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ADMINISTRATION REPORT

PUBLIC WORKS DEPARTMENT,

(IRRIGATION)

BOMBAY PRESIDENCY,

FOR THE YEAR

1898-99.

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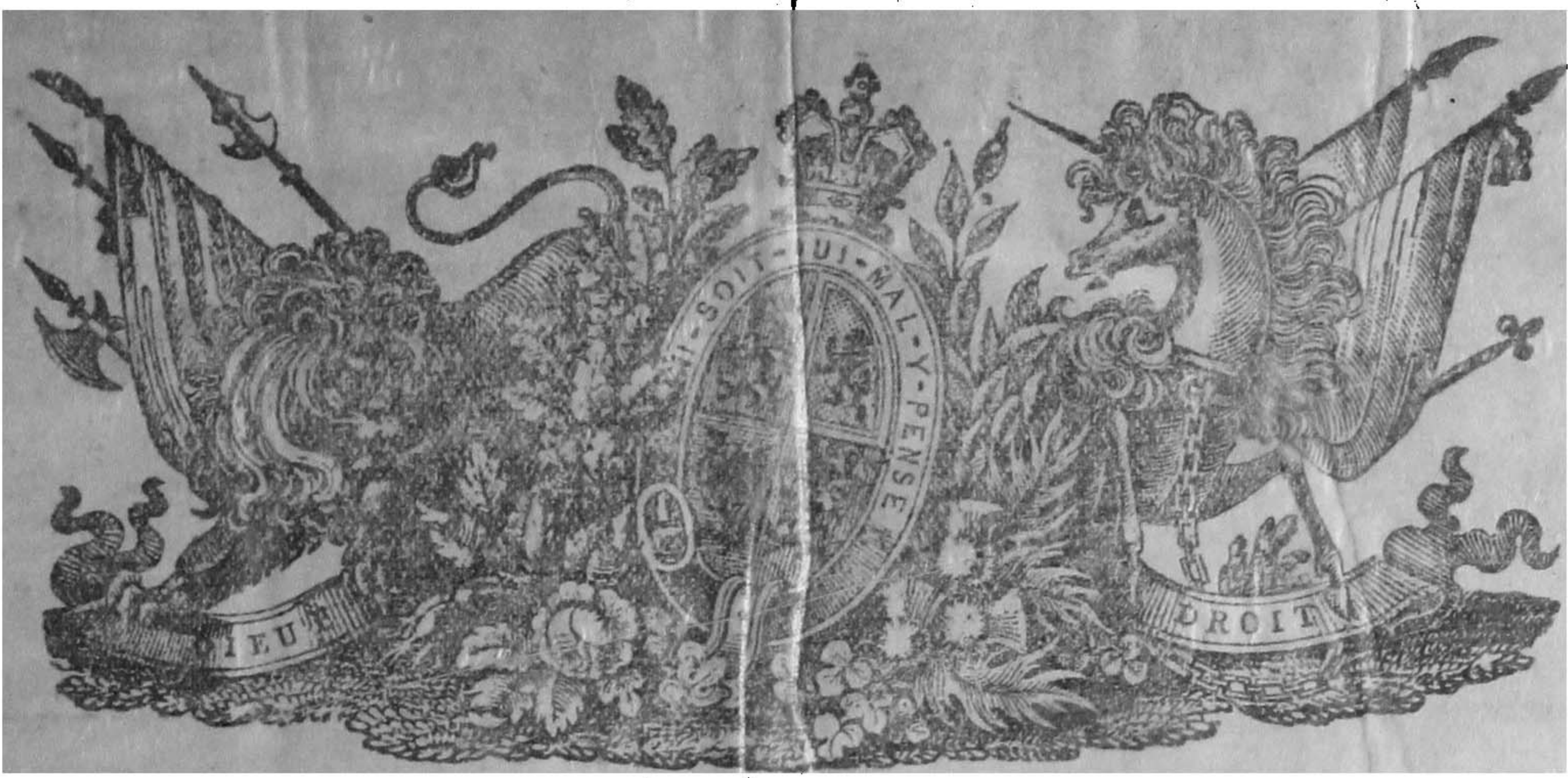
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Bombay:
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ADMINISTRATION REPORT
OF THE
PUBLIC WORKS DEPARTMENT
(IRRIGATION),
BOMBAY PRESIDENCY,
FOR THE YEAR 1898-99.

GENERAL REMARKS.

In the year under report the expenditure on irrigation works throughout the Presidency amounted to 42 lakhs as compared with 44½ lakhs in the previous year. This outlay was divided between Sind and the Presidency proper in the proportion of 6 to 1 respectively.

2. Of the total outlay, Rs. 11,97,026 were expended on Repairs in Sind and Rs. 2,14,278 in the Deccan and Gujarát.

DECCAN AND GUJARÁT.

3. The principal works in progress in the Central Division were the Mutha and the Nira Canals.

4. In connection with the Mutha Canals, the expenditure was principally on altering and improving the lower service mains of the Poona water-supply, on constructing Canal boundary wall at Karakwála and providing valves with locking arrangements to pipe outlets for distributaries, &c.

5. The expenditure on this work was chiefly on the extension of the third training wall below the north waste weir.

6. The under-sluices were opened for the monsoon on June 15th and closed on 10th August. The automatic gates were tested under full head of 8 feet on October 10th and worked very satisfactorily.

7. The only works in the Southern Division on which outlay under the head "Capital" was incurred during the year were:—

(1) The Yerla River Irrigation Works.

(2) The Gokak Canal (1st Section) and Storage Works.

8. In connection with the Yerla River System, a berm was constructed in rear of Nehr Dam in the river portion as a precautionary measure, a slight slip having occurred in the new work. The work was taken in hand and completed during the year at a total cost of Rs. 4,261 against the estimate of Rs. 4,263.

9. On the Gokak Canal the capital expenditure during the year was Rs. 41,614 mainly on account of land compensation.

10. In the Ahmedabad District irrigation has hitherto been much restricted on the Khari Cut owing to deficiency of water in the river. The supplementing of this by a supply from the Hathmati, through a large reservoir on the Bokh, has been under consideration for many years. But, as the cost of the project is heavy, Government have lately sanctioned an alternative proposal to bring the Hathmati water into the Khari through the Bhujwa Nulla and it is hoped it will be possible to have the scheme in working order before the kharif season of 1899-1900.

11. In pursuance of the policy of Government in connection with the treatment of irrigation tanks, large and small, in Gujarát and the Southern Marátha Country, expenditure on repairs and improvements was incurred as noted below :—

District.	No. of Tanks.	Expenditure during 1898-99.
		Rs.
Ahmedabad District ...	5	3,257
Surat and Broach District...	19	10,258
Belgaum District ...	12	10,980
Dhárwár District ...	39	33,000
Total ...	75	57,495

12. On April 1st 1898 the water in Lake Fife was 19.92 feet above the sill of canal sluices and the minimum level was reached on 9th June when the depth was 10.44 feet. On the 10th the lake began to rise and it filled to overflowing on the 17th. The highest flood of the year occurred on 19th July, when the water rose to R. L. 247.00 or 3.68 feet above crest of waste weir.

13. On the Vir weir the highest flood occurred on the 17th June, when the water was 5 feet over the crest of the weir. This is very small when compared with the maximum height 8½ feet of 1896.

14. In the Poona District work on the Shetphal Tank was reopened on the 20th March 1898 as a test work and continued till October. The expenditure principally on embankment and puddle trench filling was Rs. 20,293 and the greatest number of persons employed at one time was 1,871.

15. The Pathri and Mangi Tanks in the Sholápur District described in the previous year's report were in progress during the year under review as relief works up to 28th September 1898. The expenditure on them during the year and the highest number of people employed thereon were :—

	Expenditure.	No. of people employed.
Pathri Tank ...	91,205	7,398 on 28th June 1898.
Mangi Tank ...	72,694	9,236 on 3rd September 1898.

16. The total area irrigated from all works during the year was 102,091 acres and compares with the previous five years as follows :—

Years.	Area irrigated.	Rainfall
	Acres.	Inches.
1893-94 ...	78,188	21.62
1894-95 ...	82,475	22.88
1895-96 ...	73,159	24.48
1896-97 ...	116,252	21.63
1897-98 ...	124,851	23.49
1898-99 ...	102,091	22.25

Area irrigated and assessment.

17. The following table shows the area irrigated and water-rate assessment for each work during the year:—

Serial No.	Name of Work.	Area irrigated.	Assessment.
		Acres.	Rs.
1	Háthrafi Canal	4,280	11,414
2	Khári Cut	2,805	19,080
3	Hartála Tank	31	54
4	Mukti Tank	1,831	4,952
5	Mhasva Tank	219	527
6	Jámda Canals	2,586	7,959
7	Parsul Tank	550	2,286
8	Páikbed Canal	1,863	8,594
9	Wadáli Canal	341	1,187
10	Ojhar Támbat Canal	455	2,238
11	Ojhar Canal	5,472	12,508
12	Lákh Canal	979	1,953
13	Bhátodi Tank	743	2,628
14	Mutha Canals	8,045	1,35,502
15	Matoba Tank	2,139	12,442
16	Kásurdi Tank	189	852
17	Shirsuphal Tank	1,190	3,261
18	Bhádalvadi Tank	1,808	4,052
19	Nira Canal	34,360	1,11,845
20	Koregaon Tank	247	511
21	Ekrak Tank	3,884	14,038
22	Ashti Tank	1,316	3,360
23	Mhasvad Tank	6,101	18,177
24	Muchkundi Tank	4	24
25	Krishna Canal	3,970	44,797
26	Yerla River Irrigation Works	3,859	12,070
27	Upper Mán River Works	1,570	5,148
28	Rewári Canal	1,567	8,207
29	Maini Tank	1,551	4,302
30	Chikhli Canal	468	2,424
31	Gokák Canal	6,455	20,143
32	Madag Tank	833	1,854
33	Medleri Tank	99	723
34	Dámbal Tank	171	362
35	Asundi Tank	130	576
	Total	102,001	4,80,231

18. The total assessments amount to Rs. 4,80,231, and thus show a decrease of Rs. 13,096 or 2.65 per cent. below those of 1897-98, the decrease in the area irrigated being 22,760 acres.

Results of run-off. 19. A statement showing the results of run-off from the catchment areas of tanks for 1898 is appended.

SIND.

20. The inundation of 1898 may be classed as 'fair' owing to the fact that a sufficient and fairly steady level was maintained in August and the greater part of September, and that, although the river at Bukkur was abnormally low, at Kotri it remained over the fair irrigating level of 17 feet for an average number of days. The gauge record of the year is a remarkable one. Not since 1869 has the river at Bukkur been so low, and on only 5 days did it rise to 13 feet and over. At Kotri, however, the stage of 17 feet on the gauge was reached and exceeded on 48 days.

21. The river was late in rising. During May the greatest height reached was 7.90 feet on the 15th, after which date it fell rapidly until June 3rd, when the gauge registered only 4.10 feet. It rose again from that date until the 22nd when 11.80 feet

was recorded, and again fell to 10·40 feet by the 27th and was at that level on the 30th. There were considerable fluctuations in July, and 13·0 feet was reached for the first time on the 17th of that month, the lowest reading being 10·0 feet on the 25th. The maximum of the year, 13·40 feet, was recorded on the 18th July. August commenced with a reading of 13·0 feet on the 1st, the last date on which this height was registered, but a fairly steady level was maintained throughout the month, and it was not until the 16th September that 10·0 feet was again recorded. The 20th September showed 10·30 feet, but after that the fall was rapid and continuous, 5·90 feet being the reading on the 30th of the month.

