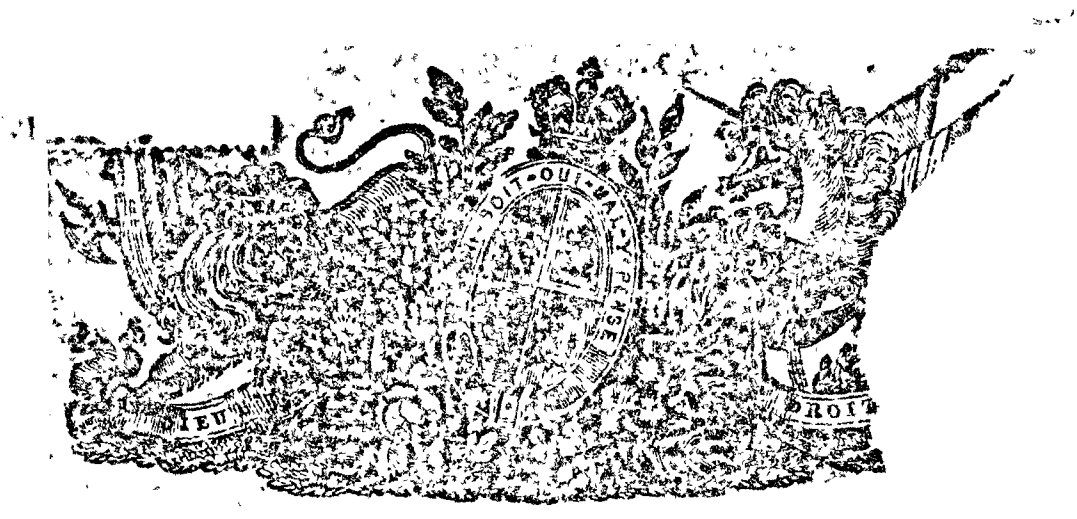


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ADMINISTRATION REPORT

OF THE

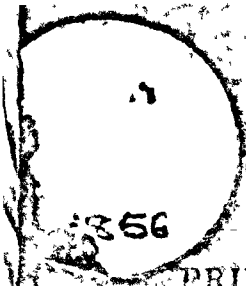
PUBLIC WORKS DEPARTMENT,

(IRRIGATION)

BOMBAY PRESIDENCY,

FOR THE YEAR

1893-94.



PRINTED AT THE GOVERNMENT CENTRAL PRESS.

1894.



ADMINISTRATION REPORT OF MILITARY WORKS

OF THE

PUBLIC WORKS DEPARTMENT,

(GENERAL BRANCH),

BOMBAY PRESIDENCY,

FOR THE YEAR

1893-94.

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ADMINISTRATION REPORT
OF THE
PUBLIC WORKS DEPARTMENT,
BOMBAY PRESIDENCY.
FOR THE YEAR 1893-94.

MILITARY WORKS.

GENERAL REMARKS.

1. The following stations remained under the control of the Bombay Public Works Department during the year :—

Poona District.

Ahmednagar.	|	Purandhar.
Sirúr.		Khandála.

.satára.

Bombay District.

Málegaon.		Baroda.
Bhúj.		Surat.

Thána.

Deesa District.

Ahmedabad.		Rájkot.
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2. The expenditure during the year on Military Works (including contributions) amounted to Rs. 1,95,538, of which Rs. 47,710 was for original works, Rs. 90,946 for repairs, Rs. 32,887 for establishment, Rs. 2,066 for tools and plant, and Rs. 21,929 for Barrack Department.

3. The Military Works Revenue for the year amounted to Rs. 24,079.

4. The works carried out during the year under each head were as follows :—

I.—ACCOMMODATION FOR TROOPS.

BUILDINGS FOR EUROPEAN TROOPS IN THE PLAINS.

The old Persian Barrack, No. XX, in the British Infantry Ahmedabad, was put into thorough repair, at a cost of Rs. 4,685.

elevation and style of roofing. The foundations and plinth have been completed, and the superstructure nearly so. The estimated cost is Rs. 18,734, and the outlay during the year was Rs. 6,704.

7. The floors of the married men's quarters, in the British Infantry lines, and also of 4 detached staff quarters, have been paved with stone, at a cost of Rs. 3,754.

BUILDINGS FOR EUROPEAN TROOPS IN THE HILLS—PERMANENT.

Khandála.

8. The work of constructing a Regimental Institute, including canteen and cook-house, described in the last report, has been completed at a total cost of Rs. 18,694, of which Rs. 220 was spent during the year.

Purandhar.

9. The provision of iron gutters to the eaves of the barracks at Purandhar, described in the last report, was completed during the year at a total cost of Rs. 3,301, of which Rs. 554 were expended during the year.

Sátára.

10. New flooring to the upper story of the Barrack in the Hill Fort was completed at a total outlay of Rs. 3,344, against the estimate of Rs. 3,472. The work consisted of replacing the old earthen floor by teak boarding, 1½" thick, on teak joists, 3" × 4½", supported on the old beams.

11. The work of providing a Mangalore tiled roof, in lieu of the existing thatched one, to the Station Hospital, was in progress, Rs. 2,201 having been expended during the year, against the sanctioned estimate of Rs. 6,338.

V.—STUD.

Ahmednagar.

12. In No. 1 stable, Remount Dépôt, three-fourths of the old masonry pillars supporting the roof have been replaced by iron-pipe pillars, at a cost of Rs. 2,834. The work is in progress, and the cost includes a balance of 200 iron-pipes required for the other stables.

VII.—GENERAL CANTONMENT WORKS.

WATER-SUPPLY.

Sátára.

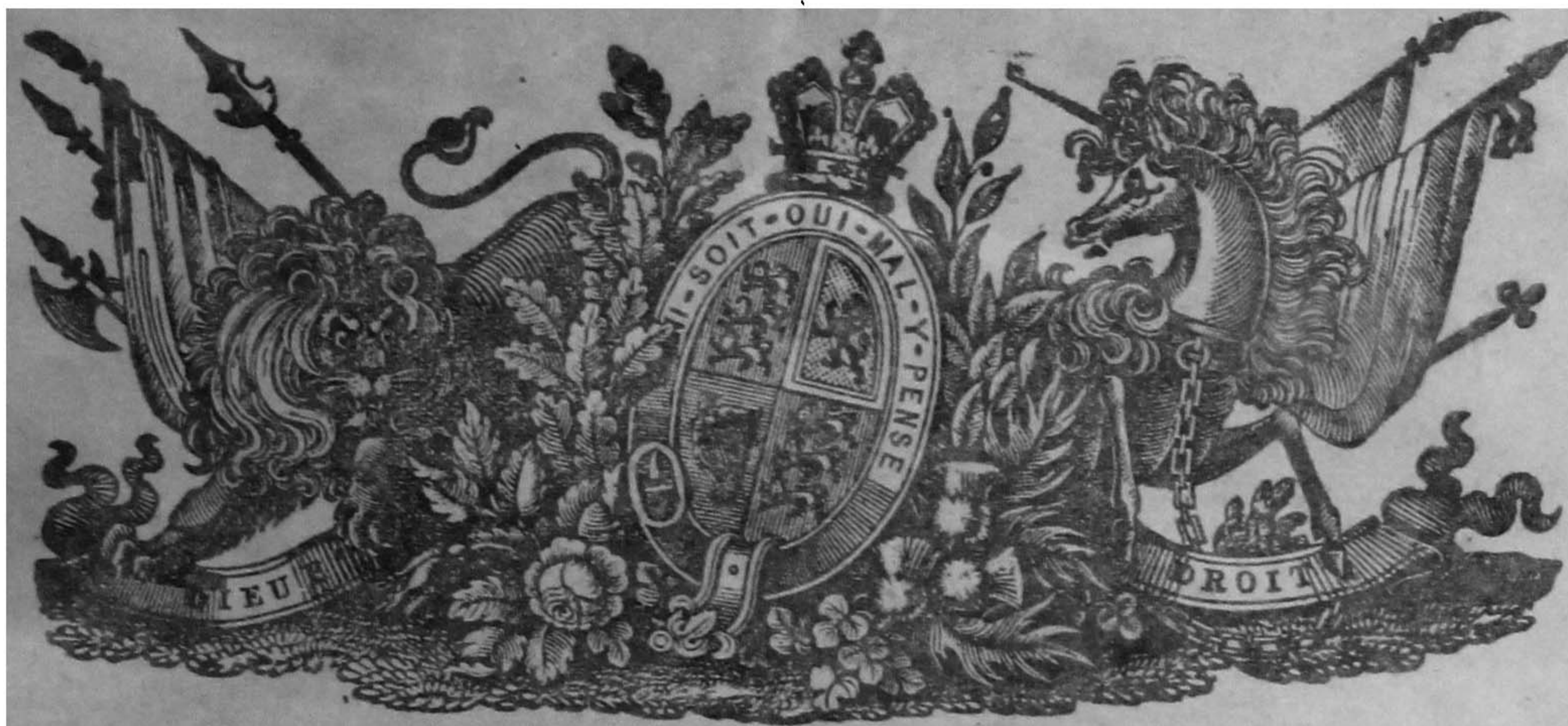
13. The work in connection with the Sátára Camp water-supply, which has been fully described in previous reports, was in progress, and the expenditure of the year was Rs. 12,015, and the total from the commencement of the work, Rs. 52,348, against the revised estimate of Rs. 70,465. It is expected that the work will be finished in the next year.

VIII.—FORTIFICATIONS.

Purandhar.

14. The work of carrying out certain defensive works, described in the report for 1891-92, has been completed during the year at a total cost of Rs. 4,360, of which Rs. 958 were spent during the year.

15. The conversion of the old arsenal was completed during the year.



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ADMINISTRATION REPORT
OF THE
PUBLIC WORKS DEPARTMENT
(IRRIGATION)
BOMBAY PRESIDENCY,
FOR THE YEAR 1893-94.

GENERAL REMARKS.

In the year under report the expenditure on irrigation works throughout the Presidency amounted to Rs. 32½ lakhs as compared with 24¾ lakhs in the previous year. This outlay was divided between Sind and the Presidency proper in the proportion of 23 to 9 respectively.

2. Of the total outlay of Rs. 24,50,730 on works and repairs, Rs. 12,65,958 were expended on repairs. The expenditure on repairs to works in Sind was Rs. 10,70,823 and to those in Deccan and Gujārat Rs. 1,95,130.

DECCAN AND GUJARÁT.

3. The principal works in progress during the year were the Nira Canal from the Protective grant and certain works in connection with the improvements of the Poona water-supply from the grant under Minor Works and Navigation.

At Bhátghar, as reported last year, the masonry in the dam was all completed with the exception of the wall and top corbelling over the arches in the up-stream side of the two weirs. A portion of this was done during the year under review and the coping was completed over the first 15 openings of the north waste weir. The pitched embankments in continuation of the flank walls at both the south and north weirs were extended in order to protect the land between them and the Yelwandi River. The fixing of the hand railing on the coping at the top of the dam was proceeded with, and the only portions still remaining to be done are the up-stream side of the river portion and of the south waste weir and both sides on the north waste weir. The lifting gear for the large under-sluices has all been permanently fixed and the screw rods are reported to work satisfactorily. The automatic gates for the north waste weir were supplied by the contractors before the end of the year. Fifteen gates were erected and hung with counter-weights before water was stored in August, and their working was tested when the water rose over the weir crest. The gates worked very well under the small head of 3 feet. Next year the full number of 45 gates on the north waste weir will be tested in the same manner under heads varying from 0 to 5 feet. They cannot be subjected to a full head until the south weir gates have been erected or until after the monsoon of 1895, when it is expected the whole of the work will be completed.

The only work carried out on the weir at Vir was the completion of the new needle gap near the scouring sluices and the conversion of the falling gate opening into a needle gap as being more workable. An overbridge in the 71st and a supper-passage in the 97th miles of the canal and distributaries Nos. 59 and 35A were practically completed and some small works such as outlets, masonry works for cross drainage and road communications, &c., were carried out.

4. The new settling tanks for the Poona Water-supply were nearly completed and all the other works in connection with that project made good progress.

5. The portion of the Mhasvad Tank dam where leaks occurred was excavated and pitching from the front slope was removed and better material for re-making the dam was collected.

6. The works in connection with improvements to the Ekruk Tank perennial Canal have been completed and the canal has been brought to its original section and the embankment raised throughout for a length of 24 miles.

7. The proposal for extension of berm with an under-pinning of murem to prevent movement in the Ashti Dam where no berm is now provided is under consideration.

8. Report on the Chankapur Tank is under the consideration of Government.

9. The two works in the Southern Division on which expenditure on Capital account was incurred during the year were the Krishna Canal, and the reconstruction of the slipped portion of the Nehr Dam in connection with the Yerla River system. The former, on which only a few sub-works now remain to be carried out, will be entirely finished, as sanctioned, during next year. Considerable progress was made with the latter work, which is described further on.

10. Pursuant to the liberal policy of Government as regards the treatment of irrigation tanks, large and small, in the Southern Marátha Country and Gujarát, the repair and improvement of as many as 137 tanks in the Dhárwár District and 5 tanks in the Belgaum District were either in progress or completed during the year, the outlay amounting to Rs. 38,569 and Rs. 16,694 respectively. In the Ahmedabad and Surat and Broach Districts the repair and improvement of 51 tanks were undertaken, the total expenditure in each district being Rs. 9,265 and Rs. 23,021 respectively. The reports of the Committees appointed by Government for the consideration of the systematic up-keep of these tanks in future and other cognate questions have some time since been submitted, and orders of Government will be issued as early as practicable.

11. The total area irrigated from all works during the year was 78,187 acres and compares with the previous five years as follows :—

Years.	Area irrigated.	Rainfall.
1888-89	77,315	19.68
1889-90	83,841	25.75
1890-91	73,141	22.49
1891-92	94,312	17.31
1892-93	63,771	33.59
1893-94	78,187	21.62

12. The following table shows the area irrigated and water rate assessments for each work during the year :—

No.	Name of Work.	Area irrigated.	Assessment.	No.	Name of Work.	Area irrigated.	Assessment.
		Acres.	Rs.			Acres.	Rs.
1	Háthmati Canal ...	3,701	10,368		Brought forward ...	51,949	2,99,419
2	Khári Cut ...	1,785	11,545				
3	Hartála Tank ...	118	266	20	Koregaon Tank ...	352	1,007
4	Mukti Tank ...	1,238	4,309	21	Ekruk Tank ...	2,889	4,364
5	Mhasva Tank ...	229	550	22	Ashti Tank ...	1,193	13,860
6	Jámda Canals ...	1,588	6,630	23	Mhasvad Tank ...	5,283	21,492
7	Parsul Tank ...	359	1,418	24	Rewári Canal ...	1,348	6,260
8	Páiked Canal ...	2,104	7,245	25	Yerla River Works ...	1,958	6,906
9	Wadáli Canal ...	385	1,306	26	Upper Mán River Works ...	1,490	7,071
10	Ojhar Támbat Canal ...	538	1,923	27	Maini Tank ...	1,359	6,534
11	Ojhar Canal ...	2,243	6,030	28	Chikhli Canal ...	370	2,033
12	Lákh Canal ...	343	1,078	29	Krishna Canal ...	4,742	42,083
13	Bhatodi Tank ...	1,613	5,172	30	Muchkundi Tank ...	12	60
14	Mutha Canals ...	8,259	1,38,962	31	Gokák Canal ...	4,237	11,629
15	Kásurdi Tank ...	124	339	32	Madag Tank ...	492	1,892
16	Mátoba Tank ...	1,142	10,790	33	Dámbal Tank ...	127	679
17	Shirsuphal Tank ...	913	3,436	34	Medleri Tank ...	96	470
18	Bhádálvádi Tank ...	764	4,349	35	Asundi Tank ...	85	291
19	Nira Canal ...	24,503	83,703				
	Carried forward ...	51,949	2,99,419		Total ...	78,187	4,26,070

13. The total assessments amount to Rs. 4,26,070 and thus show an increase of Rs. 1,09,720, or more than 34 per cent., due to increase in area irrigated.

14. Statement showing the results of run-off from the catchment areas of tanks in the Deccan for 1893 is appended. The comparative statement of dimensions and cost of storage works constructed, under construction, and proposed in the Deccan was revised during the year and is also appended to this report.

SIND.

15. A change in the Public Works administration of the Province of Sind, the necessity for which had for some time been manifest, was made during the year. The work had outgrown the power of a single Superintending Engineer to cope with, and the Sind Irrigation Committee, which met in 1892, recommended that an additional Superintending Engineer be appointed. The change was sanctioned by the Secretary of State and came into force on 31st October 1893, when the office of Superintending Engineer in Sind was abolished and two new circles were established, one entitled the Indus Left Bank Division, the other the Indus Right Bank Division.

In the Indus Left Bank Division are included at present the following executive districts :—

Nára Supply Channel (temporary).
 Eastern Nára.
 Hyderabad Canals.
 Fuleli Canals.
 Hyderabad Buildings.

The formation of a new district to deal with all matters connected with the Indus is contemplated, and several special districts will be required to carry out the Jamrao Canal and the important extensions and improvements of old canals in the Hyderabad Collectorate, projects for which are before Government. In the Right Bank Division are included the following districts :—

Begári Canals.
 Shikárpur Canals.
 Ghár Canals.
 Western Nára.
 Karáchi Canals.

