of the Governor General in Council that measures shall at once be taken for the introduction of the two rates of Rs. 2-4, and 5 per acre above noticed, and that no time should be lost in preliminary discussions on the subject. His Excellency in Council is well aware that much has been said, and may still be said, on the subject of these water rates, and he appreciates fully the anxious desire exhibited by the officers

of the irrigation department to limit to the utmost the burdens placed on the cultivators using canal water. But the experience of the older canals in these very provinces, and of the results of all irrigation in India generally, leaves no doubt on the mind of the Governor General in Council that the present rates on the Ganges Canal are far too low, and that the rates proposed will not be in excess of the reasonable capabilities of the cultivators to pay, nor of the just claims of the Government to receive. Any representations that the Lieutenant Governor may desire to make on this subject will be attentively considered, but meanwhile immediate steps should be taken for carrying out the increase of rates as now directed.

26. The Governor General in Council further desires that it shall be plainly understood, that the Government gives no pledge that the rates now fixed shall be maintained for any determined or lengthened period. On the contrary, the Government will reserve to itself the right of increasing the rates whenever the fair value of the water may warrant it. It is the first duty of the Government to endeavour to adjust the burdens on the country in an equitable manner, and it is only by carefully husbanding the resources of the State and firmly requiring a fair contribution from all classes in accordance with their means, that the advantages which have now been provided to the cultivators of the districts irrigated by this canal at the expense of the country at large, can be extended to other parts of India which are less favoured by nature, and have, if possible, still stronger claims on the Government.

27. Before leaving this subject, it is further necessary to refer to a question on which His Excellency in Council is aware that there has been much discussion from time to time, namely, the connection between the charges made as water rate, and those made as land revenue. In theory His Excellency in Council considers that the best plan would be to assess the land simply with reference to its natural productive powers and capabilities, without regard to artificial irrigation, levying a water rate to be fixed with reference to the additional fertilising properties of the canal water. But in practice, by now following this course where the assessment has already been enhanced on account of the advantages given to land by the introduction of canal irrigation, a portion of the present Land Revenue might very possibly be lost without recovering the amount in the shape of water rent. The Land Revenue, therefore, where now virtually composed in part of water rent, should not be reduced, but credit to a corresponding extent should be allowed to the cultivator in reckoning his water rates, and this portion of the Land Revenue should henceforth be credited as Canal Revenue. There might, under such circumstances, be two scales for the price of water, one for villages so assessed at the higher rate and one for those on which no part of the Revenue consisted of water rent. These views have already been briefly enunciated in Home Department despatch No. 544, dated 4th June 1864, regarding the Permanent Settlement in the North Western Provinces, para. 24.

28. In the districts watered from the Ganges Canal, the Governor General in Council believes that there has been no increase to the Land Revenue since the opening of the canal, and if that be the case, these remarks have no application to this canal, and the rates before mentioned of Rs. 2-4 and Rs. 5 per acre respectively, should be introduced everywhere along it.

29. Where it is found, however, after proper investigation, that the Land Revenue rates have been enhanced so as virtually to include a portion of the charge for canal water, the rates above noted (which the

Government of India intends to be applicable to all the Irrigation Canals of the North Western Provinces without exception) may be reduced in a corresponding degree. But such reductions in the fixed water rate, should only be allowed to follow a strict examination of the facts, and should be duly attested in every case both by the Revenue and Canal Officers who will be jointly responsible that the interests of the Government are carefully guarded.

Eastern Jumna Canal.

30. The results of the two years' operations on this canal are very satisfactory. The net income gives a return of more than 10 per cent. for 1861-62, and 9½ per cent. for 1862-63 on the capital sunk, (now amounting to Rs. 11,31,000) irrespective of the enhanced Land Revenue. The following statement of the net income of this Canal since 1858-59 is interesting:—

	Rs.
1858-59	96,308
1859-60	1,68,053
1860-61	1,71,937
1861-62	1,47,142
1862-63	1,38,321

The year 1860-61 was exceptional. The gradual increase of the revenue is seen to be directly dependent on the increase in the number of acres irrigated by the same quantity of water brought into the canal. One cubic foot of water in 1861-62 supplied water to 235 acres which in 1858-59 supplied only 118 acres. It is to be regretted that the acreage has not been given for 1862-63.

31. The Governor General in Council is gratified to observe the extensive introduction of the contract system on this canal, and Major Brownlow's efforts to this end are entitled to much praise. It would have been better if the sum realized under contract had been mentioned, as distinguished from that paid on measurement of the crops. This should be attended to hereafter.