22. At Kotri the highest reading in May was 11'·8" on the 18th, and from that date there was a steady fall to 8'·0" on the 6th and 7th June. Rising again, 16'·2" was attained on the 24th June, and, after again falling a foot, the 'fair' irrigating level was at last reached on the 9th July when the gauge recorded 17'·4". During July, however, the 17 feet reading was exceeded on 11 days only, but August and September were more favourable, as from 1st August to 13th September the river was below 17 feet for 7 days only, the highest reading being 18'·0" on the 9th and 10th August. After 13th September the river did not again reach 17 feet, but it continued over 15 feet to the 23rd, and on the 30th September stood at 11'·0".

23. Arrangements have been made to record the readings at Kotri for the future in feet and decimals as is done at Bukkur.

24. A comparison of the water-supply this year with that of each year since 1863, that is since regular readings of the Kotri gauge are available, is of interest, and is here given.

Years,	Bukkur, 13' and over.	Kotri, 17' and over.
1863	...	37
1864	8	17
1865	16	...
1866	40	22
1867	...	...
1868	...	...
1869	2	...
1870	17	7
1871	17	8
1872	12	35
1873	17	3
1874	62	57
1875	61	15
1876	62	43
1877	15	...
1878	93	79
1879	68	40
1880	46	8
1881	41	10
1882	79	63
1883	81	14
1884	53	41
1885	58	64
1886	54	73
1887	44	36
1888	30	24
1889	76	66
1890	37	37
1891	30	45
1892	38	41
1893	44	50
1894	80	87
1895	25	27
1896	49	59
1897	57	70
1898	5	48

25. The revenue figures for 1898 are not likely to reach the exceptional totals of 1897, but it is expected that they will, on the whole, be average. Rainfall was slight but opportune, and assisted the crops at a time when the canals were low.

26. The supply to most of the canals in the Begári Canals District was good, except that owing to the low inundation, cultivation on the high lands generally suffered. There was, however, a deficiency in the Toj and Kandkot branches of the Desert Canal and the tails of the Unharwah and Nasirwah. The Káshmor Bund gave little or no trouble, and although a few leaks occurred in the first 14 miles they were not of a serious nature and were closed without difficulty. The river itself is now such a long way off from the first section of the bund that no immediate danger from erosion is anywhere possible. The Wadhu Dhand, however, has greatly eroded its bed and sides and is some two or three feet deeper near the Unharwah mouth and threatens to erode right up to the Unharwah Head Regulator. Steps have been taken to try and prevent this, which, it is hoped, will be successful. Near the Loop Bund the river is cutting in towards the Desert Canal mouth and may eventually work into the Dambo dhora (Massawalla Dhand). The Shore Nai floods touched the bund on eight occasions and caused one or two small leaks.

27. In the Shikárpur Canals District the supply to the canals was good, considering the inundation, except in the case of the Sind Sanhari, a branch of the Sind Canal, where flow supply could not be obtained.

28. There was no pressure against the Sukkur Begári and Kasimpur Rohri Bunds, except in a portion of the former called "Retired Bund", where although the reading at Bukkur gauge was 4.5 feet less than in the previous year, the depth of water against the bund was only from 6" to 9" less than in 1897. This is due to the fact that the set of the river opposite the Sukkur Begári Bund was throughout along the right bank, and the river has approached the bund very considerably opposite to miles 24 and 12 where new loops are proposed. Above the Begári mouth the set of the river was very strong along its left bank at the mouth of the Kadirpur Dhand (feeder to Dengrowah). No floods from the Bhawalpur State entered British territory, and local floods did not take place. Only some "Gahs" (low channels in the country subject to floods) flowed for some days, and but little rabi has been sown in Ubaoro, Mirpur and Ghotki Talukas.

29. The inundation being a low one, there was a deficiency of water in the upper part of the Ghár and at the tails of the branch canals; otherwise the supply was sufficient. There was no rain to assist the deficiency, but owing to an entire immunity from locusts, insects and blight the yield is said to be a good one, and above the average. The erosion at the Ghár mouth continued, but the silt deposit at the mouth was not so great at the end of the season as in the previous year. The Fordwah was opened early in the season to assist the Ghár. Erosion is taking place at its mouth, the dhand supplying it having been cut into, and the river in front of it is only 1,035 feet from the old regulator.

By judicious working of the two heads of the Sukkur Canal, the supply during the kharif season was kept steady and prolonged, and the lands on the first 60 miles of the Sukkur Canal and the first 9 and 12 miles of the Kurs Khairo and Biro were flooded for rabi. Owing however to the low inundation, the rabi crop failed, except in the first 24 miles, which were supplied from the river. The outturn of kharif was good, there having been no damage from locusts, &c. The river bunds gave very little trouble, as owing to the low inundation water reached them in a few places only.

30. Considering the lowness of the inundation, the canals in the Western Nára District may be said to have worked fairly well. The falling off in areas under cultivation along the Nára itself will be large, but along Government Branch Canals not very great. The greatest falling off will be in the area under rabi. There was practically no rain to assist crops and no hill floods. With the low inundation floods were not general and only entered through low lands.

The bunds therefore gave very little trouble, there being no breaches and no leaks. The portions of bunds in which sand trenches were made had not sufficient water against them to test their stability. During the cold weather erosion had continued slightly opposite the Abad Bund; it was severe opposite the mouth of the new feeder and slight elsewhere. A great change has occurred in the river opposite Rukkan village, and another is anticipated opposite the Abad Bund near the mouth of the Nára by which it is expected that the Abad Bund will be free from danger of erosion.

31. Although the inundation was only a fair one, still, owing to its being fairly steady and continued towards the end of September, it was on the whole a very good one for the lower lands in the Karáchi Canals District. The canals may generally be said to have worked well, but the new Laikpur Canal did not work so satisfactorily as in the previous year. Owing to the lowness of the river there was no great depth of water at any place along the extensive line of river embankments in this district and certain sections were not even wetted. None of the loops constructed in the previous working season were severely tested. No great erosion or change of course of the river has occurred except opposite the 10th mile of the Kokawari Bund. Here a small loop was constructed between July 12th and August 4th, and the old bund was eaten away on the 22nd August. There was slight erosion at the mouths of the Mirwah old and Ghár Marho Canals.

32. In the Left Bank Division the only breach of any consequence that occurred was on the Mirwah Talhar *ex Fuleli*. It was open for fourteen days and necessitated an expenditure of Rs. 2,400 to close it. Other breaches in this Division were unimportant and were promptly closed without damage.

33. In the Northern Hyderabad Canals District the river continued to set very decidedly on the Left Bank and eroded the mouths of the Naolákhí, Bhur (large) Dad and Gharo Alibahar Myle. The Mirwah Sehro, which runs a little north of the Dad, was completely cut through some miles below its mouth, and both the old and new mouths of the Gharo Alibahar Myle have almost entirely disappeared. This action of the river injuriously affected the supply to some of the canals while the fluctuations of level during the height of the season acted prejudicially on the smaller canals which occasionally stopped flowing altogether.

34. The Mehrabwah worked fairly well, but its supply is never satisfactory. The supply in the Nasrat was good, the recent improvement in the mouth of its principal branch, the Fatima, having had a good effect. The Naolákhí, notwithstanding the erosion of its mouth, had a fairly good supply, but the Dad was seriously affected by the erosion of the river bank which brought large quantities of silt into its mouth. The supply at the commencement of the season was very deficient and some of the branches entirely ceased to flow. Matters improved later on, but the area under kharif was, it is understood, much less than usual, and very little rabi was sown. The Renwah worked very satisfactorily and the main canal was running late in November.

35. All the canals in the Central Hyderabad Canals District received a good supply and worked well. Crops were good throughout the district and no remissions are expected.

36. The Fuleli flowed for nine months and the supply was fairly good, assisted as it was by the attention paid to regulation and a rough system of rotation. The tails of some of the canals suffered from deficient supply, but in other parts crops were good. The supply to the canals fed from the old Fuleli was kept up by the closure of the Nareja Regulator for the greater part of the season and no deficiency was felt. Forty-four breaches in all occurred on the Fuleli and branches, but the only one of any importance was that on the Mirwah Talhar mentioned above.

37. Of the river bunds in the Fuleli District the Jamshora, the Gidu Bunder, and the Hájipur Bunds were seriously threatened by the erosion caused by the set of the river on to that side, but no damage was done. Loops have been or are being constructed where necessary.

33. No flood water entered the Nára Supply Channel during the inundation season, but the Eastern Nára District received a sufficient supply throughout. The only accidents were a breach in the Makhi Bund and one in the Bakhora-Bakar Bund. The former was useful as an escape, and failing it, a cut would probably have been necessary. It is satisfactory to know that the revenue returns in this district are likely to be at least equal to, and on the Mitrao Canal probably in excess of, those of 1897.

39. The principal works in progress in the Indus Right Bank Division were the construction of the Dhámrao, the Rajwah and the Lakpur Canals, the improvements to the Rajib, Chitti and Garang in the Shikárpur Canals District, and the Masaharwah in the Western Nára District, a supplementary feeder to the Ghár Canal near Phulpotra, the works in connection with the new loop Káshmor Bund, improvements to the Mulchand Sháhbander Bunds and a new loop 6 miles 6 furlongs to the Sukku-Begári Bund.

40. The principal works in progress in the Left Bank Division during the year were the Jamrao Canal, the improvements to the Dadwah, and the Escape for the Fuleli.

41. The Jamrao Canal made most satisfactory progress. In the first district the head works were practically completed by the end of the year, a feature of the operations being the successful closing of the Right Downstream Training Bank across the main stream of the Nára, which is fully described in the district report. The portion of the main canal which is included in this district was completed during the year as was the Notch Fall at $7\frac{1}{4}$ miles which had made good progress during the year preceding. The Jam Sahib Minor was commenced and was well advanced at the close of the year.

42. In the Second District the main canal and west branch excavation approaches completion, all the regulators and bridges have been constructed, and work on the various "Minors" is in active progress.

43. The Third District was organised as a separate executive charge late in the year. A large amount of survey work was undertaken for the alignment of the "Minors," the detailed projects for which are now under consideration; the earth-work of the main canal made good progress, and materials were collected for some of the masonry works. The excavation of the west branch from mile 17 onwards was commenced, and a start was made with the diversion of the Sangrowah, on a portion of which the Sind convict gang is now employed.

44. In connection with the "square" survey of the land, and the scheme for colonizing the waste areas commanded by the Jamrao Canal, the laying down of the base line squares was completed in the first and in most of the second district; a Colonization Officer was appointed by Government, the dividing up of the large squares into holdings was commenced by the establishment under that officer, and a close contour survey, on which the alignment of the water-courses will be based, was started by this Department and made fair progress.

45. Difficulties in the carrying out of the scheme as originally contemplated were encountered soon after the Colonization Officer commenced work and certain proposals have been submitted to Government. Meanwhile work is proceeding which will enable the demarcation of new villages and the alignment of water-courses to be commenced shortly over a sufficiently large area.

46. It is anticipated that the Jamrao Canal will be flowing for the first 84 miles of the main canal, with an escape at that point into the Puran, in May 1900, that the "Minors" in that length will be in working order, and that arrangements for the watering of lands to the east of the canal line which are at present irrigated from canals in the Central Hyderabad Canals District will be complete.