16. The inundation of 1893 was remarkable for the abnormal rise at the end of May when the Bukkur gauge read 12 feet 9 inches, a reading for that date which has only once been exceeded, namely, in 1878. The river, however, quickly fell and on June 13th the reading was only 7 feet 4 inches. It then rose normally and attained its maximum height, 15 feet 10 inches, on 30th July. The fall afterwards was rapid. Judged by the standard laid down by the late Superintending Engineer in Sind in his Annual Irrigation report for 1892-93, the inundation was an unfavourable one, as Bukkur gauge read over 13 feet for only 44 days, and Kotri gauge over 17 feet for 50 days. Its great fault was the rapid fall in August which caused some of the canals to run dry before the crops were fully matured. A point to be noted is that, whatever the causes may be that have in recent years delayed the escape of the waters of the Indus to the sea, they were still in action in 1893 as the following figures show :—

Years.	Bukkur Gauge over 13 feet.	Kotri Gauge over 17 feet.
	Days.	Days.
1889...	76	66
1890...	37	37
1891...	30	45
1892...	38	41
1893...	44	50

17. Owing to the large area under rabi in 1892, the river when it first rose in May, found the people busily engaged in harvesting their rabi crops and consequently not ready. Again, owing to the early period of the year in which the river was at its highest, the land that was flooded for rabi had lost the

greater part of its moisture when the season for sowing the seed arrived; hence both the kharif and rabi area is, generally speaking, likely to be less than the previous year, but will still probably be above the average. So far as the Hyderabad Canals District is concerned, it is believed that the figures of cultivation and revenue will show an increase over those of the previous year, which was the highest on record.

18. In the Begári Canals District several dangerous leaks appeared in the Káshmor Bund, but were fortunately stopped before any breach occurred. When the river fell in August, the dhand feeding the Desert Canal got hopelessly blocked with sand, the result being a total failure of all cultivation. In the Shikárpur Canals District portions of the Sukkur-Begári Bund and of the Kásimpur Bund were eroded by the river, but as the water level fell soon after, no serious flood escaped. In the Rohri District the usual local floods passed over the country and may be classed as moderate, while the Bhávalpur flood barely reached British territory. In the Ghár Canals District, owing to the inopportune way in which the river rose and fell, serious loss would have resulted to the cultivation had not the supply in the case of the Sukkur Canal been supplemented by admitting water through the old head, and in that of the Ghár by the supply received from the Fordwah. In the Western Nára District, owing to the low river in the latter part of the season, the rice crop suffered heavily in the upper reaches of the Nára, but with the assistance of the new feeder the lower portions were amply supplied. Owing to the set of the river on the bunds along the river bank, the water topped and breached them in several places, the result being serious flooding of the country between them and the Nára, and also several breaches in the line of railway. No hill floods occurred. In the Karáchi District the flood level rose to within a few inches of that of 1892, and had not the river eroded the bund line at Bahadipur, there would have been no floods except that from one breach in the bund line north of Jerruck.

19. The spill over the left bank of the Indus in the Rohri District was very large and caused a heavy flood down the Eastern Nára which is stated to have been the highest since 1878. The protective works in the Nára Valley as a whole worked well, and comparatively little damage was done. The sluices, at heads of the Jamrao Sang and Rata Sang, which were of very light construction, were carried away, and some minor embankments were breached. The loss of kharif cultivation was more than covered by the increase in rabi. This flood was fully reported on at the time and is referred to in Government Resolution No. 51 W. I.—588 of 31st March 1894. The supply to the canals of the Eastern Nára system is to a great extent independent of the nature of the inundation, and in the year under review the kharif supply was throughout the season ample, and the area cultivated larger than usual. There was however a falling off of rabi consequent on the closure of the Nára Supply Channel to enable the deepening to be carried out. The only river embankments of any importance in the Indus Left Bank Division are those in the Fuleli Canals District. No breaches occurred in them. Numerous small breaches occurred in the canal banks; they were all closed without any particular difficulty. These breaches usually occur during rains at unregulated kariah heads when water is not required for cultivation, and it is impossible to avoid them. The construction of regulators on the Fuleli and escapes from its tail branches has done a great deal towards lessening their number.

20. One of the principal operations of the year was the commencement of the deepening of the Nára Supply Channel, with which good progress was made and which will be described later on.

The improvements to the Unharwah intended to increase the supply of that canal and extend the area commanded by it, commenced during the previous year, made considerable progress. Preparations were made for clearing and extending the original mouth of the Desert Canal which was in use up to 1886, and also to clear the mouth used from 1887 to 1891. The suggestions of the Inspector General of Irrigation for strengthening the Káshmor Bund were partially carried out wherever urgently required. The improvement of the Sind Canal was commenced, but owing to the season having far advanced work was confined to the excavation of two new branches and the improvement of the Mirzáwah. Owing to the erosion

caused by the set of the river against the Sukkur-Begári Bund in the 22nd mile, a new loop was commenced and nearly completed. A loop in the Kásimpur Bund also became necessary and was undertaken. In the Western Nára District the expenditure was principally on the Pritchard Canal, new feeder Western Nára, Dhamrao Canal and Nára Bunds. On the Pritchard Canal it was decided to construct a new regulator. Work on the Dhamrao Canal was pushed on vigorously under great difficulties as regards labour and water. The main canal, together with five miles of the Gangrout branch were expected to be ready by the end of the first week in June. The repairs to the Nára Bunds commenced in the previous year were completed. In the Karáchi Canals District the Baragaza Khádi Bund, which had been commenced late in the previous year, was being constructed with vigour during April and May, but it had to be abandoned on account of a sudden and unexpected rise of the river which flooded the works before completion. The restoration of old embankments of the Baghar Canal was continued in the year under report.

In the Eastern Nára District the Jatri sluice and escape channel were completed and the regulator in the Makhi weir commenced. The Jatri-Kheti clearance in the Nára channel was also completed.

In the Fuieli Canals District the regulator at the 60th mile (Alipur) was practically completed, and four of the five proposed escapes for the surplus water at the tail were completed.

In the Hyderabad Canals District no new works of importance were undertaken.

21. The survey in connection with the revision of the plans and estimate of the Jamrao Canal, referred to in paragraph 18 of last year's report, was completed and the project submitted for sanction.

Surveys for the improvement of the large canals in the north of the Hyderabad Canals District were also completed, and projects prepared.

The work done by the Rohri Survey party was inspected by the Superintending Engineer, and proposals were framed for diverting the Bhávalpur flood and for a new canal.

22. The usual statement of entire expenditure with a detailed statement showing the various items of works on which the canal clearance grant for the year has been expended and the establishment debitable to it, is appended (Appendices A. and B). A general summary of this expenditure for the whole province is given below:—

Class of Works.	NEW WORKS.				REPAIRS.			Establishment proper.	Tools and Plant.	Total under all heads.
	Capital.	Revenue.	Ordinary Agricultural.	Total.	Works.	Canal Conservancy Establishment.	Total debitable to Clearance Grant.			
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.			
Major Works	4,08,362	4,460	...	4,08,322	1,44,130	39,322	1,83,452	1,13,521	4,495	7,09,790
Minor Works, Capital	37,548	29,329	...	66,877	2,25,483	39,55	2,65,038	1,07,377	2,208	4,41,498
Do. Revenue . . . . .	...	2,09,218	...	2,09,218	3,79,398	76,269	4,55,667	1,62,044	3,408	8,30,337
Ordinary Agricultural . . . . .	...	...	47,179	47,179	1,33,379	27,382	1,60,761	70,992	9,986	2,88,918
Total	4,41,410	2,43,007	47,179*	7,31,596	8,82,390	1,82,523	10,64,913	4,53,934	20,095	23,70,543*
Deposits Contribution Ordinary . . . . .	...	...	655	655	1,518	...	1,518	27	...	2,200

N. B.—The difference between the figures shown in the Finance accounts and the above statement against each class of works is due to adjustments per Government Resolution No. 598, of 13th April 1893.

* Exclusive of Refunds of Revenue Rs. 4,367.

GENERAL.

23. The revenue receipts during the year amounted to Rs. 7,67,058, of which Rs. 5,69,861 were on account of works in the Deccan and Gujarát, and Rs. 1,97,197 were on account of works in Sind. These receipts represent direct revenue accounted for in the Public Works Department, and do not include the receipts credited under Land Revenue. The figures for the year under report compare with those for the previous two years as follows:—

	1891-92.	1892-93.	1893-94.
	Rs.	Rs.	Rs.
<i>Major Works—</i>			
Protective Works	63,585	1,11,742	1,02,419
Productive Works... ..	3,80,412	4,09,304	4,12,162
Total	4,43,997	5,21,046	5,14,581
<i>Minor Works—</i>			
<i>Imperial—</i>			
Works for which Capital and Revenue Accounts are kept ...	1,34,163	1,16,073	1,42,331
Works for which only Revenue Accounts are kept	64,226	61,095	77,667
Agricultural Works	1,732	1,584	1,833
<i>Provincial—</i>			
Works for which Capital and Revenue Accounts are kept ...	16,897	17,475	30,646
Total	2,17,018	1,96,227	2,52,477
Grand Total	6,61,015	7,17,273	7,67,058

24. The expenditure of the year was distributed under different heads as under :—

	<i>Imperial.</i>	
	Rs.	Rs.
<i>Capital—</i>		
<i>Major Works—</i>		
Protective Works ... ..	... (a) 1,21,402	
Productive do. ... ..	... (b) 5,13,392	
		6,34,794
<i>Minor Works and Navigation—</i>		
Works for which Capital and Revenue Accounts are kept		(c) 1,99,948
		8,34,742
<i>Revenue—</i>		
<i>Major Works—</i>		
Protective Works	74,218	
Productive do.	3,31,916	
		4,06,134
<i>Minor Works and Navigation—</i>		
Works for which Capital and Revenue Accounts are kept	3,22,706	
Works for which only Revenue Accounts are kept	10,56,500	
		13,79,206
<i>Agricultural Works—</i>		
Works for which neither Capital nor Revenue Accounts are kept ...		(d) 4,51,857
Contribution Works		14,444
Total Imperial		30,86,383
<i>Provincial.</i>		
<i>Capital—</i>		
Minor Works and Navigation ...	1,34,672	
<i>Revenue—</i>		
Minor Works and Navigation ...	4,308	
Total Provincial		1,38,980
Grand Total		32,25,363

(a) Includes	Rs. 3,062	} On account of expenditure in England and Exchange,
(b) Do.	10,766	
(c) Do.	8,128	
(d) Do.	7,747	

25. The total expenditure is classified as follows:—

	Deccan and Gujarát,	Sind,	Total.
	Rs.	Rs.	Rs.
Works... ..	4,52,526	7,32,251	11,84,777
Repairs	*1,95,130	†10,70,823	12,65,953
Establishment... ..	2,74,514	4,53,961	7,28,475
Tools and Plant	12,420	20,095	32,515
Suspense Account	-1,806	15,449	13,643
Total	9,32,784	22,92,579	32,25,363

* Includes refunds of Rs. 3,521.

† Do. „ 4,387.

26. The cost of works establishment for certain districts in the Central and Southern Divisions is shown in Appendix C. The information as regards Sind works has been omitted from the statement, as under the peculiar conditions obtaining in Sind no useful comparison can be made as regards percentage which work establishment bears to expenditure on works. The orders in Government Resolution No. 487 E.—2130, dated 22nd December 1891, were moreover by paragraph 2 specially not made applicable to Sind.

27. Maps showing the position of the principal irrigation works in the Gujarát and Deccan and in the Province of Sind are attached.

GUJARAT AND THE DECCAN.

GUJARAT.

AHMEDABAD DISTRICT.

The season was a very favourable one for both kharif and rabi as timely rain fell for sowings and the canal was full throughout the season. The total rainfall registered at Háthmati Canal. Parántij was 51·23 inches as against 44·88 for the preceding year and against an average of 30·55 for the 10 years ending 31st December 1893.

2. The total area irrigated was 3,701 acres (1,259 kharif and 2,442 rabi) as against 2,727 acres (386 kharif and 2,341 rabi) for last year, and the revenue amounted to Rs. 10,368 against Rs. 6,944.

3. The causes of the increase were due to the facts stated above. The cost of maintenance and repairs amounted to Rs. 4,051 as against Rs. 4,044 for last year. One heavy flood occurred on 15th September 1893 when the water rose at the weir to a head 8·40, the rainfall being 3·70 inches.

4. On the Khári Cut during the season 1,786 acres were irrigated, *i. e.*, 1,760 kharif and 26 rabi, and the income amounted to Rs. 11,545, out of which free grants and remissions to the extent of Rs. 1,629 were given, leaving a net revenue of Rs. 9,916 as against a net revenue for last year of Rs. 4,374.

The increase was due to a favourable season.

5. The following new works were carried out:—

A crossing at Bag Fardose costing Rs. 1,614.

„ at Bandia costing „ 1,614.

A skew culvert across Ghodásar channel Rs. 1,263.

6. The cost of maintenance and repairs amounted to Rs. 2,812, this includes expenditure on special repairs necessitated by abnormally heavy floods.

7. The work of improvement to the Naika channel was in progress and a sum of Rs. 4,576 was expended. The extension was very much damaged by floods from the Sábarmati River, and it will probably not be advisable to carry it as far as was originally intended, and, moreover, if it is to be preserved at all, the dam at Adaria which was destroyed last year must be renewed.

8. The cost of maintenance amounted to Rs. 899 as against Rs. 847 for last year.

9. On the 7th July 1893 a very heavy flood occurred and did an immense amount of damage which has been repaired during the working season. The cost of these repairs amounted to Rs. 962, besides special repairs amounting to Rs. 557.

Viramgaum Drainage Channel.

10. The Viramgaum Drainage Channel was much damaged by heavy floods and a sum of Rs. 2,692 was spent in repairs.

11. The following tanks were taken in hand and repairs thereto executed as under, villagers and Local Funds contributing. Where the total amount was not expended the work will be completed in 1894-95:—

Tanks.

Names of Tanks	Improvements.	Repairs.	Remarks.
Sindraĵ (Channel)	244	...	Completed.
Sindraĵ (Tank)	710	...	Not completed.
Rupal ... ..	...	171	Completed.
Wathera	36	332	Do.
Degamra ... ..	...	458	Do.
Juda	50	263	Do.
Wasna Dedhal	*679	†1,248	*Do. † Not completed.
Jholápur	855	311	Completed.
Adroda	711	1,404	Do.
Changodar	378	...	Not completed.
Saleĵda	400	...	Do.
Ranissar ... ..	...	250	Completed.
Matuda	2	763	Do.
	4,065	5,200	
	9,265		

KAIRA DISTRICT.

12. The Karamsad drain project is delayed for want of information as to the land compensation which would have to be paid. The Charotar Drainage has continued to claim attention. The high death rate in the Mátar Táluka, noticed in the Revised Settlement Report, has led to an investigation being commenced with the object of ascertaining precisely the probable effect of drainage in the different villages. It is thought that while some villages would greatly benefit if the surplus flood waters could be more rapidly carried off, others, on the other hand, would find their rice cultivation seriously injured: and the present enquiry is directed to the more detailed investigation of this question. Also the general spread of the floods, their levels and their out-falls are being surveyed with the object of collecting sufficient data for a preliminary report on the whole question which is undoubtedly a most important one. So far as enquiry has gone, it is quite clear that some of the lines of drainage, at all events, can be greatly improved without doing any injury. This enquiry extends to Cambay territory and the survey extends to lands injuriously affected by the river floods of the Shedi, Watruk, Khári and Sábarmati. The Baroda authorities are also working in their own territory and partly in British lands at the survey for a drainage channel, which is likely to benefit both Baroda and British territory, if carried out.

13. There will be great difficulties in preparing a satisfactory scheme for the Charotar Drainage, but it is necessary to attempt to solve the problems.

SURAT AND BROACH DISTRICT.

14. The drainage works in Ankleshwar Táluka of the Broach Collectorate described in last year's report have been completed at a total cost of Rs. 12,290, of which Rs. 3,144 were expended during the year. The sanctioned estimate amounted to Rs. 12,811.

15. The Pakhájan-Ambhel Channel of the Broach Collectorate was in progress. The total length of the main channel is 12 miles and of the branches, of which there are three, 11 miles. These channels are intended to drain the low-lying lands of Pakhájan, Nádarkha, Ambhel, Limdi, Keshivan, Aláđhar, Goladra and Trankal villages of the Wágra Táluka. The fall of the main channel is 9 inches per mile and its bed width at the commencement is 6 feet and at end 78 feet. The branches have falls from 1 foot to 2½ feet per mile and their bed widths vary from 4 feet to 7 feet. Nearly four miles of the main channel were completed, and a sum of Rs. 7,371 was expended during the year.

The sanctioned estimate amounts to Rs. 29,219.

16. Repairs and improvements to 38 tanks were sanctioned during the year. Rs. 12,701 were expended on repairs and Rs. 10,320 on improvements. Total Rs. 23,021. Owing to the very short working season, which in a year of good rainfall is practically only 2½ months, it was impossible to expend the whole of the budget provision.

17. The breaches and eroded portions of the embankment have been repaired by filling in earth at a cost of Rs. 1,219 plus Wágrej Protective Works. Rs. 867, the usual annual grant for maintaining the embankment, or a total of Rs. 2,086.

THE DECCAN.

KHANDESH IRRIGATION DISTRICT.

Expenditure on Major and Minor works for which Capital and Revenue Accounts are kept.

18. During the year under report, Imperial funds were spent as detailed in the following table on existing Major and Minor works for which Capital and Revenue Accounts are kept :—

Works.	Capital Outlay.	Revenue Outlay.
	Rs.	Rs.
Lower Pánjhra River Works	1,127	1,458
Jámda Canals	1,127	4,484
Hartála Tank ... ..	...	74
Mhasva do.	1,536	990
Parsul do.	4,012	316

19. The Capital outlay on the Lower Pánjhra River Works was almost wholly confined to improvements to the Dhulia channel. In the last year's report, it will be observed, these improvements were reported as practically complete. But after carrying out the last year's improvements, it was found desirable to propose the diversion of the channel in two places, and the construction of two lining walls. The diversions are intended to straighten the channel, and thus to improve its bed fall, and the lining walls are intended to prevent cattle and men getting into the channel near Moglai, and constantly damaging its side banks. Both these works were in progress during the year, and will be completed during the next official year.

20. The revenue outlay has been on the works of annual maintenance of the Mukti Tank and of the plantations, and on completing the Betávad bandhára repairs and the repairs of masonry works on the Dhulia channel. The portion of the Mándal bandhára, the foundations of which leaked seriously, was examined and a large hole likely to result in the tumbling down of the structure was discovered. Proposals to strengthen this portion have been drawn up, and will be carried out next year.