32. The miscellaneous collections continue nearly stationary. As compared with 1858-59, there has, however, been a considerable falling off. The reason of this should be explained. His Excellency in Council is of opinion that, if more attention were paid to the plantations and to the development of produce from the land in the occupation of the canal, a steadily increasing income should be obtained. The Canal Officers should be invited to consider this point. The increased utilization of the motive power of the canal water should also receive attention.

33. As already noticed, the returns for this canal, which have been submitted for the year 1862-63, give no statement of the area irrigated, owing, it is said, to the introduction of the contract system. It is, however, most desirable, that these figures should continue to be given for statistical purposes, and His Excellency in Council considers that there should be no difficulty in obtaining, at all events, a fairly approximate account of the acreage irrigated, without causing interference with the cultivators. The Putwaris might be bound to furnish statements of the irrigation to the Canal Officers, and these could readily be checked so as to ascertain their substantial correctness by the ordinary Canal Establishments.

34. Colonel Turnbull should, therefore, be instructed to arrange for the supply of this information for the future, and to take care that proper attention is paid to the regular record of all the main facts that form useful standards of comparison in the operations of all the canals under his charge.

35. Amongst these points, the volume of discharge calls for particular attention. The quantity of water brought into the canal head, and the quantity thrown off by escapes, being regularly recorded; the quantity actually utilized (subject to loss by absorption and evaporation) can be ascertained with fair accuracy. All the registers of the canals should, as early as possible, be brought under an uniform system, as to this record, and in future years, these facts should be distinctly stated. The comparison of the quantity of water utilized, with that brought into the canal, and of the acreage irrigated per cubic foot utilized, and of the income and charge per acre and per cubic foot utilized, will form the main tests of the efficiency of the administration and the practical utility of the works.

36. Another very important point, a knowledge of which is quite necessary to admit of a complete estimate of the value of the canal operations, is the character of the rains. So long as the payment for irrigation on any canal is mainly based on detailed measurements of crops, the greater or less abundant supply of rain will seriously affect the extent to which the cultivators take the canal water. It is known that registers of rain-fall are kept at many points along the canals in the North Western Provinces and by the Revenue District Officers. A more systematic review of this important matter, should form a prominent point in all future reports of this nature.

37. The Governor General in Council believes that the fluctuations in the revenue of this canal during the last few years have been almost entirely due to the variations of the seasons, and he observes with satisfaction that there has been so small a reduction in the net income consequent on what are termed by the Superintendent two unusually wet seasons. As the value of irrigation becomes better known and the system of contracts extends, the cultivators will arrange their agricultural operations with less close dependence on the natural seasons and increased reliance on the artificial water supply. The permanent advance made in the extent of irrigation on this canal subsequent to the last famine year, is most striking. A like result is known to have occurred on the Western Jumna Canal after the famine of 1837-38.

38. Having reference to the observations contained in paras. 27 to 29 of this Resolution, His Excellency in Council desires, that enquiry be at once made as to the extent to which the ordinary Land Revenue has been enhanced in the districts watered from this canal, consequent on the introduction of canal water, and that the result of this enquiry may be communicated at an early date in as complete a form as possible. The regulation of the rates to be charged on this canal, in conformity to the orders above given, will be made to depend on the result of these investigations. The sum by which the ordinary revenue may be found to be enhanced will henceforth be made to appear as an addition to the canal revenues, and will be brought forward in the public accounts as such. The Lieutenant Governor will see that the best approximation possible is made in this adjustment. Great precision will perhaps not be possible; but such a fair

estimate of the increase of revenue should be made as will suffice to effect the adjustment of the water rates in the manner already explained.

39. The Governor General in Council has observed with satisfaction, the successful operations of the officers on this canal in draining swamps in its vicinity. His Excellency trusts that increased attention will continue to be paid to this most important subject. It would be satisfactory to the Government of India to hear whether the Sultanpore swamp and other similar swamps lately operated on were originally caused by the canal.

40. His Excellency in Council considers some explanation to be called for as to the increase of the establishment charges from Rs. 43,500 in 1858-59 to Rs. 57,000 in 1861-62, amounting to Rs. 13,500. If this increase has been wholly for Revenue Establishments, it will not be out of proportion to the increase of area irrigated, but no details are given in respect to it, and it is requested that these may be furnished.