47. On the Dad improvement works progress was not satisfactory for the first nine months of the year, partly owing to a doubt having arisen as to the area of land commanded which it was thought would turn out to be very much less than anticipated in the project report, and partly to the necessity for im-

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provements in the alignment of the canal which required special survey and the preparation of plans and estimates for sanction, the project estimate being a very rough one. A contour survey of the land under the Dad, Nasrat and Nau-lakhi systems was commenced during the year and made good progress. It will enable the areas to be correctly estimated and will probably be completed in June. The new cuts in the upper reaches for the improvement of the canal were started and progressed well, widening was continued, the necessary improvements to the Ren branches which are to be fed from the Dad were commenced, and the last 5 miles of the proposed Mirwah extension were taken in hand. It is proposed to adopt an entirely new line for the Mirwah instead of merely widening and extending the existing canal and plans and estimates will shortly be ready for this. The last 5 miles of the originally proposed extension, however, are common to both projects.

48. The head regulator over the Dad, two minor regulators and four bridges, which were in progress last year, were completed, but the bulk of the year's expenditure was on earth-work.

49. The New Escape for the Fuleli was nearly completed at the close of the year and will come into operation in the approaching inundation season. The head regulator was finished, and two road bridges were constructed.

50. Other works in the Fuleli Canal District were—the new mouth to the Sani Guni, which, with its regulator, was completed, a loop to the Hajipur Bund, which is in progress, and a new feeder to the Gaja from the Hasanaliwah which is nearly completed.

51. Since the levy of fees for navigation on the Fuleli Canal was sanctioned, attention has been paid to the requirements of the boat traffic. Tow paths are being cleared both on the main canal and on the principal branches and other small conveniences are being provided. There is much need for a lock at the mouth of the Fuleli at Jamshori, and it is hoped that the amount of fees derived from the traffic will soon justify its construction.

52. No works of importance were in progress in the Eastern Nara District.

53. During the year a new district named the Indus River District, was constituted. The necessity of taking scientific observations to obtain a better knowledge of the conditions and forces of the Indus was pressed on the attention of Government, the Sind Irrigation Committee of 1892 suggested the formation of a separate district for the purpose of dealing with all matters connected with the river, and a new district was formally constituted with effect from 1st May 1898. The duties and responsibilities of the Executive Engineer are detailed in Government Resolution No. 34—E. I. 743, dated 30th April 1898. The work done during the year was as follows:—

- (a) The new offices and godown at Kotri were practically completed.
- (b) Bench marks were fixed at Kotri and Sukkur.
- (c) The river channel was cleared of snags.
- (d) The field work of a large scale survey of the Indus extending from 2 miles upstream to 2 miles downstream of the new Railway bridge at Kotri was completed.
- (e) A survey of the bifurcation of the Indus was also made with a view to the improvement of the Uchito, whose head is now closed to boats at low stages by a bar, which interferes with boat traffic to Ketti Bunder.
- (f) The more important changes in the river banks were duly surveyed and recorded and its whole length was inspected during the inundation from the sea up to Kashmir.

54. 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 debitabie to Clearances Grant.			
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
Major Works ...	14,87,710	3,587	...	14,41,297	1,51,141	46,164	1,97,305	2,90,397	8,786	19,37,785
Minor Works, Capital ...	43,977	25,537	...	69,514	1,50,100	41,083	1,91,183	87,679	2,488	3,51,864
Do. Revenue ...	...	1,45,139	...	1,45,139	3,93,890	89,311	4,83,201	1,93,095	4,002	8,25,437
Ordinary Agricultural ...	...	...	29,507	29,507	2,91,908	81,062	3,22,970	89,383	9,536	4,51,396
Total ...	14,81,687	1,74,263	29,507	16,85,457	9,87,039	2,07,620	11,94,659	6,60,554	25,812	35,66,482
Deposits, Contribution— Ordinary ...	...	...	4,82	4,982	2,367	...	2,367	49	...	7,398
Total ...	14,81,687	1,74,263	34,39	16,90,439	9,89,406	2,07,620	11,97,026	6,60,603	25,812	35,73,580

GENERAL.

55. The revenue receipts during the year amounted to Rs. 9,43,900, of which Rs. 6,89,225 were on account of works in the Deccan and Gujrat and Rs. 2,54,675 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 :—

	1896-97.	1897-98.	1898-99.
	Rs.	Rs.	Rs.
Major Works—			
Protective Works ...	92,646	1,51,008	1,63,465
Productive Works ...	4,00,571	4,41,257	4,96,985
Total ...	4,93,217	5,92,265	6,60,450
Minor Works—			
Imperial—			
Works for which Capital and Revenue Accounts are kept ...	1,49,322	1,49,297	1,75,394
Works for which only Revenue Accounts are kept ...	70,578	65,098	74,287
Agricultural Works—	2,190	1,955	2,572
Provincial—			
Works for which Capital and Revenue Accounts are kept ...	22,441	31,837	31,197
Total ...	2,44,531	2,48,187	2,83,450
GRAND TOTAL ...	7,37,748	8,40,452	9,43,900

Expenditure.

56. The expenditure of the year was distributed under different heads as under.

	Rs.	Rs.	Rs.
<i>Imperial.</i>			
Capital—			
Major Works—			
Protective Works ...	33,146		
Productive Works ...	* 16,57,193		
		16,90,34	
Minor Works and Navigation—			
Works for which Capital and Revenue Accounts are kept ...		† 98,639	
Revenue—			
Major Works—			
Protective Works ...	64,426		
Productive Works ...	4,16,141		
		4,80,567	
Minor Works and Navigation—			
Works for which Capital and Revenue Accounts are kept ...	3,81,569		
Works for which only Revenue Accounts are kept ...	9,96,196		
		13,77,765	
Agricultural Works—			
Works for which neither Capital nor Revenue Accounts are kept ...		‡ 4,78,429	
Contribution Works ...		23,332	
Total, Imperial ...		41,49,076	
<i>Provincial.</i>			
Capital—			
Minor Works and Navigation ...		41,904	
Revenue—			
Minor Works and Navigation ...		5,450	
Total, Provincial ...		47,354	
		Grand Total ...	41,96,430

57. The total expenditure is classified as follows:—

	Deccan and Gujarat.	Sind.	Total.
	Rs.	Rs.	Rs.
Works ...	(a) 1,71,646	(b) 16,90,439	18,62,085
Repairs ...	(c) 1,14,278	11,97,026	14,11,304
Establishment ...	2,38,991	6,60,603	8,99,594
Tools and Plant ...	9,228	25,812	35,040
Suspense Account ...	—8,912	—2,681	—11,593
Total ...	6,25,231	35,71,199	41,96,430

58. 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 for reasons given in the report for 1893-94.

59. Maps showing the position of the principal irrigation works in the Gujarát, the Deccan and the province of Sind are attached.

* Inclusive of expenditure in England	Rs.	8,000
† Do. do. do. and exchange	„	25,876
‡ Do. do. do. do.	„	1,380.
(a) Exclusive of Rs 241	On account of Receipts on Capital Account.	
(b) Do. „ 143		
(c) Inclusive of „ 2,679	Refunds of Revenue.	
Do. „ 3	Compensation.	

GUJARAT AND THE DECCAN.

GUJARAT.

AHMEDABAD DISTRICT.

The rainfall during the year at Prantij was 42.33 inches against 28.08 inches for the preceding year and the average of 35.51 inches for the ten years ending 31st December 1898. The season was not favourable on account of the lowness of the Hâthmati River, due to scanty rainfall near its source and consequent insufficient supply of water in the canal, and there was a decrease both in the kharif and rabi areas irrigated.

2. The total area irrigated was 4,280 acres (1,800 kharif and 2,480 rabi) against 5,390 acres (1,837 kharif and 3,553 rabi) for the last year, and the revenue amounted to Rs. 11,414 against Rs. 14,486.

3. The cost of maintenance and repairs, &c., was Rs. 4,987, including clearance of silt and weeds and special repairs to certain branches under the canal, against Rs. 4,430 in the previous year.

4. Only one flood occurred in the Hâthmati River on 1st August 1898, when the water rose 2.60 feet above the crest of the weir.

5. The works, referred to in the report for 1896-97, for diverting experimentally the Hâthmati Canal water into the Bhujwa Channel were nearly completed during the year at a total cost of Rs. 2,828 against the sanctioned estimate of Rs. 3,962, but the experiment could not be completed in 1898-99, owing to standing crops in the bed of the Bhujwa.

6. During the season 2,805 acres were irrigated (2,800 kharif and 5 rabi) against 2,501 acres (2,477 kharif and 24 rabi) last year and the assessment amounted to Rs. 19,080, out of which free grants and remissions to the extent of Rs. 3,360 were given, leaving a net revenue of Rs. 15,720 against Rs. 12,169 last year. The increase is due to efficient management and economy in the distribution of water aided largely by good rainfall at the end of August.

7. The cost of maintenance and repairs was Rs. 3,107, compared with Rs. 2,903 last year.

8. The people are appreciating the advantages of water, and the irrigation revenue has considerably increased during the

Years.	Total Net Revenue.
	Rs.
1893-94	10,474
1894-95	12,907
1895-96	15,175
1896-97	17,674
1897-98	12,169

last five years as shown by the figures quoted in the margin. The revenue realized this year is the highest on record from the commencement of the Khari Cut irrigation. Owing to the scanty rainfall, there was a marked decrease of water in the Khari and there was no high flood during the year.

9. The cost of maintenance amounted to Rs. 925 as against Rs. 928 last year. During the year a sum of Rs. 878 was spent on silt clearance in addition to the ordinary repairs to the sluices, on which a sum of Rs. 1,276 was expended.

10. A sum of Rs. 224 was also spent in providing bed level and benchmark stones throughout the Khari. The total expenditure incurred on the work up to 31st March 1899 was Rs. 1,019 against the sanctioned estimate of Rs. 1,240.

11. A cross sluice, with four openings 4 feet wide, has been constructed at the tail of the Naika extension channel, at a cost of Rs. 583, for irrigating Naika lands which have suffered heavily up to now.

12. Special repairs to Groyne No. 2 at Dhamatwan have been carried out at a cost of Rs. 270.

13. During the year under report repairs to four irrigation tanks in the Dholka Taluka were undertaken from Imperial funds, assisted by contributions from villagers, and a sum of Rs. 2,149 was spent; besides the above, work on the tank at Sahijpur-Gopalpur in the Daskrohi Taluka, which was in progress last year, has been completed this year at a total cost of Rs. 1,688 against the estimated cost of Rs. 1,690, the expenditure during the year being Rs. 1,108.

14. The inspection of the Irrigation Tanks in the Viramgam and Prantij Talukas was completed in 1898-99 for the purpose of making out a list of tanks and giving effect to the orders contained in Government Resolution No. 34-W. I.—419 of 25th March 1895.

15. The object of this channel is to divert the water of the Narsingpura Ghoda Feeder. drain into Ghoda Tank, the water on its way supplying five other tanks of villages in British Territory.

16. Its length is 11 miles and 3,700 feet, bottom width 7½ to 8½ feet and side slopes 1 to 1. A weir and a regulator are provided at the head of the channel and other regulating sluices are also proposed for supplying water to the tanks.

17. During the year under report work was commenced at both ends of the channel, and a length of 2½ miles from the head and 2½ miles at the tail have been excavated. Two regulating sluices are under construction.

18. The total expenditure on the channel and feeder up to 31st March 1899 has been Rs. 11,405 against the sanctioned estimate of Rs. 26,106, and the expenditure during the year has been Rs. 8,377.

19. A sum of Rs. 1,283 (including survey establishment of Rs. 907) has been expended during the year in making a survey for the proposed channel from Chuninapara to Dhakdi to drain a portion of the Viramgam Taluka, which is flooded by surplus water from the Baroda Drainage Works. The project is nearly completed.

KAIRA DISTRICT.