21. The survey of the Náhálod channel is complete, and the scheme for its improvements and repairs has to be drawn up. This will be done during the next year.

22. The Capital outlay on the Jámda Canals has been on plantation operations, on completing the fixing of boundary stones on the Left Bank Canal, and on the construction of a road bridge for the cart track from Bambrud going over the Right Bank Canal to the Railway Station at Kajgaon. The last work is still in progress. There are several cross-drainage works required for the Right Bank Canal, which are however left in abeyance, until the question of a storage tank for these canals is decided upon.

23. The revenue charges have been incurred on canal clearances, repairs to masonry works, maintenance of buildings and plantations, and other items connected with the general up-keep of canals and the irrigation under them.

24. Plans and estimates of the Manad Tank drawn up some years ago, and of the Chankápur Tank sanctioned by the Government of India, are with the local Government with a view to consider the suitability of these projects as storage for the Jámda Canals.

25. The prospects of the Chankápur Tank, as regards its utility in connection with the Jámda Canals and the extension of irrigation under the bandháras on the Girna River from Gosrana to Chandanpurí near Málegaon, have been reported upon, and the decision of Government on the report is awaited. The Chankápur Tank works were maintained during the year under report at an expenditure of Rs. 254.

26. The revenue outlay on the Hartála Tank during the year amounted to Rs. 74. Rs. 22 of this sum were on account of repairs to the feed channel of the tank. The total estimated cost of these repairs is Rs. 313. They are intended to remove the obstruction which occurs to the easy flow of water from the feed channel into the tank owing to the channel bed being high in places.

27. The works debitabie to Capital Account of the Mhaswa Tank are complete. A sum of Rs. 1,536 has been realized during the year by the sale of the Mhaswa bungalow to the District Local Board, Khándesh. The sale was made with the sanction of Government, in order to minimize the working expenses of the tank. The revenue charges of the year were for annual maintenance of works and for the construction of a new building at Utrud to keep stores in, and to give shelter to the kárkún and other canal establishment employed on the tank.

28. The Capital expenditure on the Parsul Tank has been for the completion of the bandhára and channel for the village of Umrana, for excavating the waste weir channel of the tank, and for extension of the Soundana channel to deliver water to the Nándgaon lands in the neighbourhood. The Umrana channel has begun to flow, and to deliver water from the commencement of the rabi season of the year under report. The waste weir channel has been dug to full depth and width, as originally sanctioned. The Soundana channel extension was only begun at the close of the year. The revenue outlay was on works of ordinary maintenance of the tank.

29. Funds from the assignment for second class irrigation works were allotted for the improvements of the Soundana bandhára. Outlay from this grant during the year amounts to Rs. 391.

30. The second class or old irrigation works have continued to receive attention as usual. During the year under report, the outlay on them amounted to Rs. 19,557, distributed as under :—

					Rs.
Original works and extensions and improvements	...				15,845
Repairs	...	...	...	...	3,712
				Total	19,557

This was from Imperial funds. Outlay from the Pátfalla fund, a voluntary contribution levied from the irrigators, was also incurred to the extent of Rs. 1,518. 32 channels were under repairs or improvement during the year. Works on half of these channels are completed, and those on the other half remain to be finished.

31. Although the year's outlay shows a great improvement upon the previous year's report, the progress of the works was not satisfactory. Many of the works, considering the sums allotted for expenditure on them, should not remain in hand for more than one year, but their completion could not be accomplished owing to the difficulty in obtaining labour, and the inclemency of the climate in which the greater number of them are situated. The allotments for individual works are small, and do not admit of labour being imported from outside. The expense of importing would be prohibitive, and much of the available local labour is engaged by the cultivators on agricultural operations, at rates much higher than can be offered on Government works. Again, in the year under report,

cholera broke out in the western part of the district, which brought some of the works practically to a standstill for some time. There was not much difficulty during the year under report, as regards channel closures. These were arranged for in consultation with the irrigators concerned.

32. Out of the projects mentioned in the last year's report, the Kasara channel project still remains incomplete. It will be worked up during next year. The Dábhádi-Patna project has been matured and approved of by the Collector. The Shaháda scheme is still pending, and the Aklad-Morana project has been declared unremunerative, and has therefore been permanently shelved.

33. In accordance with the Khándesh Collector's request, the Navápur Petha was prospected during the year with a view to the restoration of the old irrigation channels. Proposals for improvements and repairs to the Khánápur Sarai channel have been submitted to the Collector for opinion, and the prospects of revenue from the Navápur channel restoration are being ascertained from the local Revenue authorities.

34. The following channels were surveyed, and proposals for their improvements and repairs were drawn up during the year :—

1. Walwada channel.
2. Nikwel channel.
3. Antápur channel.
4. Warsas channel.
5. Khákurdi channel.
6. Pimpalner channel.

The first five are awaiting approval and sanction to put them in hand. The sixth has met with the Collector's approval, and will be submitted for sanction.

River Gauges. 35. The following river gauges were maintained during the year :—

- The Aner gauge at Ganpur.
 „ Panjhra gauge at Pankheda.
 „ Kan gauge at Dahiwel.
 „ Nalla gauge at Mandal.
 „ Musam gauge at Mulher.

with a view to collect statistics for storage tank projects.

36. Rainfall was gauged on each of the five new works mentioned in the table in para. 18 above, and special rain gauges were maintained at each of the river gauge stations mentioned in the foregoing paragraph.

37. The irrigation office at Málegaon was provided with accommodation by the transfer of a provincial building formerly constructed for a telegraph office at Málegaon Camp, to the list of Imperial Buildings of the Irrigation Branch of the Public Works Department. The building was vacant for a long time. This arrangement has saved Government in the Public Works Department the annual charge of Rs. 360 incurred for office rent. A sum of Rs. 256 was spent to make the building suitable for the purposes of the irrigation office and stores. Accommodation was also provided for the irrigation sub-divisional office at Sakri by detaching for the purpose a part of the Public Works Department General Branch store building there. An expenditure of Rs. 223 was incurred in making the detached portion suitable for the irrigation sub-divisional office.

38. A powder magazine to store blasting powder was built at Sakri at a cost of Rs. 309. In this part of the district blasting powder required for works is not obtainable in local markets, and has to be kept in stock. The cost is met from the grant for 2nd class irrigation works.

39. An overbridge on the Mudhi channel was constructed during the year, the local funds having paid the cost, which amounts to Rs. 469 for works.

40. The Mukti Tank was first replenished on the 13th June 1893, and the highest water level reached was on 2nd September 1893, when it stood at 1.80 feet below waste weir. The heaviest rainfall, 1.70 inches, was gauged on 3rd August. Analysis of rainy periods gives from 15th to 22nd June a run-off of 10.7 per cent., and from 17th to 21st November of 8.82 per cent. of the rainfall.

41. The Mhaswa Tank commenced filling on 28th May 1893, and the water level reached the crest of the waste weir on 11th August 1893. The greatest rainfall occurred on 28th May, and was 2.46 inches. The run-off from 13th to 20th June was 32.2 per cent. of the rainfall, and from 18th November to 20th November 5.35 per cent. of the rainfall.

42. The Parsul Tank commenced filling on 30th May 1893, and filled to overflowing on 25th June 1893. The principal rainy periods and their runs-off were as given below:—

Periods.	Rainfall in Inches.	Per cent. run-off.
29th May to 31st May ...	2.24	14.51
13th June to 26th June ...	6.35	19.64

The maximum rainfall registered was 1.99 inches on 29th May 1893 at Umrana, close to the catchment of the tank.

43. The Hartála Tank commenced filling on 30th May 1893, and overflowed on 28th August 1893. The maximum rainfall gauged on the dam was 2.62 inches on 28th August. The principal runs-off were 23.87 per cent. from 14th to 22nd June and 53.29 per cent. from 21st to 28th August.

44. There were no extraordinary floods during the year under report.

45. The percentage charge on account of works Establishment has been 15 per cent. This is due to the peculiar nature of the works, as explained in the last year's report.

NASIK DISTRICT.

46. A temporary earthen bund was made in October 1893 across the waste weir channel, which raised the water level 3.66 feet over channel bed, or to R. L. 113.66 against 114.39 at the end of the rains of 1892. The available storage was 256½ millions of cubic feet against 273½ in 1892-93. The cause of short storage was the small rainfall after the embankment was made. The dates of closing the waste weir channel in 1891, 1892 and 1893 were 5th October, 29th September and 20th September respectively. A revised design was submitted for the permanent masonry waste weir, and it is still under discussion. The inspection bungalow at Chachadgaon and the overseer's quarters were repaired. Gauging of leakage and other observations were carried out.

47. A masonry aqueduct having 2 arches of 8 feet span was built over a nála at 3½ miles of the Ojhar Támbat distributary, and the alignment of canal has been much improved at this place, the new length of 700 feet replacing a length of 1,300 feet of old canal. The aqueduct replaces a small safety weir which was too short to discharge the floods coming down the nála. The cost of these improvements charged against Capital Account was Rs. 1,506. The main canal was cleared of weeds and its regime maintained for its entire length of 17 miles (of these 17 miles the last 6 have previously been treated as a branch but they are a continuation of the main canal). Its branches, 9 miles long, have also received due attention. The aloe fencing along each side of the canal and its branches has been extended during the year; 100 new mango trees were planted and 9,759 have been watered and attended to.

48. The canal was closed five times during the year for weed clearance, or for 25 days. The expenditure was:

	Rs.
Special silt clearance	669
For ordinary repairs	1,227
For planting and preserving trees	127
For weed clearance	222
Total	2,245

The charges for establishment and tools and plant, excluding direction and collection, were Rs. 1,537.

The cost of repairs per mile was Rs. 86.04 and the cost of establishment was Rs. 59.11.

Wadali Canal.

49. There was no expenditure on Capital Account.

The regime of the canal was maintained for its entire length of 8½ miles and the expenditure was as follows:—

	Rs.
General maintenance	429
Protecting trees	60
Weed clearance	40
Total	529

this gives a cost per mile of canal of Rs. 60.38.

50. The total number of trees on the canal was 2,032.

51. The canal was closed three times during the year for weed clearance, or for 16 days in all.

52. The establishment charges, excluding direction and collection, were Rs. 383. This gives a rate per mile of canal of Rs. 43.77.

53. Mile and furlong and bench mark-stones were fixed along the canal at a cost of Rs. 78-13-2 and the expenditure charged to Capital Account.

Ojhar Tāmbat Canal.

54. All necessary repairs along the 4½ miles of canal were carried out at the following cost:—

	Rs.
General repairs	287
Watering and protecting trees	31
Weed clearance	25
Total	343

The canal was closed four times for weed clearance or for 17 days during the year.

55. The establishment charges for measuring fields and distributing water was Rs. 373.

56. The cost of repairs per mile of canal was Rs. 76.22 and of establishment Rs. 82.88.

Old Bandhāras.

57. There are 191 old bandhāras in this district producing a revenue of Rs. 80,804.

58. The expenditure on original works (extensions and improvements)

No.	Name of Work.	Expenditure during the year.	Remarks.
IMPERIAL.			
WORKS FOR WHICH ONLY REVENUE ACCOUNTS ARE KEPT.			
<i>Works.</i>			
		Rs. a. p.	
1	Improvements to Hiravadi Bandhára at Násik, Táluka Násik ...	147 4 3	Completed.
2	Improvements to Bhagur Road Bandhára at Adgaon, Táluka Násik ...	410 8 2	Do.
3	Improvements to Khandekar's Bandhára at Adgaon ...	454 5 7	Do.
4	Bandhára Extension and Improvement Surveys in the Godávári Basin, Násik Collectorate ...	89 10 6	Do.
5	Improvements to Wadacha Bandhára and Channel at Adgaon, Táluka Násik ...	447 6 9	Do.
6	Improvements to Páchora (Wani) do., Táluka Niphád, Násik Collectorate ...	489 2 7	Do.
7	Improvements to Bandhára New Hegdya at Tisgaon, Táluka Dindori ...	414 13 7	Do.
8	Constructing a new Gulkhandi Nála Bandhára at Borala, Táluka Chándor ...	1,443 11 5	Do.
9	Improvements to Bandhára village nála at Mand Sangvi, Táluka Násik ...	60 1 0	Do.
10	Improvements to the Datali Bandhára and Irrigation Channel, Táluka Sinnar ...	1,119 4 9	In progress.
	Total ...	5,076 4 7	

With the exception of bandhára No. 8 shown above, the repairs and improvement were to works already on Canal Return No. VIII. The bandhara at Gulkhandi, when completed, is to be brought on the canal return.

59. The area actually cultivated under 8 bandháras was ascertained and was found to be 235 acres (or 20 per cent.) in excess of the land assessed for water rate, which is 1,172 acres. The average water share per acre on these 8 bandháras is Rs. 3.80. The additional area would appear liable to be charged a water rate, but as it is less favourably situated than the fields entitled to water, the assessment should be less than Rs. 3.80 per acre. Repairs to 6 bandháras were carried out during the year at a cost of Rs. 604.

AHMEDNAGAR DISTRICT.

60. The canal was opened for 19 miles only. On the Capital Account there was a net credit of Rs. 41 on the construction of five masonry outlets during the year on account of transfer of materials.

Pravara River Works:
Ojhar Canal.

The expenditure on maintenance and repairs was Rs. 3,427.

61. The canal was in operation for 23 miles. On the Capital Account there was a net credit of Rs. 252 on the irrigation outlets (modules) during the year on account of transfer of materials.

Lákh Canal.

62. No expenditure was incurred from Capital Account, which is closed.

Bhatodi Tank.

63. The expenditure on maintenance and repairs was Rs. 1,947.

64. On the 1st April 1893 the level of water in the tank was 21.87 above the sill of the sluices. The first small replenishment occurred on the 28th May 1893 and water overflowed the waste weir on 7th September 1893. The R. L. of surface of water in the tank on 31st March 1893 was 88.15, i.e., 18.15 feet above sill of sluice. No flood observations were taken.

POONA IRRIGATION DISTRICT.

65. During the year under review the expenditure under Capital amounted to Rs. 97,231, of which the greater portion was on the alterations and improvements to the Poona Water Supply works, the total estimated cost of which is Rs. 1,64,973. The works consist of (1) constructing 5 new settling tanks, each capable of storing a little over 1 million gallons, (2) converting the existing settling tanks into filter beds, (3) converting the existing filter beds into pure water tanks and roofing them in with concrete, (4) re-arrangement of the pumping machinery.

66. The new settling tanks were nearly completed by the end of the year and all the other works had made good progress. The pipes and valves ordered from England were received in March, later than expected, but in time to ensure a portion of the works being ready before the monsoon.

67. The new Worthington steam and water-power pumps have been erected and put in proper working order, and the latter have been in constant use since June 1893. There was no necessity to use steam-power as the discharge in the canal was sufficient to work the water wheel at all times. The other works undertaken were the construction of two regulators on the Right Bank Canal, one in the 18th and one in the 30th mile, and raising the parapets of the skew overbridge in the Sholapur bazar. All the works reported as in progress in last year's report were completed during the year.

68. On the 1st April 1893 the water at Lake Fife was 19.63 feet above the sills of the canal sluices, the minimum level was reached on the 7th June when the depth was 10.42 feet. The water began to rise on the 18th June and the lake filled to overflowing on the 20th of that month when the highest flood of the season occurred. This flood rose to a height of 3.75 feet above the finished crest of the weir or 1.05 feet lower than the maximum recorded flood (1882). The standards and planks were fixed on the weir by the end of September, and on the 15th October the water stood at 3 feet above the finished crest of the weir. A storm occurred early in October which necessitated some of the planks being removed and the water reduced so as to avoid a flow over the planks and putting a greater head against them than was necessary. After this storm the flow into the lake was only sufficient to raise the water to 3 feet above the crest or about 9 inches less than the previous year. The flow into the lake decreased much more rapidly than was expected owing to the October rain being exceptionally light, and this latter was the cause of the full 4 feet above weir crest not being stored. The quantity was sufficient for irrigation, and by strict economy in the distribution of water a greater area of perennial irrigation than in the previous year has been secured. The draw off from storage commenced from the 15th October, *i.e.*, nearly 6 weeks earlier than the previous year. On the 31st March 1894 the level of the water was 18 feet above sills of the sluices, *i.e.*, only 1' 9" lower than on the same date in 1893.

69. The Right Bank Canal was closed for 23 days and the Left Bank Canal for 17 days during the year for silt and weed clearance.

70. The rainfall of the year at Poona amounted to 31.09 inches, the average for the last 44 years being 29.28 inches. The canals and the Poona water-supply works were maintained in an efficient state throughout the year at a total cost of Rs. 30,948 as detailed below :—

	Rs.
Mutha Canals	19,225
Poona water-supply	11,723

Out of these amounts Rs. 8,810 was the charge for establishment charged to works in the case of the Mutha Canals and Rs. 2,672 for the Poona Water-supply. A sum of Rs. 1,109 was spent on working the new steam pumps for trials and for working them for a few hours once every month to keep them in good working order.

71. There was 13-15 feet of water above sill of outlet in this tank on 1st April 1893. From the 28th May water began to rise and the tank filled to overflowing on the 10th June

Kasurdi Tank.

1893. The water was drawn off for irrigation and on the 31st March 1894 stood at 9 feet above sill of outlet. The expenditure on maintenance and repairs amounted to Rs. 185, out of which Rs. 81 was for works establishment.

72. The water in this tank stood at 25 feet above sill of outlet on 1st April 1893. The draw off for irrigation reduced the level until the end of May, when it stood at 21.35 feet above outlet sill. The tank was filled to overflowing on the 25th June, and on the 31st March 1894 the level was 17.50 above sill of outlet or nearly 8 feet lower than the same date in the previous year. The expenditure on maintenance and repairs amounted to Rs. 1,147 including Rs. 663 for establishment charged to works.