41. As to the repairs on this canal they at first appear to stand at a very low amount as compared to those on the Ganges Canal. But on the Eastern Jumna Canal, the original cost and the repairs of the main water courses are charged directly to the cultivators. No clear details of the results of these operations are given, but on the one hand it appears that the annual charge for repairs of this class amount to a sum varying from Rs. 31,000 to nearly Rs. 40,000, which is nearly as much as the whole sum expended on the repairs of the main canal. Also it is observed that very large sums have been realized as re-payments of Tuccavy advances, varying from Rs. 80,000 to Rs. 1,10,000 in a year. It is presumed that the main cause of the great difference between the charges for maintenance and the re-payments, is that the latter include re-payments for the original cost of the water courses.

42. These annual reports should give clear statements of all such subsidiary accounts and transactions. It is plain that the actual ultimate charge falls on the cultivator equally, whether paid in the shape of a fund of Tuccavy or as a water rate, and that the actual original charge falls on the Government equally whether disbursements for such works appear as imperial works or Tuccavy advances.

43. But it seems to the Governor General in Council that this complicated system of advances and re-payments should not be allowed to continue. On the Ganges Canal, the whole of the main water courses are constructed and maintained at the cost of the Government, and this obviously seems the proper course to adopt on all Government Canals. There should be one account of all Government expenditure and one account of all receipts. The present system is most cumbersome, and, though sanctioned by custom, seems to have very little that can be advanced in its favour. The Governor General in Council desires that steps may be taken for substituting the more simple procedure of the Ganges Canal on the Eastern Jumna Canal without delay. It may fairly be assumed, that the receipts from the cultivators till now, (supposing all arrears of claims fairly made from year to year under the original arrangements,) have given the Government a reasonable return for their advances or direct disbursements for maintenance; hence the Government can without objection waive all claims to further reimbursements. Hereafter the increased water rate will cover all these charges. On the other hand it may fairly be said that the very low rates of charge till now levied by the Government will justify the arrangement by which the cultivators have hitherto been made

be revised, so that the lands irrigated be made to pay a fair revenue on the average of years. The Lieutenant Governor is requested to take the necessary steps for arranging the rates in a manner suitable to the special conditions of the cultivation in the Doon, and, especially the rapidly extending tea cultivation, on the general basis explained in the former part of this Resolution. If the rates there named are not sufficient to reimburse the Government for its outlay on these works, a still higher rate must be charged, but the charge should at all events at once be increased to those rates.

53. The Governor General in Council cannot acquiesce in the proposals made in para. 8, page 44 of the report, to reduce the charge for interest on that part of the capital sunk in these canals which represents the value of the works as giving a supply of drinking water to the town of Dehra. On the contrary, the Lieutenant Governor should consider what special charge should be made against the towns of Rajpoot and Dehra for the use of the canal water for drinking purposes. These towns are now wealthy enough to be able to bear a proper share in the expenses of the works by which they are supplied with this necessary of life, and there seems no reason why they should not be required to make a moderate payment on this ground. The local officers should consider how such a charge may best be levied. Perhaps a contribution from the municipal funds would be the simplest way of adjusting the matter.

Rohilkhund Canals.

54. In these returns the Nugeena Canal is not included. It is requested that information may be given how the accounts of income and expenditure of this canal are treated. Even though it be thought desirable to continue the management of this canal under the District Civil Officers it seems the proper course to deal with its financial results, in connexion with other similar works, and it is requested that this may be done henceforth, or that the Government of India may be satisfied that there is sufficient reason for not doing it.

55. The irrigation works under the Canal Department seem to pay nearly 7 per cent. on the capital expended on the completed portions. The charges for maintenance are very moderate, but the lowness of the rate charged for the water, 3 annas 9 pie per beegah, or 6 annas an acre, is remarkable, and calls for explanation.

56. The results of the operations of the last three years are as follows:—

	GROSS INCOME.	TOTAL CHARGES.	NET REVENUE.
	Rs.	Rs.	Rs.
1860-61	36,674	29,053	7,621
1861-62	35,633	25,439	10,144
1862-63	33,218	21,627	11,591

The returns for 1860-61 and 1861-62 do not show the detailed charges in a form that admits of proper comparison with 1862-63, but the reduction of charge appears to have arisen from economy in establishments, which is satisfactory. Some part of the saving has arisen from making the collections more completely through the District Revenue Officers. The variation in the income is not important.

57. The acreage irrigated per cubic foot of discharge seems satisfactory, being something under that on the Eastern Jumna and Western Jumna Canals. The expenses compared with the acreage irrigated, are but little more than one-half of those of the Eastern and Western Jumna Canals, and one-fourth of the Ganges Canal. Compared with the discharge, the results are equally in favour of the Rohilkund Canal, and Mr. Battie's management of these works seems to call for special commendation. The attention of Colonel Turnbull should be directed to these points.