20. During the year repairs to the tank at Malav, described in the last year's report, have been completed at a total cost of Rs. 2,865 against the sanctioned estimate of Rs. 2,899.

The Anand and Mogri Drain. 21. The Anand and Mogri Drain was maintained throughout the year at a total cost of Rs. 569.

SURAT AND BROACH DISTRICTS.

22. The Ora-Vichiad-Badalpore Drainage Channel in Vagra Taluka was in progress. The Keshwan branch of the channel, which was in progress last year, was completed during the year, and the main channel was commenced. Rs. 5,798 were expended during the year, making Rs. 11,111 from the commencement of the work, against the sanctioned estimate of Rs. 39,453.

Old Works. 23. Repairs to 19 tanks were carried out at a total cost of Rs. 10,258.

24. The breaches and eroded portion of the embankment were repaired at a cost of Rs. 321, while Rs. 1,050 were spent in current repairs.

THE DECCAN.

KHANDESH IRRIGATION DISTRICT.

25. At the beginning of the year under report, the pressure of work owing to famine entirely ceased, and the usual work of the district again received proper attention.

New Irrigation Tanks and Canals. 26. The following table gives the Capital and Revenue expenditure of 1898-99 on these works:—

Works.	Capital Outlay.	Revenue Outlay.
	Rs.	Rs.
<i>Irrigation Major Works, Productive Public Works.</i>		
1. Lower Pánjhra River Works	2,194
<i>Irrigation Minor Works.</i>		
1. Lower Pánjhra River Works ...	1,167	...
2. Jamda Canals	3,044
3. Hartála Tank	56
4. Mhasva Tank	314
5. Parsul Tank	288

27. All the projects with the exception of the Jamda Canals have been completed, the small sum, Rs. 1,167, that remained to be spent on the Lower Pánjhra River Works—Distributaries, has been utilized on the diversion of, and building a lining wall on, the Betáwad channel. The outlay mentioned was exclusive of compensation for land paid by the Revenue Department.

28. The Revenue outlay on the Lower Pánjhra River Works includes Rs. 886 on repairs to Japi Bandhara, and Rs. 234 on repairs to Betáwad channel. These repairs will be completed during 1899-1900. The expenditure on the Jamda Canals includes Rs. 280 for strengthening the bank of the Jamda Left Bank Canal between aqueduct No. 15 and overbridge No. 9. The remaining expenditure was for the ordinary maintenance of the works.

29. These important works received the usual attention in the year under report. The following table shows the amounts expended on them, both in Khándesh and Násik Collectorate in the Tápti river catchment, from Imperial revenues, and from the balance of the voluntary cess known as "Pátphála" which is now abolished.

	IMPERIAL.			PATPHÁLA.		
	Khándesh.	Násik.	Total.	Khándesh.	Násik.	Total.
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
Improvements	16,435	11,949	28,384	551	733	1,284
Repairs	3,114	1,834	4,948	230	326	556
Total	19,549	13,783	33,332	781	1,059	1,840

30. In Khándesh the improvements and repairs of the following important channels were in hand:—

Kasára, Dhádna and Kaotha in the Pimpalner Táluka, and Sháháda in the táluka of the same name.

31. The pipe syphon aqueduct on the Kaotha channel is completed. The works on the other channels are still in hand.

32. In the Násik Collectorate the following channels were improved and repaired:—

Satána and Kandhána in Báglán Táluka, Deola in Kalwan Táluka, Bhádana and Raipur in Chándor Táluka, Dábhádi Patna in Málegaon Táluka.

33. With the exception of those on Satána, all the works are completed. The design of the concrete duct across the Sakad nálla on the Satána Channel is being reconsidered and the adoption of a pipe syphon at an extra cost will probably be found necessary.

34. The Pátphála expenditure represents utilization of the money already collected, in providing regulators and sluice boards, and carrying out petty repairs, which the channels were in need of. This cess is now abolished, and such works in future will have to be carried out entirely from Imperial grants.

35. Owing to pressure of construction work, much could not be done in the way of surveying and preparing new projects for improving and repairing these old irrigation works. Channels, which required immediate attention, such as Malegaon and Kátgar in Báglán Táluka, were considered, and projects for their improvements and repairs have been submitted. Projects for the Málpur and Jirethal Ashtána channels in Khándesh, which were pending, have been matured, approved by the Collector, and forwarded for sanction.

36. An irrigation tank project at Parmápáda on the Bori, on the borders of Khándesh and Násik, intended as a famine work, has been reported upon to the Collector of Khándesh, who has approved of it; orders are now awaited for carrying out the detailed survey. A survey for a tank on the Musam near Mulher has been completed, and the project will be drawn up in the monsoon, when establishment can be spared from construction works.

37. The Chankápur Tank project was completely revised during the year under report and submitted. Sanction to resume the work, which has been suspended since the cessation of famine, is awaited.

38. The expenditure on this work amounted to Rs. 203 for maintenance of the bungalow at Chankápur, and Rs. 142 for compensation for land taken up during the famine for the Girna Left Bank Canal.

39. The rainfall has been gauged on all new tanks and canals in operation, and a special rain and river gauge was maintained at Parmápáda as in 1897-98 at a cost of Rs. 125. A rain gauge was also maintained at Nizámpur, the expenditure being Rs. 78.

40. The Inspection Bungalows and subordinates' quarters and store and office rooms on works in operation were maintained along with the works, and, excepting the two noted below, require no separate mention.

41. The Irrigation office at Málegaon and the store shed at Sakri were repaired and improved at a cost of Rs. 204 and 610, respectively. In the case of the latter, an additional space to accommodate stores has been added, and a tiled roof substituted for a thatched one.

42. The following is a list of contribution works with the expenditure on each:—

Overbridge on Satána Channel	...	...	....	Rs. 881
3" pipe outlet in Antápur Channel to water a garden at Mulher.				„ 12
Pátkaries for Hartála and Wálkheda Channel	...	...	...	„ 26
Removing and renewing boards of the Patondá Baadhára sluice...				„ 17.

43. There were no extraordinary floods during the year requiring special mention.

44. The Mukti Tank was first replenished on the 10th June 1898, and it overflowed its waste weir on 11th September 1898. The heaviest rainfall was 4.55 inches on 11th September 1898 at Surgaon, and 3.85 inches on the same date at Dahiana, the mean of the two being 4.20 inches. An examination of the rainfall and its effects gives a run-off of 4.6 per cent. from 10th to 11th September 1898.

45. Water commenced entering the Mhasva Tank on the 10th June 1898, and a depth of 20.55 feet was reached on the 30th September, which is 1.45 feet less than F. S. L. (depth 22.00). The greatest rainfall, 1.52 inches, occurred on 1st August 1898 and the run-off from 31st July 1898 to 1st August 1898 was 10.5 per cent.

46. The total rainfall on the Hartala Tank catchment from 8th June to 24th July 1898 was 9.84 inches, but water did not rise over the sill of the outlet (R. L. 80.30) till the 25th July 1898. The greatest height attained during the season was 3.46 feet over the sill on 1st October 1898, that is, 10.24 feet below the crest of the waste weir. The total replenishment during the year was 17.72 millions cubic feet against 134.86 millions cubic feet, the capacity of the tank at full supply level.

The heaviest rainfall, 2.90 inches, was gauged on 12th September 1898, and the run-off from 10th to 13th September 1898 was 14.1 per cent.

47. The Parsul Tank commenced filling on 10th June 1898 and overflowed on 18th September 1898. The greatest rainfall occurred on 31st July 1898 and was gauged 2.42 inches. The run-off from the catchment from 7th to 18th September 1898 was 31.7 per cent.

48. The percentage of Work Establishment on the expenditure of the year was Rs. 6-9-7.

NA'SIK DISTRICT.

49. These works are situated in the Niphád and Dindori Talukas and comprise the following :—

- | | |
|--------------------|-------------------------|
| (1) Wághad Tank. | (3) Wadáli Canal. |
| (2) Páلكhed Canal. | (4) Ojhar Támbat Canal. |

50. A sum of Rs. 2,468 was spent and debited to the Capital Account of the work as noted below :—

Surveying for ascertaining Wághad Tank area and fixing boundary pillars ...Rs.	307
Waste weir wall and flanks in the waste weir cut	966
Inspection Bungalow at Ojhar Támbat	1195
	—————
	Rs. 2,468
	—————

51. The full capacity of the tank when completed with its F. S. L. at R. L. 128 will be 605.55 millions cubic feet, and proposals are under consideration to secure this by constructing permanent waste weir works. The capacity up to the last year with bed of waste weir cut at R. L. 110 was only 197.64 millions cubic feet. The waste weir sill was permanently raised during 1898-99 to R. L. 114 with flanks at R. L. 118, so that the water might be stored up to this latter level by means of moveable boards between fixed iron standards. On account of the great rush of water, the foundations of this work were scoured out, but have now been strengthened by some underpinning and pavement on the downstream side so far as the available funds permitted. Demarcation pillars were constructed to mark the boundaries of the land to be acquired for the tank.

52. The waste weir sill was raised by means of boards on 6th October 1898 when the water level was at R. L. 114.15 and the storage capacity was 265.05 millions cubic feet; the maximum level secured after the closure was R. L. 114.64 on 22nd October 1898 with a storage capacity of 273.87 millions cubic feet. An earlier closure would have enabled the level being raised to the full capacity at R. L. 118 as designed by the new waste weir wall; but this could not be done on account of the scouring of the foundations.

53. The sill of outlet is at R. L. 80 and the outlet was kept open during the rains as long as the water was freely flowing over the waste weir till it was closed by boards. Water as required was passed down to Pálkhed canal during the year from 1st April 1898. to 14th June 1898, and from 4th December 1898 to 31st March 1899, the maximum discharge being 31.35 cubic feet per second.

54. The tank and the bungalow at Wághad and the overseer's quarters were maintained at a total cost of Rs. 560. Special repairs to the Wághad Tank Bungalow were also executed at a cost of Rs. 395. The charges for Establishment excluding Direction and Collection debited to the Wághad Tank works were Rs. 1,320.

55. This starts from a weir across the Kadva River about 14 miles below the Wághad Tank and is supplied by the tank when necessary. The canal, 11 miles in length, and its main distributary are complete up to 18 miles ending near the G. I. P. Railway line. But as the cross drainage works are very defective, and the canal is single-banked, several deviations and improvements are necessary so as to safely pass down the maximum calculated discharge of 75 cubic feet at the head. The necessary survey works will be taken in hand next cold season with a view to complete the project.

56. The canal was maintained and repaired at a cost of Rs. 1,783. The charges for Establishment excluding direction and collection were :—

	Rs.
Revenue	585
Executive	3,099

The cost of repairs per mile was nearly Rs. 70.

57. The irrigated areas, assessments, and the rainfall from June to January for the last three years were as follows :—

Years.		Area.	Assessment.	Rainfall at Pálkhed.
		Acres.	Rs.	Inches.
1896-97	...	2,250	8,865	30.82
1897-98	...	2,077	8,611	21.73
1898-99	...	1,863	8,594	29.36

58. The canal was closed five times (28 days in all) during the year for clearance. The area at present under command of the canal is 9,837 acres which will be increased to 23,466 acres eventually.

59. The area commanded by this canal can also be irrigated by the Pálkhed canal, but an old weir across the Kádva, situated about 10 miles below the Pálkhed Head Works, picks up the river water and so supplies Wadáli, which has recently been improved and extended. The canal is 5½ miles long and was maintained at a cost of Rs. 468. The charges for Establishment excluding direction and collection were :—

	Rs.
Revenue	213
Executive	761

The cost of repairs per mile was Rs. 89.