73. The extension and improvement of the channel from the 8th mile referred to in last year's report was completed during the year, the expenditure being Rs. 7,599. The total estimated cost was Rs. 12,145 and the amount expended was Rs. 12,573. On the 1st April 1893 the water in the tank stood at 25.78 feet above sill of outlet, *i. e.*, 11.13 feet higher than on the same date in the previous year. The only replenishment received during the year was in May and June when the water rose to 27.65 above outlet sill. At the close of the year the water level stood at 14.80 feet above outlet sill, or 11 feet lower than the last year. The expenditure on maintenance and repairs amounted to Rs. 1,817, including Rs. 623 on establishment charged to works and Rs. 605 for a dry stone drain constructed at the toe of the dam. Last year, when the level of the water reached the crest of waste weir, and the sluice valves were opened, two of the rods broke. Two of the valves were only partially opened and the third was closed, the water that passed through them was used for irrigation with very little waste. In the month of March 1894, when the water in the tank had fallen to about 15 feet above the outlet, a diver from Bombay was employed and all these sluices were thoroughly repaired and put in working order in five days. The rods had been worn away at the bearings and had snapped when the valves were worked under a great head. New bars were welded on and the rods are now quite safe for some years. It will however eventually be necessary to lay pipes from the outlet pipes in the culvert and have valves on the down-stream side where they will be out of water and can be examined and repaired without difficulty.

74. At the beginning of the year the water level stood at 31.25 feet above the outlet sill, or 13 feet higher than on the same date in the previous year. The only replenishment received during the year was at the end of May. The October rain failed completely to add anything to the storage, and the result was that the water fell to 4 feet above outlet sill on the 19th March, *i. e.*, the tank was practically empty and there was great fear that all the standing crops of sugarcane would be lost. Fortunately a storm on the 29th March raised the water level to 11 feet above the outlet, giving enough water for the standing crops until the end of May. No new sugarcane could be planted owing to the short supply, and the result will be a falling off in revenue in the next year.

75. The expenditure on this tank for maintenance and repairs during the year amounted to Rs. 921, including Rs. 580 for establishment charged to works.

76. Rain and river gauges were maintained as usual in the Poona District and observations regularly recorded. The registers of height of water in all tanks were kept for all tanks and diagrams recorded.

NIRA CANAL.

77. As reported last year the masonry in the dam is all completed with the exception of the wall and top corbelling over the Bhátghar dam. arches on the up-stream side of the two weirs. A portion of this was done during the year under review, and the coping was completed over the first 15 openings of the north waste weirs. The pitched embankments in continuation of the flank walls at both the south and north weirs were extended in order to protect the land between them and the Yelwandi river. This land is cultivable, and on the north side it may be required as a building site for mills, should the available water-power at Bhátghar ever be

made use of. The fixing of the hand railing on the coping at the top of the dam was proceeded with, and the only portions still remaining to be done are the up-stream side of the river portion, and of the south waste weir, and both sides on the north waste weir. The river portion will be completed shortly. The lifting gear for the large under-sluices has now been all permanently fixed and the screw rods work very satisfactorily.

78. The supply of the north waste weir automatic gates was satisfactorily completed before the end of the year by Messrs. Gahagan and Company. Fifteen gates were erected and hung with counter-weights, &c. complete, before the water was stored in August, and by an arrangement with valves it was possible to test the working of these, when the water rose over the weir crest. The gates worked very well under the small head of 3 feet, there being very little difference in their efficiency. In the coming year the full number of 45 gates on the north waste weir will be tested in the same manner under heads varying from 0 to 5 feet. But they cannot be subjected to a full head until the south weir gates have been erected, *viz.*, until after the monsoon of 1895, by which time it is anticipated that the whole work will be quite completed.

79. The ample supply of rain in the valley during the rabi season of 1892 caused very little water to be used for irrigation, and the depth at Bhátghar was still over 39 feet when the monsoon began. The under-sluices were opened on the 19th June and closed again on the 12th August. The tank filled in 23 days and the discharge over the waste weir began on the 4th September. There were no large floods during the year. The volume of water discharged from the catchment area between the time of opening the first sluice in June till the flow over the waste weir ceased on 3rd November was 38,187,584,752 cubic feet, giving a run-off of 128 inches from the ghát catchment area of 128 square miles.

80. No attempt was made to store water above the crest of the weirs. This enabled work to be started as early as possible on the north waste weir gates. The draw-off for rabi and perennial irrigation was rather heavy, and the storage at the end of March 1894 was only a little over 49 feet deep, showing that it will be advisable to store more next year. Water was let out by the two small sluices first; and in one of them considerable damage was done to the joints and a few paving stones were washed out. The head of water producing this result was from 50 to 44 feet. The stones have been carefully replaced, and the pointing and grouting done with cement and sand. The under-sluices had some joints scoured out as usual, which have been repaired; but in addition to this there is, in 2 sluices, a strong large squirt of water through the flat arch, about 12 inches away from the frame of the gate. The jets cannot be stopped till the water is all let out. Such jets have occurred previously, but they were small and did not issue with much force. The remedy for the above will be to rake out the joints and point the up-stream face of the masonry over the sluices for about 10 feet height; this can only be done while the water is low during the monsoon.

81. The only work done on the weir at Vir was the completion of the new needle gap near the scouring sluices, and the conversion of the falling gate opening into a needle gap, as being more workable. The storshed was moved from its isolated position beyond the Vir nála and placed in the bungalow compound.

82. There were no high floods over the weir, nor any worth noting along the canal.

83. The principal works done along the canal have been the completion of the overbridge in the 71st mile, and of the superpassage in the 97th mile. Among the smaller works are the improvement of the temporary Chowki at Pimpra, the extension of the Wadgaon bungalow out-houses, and the construction of a number of chowkidárs' sheds along the canal. The old famine banks are still being raised in some places, and this with the removal of certain gaps left for roadways forms the principal work remaining to be done in the last five miles of the canal.

84. Distributary No. 59 with its five branches has been practically completed. The length of the main channel is nearly $16\frac{1}{2}$ miles. Two new distributary outlets (*viz.*, 10 and 25A) with short channels have been made, and distributary No. 35A, mentioned last year, is now practically completed, but not yet in operation. The growth of irrigation has also necessitated the enlargement of the regulators for distributaries Nos. 11A, 28 and 29, all of which are completed and in working order. New masonry works for cross-drainage and road communication have been built on various other distributaries, as occasion demanded, and permanent field outlets with wooden shutters are being built on most of these channels.

85. The total capital expenditure on the project during the year has been Rs. 94,767; the sanctioned estimate amounts to Rs. 43,54,655.

86. Special repairs costing Rs. 2,790 were done to certain high banks by puddling on the inside, covering the slopes with muram, and raising and strengthening them where necessary.

87. Two large breaches occurred during the year, one in the 5th and the other in the 65th mile, showing the necessity of making the above repairs. These breaches take place without any warning and are very difficult to forestall. Stop-gates and efficient escapes are essential to minimize the damage done in such cases, and it is necessary to construct a new stop-gate at Sansar just before the heavy banks in that section.

88. Ordinary repairs, such as silt clearance in the canal and under-drainage works, pitching the banks near aqueducts, and in places where the soil is very friable, have been done as usual, both on the canal and distributaries. Two dry-stone wing walls of the Sagobachi aqueduct, which showed signs of bulging, were pulled down and rebuilt, and are now perfectly safe. The masonry wing walls of Culvert No. 3 have been extended so as to give a safe outer slope (2 to 1) to the bank, and the protective pitching to the up-stream bank between Culvert No. 12 and Superpassage No. 5, where the floods are often very high, has been nearly completed.

89. A pulsometer was received from England in July 1893, but owing to the rabi demands and the increase in sugarcane irrigation it was not possible to clear the superpassages this year. One superpassage was, however, cleared, and the pulsometer worked very efficiently. The remainder will be done during the coming monsoon.

90. The charges for maintenance and repairs amounted to Rs. 26,333 inclusive of Rs. 2,790 for special repairs; and Rs. 4,267 for the pulsometer.

SHOLÁPUR DISTRICT.

91. A small storage tank at Tisangi has been constructed as sanctioned. This tank is formed by throwing a bund 10.86 feet in height in low ground just behind the bifurcation of the Kasegaon and Wakri branch canals of the Mhasvad Tank at the end of canal No. II; it is intended to conserve the water which has hitherto run to waste during the night, by running it into this subsidiary tank, and distributing it during the day, and thereby reducing the supply from the head-works to the same extent. The dam with sluices and regulators have all been completed.

92. The excavation of the portion of the Mhasvad Tank dam, where leaks occurred, has been made to reduced level 933, and the pitching from the front slope removed to R. L. 926. Some muram and rubble have been collected for re-making the dam with better material.

93. A road from Katphal to Rájevadi has been completed. There was no road, and it was of absolute necessity to have constant communication with the head-works of the tank at all seasons, and therefore a portion of track from Rájevadi to Katphal has been made passable as sanctioned.

94. The annual and urgent repairs to the dam and canals were executed, and the works maintained in good order during the year, the expenses being Rs. 8,348.

95. The Capital Account of the project stands as under :—

			Rs.
Amount of Estimate	...	...	16,09,890
Expenditure during the year	...	...	6,147
Total Expenditure	...	...	15,78,798

96. There was no extraordinary flood during the year, such as to affect the dam or canals. The height of flood which passed over the waste weir was 2 feet in the month of October 1893.

97. During the present season it appeared that the water in the tank was being reduced much faster than had ever been calculated on, and experiment was made to find the actual loss from absorption and evaporation.

98. The canal was closed for three days ; there was then no water flowing from the tank ; during this time the actual loss was $\frac{7}{8}$ of an inch over a water area of 89,456,208 square feet ; this is equivalent to a discharge of 25 cubic feet per second.

99. During the time the experiment was being made, the weather was unfortunately cloudy and stormy, and 3 cents of rain fell ; this would to a considerable extent prevent evaporation, and the total fall in the tank may, under ordinary circumstances, be taken at one inch, or nearly 7,500,000 cubic feet for the three days ; this gives a loss of nearly 30 cubic feet per second, or an amount equal to the present requirements for irrigation on the canals. A further experiment is being made, the result of which will be duly reported.

Ekruk Tank. 100. The Capital Account of this tank was closed in 1885-86.

101. The improvements to the perennial canal have been completed ; silt was removed from the bed of the canal and the embankments were raised with the excavated earth, new earth being provided where necessary. The canal has been brought to its original section and the embankments raised throughout for a length of 24 miles. Catchwater drains were cut along the upper side of the canal leading to cross-drainage works in miles Nos. 15 and 18 to 24 ; paved drainage crossings were made in miles 15 and 18 to 24, and bed stones were provided from 13th to 24th miles.

102. Annual repairs were executed to the dam and canals, and they were maintained in good order, the expenditure being Rs. 5,105.

103. The account of improvement work stands thus ;—

			Rs.
Amount of estimate	...	...	15,964
Expenditure of the year	...	...	7,777
Total expenditure	...	...	12,707

104. The saving effected on this is proposed to be expended in providing an iron bridge to the outlet tower of the perennial canal, the existing wooden bridge being rotten and requiring removal.

105. There was no extraordinary flood so as to affect the dam or canals ; the highest flood passed over the waste weir was 2.70 feet on the 14th of October 1893.

106. Capital Account of this tank has been closed since March 1893 ; only annual repairs to the dam and canals were executed during the year, the expenditure being Rs. 2,410.
Ashti Tank.

107. There is a movement in the dam where no berm has been provided, and for the safety of the dam it has been proposed to extend the berm with an under-pinning of muram.

108. No extraordinary flood passed through the nálas so as to affect dam or canals, flood water passed through the 10 feet cut in the waste weir channel to the depth of 3 feet on 18th October 1893.

109. The Capital Account of this work was closed in March 1892. Only repairs to the dam and canals were executed during the year, expenditure being Rs. 354.

Koregaon Tank
There was no extraordinary flood; the flood water passed over the waste weir to a depth of 0·30 feet in the month of October 1893.

110. Surveys of certain storage tanks in the SÁngola and Málsiras TÁlukas for famine relief purposes were made. A full report on the Hatid Tank project was made to Government, and the project has been abandoned.

111. Reports of the preliminary surveys of the Málsiras and Velápur Tanks have been approved by the Superintending Engineer. A survey of the Maloli Tank has been made, but it has been found to be impracticable owing to the nature and configuration of the ground at the site.

BIJA'PUR DISTRICT.

Muchkundi Tank. 112. The tank was maintained during the year at a cost of Rs. 280.

113. The rainfall gauged at the tank during the year under report was 25·72 inches against 37·79 inches in 1892-93, or 21·56 from June to December 1893.

114. The water level in the tank rose higher than it has hitherto done. The highest level of water in the tank was 17·55 feet above the sill of sluice as compared with 17·30 feet in 1892. The tank bed is now becoming staunch.

115. The work of completing preliminary survey of this tank, which was begun last year, has been finished at a cost of Rs. 1,492 against the estimate of Rs. 1,549. The survey shows that the site is favourable for a tank to store 2,845 millions cubic feet of water which represents a run-off of 2·388 inches from the catchment area of 515 square miles.

116. The outlay incurred during the year on repairs to tanks for which only Revenue Accounts are kept was Rs. 1,442.

SA'TA'RA DISTRICT.

117. The rainfall during the monsoon was normal and seasonable and the discharge of the river during the year was sufficient to meet the demands of irrigators.

Rewári Canal. 118. No expenditure has been incurred during the year on this canal chargeable to Capital Account.

119. The canal was maintained and kept in working order during the year under review at a cost of Rs. 955, including Rs. 48 on plantation, against Rs. 1,104-4-0 of the previous year.

120. The most important work carried on was the reconstruction of the slipped portion of the Nehr dam, described in the last year's report. At the beginning of the year the state of the work was :—

- (1) The lower dry stone "revetment (or toe) wall" had been completed.
- (2) The upper dry stone "revetment wall" was not carried out, being considered unnecessary, and the trench excavated for it was refilled.
- (3) A "safety bank" had been constructed on the stable up-stream slope of the dam to M. S. L. 2671·00 (*i.e.* 5 feet above sanctioned F. S. L. or 15 feet above restricted F. S. L. and 8 feet below the top of the main dam).
- (4) A flood embankment had been made across the old river bed about 350 feet below to shut out the waste weir floods from the main dam. A sluice was provided through this to pass off the dam leakage.

(5) Five drainage channels at right angles to the centre line of the dam had been excavated in the slipped portion with their beds at rock level. Dry-stone drains were formed at their bases and the trenches were then refilled. These all worked well.

(6) A channel 10 feet wide and 2,400 feet long had been excavated in the bed of the Yerla to assist in carrying the drainage away from the dam.

121. The reconstruction of the down-stream slope of the dam was then begun on 14th June 1893 and went on satisfactorily till August 10th, when after continuous rain a slight crack appeared running along the junction of the top of the new work with that of the original sound main dam; the crack appeared to be merely on the surface, but as it gradually became more evident, this reconstruction was stopped on August 14th.

122. A revised estimate was then drawn up including a toe load on foot of the down-stream slope to prevent the latter from further sinking, which it was thought would probably be sufficient without going to the great expense of removing all the slipped earth, and work was re-started on January 10th, 1894. The down-stream slope and the toe load were both raised satisfactorily at the same time until January 29th, when a small crack again appeared following the old course, and work was stopped on the following day.

123. It was then decided to dig out the old original crack, a course which the above works were hoped to render unnecessary, and another revised estimate was prepared. This work was started on the 2nd February and has been proceeding satisfactorily.

Theodolite and level observations of the motion of the dam and gaugings of the leakage from it were made.

124. Other minor works in connection with the tank were :

- (1) A service road about 3 miles long from the Sátára-Pandharpur road to the dam.
- (2) A hut for the plantation chaukidár.

The expenditure on all these Capital Account works was Rs. 12,649.

125. The Nehr Tank Right Bank Canal and the two Yerla canals were maintained in good order, the ordinary maintenance charges amounting to Rs. 3,627 against Rs. 4,247 of last year.

Special repairs to Khatgun bungalow were commenced and the expenditure incurred on them was Rs. 418.

126. No works chargeable to Capital Account were executed during the year under report in connection with this system of Upper Mán River Works. canals.

127. The Pingli Tank and canals under this system were maintained in working order during the year at a total cost of Rs. 3,028, including Rs. 171 on plantation and Rs. 132 on special repairs to Upper Mán Canals. The Bidal feed channel was cleared of silt. Special repairs to Gondowli bungalow were commenced.

128. There was no expenditure on the Capital Account of this canal.

129. The maintenance charges amounted to Rs. 1,676, including Rs. 190 on plantation.

130. Rs. 3,550 have been spent on Revenue Account works as under :—

	Rs.
(1) Improving flood channel	1,071
(2) Constructing chankis for Patkaris	292
(3) Diversion of road in connection with Maini Tank	2,187
Total	3,550

131. No works, the expenditure on which is chargeable to the Capital Account of this canal, have been carried out during the year under review.

132. The maintenance charges amounted to Rs. 528, including Rs. 25 on plantation, against Rs. 605-9-9 of the last year.

133. The following works, the expenditure on which is chargeable to the Capital Account, have been executed during the year under report :—
Krishna Canal.

- (1) Stop-gates on Krishna Canal on Nálas 21, 47 and 63.
- (2) Tail outlet, Retre Harnaksh Branch Channel.
- (3) Extension, Burli Branch Channel.
- (4) Tail outlet on do. do.
- (5) Communication drains on do.

The total expenditure incurred on these works amounted to Rs. 4,353.

134. The canal was maintained and kept in working order throughout the year. Special repairs had to be carried out to remedy the damage done to the canal banks, especially from mile No. 23 downwards, by the heavy rains, and outlay also had to be incurred on the removal of sand and silt deposited in the nálas and which block the cross-drainage works of the canal.