58. Unless some satisfactory reason can be given for adopting a contrary course, the Governor General in Council will expect the water rates to be gradually raised on these canals to the general extent already ordered for the Ganges Canal.

59. The very profitable results obtained from these works show the importance of hastening the completion of the Kylas Canal which still continues unfinished. The explanation given in the report of the cause of this is not satisfactory. The further development of irrigation from the minor streams of Rohilkund seems most desirable in the light of these reports, and the attention of the Lieutenant Governor is requested to the matter. The improvement of the Nugeena Canal would probably be found financially expedient. The whole subject is one calling for early and careful consideration; as there seems every reason to think that with water rates properly adjusted, an important increase of revenue might be obtained from the steady maintenance and extension of a series of small works, such as the Rohilkund Canals.

Agra Irrigation Works.

60. The financial condition of these works is not clearly explained. During the year 1861-62, an increase of capital appears of Rs. 36,000, increasing the amount invested by nearly one-half. A still larger outlay took place in 1862-63, viz., Rs. 42,100, what this money has done is not explained distinctly. Excluding this charge, the profits for 1861-62 would have been 1½ per cent., while in 1858-59, they were as high as 5 per cent. In 1862-63 there is a deficit of Rs. 750.

61. The following are the main features of the results of these works:—

	CAPITAL SUNK.	TOTAL INCOME.	TOTAL CHARGES.
	Rs.	Rs.	Rs.
1860-61	89,000	8,800	11,600
1861-62	1,25,000	12,700	14,900
1862-63	1,67,000	14,100	

This is far from satisfactory at first sight. The attention of the officers in charge of these works must at once be directed to the necessity for so arranging matters that no further outlay takes place, for which some sufficient return is not secured. If this has in fact been done by the operations already carried out, a more clear explanation of the circumstances should be given.

to pay the cost of all main water courses. With the introduction of the higher rates, the Government will for the future undertake the construction and maintenance of all Rajbhuas at its own cost, and all existing works of this class should now be transferred to the Government.

44. The extent to which the complications of this system of Tuccavy have gone is shown by the following figures :—

		DIRECT REVENUE.		TUCCAVY REFUNDS.		TOTAL.	
		Amount. Rs.	Per Cent.	Amount. Rs.	Per Cent.	Amount. Rs.	Per Cent.
1858-59	...	1,37,000	63	81,000	37	2,18,000	
1859-60	...	2,08,000	70	89,000	30	2,97,000	
1860-61	...	2,91,000	62	1,13,000	28	4,04,000	100
1861-62	...	2,51,000	73	95,000	27	3,46,000	
1862-63	...	2,56,000	75	86,000	25	3,42,000	

Hence the indirect payments of the cultivators for their water courses have never been less than one-fourth, and have at times been upwards of one-third of their direct payments. Colonel Turnbull, (para. 6 of his No. 990, dated 10th July 1863,) when discussing the water rates on the Eastern Jumna Canals, states that on an average for the last eight years, the following had been charges :—

	Rs.
Water rate	1,57,444
Rajbhuha clearances	49,201

showing that the extra charge for water-courses had been nearly one-third of the direct charge levied as water-rate. The practical result of this may be thus stated with reference to the returns of 1861-62. The actual rate paid per acre would be Rs. 1.37 instead of 1.08; per cubic foot of water the receipts would be Rs. 324 instead of Rs. 255. The charges also would be increased from 0.45 to 0.57 per acre, and from Rs. 105 to Rs. 134 per cubic foot of discharge.

45. Referring next to the condition of the works on this canal it seems to the Governor General in Council necessary, with reference to the effect of floods as set forth in the reports, to enquire whether a permanent head dam should not be constructed. Such a work would give the Engineers a complete command over the River Jumna, and by means of it the Jumna floods might be kept entirely out of this and the Western Jumna Canals; in the latter of which most serious injury is known to arise by reason of them. There is ground for believing that such a work would neither be seriously difficult to construct nor very costly, and it is requested that the subject may be duly considered.

46. The only other point calling for remark, is the system of reckoning the interest on the capital sunk on the works referred to in para. 32 of the report for 1862-63. It has been ruled by the Government of India that the surplus of income may be set off against the gross capital charge to the extent of any supposed deterioration in the works and no more, so that the

works shall always be chargeable with interest on what may be regarded as the present value of the block (vide Appendix Public Works Code, pages 43-44.)