60. The area commanded by the canal is 2,433 acres, of which 286 acres are assessed at consolidated rates. The irrigated areas, assessments and the rainfall from June to January for the last three years were as under:—

Years.		Area Irrigated.	Assessment.	Rainfall at Niphád.
		Acres.	Rs.	Inches.
1896-97	... ..	515	1,983	20.98
1897-98	... ..	432	1,671	25.37
1898-99	... ..	341	1,187	20.90

61. The canal was closed six times for the usual silt and weed clearance for 31 days in all.

62. This canal takes off above a weir across the Bánganga River and is situated about 7 miles south-east of the Páلكhed Head Ojhar Támbat Canal. Works. It is $4\frac{1}{2}$ miles long and is aided when the discharge from the Bánganga River fails, by a supply from the Wághad Tank, conveyed through the Páلكhed Canal and the Ojhar Támbat Distributary. This promises to be the most paying part of the Kádva system and extension of the canal and its distributaries is very necessary. An Inspection Bungalow, estimated to cost Rs. 2,557, was sanctioned to be built at Ojhar Támbat and Rs. 1,195 were spent on it during the year. Special repairs to an aqueduct on the Ojhar Támbat Distributary were executed at a cost of Rs. 577. An inspection path was provided along the bank up to 12 miles at a cost of Rs. 281.

63. The expenditure on repairs was Rs. 400. The charges for establishment excluding direction and collection were:—

				Rs.
Revenue ...	..	...	...	216
Executive...	..	...	...	1,400

The cost of repairs per mile was Rs. 89.

64. The net irrigable area under the canal is 6,824 acres, of which 2,367 acres are at present commanded. The irrigated areas, assessments and the rainfall from June to January for the last three years were as under:—

Years		Area.	Assessment.	Rainfall at Niphád.
		Acres.	Rs.	Inches.
1896-97	... ..	628	2,707	20.98
1897-98	... ..	573	2,263	25.37
1898-99	... ..	455	2,233	20.90

65. The total number of trees on the Páلكhed Canal is 9,306, the cost of preservation, watering and hedging being Rs. 60. On the Wadáli Canal 2,108 trees were preserved at a cost of Rs. 24. Rs. 30 were spent on 807 trees on the Ojhar Támbat Canal. In all there were 12,221 trees on the Kádva River system maintained at a total cost of Rs. 114.

66. There are 191 old bandhíras in charge of the Executive Engineer, Násik District, producing a revenue of Rs. 80,804 and irrigating 17,817 acres which are under consolidated assessment.

67. The expenditure on original works was Rs. 3,254 and on repairs Rs. 842, as follows:—

No	Names of Works.	Allotment.	Expenditure during the year.	Remarks.
	IMPERIAL.	Rs.	Rs. a. p.	
	IRRIGATION MINOR WORKS AND NAVIGATION—WORKS FOR WHICH ONLY REVENUE ACCOUNTS ARE KEPT.			
	<i>Extensions and Improvements.</i>			
1	Improvements to Khopdi Khurd Bandhára, Táluka Sinnar	I. 886	I. 886	Completed. Work completed. Land compensation to be paid.
2	Improvements to Khetrya Bandhára at Musalgaon, Táluka Sinnar	I. 1,370 C. 152-5-9	I. 1,223 4 3 C. 152 0 0	
3	Improvements to Harsul Bandhára at Sinnar, Táluka Sinnar	I. 405 C. 45	I. 398 14 3 C. 45 0 0	Completed.
4	Constructing a syphon across Munja Ohol, Táluka Sinnar,	I. 807 C. 90	I. 761 8 6 C. 90 0 0		In progress.
5	Improvements to Shahaja Bandhára at Musalgaon, Táluka Sinnar	I. 116 C. 13	I. 109 5 5 C. 13 0 0	Completed.
6	Land compensation for improvements to the Khedgaon Bandhára, Táluka Dindori	I. 25	I. 24 6 0		Do.
7	Improvements to Niphád Bandhára Channal near Shiwadi, Táluka Niphád	I. 370 C. 41	I. 367 9 2 C. 41 0 0	Do.
8	Extension and Improvement Surveys in the Godávri Basin, Násik Colloc-torate... ..	I. 45	I. 10 14 0		Do.
	Total ...	I. 3,138 C. 41-5-9	I. 2,913 6 1 C. 341 0 0	
	<i>Maintenance and Repairs.</i>			
1	Repairs to Bandhára at Belgaon Dhaga, Táluka Násik	I. 253 C. 26	I. 223 3 7 C. 26 0 0	In progress.
2	Repairs to Khetrya Bandhára at Musalgaon, Táluka Sinnar	I. 43	I. 40 14 0		Completed.
3	Repairs to Niphád Bandhára Channel near Shiwadi, Táluka Niphád	I. 182 C. 20	I. 155 11 6 C. 20 0 0	Do.
4	Repairs to Shahaja Bandhára at Musalgaon, Táluka Sinnar	I. 158 C. 17	I. 150 14 7 C. 17 0 0		Do.
5	Maintenance and Repairs to old Wadáli Canal	I. 163	I. 169 0 5	Do.
6	Bandhára repair Surveys in the Godávri Basin, Násik Colloc-torate	I. 120	I. 39 2 0		Do.
	Total ...	I. 919 C. 63	I. 778 14 1 C. 63 0 0	
	<i>Note—I. Imperial. " C. Contributions.</i>		3,254 6 1	
			841 14 1	

68. The preliminary Survey of the Pimplad Tank was completed at an expenditure of Rs. 46-11-0 on Works and Rs. 36-12-2 on Establishment.

69. An expenditure of Rs. 1,163 was incurred on Maládevi Tank in the Ahmednagar Colloc-torate on account of wood supplied to the relief labourers during the last famine by the Forest Department.

AHMEDNAGAR DISTRICT.

70. Nineteen miles of main canal and 21 miles of distributaries were kept in good working order at a cost of Rs. 2,799. A temporary earthen bund was constructed on the weir as usual to increase storage for rabi and hot weather crops.

Ojhar Canal.

The discharge of the river on 31st March 1899 was 10.73 cubic feet per second against 16.21 on the same date in the previous year.

71. Twenty-three miles of main canal and 9.37 miles of distributaries were kept in good working order at a cost of Rs. 1,972. A temporary earthen bund was constructed on the weir, as usual, to increase storage for rabi and hot weather crops.

Lakh Canal.

The discharge of the river on 31st March 1899 was 5.03 cubic feet per second against 8.94 on the same date in the previous year.

72. The tank and canal, $4\frac{1}{2}$ miles in length, with $5\frac{1}{2}$ miles of distributaries, were kept in good working order at a cost of Rs. 1,257.

Bhatodi Tank.

Till 6th September 1898 the supply in the tank was insufficient to meet the requirements of cultivators, and this led to a large decrease in the area cropped in the kharif season.

73. Rs. 202 were spent on surveying for and preparing the Visapur Tank Canal project and Rs. 134 on resurveying and estimating the Ojhar Right Bank Canal.

Surveys.

POONA IRRIGATION DISTRICT,

74. During the year under review the expenditure under Capital amounted to Rs. 32,865 viz., Rs. 25,622, on altering and improving lower service mains of Poona Water-supply and Rs. 7,243 on minor works, such as constructing canal boundary wall at Khadakvasla and providing valves with locking arrangements to pipe outlets for distributaries, &c.

Mutha Canals.

75. On the 1st April 1898 the water in Lake Fife was 19.92 feet above the sill of canal sluices and the minimum level was reached on 9th June when the depth was 10.44 feet. On the 10th the lake began to rise and it filled to overflowing on the 17th. The highest flood of the year occurred on the 19th July when the water rose to R. L. 247.00 or 3.68 feet above crest of waste weir.

Lake Fife.

76. The standards and planks were fixed on the weir by the end of September, and on the 15th October the water stood at 4.73 feet above the crest. The draw-off from the storage commenced on 18th October, about a fortnight earlier than usual, and on 31st March 1899 the level of the water was only 18.99 feet above the sill of the sluices, or 1.05 lower than on the same date in the previous year.

77. The Right Bank Canal was closed for 30 days and the Left Bank Canal for 22 days during the year for silt and weed clearance. The rainfall of the year at Poona amounted to 22.12 inches, the average for the last 49 years being 29.74 inches.

78. The Canal and the Poona Water-supply works were maintained in an efficient state throughout the year at a total cost of Rs. 21,576, as detailed below :—

Mutha Canals	...	...	Rs. 12,982
Poona Water-supply	...	...	" 8,594

In addition to this a sum of Rs. 5,023 was expended on Establishment charged to Works in the case of the Mutha Canals, and Rs. 6,000 for the Poona Water-supply.

79. During the year considerable progress was made in improving the distributaries of the canal. Those at mile No. 1 and 4,900 feet, $13\frac{1}{4}$, $20\frac{1}{2}$, $21\frac{3}{4}$ and $17\frac{1}{2}$ miles, being the principal distributaries for sugarcane irrigation near Poona, were taken in hand. They were cleared, banks renewed, drops or falls in bed rebuilt where necessary, and field outlets to the total number of 53 built and provided with locking arrangement. This should in future years result in a considerable economy in the use of water.

80. On the 1st April 1898 the tank was dry and remained so till 4th June. It commenced to fill on the 5th June and on 12th June the water stood at 14.10 feet above sill of outlet. The draw-off commenced from the same date and the tank became dry again on 7th August. On the 9th September it received replenishment and on the following day the tank overflowed. The draw-off commenced on 10th September and on 15th December 1898 the tank became dry again. During this year a sum of Rs. 522 was expended on Maintenance and Repairs of the tank and Rs. 84 on Works Establishment.

81. Special repairs in the shape of cutting out and filling up a crack in the dam were carried out at a cost of Rs. 112. Also special repairs to the wing wall near waste weir were completed at a cost of Rs. 363.

82. On the 1st April 1898 the water level stood at 16.40 feet above outlet or 0.43 feet higher than on same date in 1897. The tank commenced to be replenished from 8th June and filled to overflowing on 11th September 1898, and on 31st March 1899 the level was 76.45 above sill of outlet, or practically the same as in the previous year.

83. The expenditure on maintenance and repairs amounted to Rs 1,282, and Rs. 420 for establishment charged to works.

84. On the 1st April 1898 the water level stood at R. L. 76.50 or 16.50 feet above outlet, 3.41 feet higher than on same date in 1897. The tank commenced to fill on 9th September, and on 5th October the surface reached R. L. 83.85 feet. The draw-off commenced from 9th October and on 31st March 1899 the water level stood at 72.90 or 12.90 feet above outlet.

The supply was sufficient throughout the year. The dam and canal as far as 7th mile were kept in good repair and the expenditure incurred was Rs. 1,463, of which Rs. 252 were spent on establishment.

85. On the 1st April 1898 the water level stood at R. L. 56.50 or 23.20 feet above sill of outlet and 13.13 feet higher than in the previous year. The tank was replenished on 9th June and again on 9th September, and on 3rd October the water stood at R. L. 62.90 feet. The draw-off commenced on 5th October, and by 31st March 1899 the level sank to 12.50 feet above outlet.

The dam, canals and all works connected with the system have been kept in good repair at a cost of Rs. 941, of which Rs. 252 were for Establishment.

86. Rain and river gauges were maintained as usual in the Poona district and observations regularly recorded. Registers of heights of water were kept for all tanks, and diagrams recorded.

87. The total expenditure on Capital Account during the year was Rs. 6,089, chiefly incurred on the extension of the third training wall below the north waste weir. Owing to bad foundations in one length in which they had to be taken down 15 or 16 feet the work was not completed. It will be finished about the end of April 1899.