135. The maintenance charges amounted to Rs. 6,495, including Rs. 606 on plantation against Rs. 7,717 of the previous year. The expenditure incurred for "executing repairs to the bungalow at Takari" and "special repairs in remedying damages to the canal" has been included in the maintenance charges.

BELGAUM DISTRICT.

136. The description of the Gokák Canal 1st Section and Storage Works was given very fully in the Administration Report for 1891-92, paragraphs 105—108, and need not therefore be repeated here.

137. No damage was done to the improvements made to the front wall of main river gauge notch.

138. The effect of the over-fall is felt on the left flank where the ground slopes rapidly to the bed of the river, and apparently this is the only part of the concrete foundations which will require repairs, as in the other portions the water forms a cushion and saves them.

139. The concrete filling made last year along the foot of the left flank of the weir has withstood the over-fall of water during the last monsoon. Only a few small holes were formed on the surface; these have been repaired during the year. It will be necessary to watch the foundations for a few years more.

140. Compensation for land submerged has been paid off to the extent of Rs. 1,34,028 during the year, the total amount paid from the commencement being Rs. 1,52,072. A few awards amounting to about Rs. 1,215 still remain to be paid.

141. The entire Capital expenditure during the year amounts to Rs. 1,33,875 and from the commencement of the work to Rs. 6,45,928.

142. The charges for maintenance and repairs amounted to Rs. 2,439 against Rs. 2,389 of the last year.

143. The reservoir filled up to level of weir crest and overflowed on the 8th June 1893.

144. The maximum flood occurred on the 7th August 1893, which rose to the reduced level of 2008-20 or 2-20 feet above the weir crest, the discharge being estimated at 35,600 cubic feet per second.

145. The under-sluices were closed on 23rd October 1893.

146. No remarkable floods occurred during the year.

147. The total discharge of the river between the 1st July and the 31st October 1893 inclusive was 73,291 million cubic feet, thus representing a run-off of 29 inches from the catchment,

148. The level of the water with the crest of the weir was maintained till 18th January 1894 on which date it began to fall.

149. A continuous discharge of 47 cubic feet per second was let out to the mills, but as this was found to be insufficient, intermittent discharge was given increasing the day supply to 57 cubic feet a second. This matter, including a proposal to allow the Gokák Mills Company to raise the level of their storage weir is under discussion.

150. Owing to the difficulty experienced in crossing the river Ghatprabha at the Konur ford, a paved crossing has lately been sanctioned by Government and the work was put in hand in February 1894. An expenditure of Rs. 499 has been incurred.

151. It has been proposed to extend the main canal so as to supply water to irrigators of Mallapur and Badigwad beyond Mallapur nála. Plans and estimates will be submitted shortly to Government. This extension will increase the irrigation by about Rs. 900 a year.

152. Surveys for sites for the Durdundi and Taosi Tanks were carried out during the year at a cost of Rs. 583 and 1,249 respectively.

153. The tank subdivision organized last year
2nd Class Revenue Works. has been abolished since the completion of the works.

154. The expenditure on the below-mentioned tanks was :—

Number on List.	Name of Tank.	Village.	OUTLAY.		Total.
			Repair.	Improve-ment.	
			Rs.	Rs.	
1	Dhodkeri	Ambadgatti	3,894	1,101	4,995
7	Hirekeri	Bechinkeri	4,086	390	4,476
11	Hoskeri	Devarsigihalli	1,479	868	2,347
13	Dadunkeri	Do.	1,634	1,143	2,777
10	Komarikeri	Basarkod	2,099	...	2,099
		Total	13,192	3,502	16,694

The repairs and improvements to the above works described in the last report were completed during the year.

155. The survey of the tanks in the Sampgaon Taluka was completed sufficiently to serve as a guide for the Committee which assembled by order of Government.

156. The river gauge at Gurlhosur on the Malprabha river has been maintained.

DHA'RWAR DISTRICT.

Capital Expenditure. 157. There was no expenditure on Capital Account during the year.

158. Of these there are 4:—*Madag and Medleri Tanks*, which are practically entirely new; and *Dámbal and Assundi Tanks*, which are old works enlarged. Under the former two, the land irrigated is assessed at crop rates, and under the latter two, in respect to old irrigation, at consolidated rates, and in respect to new at crop rates. The cost of maintenance of these 4 during the year was Rs. 285 less than during 1892-93, and as the special repair and land compensation charges are not likely to recur, the maintenance, &c., charges will be less.

159. The total sum expended during the year for the repair and improve-
2nd Class Revenue Works. ment of 46 tanks irrigating more than 50 acres was Rs. 30,501 and that for those of 91 tanks irrigating less than 50 acres, Rs. 8,068. Thus the repair and improvement of 137 tanks

was in progress, a very much larger number than has been undertaken during any previous year.

160. The maintenance and repair and the management of water distribution on the Dharma Canal was undertaken at a cost of Rs. 993, much to the satisfaction of the irrigators.

161. The Assundi Tank was dry from the 4th December 1892 until the 19th April 1893, when replenishment commenced.
 Replenishment. All other tanks had a fair supply of water at the commencement of the year, and the replenishment commencing in April and May a good supply was maintained throughout the year, and at the end of March 1894 the water level of all the tanks was about half way between sill level and full supply level.

162. All the possible sites for storage reservoirs on the Kalhalla have been inspected. Two sites are possibly feasible, *viz.*, one at Mavanur and the other opposite the village of Kordikop formerly called the Virapur site. The Mavanur site appears to be the more favourable of the two, principally for the reason that it is more favourably situated in respect to the land to be irrigated.
 Storage site on the Kalhalla.

163. The usual rain gauges were maintained. The rainfall gauged was generally satisfactory throughout the district; the very heavy late rain in November was most useful in replenishing the tanks and furnishing a good supply of water for rabi and garden crops. The Kumadwati river, which is fed by the waste water of the Madag Tank, was gauged as usual.
 Gauges.

RATNA'GIRI DISTRICT.

164. During the year under review only current repairs to the Varad and Pat tanks were executed.

SIND.

BEGA'RI CANALS.

165. Final payments, amounting to Rs. 163, were made for the inverted syphon under the Ahmed Rájwáh completed in the previous year and described in that year's report. The total expenditure has been Rs. 2,153 against an estimated amount of Rs. 2,150.
 Desert Canal (Capital).

166. A full description of the improvements proposed to this canal were given in last year's report. The widening of the main canal up to the point where the Nasirwáh takes off has been nearly completed and silt clearance below that point has been partially effected.
 Unharwáh.

The widening and deepening of the Násir and the extension of its tail into the Sonwáh have been in progress, the latter being nearly completed.

All the masonry works except a road bridge over the "Násir" and the masonry heads to kariahs have been practically completed.

The canal will be ready to be opened by the coming inundation season. The expenditure during the year has been Rs. 1,05,257.

167. As the spill of the Indus over its right bank for a distance of 3 miles north of the 1891 mouth of the canal, when combined with the hill floods, reached the canal and caused heavy silt deposits, a small bund was constructed to stop this overflow; this has been completed at a cost of Rs. 2,289 against an estimated amount of Rs. 2,818.
 Desert Canal: Extending north bank.

168. In the inundation of 1892, owing to erosion of the river bank some 4 to 5 miles north of the 1891 mouth of the canal, a large sand bank was formed opposite the mouth, but having an open channel between it and the canal. This channel in the inundation of 1893, owing to still further erosion, was blocked up and by the 28th August the
 Special Repairs.

canal ceased flowing, a considerable depth of fine sand being also deposited in the 5 miles of this mouth.

As it was considered hopeless to obtain a proper supply from this mouth in the next inundation, preparations were made to clear and extend the original mouth which was in use up to 1886, and also to clear the mouth used from 1887 to 1891. The latter of these will be ready by the beginning of the inundation, and the other soon after. The expenditure has been Rs. 17,826 against an estimated amount of Rs. 86,278,

169. The ordinary maintenance and repairs necessary were carried out and the usual Abkaláni establishment employed. The expenditure under this head is as follows:—

				Rs,	Rs,	
Establishment.	Works	...	...	...	45,228	
	{	Abkaláni	...	...	2,299	
		Revenue	...	...	1,568	
		Works	...	...	1,341	
		Gardens	...	...	88	
				<u>5,296</u>		
Total ...					<u>50,524</u>	

170. The ordinary maintenance and repairs on this canal were executed and the usual Abkaláni establishment entertained, the details being as follows:—

				Rs.	Rs.	
Establishment.	Works	...	...	...	2,993	
	{	Abkaláni	...	...	1,196	
		Revenue	...	...	740	
		Works	...	...	554	
		Gardens	...	...	76	
				<u>2,566</u>		
Total ...					<u>5,559</u>	

171. The canal worked well but the usual complaints of deficiency of water at the tail were received; this will be partially remedied when the Unharwáh is completed and the water formerly given to the Sonwáh (which will then be a branch of the Unharwáh) is available. The ordinary maintenance and repairs were effected and the usual Abkaláni establishment maintained, the expenditure being as follows:—

				Rs.	Rs.	
Establishment.	Works	...	...	...	17,731	
	{	Abkaláni	...	...	2,710	
		Revenue	...	...	2,150	
		Works	...	...	1,476	
		Garden	...	...	82	
				<u>6,418</u>		
Total ...					<u>24,149</u>	

172. The loop in the 7th mile which was begun last year was completed at a total cost of Rs. 8,363 against an estimated amount of Rs. 8,700.

173. The original mouth of this canal having silted up, a new one has been excavated at a cost of Rs. 3,855, the estimated amount being Rs. 4,000.

174. Colonel Home, R. E., Inspector General of Irrigation, inspected the bund in the end of the previous year and made certain suggestions for strengthening the bund; these are being carried out wherever urgently required, and consist of filling in barrow pits in front and rear and constructing a berm in rear of the bund where water collects.

175. The first $4\frac{1}{2}$ miles of the bund, owing to the treacherous nature of the soil, has always given much anxiety; in this portion an inner line of bund at a slightly lower level and divided into compartments is being made; the water will be admitted freely under control into each compartment, and should a leak occur in any portion of the main bund, the water entering the compartment opposite to it will be shut off, until it is made good. The expenditure on both these heads has been Rs. 8,700, the estimated cost being Rs. 50,469.

176. Ordinary repairs were carried out and the usual Abkaláni establishment entertained, the expenditure being as follows:—

		Rs.	Rs.
Establishment.	Works	...	14,631
	Abkaláni	...	11,933
	Revenue	...	380
	Works	...	1,083
	Gardens	...	388
			<u>13,784</u>
Total ...			<u>28,415</u>

Nine small gardens at canal chaukis and one at Badani on the Kashmor Bund were maintained at a cost of Rs. 634.

177. The following is a summary of the entire expenditure during the year in this district:—

		Rs.
New Works, Major—		
	Capital ...	1,05,419
Repairs, Major—		
	Clearance and Repairs	83,778
Establishment.	Abkaláni	6,205
	Revenue	4,458
	Works	3,371
	Gardens...	246
		<u>14,280</u>
Total, Major Works		<u>2,03,477</u>

Minor Works, Kashmor Bund—

		Rs.	Rs.
	New Works	...	7,218
	Repairs	...	23,331
Establishment.	Abkaláni	...	11,933
	Revenue	...	380
	Works	...	1,083
	Gardens	...	388
			<u>13,784</u>
Total, Minor Works		...	<u>44,333</u>
Total, Major and Minor Works		...	2,47,810
Add—Regular Establishment .		...	47,678
Total		...	<u>2,95,488</u>

178. Total cost of work establishment is Rs. 28,064, and the percentage of it of total outlay of Rs. 2,19,746, is Rs. 12·7. If regular establishment is included, the percentage is Rs. 34·9.

SHIKARPUR CANALS.

179. In 1885 this canal was improved, its bed width in the first six miles being increased from 35 to 45 feet, and in the next 6 miles to 40 feet. The average cultivated area for the 3 years previous to these improvements being carried out was 48,187 acres as compared with 66,701 acres during the last three years.

Extensions and improvements—Sind Canal,

The canal is being still further improved, the bed width being increased to 60 feet at its head and to 20 feet at the 30th mile, while two new branches are to be excavated for the irrigation of lands on the left bank, one in the 11th mile, which will have a bottom width of 6 feet at its head and 3 feet at its tail, the length being 10 miles. The other branch will be in the 30th mile with a bed width of 7 feet and length of about 10 miles.

The existing branches, viz., the Mirzawah, the Chota Begari, Rais and Mangirwah, are also to be widened and improved.

Sanction to begin work was received too late in the year to utilize fully the allotment of 1 lakh. Work was confined to the excavation of the two new branches and the improvement of the Mirzawah, the expenditure being Rs. 50,058.

180. Owing to erosion caused by the set of the river against the bund in the 22nd mile, a new loop was rendered necessary; this is 5 miles in length, the top width being 8 feet, and the front and rear slopes being 5 and 2 to 1 respectively. The estimated cost is Rs. 74,033 and the expenditure to end of year Rs. 50,000.

Special repairs, Sukkur-Begari Bund.

Compensation to the extent of Rs. 2,503 was paid in this year for land taken up in 1892 for a new loop to this bund in its 10th mile.

181. Owing to a portion of the bund in the 2nd mile having been cut away by the river, a new loop was necessary; its length is nearly $3\frac{1}{2}$ miles, the top width being 6 feet and front and rear slopes 3 and 2 to 1 respectively. The estimated cost is Rs. 37,398, while the expenditure was Rs. 14,999.

Kasimpur Bund.

182. The ordinary clearance and repairs to all canals and bunds were carried out where necessary. The dhand or channel from the Indus which supplied the principal canals in the Rohri District having formed an escape into the river in Derajat territory through an old kariah called the Muradgah, it was found necessary to close it in order to ensure the supply during the next inundation. The expenditure during the year was Rs. 9,500. The usual Abkalani establishment was maintained.

Maintenance and Repairs.

The outlay on maintenance and repairs was as follows:—

		Rs.	Rs.
Works—			
	Canals...	...	36,643
	River bunds	...	79,145
	Other works	...	1,478
			<hr/> 1,17,266
Establishment	{ Abkalani	...	9,650
	{ Revenue	...	1,555
	{ Works...	...	4,551
			<hr/> 15,756
	Total	...	<hr/> <hr/> 1,33,022

The average expenditure during the three previous years on work establishment was Rs. 16,801 as compared with Rs. 15,756 during the present year.

183. There are no nurseries in this district but some useful work was carried out by sowing the seeds of tamarisk along the toe of the front slope of river bunds, the result being a thick growth of jungle which protects the bund from wash. Rs. 626 was realized during the year from the sale of timber.

Plantation.

184. The work done by the Survey party during the previous year, alluded to in paragraph 21, page 3 of last year's report, was inspected by the Superintending Engineer and some slight alterations in the alignment of embankment for diverting the Bhawalpur flood and also of the proposed new canal were proposed by him. A next expenditure of Rs. 237 was incurred on this head.

185. The following is a summary of the entire expenditure in the district :—

	New Works—		Rs.
	Extensions and Improvements	... ..	50,058
	Repairs—		Rs.
	Canal clearance	... ..	36,643
	Bunds...	... ..	1,478
			<hr/>
			38,121
Establishment	{	Abkaláni	... .. 4,378
		Revenue	... .. 1,197
		Works	... .. 3,537
			<hr/>
			9,112
	Ordinary Agricultural Work—		
	Extensions and Improvements	... ..	2,503
	Repairs —		
	Ordinary	... ..	14,146
	Special	... ..	64,999
			<hr/>
			79,145
Establishment	{	Abkaláni	... .. 5,272
		Revenue	... .. 358
		Works	... .. 1,014
			<hr/>
			6,644
		Total	... 1,85,583
		Add—Surveys	... 237
			<hr/>
		Total	... 1,85,820
		Add—Regular Establishment	... 22,845
			<hr/>
		Total	... 2,08,665

186. The total cost of work establishment was Rs. 15,756 and the percentage of it on a total outlay of Rs. 1,70,064 comes to Rs. 9.2, and if the cost of regular establishment is included the percentage is Rs. 22.69.

GHAR CANALS.

187. The three bridges alluded to in last year's report as having been commenced were completed at a total cost of Rs. 5,148 against an estimated amount of Rs. 5,305, the expenditure during the year being Rs. 3,148.

188. A new regulator of three spans of 5 feet each in width with springing at 12 feet and fitted with cross iron rails and teak needles was constructed over the Mirwah No. 1 in place of the old sluice which was washed away during the inundation. The estimated cost is Rs. 2,774, while the expenditure during the year was Rs. 1,929.

189. A small sluice was completed on the Nekarwah over a kariah called the Sobdarwah at a cost of Rs. 122.

190. A sum of Rs. 1,061 was paid during the year as compensation for land taken up for strengthening the Saidabad bund, a work carried out in 1890-91.

191. All clearance is now carried out according to bed levels, and owing to the thorough clearance carried out the previous year the quantity of silt to be removed this year is considerably reduced; as for instance on the Ghar 74 lakhs had to be removed in 1892-93 against 158 lakhs in 1890-91. Rates are still high, but these are being gradually lowered owing to the local Zamindars being induced to do the work.

192. No breaches occurred during the year in any of the embankments, and the only work done was that of ordinary repairs, the usual Abkláni establishment being maintained. The expenditure under this head was as follow :—

				Rs.	Rs.
Establishment.	Work	...	...	...	65,293
	Abkaláni	...	...	5,531	
	Revenue	...	...	2,177	
	Work ...	...	...	6,699	
	Garden	...	...	859	
				<hr/>	15,266
Agricultural works				...	4,356
Abkaláni				...	2,659
Revenue				...	325
Works				...	994
				<hr/>	3,978
					<hr/>
					8,334
					<hr/>
Total				...	68,893

193. The expenditure on establishment charged to works was Rs. 19,241 as compared with Rs. 20,729 in the previous year.

194. On the Sukkur, Ghar, and Fordwáh canals and on the Ghár bunds 305 tali trees and 30 mango trees were transplanted from the different nurseries. The heavy storms of 27th May and 15th July did a lot of damage to the trees along canals and bunds. The receipts from the sale of timber during the year amounted to Rs. 4,579.