Doon Canals.

47. The general results of these canals in a financial point of view, His Excellency in Council regrets to be obliged to consider altogether unsatisfactory. The Doon Canals continue to be worked at an absolute loss amounting in each of the last two years to about Rs. 5 or 6,000, independently of the interest on the capital which is 4 lakhs or more.

48. The following are the results of the last three years :—

YEAR.	GROSS REVENUE.	TOTAL CHARGE.	DEFICIT.
	Rs.	Rs.	Rs.
1860-61	14,922	15,351	429
1861-62	16,011	22,543	6,532
1862-63	15,649	20,979	5,330

The revenue is almost stationary, and the charges appear to be increasing.

49. The acreage irrigated per cubic foot of water is, on an average of three years, somewhat more than on the Ganges Canal, being about 84 acres for the year. The maintenance charges per acre irrigated, have varied from Rs. 2 to Rs. 2.6 in the last three years. Per cubic foot of water they have been from Rs. 167 to Rs. 235. The corresponding figures for the Eastern Jumna Canal are per acre Rs. 0.45 and per cubic foot of water Rs. 80 to Rs. 105 not including the charges on main water courses which would increase the above figures to Rs. 0.57 and Rs. 134.

50. The gross income per acre appears to have been about the same as on the Ganges Canal, Rs. 1.9. Per cubic foot of water it varied from Rs. 141 to Rs. 167, which is rather in excess of the Ganges Canal. This comparison, however, gives a very incomplete idea of the actual facts, for one-half the total income of these canals being derived from mills (Rs. 23,322 out of Rs. 46,582 in three years), the above rates of income are more than double what is in fact realized for irrigation.

51. From a table given in the report for 1862-63, it is seen that the water rates per acre are as follows :—

	Rs.	A.	P.
1st Class	1	4	0
2nd Class	0	10	0
3rd Class	0	8	0

These charges are most incommensurate with the value of the water. At the rates named, as those which the Governor General in Council desires to be adopted generally, the income would be increased on the present acreage by about Rs. 20,000, leaving a net income of Rs. 15,200. This is something under 3½ per cent. on the capital sunk, a return which is still very unsatisfactory.

52. The position of these canals therefore calls for special consideration, both as to increase of rates and reduction of expenses, and the Governor General in Council requests that the rates for irrigation shall at once

be revised, so that the lands irrigated be made to pay a fair revenue on the average of years. The Lieutenant Governor is requested to take the necessary steps for arranging the rates in a manner suitable to the special conditions of the cultivation in the Doon, and, especially the rapidly extending tea cultivation, on the general basis explained in the former part of this Resolution. If the rates there named are not sufficient to reimburse the Government for its outlay on these works, a still higher rate must be charged, but the charge should at all events at once be increased to those rates.

53. The Governor General in Council cannot acquiesce in the proposals made in para. 8, page 44 of the report, to reduce the charge for interest on that part of the capital sunk in these canals which represents the value of the works as giving a supply of drinking water to the town of Dehra. On the contrary, the Lieutenant Governor should consider what special charge should be made against the towns of Rajpore and Dehra for the use of the canal water for drinking purposes. These towns are now wealthy enough to be able to bear a proper share in the expenses of the works by which they are supplied with this necessary of life, and there seems no reason why they should not be required to make a moderate payment on this ground. The local officers should consider how such a charge may best be levied. Perhaps a contribution from the municipal funds would be the simplest way of adjusting the matter.

Rohilkhand Canals.

54. In these returns the Nugeena Canal is not included. It is requested that information may be given how the accounts of income and expenditure of this canal are treated. Even though it be thought desirable to continue the management of this canal under the District Civil Officers it seems the proper course to deal with its financial results, in connexion with other similar works, and it is requested that this may be done henceforth, or that the Government of India may be satisfied that there is sufficient reason for not doing it.

55. The irrigation works under the Canal Department seem to pay nearly 7 per cent. on the capital expended on the completed portions. The charges for maintenance are very moderate, but the lowness of the rate charged for the water, 3 annas 9 pie per beegah, or 6 annas an acre, is remarkable, and calls for explanation.

56. The results of the operations of the last three years are as follows:—

	GROSS INCOME.	TOTAL CHARGES.	NET REVENUE.
	Rs.	Rs.	Rs.
1860-61	36,674	29,053	7,621
1861-62	35,633	25,489	10,144
1862-63	33,218	21,627	11,591

The returns for 1860-61 and 1861-62 do not show the detailed charges in a form that admits of proper comparison with 1862-63, but the reduction of charge appears to have arisen from economy in establishments, which is satisfactory. Some part of the saving has arisen from making the collections more completely through the District Revenue Officers. The variation in the income is not important.