88. Before the monsoon broke, arrangements were made to ensure that all the gates were in proper working order, the usual number of counterweights being taken out, cleaned and rehung. The under-slucices were opened finally for the monsoon on June 15th and 16th under heads of 48.10 and 45.80 feet. The highest flood when the under-slucices were open reached 28 feet only, the highest

previously recorded being 64.6 feet in 1894. The sluices were closed on 10th August, the water level in the lake then being 9.50 feet, the closing operation on this occasion taking 1 hour 15 minutes. The water rose to the waste weir crest on August 25th, at that time all the south waste weir gates being open. From this date until September 7th the water was allowed to rise gradually. The automatic gates were then set to their full height, 8 feet, and the water allowed to rise to full supply level. The automatic gates were all tested under full head of 8 feet on October 10th and worked very satisfactorily.

89. On the 31st March the water in the lake stood 5.15 feet higher than on the same date in the previous year. The storage was first drawn on for irrigation on the 25th October. The upper sluice was first opened on 1st January, and the intermediate on 1st February. The volume of water discharged from the catchment during the monsoon was 41,720 millions cubic feet, equal to a run-off of 140 inches from the area of 123 square miles, as compared with 123 inches for last year.

90. After the rains of 1898 it was found that the protection wall in front of the under-sluices had suffered considerable damage, in some places the top three courses having been washed off. This has been repaired, through stones being used as much as possible, the top stones being clamped together.

91. The highest flood occurred on June 17th when the water was 5 feet over the crest of the weir. This is very small when compared with the maximum height, 8½ feet, in 1896.

92. The capital account works had for the most part to stand over owing to the money being required at Bhátghar. There was a great demand for water beyond Wádápurí cut during the monsoon owing to rain holding off, and some pipe outlets were made in that length, but were not taken advantage of to the extent expected. The Awsari Branch was completed, except for the pitching. The canal and distributaries were maintained in good order at a cost of Rs. 15,495 and Rs. 7,690 for work establishment. The principal maintenance works have been special repairs to Nimbodi banks and Kara banks and general repairs to distributaries and main canal.

93. This work was re-opened on 20th March 1898 as a test work and continued open till October. Work was carried out entirely on the modified piece-work system, the rates being so arranged that by doing A class tasks according to Famine Code the people could earn B class wage and 3 annas per week per adult in addition. Considerable progress was made with the embankment and puddle trench filling. The work done was as follows :—

	Rs.
272,089 cubic feet puddle filling	... 3,614
1,052,564 cubic feet embankment	... 13,074
Masonry of outlet	... 3,115
Waste weir	... 490
Total	... 20,293

94. The greatest number of persons employed at one time was 1,871; their health was good; there was no distress and no epidemic.

SHOLA'PUR DISTRICT.

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

	Rs.
Estimated amount	... 16,09,890
Previous expenditure	... 15,81,471
Allotment for 1898-99	... 1,700
Expenditure during 1898-99	... 1,700
Total expenditure	... 15,83,171

96. The expenditure of Rs. 1,700 was incurred in providing 6" cast iron pipes for heads of distributaries.

97. The dam and canals were repaired and maintained at a cost of Rs. 6,238. Of this, Rs. 1,006 were expended on removing silt and *débris* from Canal No. 1 and tunnel and its approaches. These works were found necessary to restore a sufficient flow of water in the canal system. They will be completed during 1899-1900.

98. Water commenced to flow over the waste weir of the tank on 10th September 1898 and the maximum depth on it during the season was 1.70 feet, on 4th October 1898.

99. The water in the tank reached its lowest level for the year on the 2nd September, when it stood 9.7 feet above the sill of the outlet sluice.

100. The Capital Account of this tank was closed in 1885 and no original work was executed during the year. The dam and canals were maintained at a cost of Rs. 6,948. The special repairs to the perennial canal commenced last year were completed. Special repairs to the dam consisting of raising and widening it to its original dimensions were commenced. These will be completed during 1899-1900. The other repairs were of ordinary nature.

101. No extraordinary flood occurred and no water passed over the waste weir, but its level, 1521.60, was just attained on the 5th October 1898. The minimum level was R. L. 1513.70 on 28th June 1898, which was 30.35 feet above the sill of Low Level Canal sluice.

102. No original work was executed during the year. The dam and canals were repaired and maintained at a cost of Rs. 2,176, including silt clearance from the Left Bank Canal.

103. The waste weir began to overflow on 10th September 1898 and the maximum depth of water on it was 2.80 feet on 14th September 1898.

104. The lowest level of water in the tank was R. L. 1540.60 (that is 13 feet above sill of outlets) which was reached on 28th June 1898.

105. No original works were carried out on this tank, the capital account of which was closed in 1892. The dam and channel were repaired and maintained at a cost of Rs. 327.

106. Water first passed over the waste weir on 10th September 1898; the maximum depth attained was 20 feet on 11th September 1898. The lowest level reached during the year was R. L. 80.00 on 19th May 1898.

107. This work, described in last year's report, was in progress during the year as a Famine Relief work. It was closed on 28th September 1898. The following are the details of the principal items executed up to the date of closure of the work:—

Items.	Quantities of Work executed up to date of closure.
Clearing site... ..	Square ft. 667,335
Embankment	Cubic ft. 7,302,095
Excavation for puddle trench	" 631,116
Filling in do.	" 629,005
Excavation for waste weir	" 1,634,900
Collecting metal for concrete trench	" 87,067
Excavation for outlets	" 21,263
Filling in do.	" 13,885

A revised project for this tank has since been prepared and submitted for sanction.

108. The Famine expenditure on the work during the year was Rs. 91,205. This amount includes all charges except gratuitous relief and engineering establishment.

109. The highest number of relief workers was 7,398 on 28th June 1898.

110. This work, described in last year's report, was also in progress as a Mángi Tank. Famine Relief work. It was closed on 28th September 1899. The following are the details of the principal items of work executed :—

Items.		Quantity.
Excavation for puddle trenches	... ..	Cubic ft... 499,315
Filling in do.	... ..	„ ... 587,370
Embankment of dam	... ..	„ ... 7,308,166
Excavation of waste channel in soil murum and hard rock	.. ..	„ ... 2,066,813
Excavation for seat of dam	... ..	„ ... 108,187

The project is under revision.

111. The Famine expenditure on the work during the year was Rs. 72,694. This amount includes all charges except gratuitous relief and engineering establishment.

112. The highest number of relief workers was 9,236 on 3rd September 1898.

113. Surveys of Bhámburdi and Budhihal Tanks were continued during the year, and rough estimates were submitted, which have been returned for revision and modification. The expenditure under this head during the year under report was Rs. 698.

BIJAPUR DISTRICT.

114. The only work in operation was the Muchkundi Tank. The tank was constructed during the famine of 1876-77, but it never fills owing to restricted catchment area and slight rainfall. The tank was repaired and maintained during the year at a cost of Rs. 196.

115. The rainfall gauged at the tank was 23.05 inches against 23.46 inches in the previous year. From June to December 1898, 19.67 inches fell as compared with 17.79 inches for a similar period in 1897-98.

116. The highest level of water in the tank was 10.30 feet above the sill of sluice as compared with 10.50 feet in 1897.

117. Survey in connection with the proposed repairs to Dodkeri Tank at Timasagar was completed during the year at an outlay of Rs. 16.

118. There were no famine works in progress during 1898. The expenditure incurred was on account of the maintenance of chaukidárs for guarding hutting materials, &c., on the Sangogi and Hullur Tanks and also on account of repairs to tools and plant.

SÁTARA DISTRICT.

119. There was no capital expenditure during the year on this canal.

The canal was maintained in working order at a cost of Rs. 8,031 as per detail given below.

					Rs.
Ordinary repairs	...	...	...	...	5,537
Special repairs	...	...	...	...	1,997
Plantations	...	...	...	...	497
				Total	8,031

120. The area irrigated this year was 3,970 acres, and the assessments amounted to Rs. 44,797 as compared with Rs. 48,608 in 1897-98.

121. The revenue has decreased owing to the prohibition of perennial irrigation within $\frac{1}{4}$ th mile radius of villages. In course of time other land will probably be prepared for perennial irrigation, but a great deal of the best land is situated close to the villages which it will be difficult to replace.

122. Wire fencing on both sides of the road near Takari was completed and Rs. 1,997 were spent in removing silt from the canal during the year under report.

123. Besides the Krishna Canal, there are in the Sátára District five other works of which Capital and Revenue Accounts are kept, *viz.*:—

- (1) Yerla River Irrigation Works including Nehr Tank.
- (2) Upper Mán River Works including the Pingli Tank and Gondowli Canal.
- (3) Rewári Canal.
- (4) Maini Tank.
- (5) Chikhli Canal.

124. Of these five works, capital outlay was incurred only on the first. A berm was constructed in rear of the Nehr Dam in the river portion as a precautionary measure, a slight slip having occurred in the new work. The estimated cost of the work is Rs. 4,263. The work was taken in hand and completed during the year under report at a total cost of Rs. 4,261.

125. Special Repairs to Lodhowda Weir debitable to Upper Mán River Works were taken in hand during the year under report and will be completed in 1899-1900. Rs. 780 were spent on the work in 1898-99.

126. Owing to heavy rains during August 1898, the high banks of the Maini Tank Canal were breached in many places near aqueducts and Rs. 213 had to be spent in making special repairs to damaged portions. Rs. 1,100 had also to be spent in removing silt which accumulated during the heavy floods.

127. All the five works were maintained in good order at the cost noted below.

Number.	Work.	Extensions and Improvements.	Maintenance and Repairs.	Special Repairs.	Plantations.	Total.
		Rs.	Rs.	Rs.	Rs.	Rs.
1	Yerla River Irrigation Works.	635	4,392	...	256	5,283
2	Upper Mán River Works ...	...	2,295	780	205	3,280
3	Rewári Canal... ..	...	1,173	395	79	1,647
4	Maini Tank ... ..	...	2,699	213	162	3,074
5	Chikhli Canal ... ..	...	710	146	36	892
	Total ...	635	11,269	1,534	738	14,176

128. The irrigation of the year, as contrasted with that of the previous year, is as under.

Number.	Work.	Rainfall		Irrigation.			
				1897-98.		1898-99.	
		1897-98.	1898-99.	Area.	Revenue.	Area.	Revenue.
		Inches.	Inches.	Acres.	Rs.	Acres.	Rs.
1	Yerla River Irrigation works	24.41	20.10	3371	10,638	3,859	12,070
2	Upper Man River Works. {	Pingli 26.27	Pingli 17.93	2,022	5,623	1,570	5,148
	Gondowli	Gondowli 22.12	22.44				
3	Rewari Canal	35.85	28.07	1,647	8,265	1,557	8,207
4	Maini Tank	16.42	15.89	1,616	4,705	1,551	4,302
5	Chikhli Canal	27.32	12.68	524	2,151	468	2,124
	Total ..	...	...	9,210	31,382	9,015	32,151

129. This work, classed under "Works for which only Revenue Accounts are kept," was taken in hand during the year under report at a cost of Rs. 478, of which Rs. 100 were contributed by the rayats.

BELGAUM DISTRICT.

130. A full description of the Gokak Canal 1st Section and Storage Works will be found in the Administration Report for 1891-92. The crest of the weir at Dhupdal now stands at R.L. 2008.06 or 27 feet above the bed of the river.