195. The sale of fishing rights on the Sukkur and Ghár canals realized Rs. 2,743 as compared with Rs. 2,146 of the year before.

196. The following is a summary of the entire expenditure in the district :—

<i>New Works.</i>				Rs.	Rs.
Capital and Revenue	...	...	...	5,199	
Ordinary Agricultural	...	...	...	1,061	
				<hr/>	6,260
<i>Repairs.</i>					
Clearance—Capital and Revenue and other					65,293
works	...	...	...
Abkaláni	...	...	...	5,531	
Revenue	...	...	...	2,177	
Works ...	...	...	...	6,699	
Gardens...	...	...	...	859	
				<hr/>	15,266
<i>Agricultural works.</i>					
Repairs to bunds	...	...	...	4,356	
Abkaláni	...	...	...	2,659	
Revenue	...	...	...	325	
Works ...	...	...	...	994	
				<hr/>	3,978
					<hr/>
Regular Establishment				...	95,158
					34,484
					<hr/>
					1,29,637
Contribution				...	246
					<hr/>
Total				...	1,29,883

197. The total cost of work establishment came to Rs. 19,244, which on a total outlay of Rs. 75,909 gives a percentage of Rs. 25.3, and if the regular establishment is included, the percentage comes to Rs. 70.7.

WESTERN NÁRA CANALS.

Extensions and Improve- 198. Under this head Rs. 1,00,985 were expended, ments. the details being as follows.

199. The remaining works on the Pritchard Canal, viz. karia heads and strengthening of the canal banks in places, were completed at a cost of Rs. 2,631.
Pritchard Canal.

200. The canal chauki at head of this canal was carried away early in this season by the erosion of the river, and this continuing to such an extent as to seriously endanger the safety of the regulator at head, it was decided to construct a new one about one mile further back. This will consist of 4 spans of 11 feet each and one of 14 feet, for passage of boats; height to springing will be 15 feet, rise of arch 5 feet and width of roadway 12 feet. The foundations were partly excavated and materials collected, the expenditure being Rs. 5,004.
New regulator to head of Pritchard Canal.

201. The only expenditure on this work during the year was Rs. 10,160 for land compensation, but the actual cost taken here into account of this work is Rs. 6,910, as materials of the value of Rs. 3,250 were transferred and charged against Dhamrao Canal works reported in para. 203 following. The work is still incomplete and is kept in abeyance pending the completion of the Dhamrao Canal which takes off from the Nára just below the junction with it of the feeder.
New feeder to Western Nára.

202. Work commenced on this canal in the end of the previous year was during the year under review pushed on vigorously, but under great difficulties both as regards labour and water. These, however, by careful and well planned arrangements of the officers in charge have been surmounted with the result that the main canal together with five miles of the Gangrout Branch will be ready to be opened by the end of the first week in June.
Dhamrao Canal.

203. All the masonry works will also be completed except two regulators on the Gangrout Branch, one at its head and the other where the Mehar and Nasirabad road crosses it.

The grant for this year was 76,090, but this was subsequently increased to Rs. 84,590, the year's expenditure being Rs. 84,539.

204. This has been rendered necessary owing to the increased supply of water which has of late years entered the canal, and which overflowing its banks flooded the country and endangered the line of railway. The regulator will consist of 2 spans each of 8 feet, height to springing 12 feet, rise of arch 3 feet, and width of roadway 10 feet. Materials were collected and the foundations got in, the expenditure being Rs. 500.
Regulator at head of Marviah.

205. A masonry sluice was constructed at the head of the Sobhnari karia for the purpose of irrigating lands in the Sobrani dhand from the Western Nára. The work was completed at a cost of Rs. 1,299, which amount was met from the Superintending Engineer's discretionary grant.
Karia sluice.

206. The nursery at Bháwalpur was completed, the expenditure being Rs. 102.
Plantations.

Rs. 7,132 were realized by the sale of timber and Rs. 1,461 from produce of trees on canal banks. Several thousands of trees were planted out during the year on the Pritchard Canal and Western Nára.

207. The old embankments of the Western Nára in miles 105 were thrown back. The banks of all canals where breached or damaged by flood water were repaired and strengthened, and the usual clearance and repairs to all canals were carried out.
Maintenance and repairs.

208. The outlay on revenue works under this head was as follows :—

<i>Works.</i>				Rs.	Rs.
Canal clearance	...	...	...	43,621	
Other works	...	...	...	19,854	
				<hr/>	63,475
Abkaláni	...	...	...	8,570	
Work ...	...	...	...	5,989	
Revenue	...	...	...	3,129	
Garden ...	...	...	...	586	
				<hr/>	18,274
					<hr/>
			Total ...		81,749
					<hr/>

209. The repairs to these bunds (called in the last year's report Nára bunds) which were commenced the previous year were completed at a cost of Rs. 23,429.
Extensions and Improvements, River Bunds.

210. The line of bunds from A'bad to Sita, which was badly damaged during the previous year, was repaired and strengthened, as well as repairs to the rest of the bund, at a cost of Rs. 9,130.
Maintenance and Repairs.

211. The usual Abkaláni establishment was maintained but was found inadequate to cope with the high level of water against the bund, and several breaches occurred. Next season the estimate will be increased.

212. The outlay on works under the above two heads was as follows :—

				Rs.	Rs.
Repairs	...	...	...		26,165
Establishment	{	Abkaláni	...	2,643	
		Revenue	...	211	
		Work ...	...	510	
				<hr/>	3,364
			Total ...		29,529
					<hr/>

213. The following is a general summary of the entire expenditure in this district during the year :—

				Rs.
New works	{	Western Nára	...	1,00,985
		River bunds	...	33,429
Repairs	{	Clearance to canals	...	63,475
		Do. to bunds	...	Rs. 26,165
Abkaláni	...	...	...	11,213
Revenue	...	...	...	3,340
Works ...	...	...	...	6,499
Gardens	...	...	...	586
				<hr/>
			Total ...	21,638
				<hr/>
			Total ...	2,45,692
			Regular Establishment ...	37,157
				<hr/>
			Total ...	2,82,849
				<hr/>

214. The total cost of work establishment comes to Rs. 21,638 which gives a percentage on the total outlay, viz. Rs. 2,24,054, of Rs. 9.6 and if regular establishment be included, of Rs. 26.2.

EASTERN NÁRA CANALS.

215. This survey was ordered in Government Resolution No. 146 W. I.—1672 of 22nd October 1892, and had for its object the revision of a project got up in 1873 by Major F. J. Smith, R.E., for the irrigation of a large area of land in the east of the Hyderabad Collectorate and west of the Thar and Párkar District. The Survey party consisted of an Executive Engineer, an Assistant Engineer, one upper and one lower subordinate, and the necessary clerical and menial establishment.

The field work of the Executive Engineer was completed in 1892-93, but the Assistant Engineer and subordinates were surveying in the neighbourhood of Jamrao till May 1893. The plans and estimates prepared by Major Smith were all revised and the canal practically re-designed in the light of modern experience. The project was submitted to the Superintending Engineer early in October 1893, and the special Survey district closed, most of the establishment being transferred to the Nára Supply Channel works.

The total expenditure on the Survey was Rs. 23,355, of which Rs. 7,766 were expended in 1892-93 and Rs. 15,590 in 1893-94. The estimate was exceeded by Rs. 1,918 owing to the work having taken slightly longer than was expected.

216. This work was sanctioned in Government Resolution No. 114 W. I.—1577 of 11th October 1893 and a special district formed to carry it out.

The Nára Supply Channel has its head in the left bank of the Indus just above the town of Rohri. It was constructed in 1858 to afford a certain supply of water to the Eastern Nára Valley. The supply in the cold weather being found insufficient, the channel was deepened $2\frac{1}{2}$ feet in 1884-85. The present deepening is being carried out partly to ensure an ample supply in very low inundations for the existing canals of the Eastern Nára system, and partly to provide an additional supply for the proposed Jamrao Canal.

217. The work may be divided into two parts—(a) the deepening, (b) the necessary alteration to the regulator.

The channel is being deepened $3\frac{1}{2}$ feet below the bed of 1884-85, or to 6 feet below the original level. The reduced level of the new bed at the regulator is 176.32, or $7\frac{1}{2}$ feet below the zero of Bukkur gauge.

The deepening is estimated to cost for works Rs. 2,10,372, the greater part of the expenditure being on rock excavation.

218. The regulator had been strengthened in 1884-85 by extending and raising the cut waters on the up-stream side, and this new work was founded at a sufficiently low level for the additional deepening now being carried out. The old portion of the regulator was founded on rock somewhat below the original bed of the channel, and in 1884-85 the rock between the piers was simply cut away. As it was not considered safe to trust to these natural rock piers for the additional deepening now being carried out, the estimate provides for demolishing the whole of the old work and rebuilding it on foundations set at the proper level. It also provides for lengthening the cut waters $7\frac{1}{2}$ feet to afford sufficient strength to resist the increased pressure of water.

New regulating apparatus also is provided for, the lower 8 feet being closed by wrought iron gates in two leaves, each rolling in a cast-iron groove of its own, while the upper part is to be closed with verticle needles in the ordinary way. As much trouble had been experienced from brushwood becoming entangled in the old regulating apparatus, a "Brushwod catcher" is provided for, consisting of steel wire ropes placed vertically at 9-inch intervals, and held at top and bottom by hooks fixed in wrought iron straining beams.

219. The canal was closed without much difficulty on 16th November 1893, and the person to whom the contract had been given might have commenced work

at once. He, however found it more difficult than he had expected, and refused to go on. After some delay the contracts were given to Tahil and Company of Sukkur, who made a vigorous start on 22nd December 1893, and during the year under report made very good progress. As the water did not flow off so freely below the 4th mile (above which all the rock excavation is situated) as was expected, they hired a portable engine and pump and by their means were able to get out the rock in the 4th mile without any great difficulty. For the work in 1st, 2nd and 3rd miles, they relied on hand labour for removing the water, and this has answered fairly well.

The demolition of the old regulator was found very troublesome as the artificial hydraulic lime mortar made by Mr. Price in 1858 had set nearly as hard as the stone itself. The work however was carried out, the rock excavation under the bridge completed, and the new work started. By the end of the year under report everything, except right abutment and two of the piers, was up to springing. The masonry throughout is of limestone set in Portland-cement mortar, 1 to 2 for the face work and 1 to 4 for the interior.

The wrought iron gates, brushwood catcher and cast-iron grooving have been manufactured in Karáchi.

220. The total estimated cost for work is Rs. 3,22,770, of which Rs. 1,62,154 were expended in the year under report. Executive establishment cost Rs. 13,772 and tools and plant Rs. 1,833.

221. The expenditure on work establishment was Rs. 186. Under this head three maistries were employed on the deepening work and one on the regulator.

222. The improvements of the channel of the Nára between Jatri and Capital, Eastern Nára. Kheti, referred to in last year's report, were completed at a total cost of Rs. 67,790 against an estimate of Rs. 71,373. The expenditure of the year was Rs. 21,280. The Jatri sluice was completed with its flank embankments, and the work of strengthening the bunds between Jatri and Kheti practically completed. The total expenditure on the sluice was Rs. 53,032, showing a saving of Rs. 1,096 on the estimate. It was severely tried during the inundation by being called on to pass a heavy flood while the masonry was still green, and a large hole was scoured in the downstream dry brick pavement. The foundations however were not damaged.

A sluice, with escape channel, in the Pabnai bund and a sluice in the Ghag bund were commenced, the expenditure on them being Rs. 6,199 and Rs. 3,501 against estimate of 17,766 and Rs. 12,453 respectively.

The bund between Bakhora and Bukkur, across the head of the unprotected area was completed: the expenditure of the year was Rs. 5,296, and total expenditure Rs. 19,560, estimate being Rs. 19,920. The construction of an embankment on the right bank of the Nára from Bukkur to Sirevári, and the raising of the banks between Khipra and the Thar Canal, were commenced during the year. The expenditure on the first work was nominal; on the second Rs. 5,016 were spent against an estimate of Rs. 52,534: both were in progress.

223. The usual Abkaláni, revenue, and works establishments were maintained and ordinary repairs carried out at a cost of Eastern Nára, Revenue. Rs. 15,949, and the following special repairs effected. Repairs to Nára bunds Rs. 6,314. Clearance of bed of Nára between Chundawáhi and Puran Rs. 5,057, being a liability of the previous year. Repairs to Jatri sluice Rs. 7,830. Extension of Rata band Rs. 1,454. The total expenditure on maintenance was Rs. 36,604.

224. The alteration to 30th mile regulator, to allow of boats passing, was completed, at a cost of Rs. 2,576, partly debited to Mithrao Canal, Capital. Capital and partly to Revenue. Masonry and iron bridges to replace old trestle bridges in the 14th, 20th, 33rd, 37th and 40th miles were completed and similar works in the 52nd, 57th, 65th, 72nd, 83rd, and 89th miles were in progress. The most important work of the year in connection with the canal was the commencement of the regulator in the Makhi weir, which, with its subsidiary works (embankment and clearance), is intended to secure a

better supply, as year by year the difficulty of keeping the channels through the Makhi Dhand has increased. The combined works are estimated to cost Rs. 52,156, of which Rs. 15,163 were expended during the year. It was found impossible to carry out the foundation as designed owing to the subsoil water. Shallow well foundations have been used for the piers. A revised plan and estimate will shortly be submitted for sanction. These show no excess.

225. Under this head the expenditure was Rs. 31,937, of which Rs. 1,637 were for works of improvement to the 45th mile Mithrao Canal, Revenue. chauki, and the balance on ordinary repairs and the usual garden and maintenance establishment.

Minor canals, Revenue. 226. These canals were maintained at a total expenditure of Rs. 16,898, the works being ordinary.

227. Gardens were maintained at Sindri and Samara at a total cost of Rs. 935, the receipts of the year being Rs. 940. In connection with the Sindri garden, an excess expenditure of Rs. 91 over that sanctioned in Government Resolution No. 10 W. I.—43 of 9th January 1892, was incurred, which the Executive Engineer explains is due to the extra cost of fitting up a Taylor's Patent lift which had been purchased for the Samara garden, but could not be used there.

228. The following is a summary of expenditure in this district :—

				Rs.	
New works—					
Capital expenditure ...	...	...	...	2,98,167	
Revenue do. ...	...	...	...	1,637	
Ordinary agricultural works ...	...	...	...	1,835	Rs.
				<hr/>	3,01,639
Repairs—					
Clearance ...	...	...	...	15,562	
Other works ...	...	...	...	43,604	
				<hr/>	
				59,166	
Maintenance of gardens ...	...	...	...	935	
				<hr/>	
				Rs.	
Establishment—					
Works ...	...	...	...	8,384	
Abkaláni ...	...	...	...	12,877	
Revenue ...	...	...	...	4,027	
				<hr/>	
				25,288	
				<hr/>	85,389
					<hr/>
Add—Regular Establishment charges ...				...	3,87,028
					<hr/>
Total charges under all heads ...				...	4,48,252
					<hr/>

229. The average expenditure of three previous years on establishment charged to the maintenance grant was Rs. 23,069.

HYDERABAD CANALS DISTRICT.

Works for which Capital and Revenue Accounts are kept.

230. There was no Capital expenditure under this head, and under Revenue the works were ordinary. The expenditure was as follows :—

				Rs.	
Works ...	...	...	...	31,751	
				<hr/>	
Establishment—					
Abkaláni ...	...	...	...	2,531	
Revenue ...	...	...	...	1,013	
Works ...	...	...	...	3,514	
				<hr/>	
				7,058	
				<hr/>	38,809
					<hr/>

Works for which only Revenue Accounts are kept.

231. A sluice was constructed at the head of the Dhora Begam on Dambrowah, with a head to regulate the supply and prevent waste at a cost of Rs. 1,482.

A new feeder to the Bhörtiwah, which runs for a considerable part of its length through a forest, had many bad bends and was often choked up by fallen trees, &c., was commenced and will be completed before the inundation. The new cut is 192 chains long, and is estimated to cost Rs. 4,000. The expenditure of the year was Rs. 579.

The cost of the surveys of the Naulákhí, Dád, and Nasrat is debited to this head. They were completed during the year as also a survey of the Gháro Mahmuda. Projects for the improvement of these canals are now before Government. The total cost during the year of the surveys, inclusive of permanent establishment, was Rs. 17,103, of which Rs. 676 were debited to the maintenance grant.

232. The expenditure on maintenance was for ordinary clearance, &c., and establishment, and was divided as follows:—

Works					Rs.
Maintenance of gardens					97,874
					891
Establishment—				Rs.	
Abkaláni				6,913	
Revenue				3,256	
Works				9,835	
					<u>20,004</u>
					<u>1,18,769</u>

233. Two gardens are maintained in this district—one at Bhour, the other at Mithani. The expenditure on them was Rs. 891 and receipts Rs. 274. The expenditure is somewhat less than in 1892-93 and the revenue nearly doubled.

234. Under "Work" establishment proper, as distinguished from that portion of the canal maintenance establishment so called, the expenditure in this district was Rs. 24 only, being the pay of a maistry employed for a short time on the sluice over Begum dhora referred to above.

235. The following is a summary of expenditure under all heads in this district:—

New Works—				Rs.	Rs.
Capital expenditure ... ..				...
Revenue expenditure				2,737	
					<u>2,737</u>
Repairs—					
Clearance				93,988	
Other works				35,637	
					<u>1,29,625</u>
Maintenance of gardens				891	
				Rs.	
Establishment... { Works				13,349	
{ Abkaláni				9,444	
{ Revenue				4,269	
					<u>27,062</u>
					<u>1,57,578</u>
					<u>1,60,315</u>
				Add—Regular Establishment Charges ...	71,413
				Total under all heads ...	<u>2,31,728</u>

236. The average expenditure of three previous years on establishment charged to the maintenance grant in this district was Rs. 25,873.

FULELI CANALS DISTRICT.