57. The acreage irrigated per cubic foot of discharge seems satisfactory, being something under that on the Eastern Jumna and Western Jumna Canals. The expenses compared with the acreage irrigated, are but little more than one-half of those of the Eastern and Western Jumna Canals, and one-fourth of the Ganges Canal. Compared with the discharge, the results are equally in favour of the Rohilkund Canal, and Mr. Battie's management of these works seems to call for special commendation. The attention of Colonel Turnbull should be directed to these points.

58. Unless some satisfactory reason can be given for adopting a contrary course, the Governor General in Council will expect the water rates to be gradually raised on these canals to the general extent already ordered for the Ganges Canal.

59. The very profitable results obtained from these works show the importance of hastening the completion of the Kulas Canal which still continues unfinished. The explanation given in the report of the cause of this is not satisfactory. The further development of irrigation from the minor streams of Rohilkund seems most desirable in the light of these reports, and the attention of the Lieutenant Governor is requested to the matter. The improvement of the Nugeena Canal would probably be found financially expedient. The whole subject is one calling for early and careful consideration; as there seems every reason to think that with water rates properly adjusted, an important increase of revenue might be obtained from the steady maintenance and extension of a series of small works, such as the Rohilkund Canals.

Agra Irrigation Works.

60. The financial condition of these works is not clearly explained. During the year 1861-62, an increase of capital appears of Rs. 36,000, increasing the amount invested by nearly one-half. A still larger outlay took place in 1862-63, viz., Rs. 42,100, what this money has done is not explained distinctly. Excluding this charge, the profits for 1861-62 would have been 1½ per cent., while in 1858-59, they were as high as 5 per cent. In 1862-63 there is a deficit of Rs. 750.

61. The following are the main features of the results of these works:—

	CAPITAL SUNK.	TOTAL INCOME.	TOTAL CHARGES.
	Rs.	Rs.	Rs.
1860-61	89,000	8,800	11,600
1861-62	1,25,000	12,700	14,900
1862-63	1,67,000	14,100	

This is far from satisfactory at first sight. The attention of the officers in charge of these works must at once be directed to the necessity for so arranging matters that no further outlay takes place, for which some sufficient return is not secured. If this has in fact been done by the operations already carried out, a more clear explanation of the circumstances should be given.

The Governor General in Council trusts to see some decided advantage from the late arrangements by which these works have been placed under a scientific officer.

62. The income seems to be derived in part from irrigation properly so called, and in part from land submerged by the action of the embankments. The acreage irrigated is stated to be 31,513 acres for 1861-62, and 34,960 acres for 1862-63, giving a return of Rs. 12,600 and 14,000 respectively. This is a trifle less therefore than 4 annas per acre. Whether this can be considered a fair rate, depends on the extent of the benefit obtained from the works, and in regard to this, nothing can be ascertained from the report. His Excellency in Council will be glad to have the exact circumstances considered as early as possible, and the results of the enquiries submitted for further orders. In these works, as in all others of this class, it is quite essential that the Government shall be fairly remunerated for their outlay, provided the land can, at the same time, be fairly made to bear the additional burden.

GENERAL RESULTS.

63. The following is a general review of the position of the irrigation works in the North Western Provinces as they stood at the end of the year 1862-63.

CAPITAL SUNK.

	Rs.
Ganges Canal	2,00,63,399
Eastern Jumna Canal	14,34,490
Doon Canal	4,75,874
Rohilkund Canal	2,23,881
Agra Irrigation Works	1,67,103
Total	2,23,64,747

Say 2½ millions sterling.

INCOME AND CHARGES FOR 1862-63.

	GROSS INCOME.	MAINTENANCE.	GENERAL DIRECTION.	TOTAL OUTLAY.	PROFIT.	LOSS.
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
Ganges Canal	5,32,278	6,32,928	77,957	7,10,885		1,78,607
Eastern Jumna Canal	2,15,574	77,253	19,607	96,860	1,18,714	
Doon Canal	15,649	20,979	2,476	23,455		7,806
Rohilkund Canal	33,219	21,627	3,681	25,308	7,911	
Agra Irrigation Works	14,112	14,866	1,940	16,806		2,694
Total	8,10,832	7,67,653	1,05,661	8,73,314	1,26,625	1,89,107
Net loss ... 62,482.						