131. The construction estimate, amounting to Rs. 13,89,985 (of which Rs. 11,12,133 was for Works), was closed under the orders of the Government of India with effect from 31st March 1897 and the completion report has since been approved by that Government. The amount appearing in the schedule of unfinished works was Rs. 1,29,535, inclusive of Establishment and Tools and Plant charges, and the expenditure of this sum has also received the sanction of the Government of India. Of this Rs. 89,516 is for Works, including land compensation.

132. The whole of the land submerged by the 27 feet weir has now been acquired and paid for. The sum of Rs. 40,475 was paid under this head during the year.

133. Orders to commence the following works, included in the schedule of unfinished works, the plans and estimates for which were sanctioned in Government Resolution No. 12—W.I.-243, dated 16th February 1899, were received late in the year.

- (1) Constructing 2 Patkaris chunkies on the canal.
- (2) Completing the sub-division of land under the canal.
- (3) Constructing a Service Road.

As plague was prevalent in several of the villages under the canal, it was found impossible to spend the full grant for the year.

134. The works were maintained in good and efficient order throughout the year.

135. The capital expenditure during the year was Rs. 41,614 as under.

	Rs.
Land compensation for 25 feet weir	2
Do. for 2 feet raising	40,473
Do. small extension of the canal	5
Constructing Patkaris' chaukies	419
Do. Service Road	461
Improvements to regulating outlets	251
Total ...	41,614

136. From the commencement of the work, the capital outlay has been Rs. 10,67,907 as detailed below.

As per Completion Report—

	Rs.
1st Section	3,21,976
Storage Works... ..	7,01,241
	10,22,67

Open Capital Account—

	Rs.
1st Section	1,068
Storage Works... ..	44,222
	45,230
Grand Total...	10,67,907

137. The working expenses amounted to Rs. 2,838 against Rs. 2,868 in the previous year.

138. The level of the tank fell to its lowest point on the 25th March 1898, when the water stood 4.6 feet below the crest of the weir and 17.44 feet deep on the sill of the canal sluices. There was, therefore, no scarcity of water at any time. The tank overflowed on the 9th June 1898.

139. The maximum flood of the year occurred on the 28th July 1898. It rose to 3.26 feet above the weir crest, the discharge being estimated at 2,925 cubic feet per second, equal to a run-off of 0.03 inch per hour from the whole area of the catchment basin (1,080 square miles).

140. The total discharge of the river between 1st July and 31st October amounted to 100,872 millions cubic feet, representing a run-off of 40 inches from the catchment basin.

141. The reservoir was first drawn upon during the succeeding season on the 2nd January 1899. No freshet occurred between that date and the end of the year.

142. The area irrigated was 6,455 acres, as compared with 6,856 acres during the previous year, showing a decrease of 401 acres or 6 per cent. The area in the previous rabi season was however specially great owing to the dry nature of the season. This year's area is a little above the average.

143. The water-rate assessment amounted to Rs. 20,143, being an increase of 28 per cent. over the previous year. This was due to the increase in the water-rates sanctioned in G. R. No. 29—A.I.-233, dated 7th February 1898.

144. Besides the water supplied for purposes of irrigation, the storage gave a constant supply of 68 cubic feet per second to the Mills, for which the Company paid Rs. 14,313.

145. The average monthly consumption of water by the Southern Marátha Railway Company was 148,000 gallons and the charges for the year under report amounted to Rs. 240.

146. The work of raising the level of the notch of the gauging basin below the main sluices of the storage reservoir, sanctioned and commenced during the previous year, was completed during the year under report at a total cost of Rs 943 against the estimate of Rs. 944. This was classed as a contribution work and the money recovered from the Mills Company.

147. A rain gauge was maintained at Dhupdal near the Head Works of the Gokak Canal. The fall registered here for the whole year was 25.13 inches, as compared with 23.60 in the previous year.

148. The management of this tank is vested in the Revenue Department. Petty repairs to the extent of Rs. 122 were carried out by this Department during the year under report.

149. Large tanks irrigating over 50 acres, repaired during the year, were as under.

Particulars.	Number of Tanks.	Expenditure during the year.
		Rs.
Commenced in the previous year	3	2,056
Commenced and completed during the year	3	4,617
Commenced but not completed during the year	2	1,650
Total	8	8,403

150. Smaller tanks irrigating less than 50 acres, repaired during the year, were as follows:—

Particulars.	Number of Tanks.	Expenditure during the year.
		Rs.
Commenced in the previous year ... ..	...	...
Commenced and completed during the year	3	2,253
Commenced but not completed during the year	1	324
Total	4	2,577

151. The expenditure incurred on surveys was Rs. 742 against an allotment of Rs. 795. The survey work done was as under.

	Number.
Tanks newly surveyed	13
Do. surveys of which were completed and checked	3
	21

152. The work of surveying the tank at Yádwad, sanctioned in G. R. No. 104—A.I -801, dated 11th May 1893, was taken in hand in December 1898. The expenditure on this account to the end of March 1899 was Rs. 561 against an allotment of Rs. 454. The work is still in progress.

153. This was originally commenced as a Famine Relief work in 1896-97. The work done was maintained during the year under report at a cost of Rs. 1,683. Orders for the abandonment of the project have been issued in G. R. No.43—W.I,-622, dated 21st April 1899.

DHA'RWAR IRRIGATION DISTRICT.

Capital expenditure. 154. There was no expenditure during the year chargeable to the Capital Account.

155. There are four works of this class in this district, *viz.*, Madag, Medleri, Assundi and Dámbal. In addition to these, there is the Mávinkop Tank, which lies on the western border of the Dhárwár District. This tank irrigates lands which are situated in the Haliyál Taluka of the Kánara Collectorate, and is under the management of the Revenue Department.

156. The following table gives details of expenditure incurred:—

Tanks.		Maintenance and Repairs.	Special Repairs.	Plantation.	Total.	Remarks.
		Rs.	Rs.	Rs.	Rs.	
Madag	...	548	...	149	697	...
Medleri	...	264	...	...	264	...
Assundi	...	292	1,546	...	1,838	...
Dámbal	...	261	...	...	261	...
Mávinkop	...	...	...	...	...	...
Total ..		1,365	1,546	149	3,060	

157. The expenditure is slightly in excess of the previous year, and this is due to finding to young saplings having been carried out to a greater extent than was done in the previous year.

Madag.

Medleri and Dámbal.

158. The expenditure incurred is nearly the same as last year.

Assundi—Maintenance and Repairs.

159. The expenditure incurred is less than that of the previous year.

160. Out of the total estimated amount of Rs. 3,142, the expenditure incurred to end of the year was Rs. 2,277. The work could not be completed during the year owing to certain difficulties in obtaining labour.

Special Repairs.

161. *Mávinkop*.—A project for a new sluice and channel was sanctioned in G. R. No. 133—W.L.-1544, dated 3rd November 1897, but no funds were allotted.

162. *Madag Tank*.—The water level in the tank stood at R. L. 47.66, *i.e.*, 2.66 ft. above the outlet sill on 1st April. During the months of April and May the tank received slight replenishments. It received further large replenishments in subsequent months and the waste weir overflowed several times. A fair supply of water was maintained throughout the year.

Replenishments.

163. *Medleri Tank*.—The water level in the tank stood at R. L. 171.28, *i.e.*, 6.28 ft. above the outlet sill on 1st April. During the months of April and May the tank received slight replenishments. It received further replenishments in subsequent months and the waste weir overflowed several times. A fair supply of water was maintained throughout the year.

164. *Assundi Tank*.—The water level in the tank stood at R. L. 101.74, *i.e.*, 4.74 ft. above tank bed on 1st April. During the months of May and June the tank received slight replenishments. It received further large replenishments in subsequent months, and the waste weir overflowed several times. A fair supply of water was maintained throughout the year.

165. *Dámbal Tank*.—The water level in the tank stood at R. L. 138.85, *i.e.*, 4.85 ft. above tank bed on 1st April. The tank was dry from 20th May to 3rd June. During the month of June the tank received good replenishments. It

received further replenishments in subsequent months and the waste weir overflowed several times. A fair supply of water was maintained throughout the year.

166. Rain gauges were maintained during the year throughout the district. The rainfall gauged at Madag, Medleri, Dámbal and Assundi shows an increase as compared with the figures of the previous year.

167. The following tables give details of 2nd class works carried out and expenditure incurred on them:—

Particulars.	Number of Tanká.	Expenditure during the year.
		Rs.
<i>Large tanks irrigating over 50 acres repaired or improved.</i>		
Commenced in the previous year	8	2,850
Commenced and completed during the year	6	4,837
Commenced but not completed during the year	17	21,683
Total ...	31	29,370
<i>Smaller tanks irrigating less than 50 acres repaired or improved.</i>		
Commenced in the previous year	2	792
Commenced and completed during the year	3	1,545
Commenced but not completed during the year	3	1,293
Total ...	8	3,630

168. The total expenditure incurred on the 2nd class works amounted to Rs. 33,000, inclusive of contribution outlay, Rs. 3,947.

169. The supervision exercised by the Irrigation Department over the Dharma and Naregal Canal systems. distribution of the water of these canals appears to have been beneficial.

Detail of Expenditure.

	Rs.
Emergent and petty repairs	1,656
Supervising, distribution, &c	420
Providing miles and furlong stones	269
Surveying Dharma Canal	565
Total ...	2,910

Surveys of the canals have been completed and the completion of the project will be taken up as soon as possible.

170. The project was completed and submitted. Its abandonment has been ordered in G. R. No. 27—F.-433 of 17th March 1899.

171. The question whether the same objections cannot be advanced against this project as those which decided the abandonment of the Kardikop is under consideration before steps are taken for further elaboration.

RATNA'GIRI DISTRICT.

Second class Revenue
Works.—Tank at Pát.

172. The repairs to this tank consisted of—

- (1) Removing sluice gates at the beginning of the monsoon and tarring and refixing them at the close of it;
- (2) Providing earthen dam with shrubs at the gates; and
- (3) Repairing the dam where necessary.

The outlay on account of the above amounted to Rs. 48.

Tank at Varád.

173. The repairs to this tank consisted of—

- (1) Removing sluice gates before monsoon and tarring and refixing them at the close of it;
- (2) Providing earthen dam with shrubs at the gates; and
- (3) Repairing dam where necessary.

The outlay on the above items amounted to Rs. 74.

Dhámápur and Pendur
Tanks

174. No repairs were considered necessary to these tanks during the year.

KOLA'BA DISTRICT.

Agricultural Works—Ma-
sonry Dam at Borvi in Pen
Táluka.

175. The repairs to this dam consisted of—

- (1) Repairing and tarring wood-work of gates, and
- (2) Chunam pointing and renewing pitching where necessary.

The outlay amounted to Rs. 36.

SIND.

BEGARI CANALS.

176. The fall mentioned in last year's report was completed during the year before the canal was opened. The total cost of the work was Rs. 7,847 against the estimate of Rs. 11,866. The difference is due to the omission of two piers, regulating apparatus, and two feet of raised stone sill, which will not be required till the construction of the Uch Rajwah is commenced. These items are fully provided for in the project for remodelling the Desert Canal. The fall has been very successful in maintaining a good supply during an exceptionally bad inundation in the Thari Majhi, Ahmed and Burdi Rajwahs, and its effect will probably be more pronounced if the supply is good in the river during the current year.

177. The escape mentioned in last year's report was completed at a total cost of Rs. 11,997 against the estimate of Rs. 13,064, the difference being partly due to the omission of the top one foot of horizontal baulks, which will probably not be required till the canal is remodelled. Of the total cost of the work, Rs. 7,013 is debited to Capital and Rs. 4,984 to the Revenue Account, the year's expenditure being Rs. 5,713 and Rs. 1,284, respectively. The working of the escape remains to be seen, as no water passed over it owing to the low inundation and absence of hill floods crossing the canal at this point.