237. The regulator at 60th mile, described in last year's report, was completed at a cost of Rs. 58,128 against an estimate of Rs. 58,813. It was not however brought into use in the inundation of 1893 as the new head to the Mulchand, which forms part of the scheme, had not been completed. When this is done, the supply can be regulated and the shortness of water in the Dero-Mohbat Taluka, regarding which complaints are always made when the Fuleli Head Regulator is closed, will be obviated and at the same time flooding in the low-lying districts minimised.

Fuleli Canal, Capital.
Regulator at 60th mile.

238. This work is required in consequence of the construction of the new regulator at 60th mile below which the old head takes off, the supply in which would be unduly reduced when the water is shut off. The whole work is estimated to cost Rs. 69,188, Rs. 50,401 for the new head and Rs. 18,787 for thorough clearance. The proper distribution of the charges against Capital and Revenue respectively is under discussion. In the year under review about 13 lakhs of cubic feet of excavation have been carried out and jungle cleared at a total cost of Rs. 10,385, of which Rs. 9,493 have been debited to Capital.

239. On the eight new buildings mentioned in last year's report, Rs. 476 were expended in making final payment, bringing up the total cost to Rs. 19,653, showing a saving of Rs. 5 on the estimate.

Inspection chaukis.

240. These works are intended to afford a free escape for surplus water when not required for cultivation, especially during rain. They are as follows:—

1. Escape to Sherwah, large.
2. Do. Aliwah, large.
3. Do. Sanhi Guni.
4. Do. Rajwah Kadan.
5. Do. Aliwah, small.

Enlarging and extending the tails of 5 branches of Fuleli.

The first two were practically completed before the inundation, and did good service. The third and fourth were completed after the inundation. It has been proposed that the 5th escape be not constructed and the matter is under consideration. The estimate for the four amounts to Rs. 29,322, of which Rs. 22,493 have been expended, Rs. 17,521 in 1893-94.

Fuleli Canal.
Revenue Accounts.
Extensions and Improvements.

241. Under this head Rs. 19,248 were expended in 1893-94 on works as follows:—

Band from Jamshora to Gidu Bandar.

242. This work, described in last report, was completed at a total cost of Rs. 12,516 against an estimate of Rs. 15,268. The expenditure of the year was Rs. 10,407.

243. This work consists in opening up a long disused portion of the canal with a view to afford a free escape to surplus water. The length improved is about two miles. The earth-work was practically completed during the year. The scheme includes a sluice with two six-foot openings at head of escape. Materials for this were collected and the whole will be ready for use in the coming inundation. Estimate Rs. 3,982, expenditure Rs. 3,720.

Escape to Shadiwah, small.

244. This is a similar work to that described in the preceding para. It is completed and will be brought into use this inundation. Estimate Rs. 3,972, expenditure Rs. 3,902.

Improving the tail of Rajwah Talbar.

245. The two gardens mentioned in last year's report were completed at a total cost of Rs. 1,540 against an estimate of Rs. 1,541. The expenditure on their maintenance was Rs. 448 and

receipts Rs. 10. Much larger receipts may be expected when the gardens are a little older.

246. The works were of the usual character and the ordinary maintenance establishment was employed. Considerable progress was made in forming proper inspection paths along the canal banks. These were much required.

247. The total expenditure on the Fuleli during the year was as follows :—

		Rs.	Rs.
New Works—			
Capital	...	41,579	
Revenue	...	19,248	
		<hr/>	60,827
Repairs—			
Works	...	...	1,27,983
Maintenance of garden	...	...	448
Establishment	{ Abkaláni	5,747	
	{ Revenue	3,002	
	{ Works	9,341	
		<hr/>	18,090
Total		...	<hr/> 2,07,348 <hr/>

248. These consist of the Hájipur and Budka Takar river embankments and some minor canals which have their heads direct from the Indus. No breaches occurred in the river embankments. All these canals ceased to flow when the river fell in August, but fortunately the rise in September saved the crops from the loss which would otherwise have occurred. The total expenditure on maintenance was Rs. 17,278 (Rs. 5,917 on embankment and Rs. 11,361 on canals).

249. In addition to the usual maintenance establishment under this head some maistries, &c., were employed on the new works and special repairs. The total cost was Rs. 1,741 or Rs. 0.96 per cent. on the cost of the works concerned. The percentage on the total irrigation expenditure was only Rs. 0.79.

250. The following is a summary of all irrigation expenditure in this district :—

		Rs.	Rs.	Rs.
New works—				
Capital expenditure	...	...	41,579	
Revenue expenditure	...	...	19,248	
			<hr/>	60,827
Repairs—				
Clearance to canals	...	...	1,05,814	
Repairs to Bunds	...	...	1,757	
Other works	...	...	35,117	
			<hr/>	1,42,688
Maintenance of gardens	...	...	448	
Establishment.	{ Works	10,554		
	{ Abkaláni	6,820		
	{ Revenue	3,289		
			<hr/>	20,663
			<hr/>	1,63,799
Add—Regular Establishment charges			...	47,097
Total under all heads			...	<hr/> 2,71,723 <hr/>

The average expenditure of 3 previous years on establishment charged to the maintenance grant was Rs. 16,983.

KARACHI CANALS.

251. Under this head Rs. 55,442 were expended, of which Rs. 38,297 were on river embankments and Rs. 16,620 on works connected with canals and Rs. 525 on plantations. The following paragraphs give the details :—

252. On the construction of this bund the safety of the cultivation in part of the Mirpur Táluka and nearly the whole of that in the Sujawal Táluka depended. Work which had been commenced late in the previous year was vigorously pushed on during April and May, but unfortunately a sudden and unexpected rise of the river flooded the works before completion and they had to be abandoned after an outlay of Rs. 31,983. All the available labour was then concentrated on an old zamindari bund some two miles farther to the south situated on ground that could only be flooded during the height of the inundation; this was hurriedly repaired at a cost of Rs. 3,885 and successfully kept out last year's floods from the Sujawal Táluka. It has now been adopted as the permanent bund line.

253. Rs. 2,730 was spent on the special repairs of two lengths of these bunds which the owners had allowed to fall into a dangerous state of disrepair. They have been taken over by Government and in future will be maintained as Government bunds. It is most desirable that the rest of the jágghir bunds in the district, some 6½ miles in length, which protect both Government and Jágghir lands, should be taken over by the Irrigation Department, and this is now under consideration.

254. This is a new bund constructed across a narrow but low bit of ground over which for the last few years floods have found their way from the river, submerging a considerable area of cultivation. This overflow has now been stopped at a cost of Rs. 2,856.

255. This is a small sluice of 4 feet width which is being built in the Shah Lanka Bund to supply the forest immediately in rear with water. Expenditure during the year was Rs. 500.

256. The restoration of the old embankments of the Baghar canal was continued in the year under review, the expenditure being Rs. 16,502. The usefulness of this work has been already fully established; for although not by any means complete, there was an increase in revenue this year in the Mirpur Sakro Táluka alone of over Rs. 10,000.

257. The project for the drainage of the remaining low lands in the Sujawal Táluka has now been thoroughly investigated, and certain experimental cuts have been commenced, the expenditure during the year being Rs. 118; these will be completed before the next inundation and their action will be closely watched. When the result is known, a comprehensive scheme for the drainage of all these low lands will be drawn up and submitted to Government.

258. The early part of the year under review was occupied in completing the yearly repairs rendered necessary by the high inundation of 1892. Although the inundation of 1893 was within a few inches of the maximum only, two breaches occurred, one on the right bank and one on the left, the latter being due entirely to erosion.

259. The expenditure on work establishment during the year is Rs. 26,871 compared with Rs. 23,385, the average of three previous years. This increase in cost is due to the extra establishment rendered necessary owing to the increase in height of the flood level of the river in the Delta, and also to the fact that the length of the embankments has increased especially on those canals which have no regulators at head.

260. The two vegetable and nursery gardens, the one on the left bank on the Pinyári at Daro, the other on the right bank on the Baghar at Purijan, which were begun last year, were completed at a cost of Rs. 1,193 and Rs. 1,451 respectively.

261. The following is a general summary of the entire expenditure in the district :—

New works	...	...	...	Rs.	55,442
Repairs—				Rs.	
Clearance to canals	...	...	...	Rs.	19,215
Other works	...	...	...	Rs.	43,668
Repairs to bunds	...	...	...	Rs.	99,345
					<u>1,62,228</u>
Establishment	{	Abkalani	...	Rs.	12,748
	{	Revenue	...	Rs.	5,853
	{	Work	...	Rs.	8,270
	{	Gardens	...	Rs.	950
					<u>27,821</u>
			Total	...	<u>2,45,491</u>
Regular Establishment	...	...	...	Rs.	45,338
Mathematical Instruments and Establishment	...	...	...	Rs.	7,112
			Total	...	<u>2,97,941</u>

262. The total cost of work establishment comes to Rs. 27,821 on an outlay of Rs. 2,17,670, giving a percentage of Rs. 12·7; if regular establishment is added the percentage on outlay will be Rs. 33·6.

APPENDIX A.

Statement showing the entire Expenditure incurred during the financial year 1893-94 on Irrigation Works, Repairs and Establishment, in the Province of Sind.

Service.	Works.	Repairs.	Total.
	Rs.	Rs.	Rs.
PRODUCTIVE PUBLIC WORKS.			
MAJOR WORKS.			
49.—Capital Account.			
Works	4,03,862	.....	4,03,862
Establishment ... ..	.....	.. ..	82,309
Tools and Plant ... ..	.....	.....	3,989
Total ...	4,03,862	.....	4,90,160
42.—Revenue Account.			
Extensions and Improvements... ..	4,460	.....	4,460
Maintenance and Repairs ... ..	.....	1,83,452	1,83,452
Establishment ... ..	.....	.....	31,212
Tools and Plant ... ..	.....	.....	506
Refunds of Revenue ... ..	.....	.....	4,376
Total ...	4,460	1,83,452	2,24,006
43.—IRRIGATION MINOR WORKS AND NAVIGATION.			
WORKS FOR WHICH CAPITAL AND REVENUE ACCOUNTS ARE KEPT.			
Capital Account.			
Works... ..	37,548	.....	37,548
Establishment ... ..	.....	.....	7,306
Tools and Plant ... ..	.....	.....	514
Total ...	37,548	.....	45,368
Revenue Account.			
Extensions and Improvements	29,329	.....	29,329
Maintenance and Repairs ... ..	.....	2,65,038	2,65,038
Establishment ... ..	.....	.....	1,90,071
Tools and Plant ... ..	.....	.....	1,692
Refunds of Revenue ... ..	.....	.....	1
Total ...	29,329	2,65,038	3,96,131
WORKS FOR WHICH ONLY REVENUE ACCOUNTS ARE KEPT.			
Revenue.			
Extensions and Improvements	2,09,218	.....	2,09,218
Maintenance and Repairs ... ..	.....	4,55,667	4,55,667
Establishment ... ..	.....	.....	1,62,044
Tools and Plant ... ..	.....	.....	3,408
Refunds of Revenue ... ..	.....	.....	10
Total ...	2,09,218	4,55,667	8,30,347
WORKS FOR WHICH NEITHER CAPITAL NOR REVENUE ACCOUNTS ARE KEPT.			
Works and Surveys	47,179	.....	47,179
Maintenance and Repairs ... ..	.....	1,60,761	1,60,761
Establishment ... ..	.....	.....	70,992
Tools and Plant ... ..	.....	.....	9,986
Total ...	47,179	1,60,761	2,88,918
DEPOSITS.			
Contributions, Ordinary.			
Works	655	.....	655
Repairs ... ..	.....	1,518	1,518
Establishment ... ..	.....	.....	27
Tools and Plant ... ..	.....	.....	.....
Total ...	655	1,518	2,200
Total under all Heads ...	.....	.....	22,77,130

Note.—Expenditure exclusive of Establishment and Tools and Plant Rs. 18,03,074
 Cost of Establishment and Tools and Plant ,, 4,74,056
 Percentage of Establishment and Tools and Plant on Outlay ,, 26.29

Statement showing in detail Expenditure incurred on Works (Repairs) and Establish

Names of Canals.	CLEARANCE PROPER IN CANALS.		Jungle cutting.	Removing Teodas.	IMPROVING CANAL HEADS.		SIDE SLOPING AND REPAIRING CURVES.		Buildings and Gardens.	Regulators, Bridges and Sluices.	REPAIRS TO CANAL BANKS.		Removing Topsoil and Re-specimen path.
	Cubic feet.	Cost.			Cubic feet.	Cost.	Cubic feet.	Cost.			Cubic feet.	Cost.	
1	2	3	4	5	6	7	8	9	10	11	12	13	14
		Rs.	Rs.	Rs.		Rs.		Rs.	Rs.	Rs.		Rs.	Rs.
Desert Canal ...	8,405,655	53,318	879	460	...	...	...	...	890	418	324,806	1,557	...
Unarwah ...	456,996	1,963	316	...	...	...	...	...	76	86	27,396	169	...
Begari Canal ...	1,892,890	9,190	1,239	190	...	...	...	...	208	2,047	601,011	3,377	...
Kashmor Bund ...	147,677	1,267	1,270	...	...	...	...	...	1,654	849	128,067	676	...
Canals in Rohri ...	2,492,603	12,902	168	935	1,849,020	9,974	...	...	465	93	918,321	4,934	...
Bunds in Rohri ...	...	...	...	...	...	...	...	...	60	...	...	...	...
Sud Canal and Bund ...	815,773	3,760	2	354	...	...	24,227	12	406	265	162,129	801	146
Sukkur-Begari Bund ...	...	...	439	...	...	...	...	...	159	203	...	...	...
Kasimpur Bund ...	...	...	110	...	...	...	...	...	130	300	...	...	...
Ghar Canal ...	6,180,688	28,639	2,096	2,779	...	...	22,302	112	906	1,173	2,142,562	8,651	...
Sukkur Canal ...	767,419	4,740	671	715	...	...	...	...	1,589	3,113	95,691	488	...
Ghar Bunds ...	...	...	421	...	...	...	...	...	3	208	...	...	...
Western Nara ...	3,803,638	14,663	668	1,273	...	...	...	...	2,150	814	8,015,228	12,072	259
Pritchard Canal ...	1,700,799	4,854	283	318	...	...	...	...	230	...	1,179,745	3,865	24
Dadu Canals ...	1,596,869	5,588	221	153	...	...	...	...	170	...	188,241	793	50
Phitta Canal ...	191,882	713	56	43	...	...	1,736	6	...	...	18,732	89	14
Marvi Wah ...	146,180	551	100	242	...	...	...	...	...	...	14,371	61	...
Wahur Wah ...	125,120	500	17	...	...	...	...	...	...	...	...	...	...
Nara Bunds ...	...	...	158	...	...	...	...	80	...	...	...	...	...
Nara Supply Channel ...	...	...	...	...	...	...	...	...	...	86	39,091	205	...
Eastern Nara ...	1,509,993	5,850	370	93	...	...	...	...	98	8,322	228,670	914	...
Mithrao Canal ...	1,428,757	5,903	4,532	41	...	...	...	...	1,417	6,531	865,736	1,637	...
Dijwah ...	Weeds.	334	205	...	...	...	...	...	...	3	...	...	...
Soranwah ...	360,057	1,125	...	...	...	...	...	...	...	...	...	...	...
Krupra Canal ...	Weeds.	547	318	...	...	...	...	...	46	...	175,752	674	...
Mar Canal ...	Weeds.	431,951	1,296	...	...	...	...	...	...	...	...	...	...
Other Canals ...	Weeds.	507	1,833	480	...	...	49,707	137	580	2,105	130,276	436	...
Mohrabwah ...	1,497,655	5,331	141	102	...	...	...	...	...	57	136,799	637	33
Musrat ...	1,211,704	4,262	149	831	...	...	...	...	596	...	578,741	2,418	...
Naolakhi ...	2,602,978	8,297	656	533	...	...	...	...	3	...	313,247	1,248	...
Dambro ...	788,540	3,025	305	116	...	...	...	...	...	...	60,486	242	...
Dad ...	821,085	4,727	522	969	...	...	...	...	524	...	748,093	2,815	...
Renwah ...	1,496,171	6,181	516	910	...	...	...	...	...	37	190,046	780	...
Alibhar Kacheri ...	531,502	1,934	132	487	...	...	...	...	...	...	56,991	108	...
Marak ...	2,108,502	10,702	354	907	6,391	30	...	...	...	...	314,457	1,347	...
Ghro Mahmuda ...	5,748,014	19,466	630	1,772	...	...	...	...	...	...	388,631	1,459	124
Kari Shumali ...	2,202,181	9,791	1,299	2,178	...	...	...	...	...	...	4,309	25	...
Nasirwah ...	1,182,349	5,128	302	176	...	...	...	...	...	...	39,471	135	34
Sarfrazwah ...	1,193,898	4,791	297	1,101	...	...	...	...	...	...	282,151	1,185	...
Other Canals ...	2,812,385	9,760	311	191	4,746	15	...	...	...	...	42,056	150	...
Fuleli Canal ...	27,359,319	99,631	4,790	3,207	...	...	82,119	329	1,507	1,736	2,411,316	9,434	2,727
Other Canals ...	1,902,859	6,182	43	622	...	...	...	...	...	496	...	...	...
Other Canals north of Kotri ...	1,220,308	4,155	11	116	...	...	...	...	...	...	24,271	84	...
Shal ...	206,534	672	10	...	...	...	381	11	...	191	101,660	285	...
Other Canals—Tata, Sakro.	...	...	...	...	...	...	...	...	...	...	...	...	...
Ghorabari ...	595,302	1,824	33	58	...	...	5,860	21	...	51	407,336	1,354	...
Kalri ...	900,439	2,416	73	260	...	...	...	...	...	56	670,584	1,973	...
Baghar ...	605,539	1,906	22	162	...	...	34,913	120	548	...	3,316,165	4,160	...
Ochita ...	150,637	369	...	3	...	...	4,643	16	...	...	...	...	...
Other Canals—Mirpur Batoro.	188,865	548	107	164	261,453	728	13,658	46	...	...	210,949	648	...
Pinyari ...	1,050,837	3,148	680	43	...	...	4,240	12	1,916	2,376	4,133,405	13,577	...
Other Canals—Sujawal	226,686	494	66	39	...	...	...	...	...	...	354,374	996	...
Do. Jati ...	94,000	91	...	...	...	...	...	...	...	...	350,696	883	...
Satah ...	217,680	571	63	...	...	...	...	...	...	...	90,796	307	...
Other Canals—Shahbandar	16,000	34	26	...	...	...	...	...	...	...	358,391	1,010	...
Kantah ...	1,046,630	2,377	64	...	...	...	...	...	...	...	766,191	1,179	...
Kokawari ...	203,000	500	48	65	151,228	476	...	...	...	...	185,589	522	...
Bunds Right Bank ...	...	...	379	...	...	...	...	...	...	4,704	...	...	...
Do. Left do. ...	...	...	882	...	...	...	...	...	...	3,836	...	...	...
Begari Canals ...	10,903,218	65,738	3,704	659	...	...	...	...	2,828	3,400	...	5,669	...
Shikarpur Canals ...	3,308,376	16,662	719	1,289	1,849,020	9,974	24,227	12	1,219	86	1,070,120	6,735	146
Ghar Canals ...	6,948,107	33,379	3,188	3,494	...	...	22,302	112	2,497	4,491	2,237,853	9,139	351
Western Nara ...	6,964,488	26,869	1,503	2,029	...	...	1,736	86	2,550	514	4,410,876	16,751	351
Eastern Nara ...	3,920,758	15,567	720	675	...	...	49,701	137	2,125	17,001	929,426	3,768	...
Hyderabad Canals ...	24,196,931	93,988	5,665	10,271	11,131	45	...	...	1,120	619	3,149,476	12,524	191
Fuleli Canals ...	29,632,777	1,05,814	5,227	3,329	...	...	82,119	329	1,507	2,231	2,411,316	9,434	2,727
Karachi Canals ...	6,692,457	19,215	2,452	910	412,681	1,144	63,695	226	2,464	11,770	10,943,507	27,071	...
Grand Total	92,206,516	3,77,227	29,682	23,096	2,272,832	11,163	1,06,826	878	16,321	40,590	25,162,913	90,090	3,766