64. From these figures it may be calculated that the following are the percentages of income and charge:—

PERCENTAGE OF GROSS INCOME ON CAPITAL.

Ganges Canal	2½ per cent.
Eastern Jumna Canal	15 "
Doon Canal	3½ "
Rohilkund Canal	15 "
Agra Works	8½ "

PERCENTAGE OF TOTAL OUTLAY ON INCOME.

Ganges Canal	133 per cent.
Eastern Jumna Canal	45 "
Doon Canal	149 "
Rohilkund Canal	75 "
Agra Works	120 "

These results are plainly far from satisfactory as a whole, though they give reasonable grounds for expecting that these works may be made fairly remunerative if proper attention be paid to them. It may be added that these figures include the charges for general direction, which are not taken into account in the detailed statements of the several works.

65. The Governor General in Council cannot conclude this review of the operations of this highly important branch of the Administration without stating the conviction left on his mind, by a consideration of all the facts that have been now before him, that a closer attention to the financial scope of the operations of the Irrigation Department has become necessary. His Excellency in Council has much satisfaction in looking back to the continued activity and intelligence that has characterized the operations of many of the officers of the Canal Department of the North Western Provinces, and he is happy to be able to add his testimony to the important services that have been rendered to the country through their instrumentality. But the progress that has thus far characterized the operations of the Canal Department must be still further advanced, and the knowledge derived from the experience of the past must be applied to improve to the utmost all branches of its Administration.

66. The Governor General in Council desires to impress on the Government of the North Western Provinces the increasing importance of watching with close attention the development of irrigation in the districts of Upper India. The high value to the cultivators of works designed for this object, is too well known to call for special comment. But to admit of the Government extending them to all parts of the country as fully as may be desired, it is quite essential that it should be shown that they may, as a rule, be made remunerative to the State. The outlay required for the development of this class of works can only be legitimately incurred so far as the increased income to be realized from them is shown to be able to compensate for the original charges. Apart from the general importance of obtaining an increased revenue, without which all material and social progress becomes difficult, the special necessity for an ample return being secured on the outlay of public money on irrigation works, is thus strongly made apparent. The Government of India anxiously desires to do what may be practicable in the way of extending the benefits of irrigation to all districts of India. But it will obviously be a necessary preliminary, before any extraordinary outlay on such works can

be sanctioned; or recommended for sanction to Her Majesty's Government, that decisive proof shall be given, that there is reasonable ground for expecting that no financial embarrassment or loss shall arise from such outlay.

67. His Excellency in Council feels quite satisfied that irrigation works carefully designed, executed, and maintained, may be made highly profitable to the State, and at the same time to the cultivators, and he must require that renewed attention shall be given to that most important part of the duties of the officers charged with the direction of the Canal Department, which is concerned with the financial results of these works.

68. The superior officers of the Irrigation Department must not be content to leave the administration of the canals in the position in which they find it. They must earnestly apply themselves to placing the financial results of all of these operations, without exception, on a thoroughly sound basis. In doing this, they will receive every support from the Governor General in Council. But all officers of this department must understand that the Government of India will henceforth expect that every one of them constantly keeps in view the primary importance of making the works in his charge productive of a fair money return to the State. They must make themselves acquainted with the practical result of the agricultural operations with which their duties are so much involved, and watch carefully the interests of the Government by seeing that fair rates are charged for the water, neither in excess of the capabilities of the land to pay nor short of the equitable return that may be expected from the capital sunk on the works. A close economy in all work and establishment charges must be maintained, and an intelligent comparison of the results obtained under various systems or individuals constantly kept up. It is thus only that this most useful branch of the administration can be placed on the footing of efficiency at which the officers of the department should steadily aim, and which the Governor General in Council hopes they may soon attain in the management of all the important works under them. Some of these works have already been brought into a highly satisfactory condition, and His Excellency in Council trusts that all exceptions to this rule may soon cease.

ORDER.—Ordered, that a copy of the above Resolution be forwarded to the Government, North Western Provinces, for early attention.

Also to the Home Department and to the Government of Punjab for information.

Also that a copy of the Resolution with the North Western Provinces' Canal Returns for 1861-62 and 1862-63, be forwarded to Her Majesty's Secretary of State.

No. 822 C.
4570.

FROM

COLONEL R. STRACHEY, R. E.,
SECY. TO THE GOVT. OF INDIA,

TO

THE SECY. TO THE GOVT. OF MADRAS,
IN THE PUBLIC WORKS DEPARTMENT.