B.
ment debitable to the Canal Clearance Grant in 1893-94 in the Province of Sind.

REPAIRS TO RIVER EMBANKMENTS.		IMPROVEMENT TO LOOPS, &c., RIVER EMBANKMENTS.		Protecting slopes of Embankments and Canals.	Miscellaneous.	Contingencies.	Advances.	Abkalmi Extraordinary Expenditure, closing breaches, &c.	Total Works.	ESTABLISHMENT.				Total Works and Establishment.	Remarks.
Cubic feet.	Cost.	Cubic feet.	Cost.							Abkalmi.	Revenue.	Works.	Total.		
15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
	Rs.		Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	
420,601	2,103	...	...	...	335	1,368	...	1,805	63,142	2,299	1,568	1,341	5,208	68,350	
...	...	...	...	...	265	111	...	93	3,069	1,196	740	554	2,419	5,659	
...	...	...	...	...	645	422	...	495	17,813	2,710	2,150	1,476	6,336	24,149	
1,882,092	9,227	...	2,810	...	1,818	708	...	3,540	23,719	11,933	350	1,083	13,996	37,115	
...	...	...	...	302	416	73	...	278	30,570	2,734	758	2,307	5,799	36,369	
246,107	1,418	...	...	...	...	...	...	...	1,478	316	43	84	443	1,921	
...	...	...	...	243	48	61	...	...	6,073	1,328	396	1,146	2,870	8,943	
102,124	760	11,134,114	60,511	44	54	127	...	...	62,296	4,767	270	765	5,842	68,098	
201,157	1,109	2,738,550	14,909	180	21	...	...	...	16,849	505	88	249	842	17,691	
...	...	...	...	...	7,614	196	...	...	52,166	3,408	1,361	4,084	8,853	61,019	
...	...	...	...	...	2,575	95	...	...	13,986	2,123	816	2,615	5,554	19,540	
710,267	3,275	...	...	...	447	2	...	...	4,356	2,659	325	994	3,978	8,334	
...	...	...	...	193	1,607	109	...	6,009	39,817	7,746	2,846	5,354	15,946	55,763	
...	...	...	...	...	456	19	...	3,829	13,898	...	...	...	...	13,898	
...	...	...	...	...	167	11	...	...	7,159	223	108	216	547	7,706	
...	...	...	...	...	150	1	...	177	1,099	298	109	308	715	1,814	
...	...	...	...	...	404	6	...	107	1,471	179	46	54	279	1,750	
...	...	...	...	...	...	57	...	43	617	124	20	57	201	818	
3,210,549	15,493	...	...	2,200	292	96	...	7,846	26,155	2,643	211	510	3,864	29,529	
...	...	...	...	126	102	...	...	...	469	438	171	509	1,118	1,587	
1,685,930	7,197	...	...	...	2,149	...	...	1,358	26,305	6,375	1,537	2,387	10,299	36,604	
...	...	...	...	...	1,701	...	...	480	22,143	3,545	1,263	3,349	8,157	30,300	
...	...	...	...	...	...	...	...	10	1,677	309	119	318	746	2,423	
...	...	...	...	...	78	...	...	...	78	...	...	...	...	78	
...	...	...	...	...	...	...	...	58	2,933	624	144	206	974	3,907	
...	...	...	...	...	407	...	...	11	6,496	1,586	793	1,615	3,994	10,490	
...	...	...	...	...	72	...	...	322	7,211	552	194	463	1,139	8,350	
...	...	...	...	...	88	...	...	418	8,753	475	297	680	1,352	10,105	
...	...	...	...	...	105	...	...	1,513	12,955	900	360	1,192	2,452	15,407	
...	...	...	...	...	22	...	...	10	3,723	430	194	661	1,285	5,008	
...	...	...	...	...	96	...	...	915	10,568	904	305	936	2,145	12,713	
...	...	...	...	...	293	...	...	20	8,753	705	275	1,028	2,008	10,761	
...	...	...	...	...	181	...	...	...	2,892	317	146	494	957	3,849	
...	...	...	...	...	311	...	...	241	13,886	932	455	1,597	3,034	16,920	
...	...	...	...	...	261	...	...	86	23,798	1,557	881	2,285	4,723	28,521	
...	...	...	...	...	160	...	...	42	13,495	855	463	1,450	2,768	16,263	
...	...	...	...	...	351	...	...	...	6,126	624	317	1,199	2,140	8,266	
...	...	...	...	...	191	...	...	196	7,762	620	288	960	1,928	9,690	
...	...	...	...	...	194	...	...	...	10,594	463	164	504	1,131	11,725	
...	...	...	...	833	1,888	209	...	2,140	1,28,431	5,747	3,002	9,311	18,090	1,46,521	
288,561	1,757	...	...	3,301	251	...	...	1,658	14,705	1,073	287	1,213	2,573	17,278	
...	...	...	...	...	127	...	...	...	4,482	204	65	234	503	4,985	
...	...	...	...	...	80	...	700	9	1,961	170	68	201	439	2,400	
...	...	...	...	...	272	...	750	223	4,591	225	84	193	502	5,093	
...	...	...	...	1	229	...	700	118	5,829	625	431	851	1,907	7,736	
...	...	...	...	...	357	...	230	224	7,829	1,658	613	944	3,215	11,044	
...	...	...	...	...	6	...	...	...	394	...	...	...	...	594	
...	...	...	...	...	123	...	...	160	2,519	367	97	244	708	3,227	
...	...	...	...	104	835	...	3,071	132	25,837	2,876	2,337	2,120	7,333	33,170	
...	...	...	...	...	82	...	...	15	1,799	120	27	94	241	2,040	
...	...	...	...	...	27	...	...	30	1,031	...	...	...	...	1,031	
...	...	...	...	...	139	...	...	16	1,058	215	75	213	502	1,560	
...	...	...	...	...	44	...	...	...	1,114	...	...	...	...	1,114	
...	...	...	...	...	74	...	...	...	3,699	281	111	398	790	4,489	
...	...	...	...	...	139	...	...	...	1,690	109	160	60	319	2,009	
11,418,429	14,398	1,987,960	3,941	...	2,070	...	1,550	1,686	28,327	2,447	800	1,563	4,810	33,137	
14,114,595	44,325	2,641,000	16,749	1,591	423	...	3,557	495	71,018	3,451	995	1,156	5,872	76,620	
...	11,330	...	2,810	...	3,063	2,609	...	5,933	1,07,743	18,153	4,833	4,454	27,430	1,35,173	
549,388	3,287	13,872,061	75,510	768	569	161	...	278	1,17,166	9,650	1,555	4,551	15,756	1,33,022	
710,267	3,975	...	...	...	10,636	293	...	...	70,508	8,190	2,502	7,633	18,385	88,893	
3,210,549	15,493	...	...	2,393	3,076	299	...	18,017	50,216	11,213	3,310	6,499	21,052	1,11,278	
1,685,930	7,97	...	...	126	4,437	...	...	1,917	60,101	12,877	4,027	8,384	25,268	85,389	
...	...	...	...	...	2,330	...	...	3,763	1,30,516	9,444	4,269	13,349	27,062	1,57,578	
288,561	1,757	...	...	4,134	2,139	209	...	3,798	1,43,136	6,820	3,229	10,554	20,663	1,63,799	
25,563,024	59,723	4,628,960	50,690	1,699	4,181	...	10,285	2,975	1,63,178	12,748	5,853	8,270	26,871	1,90,049	
32,007,422	1,01,062	18,501,824	99,010	9,120	30,431	3,671	10,285	56,675	8,82,674	89,080	29,673	63,754	1,82,507	10,65,181	

Nāra, not River Indus embankments.

APPENDIX C.

Statement showing the Expenditure incurred on Work Establishment employed in the Deccan Districts during the year 1893-94, and the percentage it bears to the Outlay on Works and Repairs proper.

No.	Name of Sub-division or District.	OUTLAY ON						Total Contract and Departmental Columns 5 and 8.	COST OF WORK ESTABLISHMENT SANCTIONED BY			Percentage (column 12 bears to column 9).	REMARKS.
		By Contract.			By Departmental Agency.				Chief or Superintending Engineer.	Executive Engineer.	Total.		
		Original Works, including additions and alterations and improvements, and extensions.	Repairs.	Total.	Original Works, including additions and alterations and improvements, and extensions.	Repairs.	Total.						
1	2	3	4	5	6	7	8	9	10	11	12	13	14
		Rs.		Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	
1	Mutha Canals ...	68,387	...	68,387	28,534	10,415	38,949	1,07,336	2,217	6,903	9,120	} 10-13	
2	Poona Water Supply...	9,051	9,051	9,051	611	2,061	2,672		
3	Nira Canal ...	66,589	...	66,589	26,207	16,475	42,682	1,09,271	2,574	9,255	11,829	10-82	
4	Other Poona Irrigation Works ...	5,735	...	5,735	2,070	1,518	3,588	9,323	555	1,791	2,346	25-26	
5	Sholapur Irrigation Works ...	...	...	...	13,442	14,234	27,676	27,676	1,405	1,073	2,478	8-95	
6	Ahmednagar Irrigation Works ...	...	...	...	293	4,393	4,100	4,100	541	2,192	2,733	66-65	
7	Násik Irrigation Works ...	1,456	...	1,456	5,457	2,964	8,421	9,877	...	1,134	1,134	11-48	
8	Khándesh Irrigation Works ...	...	...	...	21,999	9,147	31,146	31,146	1,988	2,743	4,731	15-00	
9	Hubli Water Works ...	...	...	...	81,693	71	81,764	81,764	460	1,830	2,290	2-80	
10	Dhárwár Irrigation Works ...	...	...	...	10,677	26,535	37,212	37,212	1,047	1,245	2,292	6-16	
	Total ...	1,42,167	...	1,42,167	1,89,786	94,803	2,84,589	4,26,756	11,398	30,227	41,625	9-75	

Extract paragraphs 2—4 of letter No. 171, dated 23rd January 1894, from the Executive Engineer, Nira Canal, furnishing information concerning the run-off from the catchment of the Bhatghar Tank.

2. The first important rise in the tank took place on the 18th June 1893, when 4 under-slucices were opened and remaining 11 sluices were opened on the 19th. They were closed again on the 12th August when the water-level was only 6.60 feet over the sill.

3. The tank filled in 23 days, and the water flowed over the weir on the 4th September. This flow continued until the morning of the 3rd November. The volume of the run-off from the catchment area, viz., 128 square miles is therefore, given by the sum of the three items :—

	Cubic feet.
(a) Volume passed through under-slucices during the monsoon from 18th June till 11th August, both included	28,181,493,776
(b) Volume of tank between 6.60 and 75 feet (crest of weir) (the deduction due to 6.6 feet at the bottom is negligible)	3,807,691,915
(c) Volume discharged from date of filling 4th September up to date of overflow ceasing 3rd November	6,198,399,061
Total ...	<u>38,187,584,752</u>

This figure gives a total run-off of $10\frac{2}{3}$ feet on the catchment area, which is mostly subject to the heavy rainfall of the Gháts.

4. The only flood worth mentioning was a small one which on the 5th August attained its maximum height of 34.20 feet, while 14 under-slucices were open. There were no floods worth recording after the closure of the sluices.

Statement showing the Results of Run-off from Catchment Areas of Tanks in the Deccan for the year 1893.

District.	Name of Tank.	Year.	Area of Catchment, Square Miles.	Rainfall in Inches.	Supply due to Rainfall, millions of Cubic Feet.	Actual Run-off, millions of Cubic Feet.	Proportion of Run-off to Rainfall, Column 7 divided by Column 6.	REMARKS.
1	2	3	4	5	6	7	8	9
Khándesh ...	Mukti Tank ...	1893	34.2	8.88	705.54	84.42	.119	Rainfall from 17th June 1893 when the tank commenced filling to 2nd September 1893, when it reached its highest water-level for the year. The tank did not fill up to waste level in the year.
	Mhasva Tank ...	Do.	13.4	18.88	587.75	85.82	.146	Tank was at its lowest water-level on 27th May 1893 and filled up to waste weir on 23th August 1893. Rainfall taken between these dates.
	Hartála Tank ...	Do.	6.8	23.23	366.98	89.24	.243	Tank at its lowest capacity on 14th June 1893 and filled up to overflowing on 23th August 1893. Rainfall taken between these dates.
Abmednagar ...	Bhatodi Tank ...	Do.	44.00	7.47	763.59	50.680	0.066	Rainfall from 23th May when there was first replenishment to 19th June when the tank filled up to crest of waste weir.
	Pársul Tank ...	Do.	17.75	11.19	461.43	73.69	.159	Tank was at its lowest level on 29th May 1893 and filled up to overflowing on 26th June 1893. Rainfall taken between these dates.
Násik ...	Wághad Tank ...	Do.	29.00	56.73	3,822	3,675		Rainfall for 4 months from June to September. Tank filled on 18th June 1893. * The waste discharge from this tank being through a channel of irregular section, no reliable figures of discharge can be obtained. The proportion of run-off to rainfall in the calculation of which the waste discharge is in this case a prime factor cannot therefore be at all accurate. The proportion as calculated is 0.96, but this figure must be taken merely for purposes of comparison with recorded proportions in other years which were based on similar calculations.

Poona ...	{	Shirsuphal Tank ...	Do. ...	23.5	10.83	591.26	313.21	.529	} Rainfall from 1st June 1893 to 31st October 1893. The tanks did not overflow this year.
		Bhádálwádi Tank ...	Do. ...	23.0	10.48	559.98	183.48	.327	
Sholápur ...	{	Mhasvad Tank ...	Do. ...	480.00	16.77	18,700.83	1,445.99	0.077	Rainfall from June to October 1893. The tank filled on 24th July 1893, the run-off to that date being 0.131.
		Ekruk Tank ...	Do. ...	159.00	29.22	10,793.54	2,121.02	0.196	Rainfall from June to October 1893. The tank filled on 12th October, the run-off to that date being 0.19.
		Ashti Tank ...	Do. ...	92.00	22.35	4,776.96	842.13	0.176	Rainfall from June to October 1893. The cut in the waste weir overflowed on 16th June, the run-off to that date being 0.79.
		Koregaon Tank ...	Do. ...	4.40	18.50	189.10	74.80	0.396	Rainfall from June to October 1893. The tank filled on the 9th October, the run-off to that date being 0.458.
Belgaum ...	...	Gokák Canal Storage Reservoir.	Do. ...	1,080	21.46	53,844	98,617	...	Rainfall from 1st June to end of October 1893. The rainfall was gauged at the weir. The river has a ghat catchment and the rainfall at its source is much heavier than at the weir. The actual run-off gauged at 39 inches is nearly twice the rainfall gauged at the weir.
Dhárwár ...	{	Asundi ...	Do. ...	23	19.42	1,037.680	91.966	0.089	Rainfall from 1st June to end of October 1893. The tank did not fill.
		Medleri ...	Do. ...	11	12.50	319.440	42.863	0.134	Do. do.
		Dámbal ...	Do. ...	43	17.88	1,786.169	160.008	0.09	Do. Tank overflowed from 10th to 12th June 1893 and run-off is 0.008.
Bijápur ...	..	Muchkundi Tank ...	Do. ...	26	19.50	1,177.862	247.777	0.210	Rainfall from 1st June to end of October. The tank did not fill.
Sátára ...	{	Nehr Tank ...	Do. ...	59.50	21.53	2,976.10	730.00	0.245	The run-off is calculated from 1st June to 6th October. The tank filled on the latter date.
		Maini ...	Do. ...	59.50	25.69	3,551.14	860.00	0.242	The run-off is calculated from 1st June to 31st October 1893.
			Do. ...	54.00	15.41	1,933.23	219.41	0.113	Do. do.