PUBLIC WORKS DEPARTMENT,
SIMLA, 17th September, 1864.

Civil Works.
Agricultural.

SIR,

I am directed to forward the accompanying copy of a Resolution by the Government of India in this Department, on the Revenue Reports of Canals in the North Western Provinces for the years 1861-62 and 1862-63, and to request that you will invite the attention of His Excellency the Governor in Council to the principles it lays down.

2. The Governor General in Council would be glad if the Madras Government will consider to what extent a like general course can be adopted in furnishing Returns of the results of the Irrigation Works in that Presidency. His Excellency in Council is of opinion, that the experience obtained in all parts of India, on this very important subject may, with the greatest advantage to the Administration every where, be collated, and so made to help in the general progress of knowledge applied to this branch of Engineering science, and its economical application under varying circumstances.

3. The Governor General in Council is satisfied, that works of irrigation are of very great utility in most parts of India; and believes that no better method of leading to their extension can be adopted, than fully demonstrating their fiscal and general value. To do this effectually, a critical analysis of the whole of the elements of income and expenditure is necessary, and the co-operation of the Madras Government is invited in obtaining data which cannot fail to be most useful to the Officers of the Government charged with the construction and maintenance of Irrigation Works in all parts of India.

I have the honour to be,

SIR,

Your most obedient Servant,

(Signed) R. STRACHEY, Colonel, R. E.,

Secy. to the Govt. of India.

Captain, R. E.,

Under Secy. to the Govt. of India.

Civil Works

Public Works Dept

1705

371

No 1005

Proceedings of the Madras Government

Under date the 12th April 1865.

Read the following

From
The Secretary to the Govt of India
Forwarding Copies of the Resolutions
of the Government of India on the
Revenue Reports of Canals in the
North Western Provinces for 1861-62 - 1862-63,
and inviting the co-operation of the Madras
Govt in the preparation of returns showing
the results of Irrigation Works in that Province.

Here enter 17th September 1864
No 822 C
4570.

Ordered that the
following letter be sent

To No 1006
The Secretary to the
Government of India
P.W.D.

Sir. In acknowledging
the receipt of your letter
dated the 17th September
last, with Resolution by
the Government of India
which accompanied it,

[Signature]
770

[Signature]

+ No 822 C
4570

+ No 656. 8C
3825

CIVIL WORKS.
Agricultural.

TO
SECT. TO GOVT. OF MADRAS,
IN THE PUBLIC WORKS DEPT.,

FROM
SECT. TO GOVT. OF INDIA,
IN THE PUBLIC WORKS DEPT.

No. 822 C.
4570.

Dated SINGA, 17th September, 1864.

Received *[Signature]*

Forwarding copies of the Resolution of the Gov-
ernment of India on the Revenue Reports of Canals
in the North Western Provinces for 1861-62,
1862-63, and inviting the co-operation of the
Madras Government in the preparation of returns
showing the results of Irrigation Works in that
Presidency.

No 1005-81006-125th/65

10229

27/10/1864

I am directed to state that the Macha Government are fully alive to the importance of accurately registering the results of the great irrigation works in this Presidency, and that a Return, embodying these results, has been regularly prepared and forwarded to the Government of India.

2. I am to explain that in giving the financial results of irrigation works, it is not possible, in this Presidency, to enter into such detail as has been done in the Canal Reports of the North Western Provinces.

* Statement of Remunerative
Works.
That for 1863/64-1864 for.
rounded with letter No. 554
dated 27th February 1865.

It should be credited only with
the difference between the
average Punjab & Punjab
apportionments. W

410
The Revenue system which prevails here, and the difficulty of separating the water rates from the land rental, together with the non-protection of the quantity of water allowed for irrigation, render it impossible to do more than show the general financial result of the outlay upon each irrigation work. In the Return in question, this result is exhibited by crediting each work with the gross revenue derived from it, and by debiting it with the entire cost of maintenance and repairs, as well as with interest.

at the rate of 4 per cent
upon the original capital
sum.

at W
J. W. 1865 (Departure)
Pro: of Govt for April
sum.

Fort St George
12th April/65

No 1005 & 1006
Pro: of the Madras Govt
of 12th April 1865

Recd 13th April

Letter from the Govt of
India, forwarding copy of
Resolutions on the Revenue
Reports of Canals in the
North-Western Provinces for
1861/62, 1862/63 and inviting
the operations of this Govt
in the preparation of Returns
showing the results of irri-
gation works in this Pro-
"cedency, with orders thereon

229
69
No 201

229-201

27th April 1865