178. The raising and strengthening of the banks between miles 5 and 36 was completed during the year at a cost of Rs. 7,264 against the estimate of Rs. 7,645.

As the accommodation available for the office of the Executive Engineer at Draha proved insufficient, one of the baulk sheds on the Unharwah was converted into an office by the addition of a verandah on three sides and

Unharwah Revenue Ac-
count.

the insertion of doors and windows, at a cost of Rs. 681 against the sanctioned estimate of Rs. 707.

179. The survey above the mouths of the Desert Canal mentioned in last year's report was completed at a total cost of Rs. 197 against the estimate of Rs. 319, the outlay of the year being Rs. 10.

180. The survey of the contours of this district mentioned in last year's report was in hand and the area surveyed during the year comprised nearly the whole of the Jacobabad Taluka, a large portion of the Shádádpur Taluka and the lands in Kelat stretching from the tail of the Desert Canal to beyond the Edenwah. The amount of the estimate, *viz.* Rs. 18,837, was distributed between the three large canals as under—

	Rs.
Begári	9,897
Desert	5,960
Unharwah	2,980

The expenditure on the first item was Rs. 3,743, of which Rs. 1,611, were spent during the year. No expenditure was incurred on the other items.

181. The survey of the Sind Dhoro project referred to in last year's report was completed at a cost of Rs. 2,647 against the estimate of Rs. 2,753, the expenditure during the year being Rs. 1,980.

182. The construction of a cattle-pound, store-room and chowkidárs' quarters on the new loop Kashmor Bund mentioned in last year's report was completed at a cost of Rs. 1,222 against the estimate of Rs. 1,347, the expenditure during the year being Rs. 953.

183. The construction of quarters for the Executive Engineer's establishment at Draha, necessitated by the flooding of the compartments, was completed at a cost of Rs. 954 against an estimate of Rs. 1,194.

184. The upper three feet of a short length of the bund as also the few minor items mentioned in last year's report remaining to be done, were practically completed during the year, the expenditure being Rs. 3,90,961 against the estimate of Rs. 4,13,580, of which the year's outlay was Rs. 13,484.

185. The repairs to the new loop Kashmor Bund, which were not carried out last year, were practically completed, and in addition all leaks caused by the inundation of the year under report have been cut out and refilled and a sand core has been inserted. The sluice in mile 11 is under construction and will be completed before the inundation. The total of the estimate amounts to Rs. 2,28,282, of which Rs. 1,80,295 have been spent up to the end of the year.

186. The small loop constructed in mile 7, Kashmor Bund, when the dhund threatened to erode it, was constructed at a cost of Rs. 5,337 against the estimate of Rs. 6,550. The cut made to shorten the circuit of the Wadhu dhand above Dari was completed at a cost of Rs. 2,032 against the estimate of Rs. 3,346. The special repairs to the Khaiwah were completed at a cost of Rs. 1,145 against the estimate of Rs. 2,554.

187. The usual establishment was maintained and the ordinary clearance and repairs executed at a cost of Rs. 43,351. The details were as under—

	Rs.
Repairs	36,650
Establishment ... {	Rs.
Abkalani	3,339
Revenue	1,586
Works	1,684
	<hr style="width: 50px; margin-left: auto; margin-right: 0;"/>
Gardens	6,609
	92
	<hr style="width: 50px; margin-left: auto; margin-right: 0;"/>
Total ...	43,351
	<hr style="width: 50px; margin-left: auto; margin-right: 0;"/>

188. The ordinary maintenance and repairs were carried out and establishment maintained. The clearance was heavier than usual owing to changes in the dhand. The details of expenditure were as under—

					Rs.
Repairs	...	...	...	...	22,354
					Rs.
Establishment	...	{	Abkaláni	...	2,964
			Revenue	...	874
			Works	...	1,163
					<hr/> 5,001
Gardens	...	...	...	...	105
					<hr/> Total ... 27,460

189. The usual establishment was maintained and the ordinary clearance and repairs executed at a cost of Rs. 58,880. The details were as follows:—

					Rs.
Repairs	...	...	...	...	50,588
					Rs.
Establishment	...	{	Abkaláni	...	4,264
			Revenue	...	2,188
			Works	...	1,773
					<hr/> 8,223
Gardens	...	...	...	...	64
					<hr/> Total ... 58,880

190. The ordinary repairs were executed and the usual establishment maintained at a cost of Rs. 29,936, detailed as follows:—

					Rs.
Repairs	...	...	...	...	20,373
					Rs.
Establishment	{	Abkaláni	...	6,656	
		Revenue	...	647	
		Works	...	1,895	
					<hr/> 9,198
Gardens	...	...	...	...	* 365
					<hr/> Total ... 29,936

191. The ten gardens in this district were maintained at a cost of Rs. 626 and the receipts amounted to Rs. 62 as compared with Rs. 65 in the previous year.

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

Major Works—					Rs.
Capital	...	...	...	...	18,324
Extensions and Improvements	...	...	...	...	3,586
Clearance and Repairs	...	...	...	...	109,592
					Rs.
Establishment	...	{	Abkaláni	...	10,567
			Revenue	...	4,648
			Works	...	4,623
					<hr/> 19,838
Gardens	...	...	...	...	261
					<hr/> Total Major Works ... 151,601

Minor Works—Kashmor Bund—

					Rs.
Works	...	...	...	...	3,887
Repairs	...	...	...	...	79,401
					Rs.
Establishment	...	Abkaláni	...	...	6,656
		Revenue	...	...	647
		Works	...	...	1,895
				<hr/>	9,198
Gardens	...	...	...	...	365
Total Minor Works					<hr/> 92,851
Total Major and Minor Works					... 244,452
Contributions	...	...	...	...	275
					<hr/>
					244,727
Add—Regular Establishment and Tools and Plant	...	...	...	...	52,386
					<hr/>
					297,113

The cost of establishment and tools and plant was Rs. 52,386, and its percentage on the outlay was Rs. 21.43 as compared with Rs. 16.67 of the previous year.

The total cost of Abkaláni, Revenue and Works Establishment was Rs. 29,036 as compared with Rs. 38,498 in the previous year.

SHIKA'RPUR CANALS.

193. This bend caused the left bank of the canal to be eroded and thereby endangered the country around. The work of cutting off this bend is in progress. The outlay during the year was Rs. 1,000 against the estimate of Rs. 5,022.

Sind Canal—Cutting off a bend in the second mile.

194. There being no masonry sluices at the heads of these karias they were constructed during the year at a total cost of Rs. 609 each against the estimate of Rs. 614. A sum of Rs. 308 was contributed for each sluice by the zamindárs interested.

Sluices over Napur and Bhagawa ez Sind Canal.

195. This work is described in the report for 1896-97. During the year, improvements to the Abad dhand and the Rajib canal and the fall regulator over the latter were completed. About half the earthwork for embankments, about $\frac{1}{8}$ of the entire excavation for widening, and 11 miles jungle cutting were done in connection with improvements to the Chittiwah:—

Rajib Chitti and Garang—Improvements to.

					Rs.
Amount of estimate	...	...	...	...	1,14,602
Expenditure during the year	...	...	...	...	26,000
Do. up to date	...	...	...	...	54,080

196. The tail portion of this canal, $3\frac{1}{2}$ miles in length, which was hitherto very unsatisfactorily maintained by the zamindárs and consequently affected the water-supply in the first 7 miles of the Government canal, was taken over this year and improved and cleared at a total cost of Rs. 3,954 against the estimate of Rs. 4,000.

Umarnaswah.

197. During the inundation of 1898, which was a very low one, the water level in the retired portion of the bund was only 8' below that of 1897, the highest inundation on record. It was therefore proposed to raise the top of the bund 4' above the highest water level of 1897, and this was taken in hand during the year. The outlay was Rs. 1,000 against the estimate of Rs. 4,390.

Sukkur-Begári Bund—Extension and Improvements.

198. The existing bund having been approached by the river at 7 M. 4 F. to 14 M. 3 F., a loop 6 miles and 6 furlongs in length was aligned and its construction taken in hand. The work was partially carried out at a cost of Rs. 56,209 against the estimate of Rs. 1,32,993. The section of the loop is 8 feet top width with front slope 5 to 1 and rear slope 2 to 1.

199. In the last inundation the supply feeder to Sind canal, being silted, was cleared at an outlay of Rs. 16,558 against the estimate of Rs. 17,994. The work is in progress.

200. Ordinary clearance of canals and repairs to bunds were carried out.

The outlay under this head was :—

				Rs.
Works ...	{	Canals ...	...	63,100
		Bunds, Rohri district ...	...	1,134
		River bunds ...	...	16,416
				Rs.
Establishment ...	{	Abkaláni ...	...	12,252
		Revenue ...	...	1,958
		Works ...	...	5,672
				<u>19,882</u>
Total ...				<u>1,00,532</u>

201. The total expenditure on establishment amounted to Rs. 19,882 as compared with Rs. 20,925, the average of the three previous years. The little excess is due to the employment of establishment on the Rajib and Chitti canals taken up during the year.

202. The trees along canals and river bunds were looked after by the ordinary establishment. The following details will show the amounts realised by the sale of trees cut during the year :—

				Rs.
Sind Canal ...	...	...	...	443
Canals in Rohri ...	...	...	...	1,538
River bunds ...	...	...	...	56
Garang, Rajib and Chitti ...	...	...	...	554
				<u>2,591</u>

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

				Rs.
Extensions and Improvements ...	...	...	...	31,648
Repairs—			Rs.	
Clearance of canals ...	...	...	...	63,100
Repairs to bunds ...	...	...	...	1,134
				<u>64,234</u>
Establishment ...	{	Abkaláni ...	...	5,022
		Revenue ...	...	1,599
		Works ...	...	4,632
				<u>11,253</u>
				<u>1,07,135</u>
Ordinary Agricultural Works—				
Extensions and Improvements ...	...	...	...	1,000
Repairs—				
Special ...	...	...	...	56,394
Ordinary ...	...	...	...	16,416
				<u>72,810</u>

				Rs.	Rs.	
Establishment ...	{	Abkaláni ...	...	7,230	
		Revenue ...	...	359	
		Works ...	...	1,040	
				<hr/>	8,629	
Contributions, ordinary		...	...		82,439
					<hr/>	1,064
			Total ...	1,90,638		
<i>Add</i> —Regular Establishment and Tools and Plant			...	25,776		
Suspense		...	...	256	
			Total ...	2,16,670		

The total cost of establishment and tools and plant was Rs. 25,776, and its percentage on the total outlay of Rs. 1,90,638 was 13·52 as compared with 17 in the previous year.

GHA'R CANALS.

204. No expenditure was incurred against this head during the year, as there was no provision in the Budget for the completion of the Karia heads. The period of completion has been extended to 31st March 1900.

Sukkur Canal—Capital Account.

205. The expenditure on this head amounted to Rs. 2,439. This sum was expended in substituting permanent roofs for the temporary existing ones on chaukis at Gungro and Sanjarbati on the Sukkur Canal and removing and renewing the roofs of the office rooms of the Executive Engineer's quarters in the chauki at Sukkur and store-house at old head, Sukkur Canal. The works were completed during the year.

Sukkur Canal—Revenue Account, Extensions and Improvements.

206. The expenditure under this head amounted to Rs. 22,453 and the principal works carried out were as mentioned in the following paragraphs.

Ghár Canals—Extensions and Improvements.

207. The survey of certain canals, &c., for improving the irrigation water-supply of the Nasirabad Taluka, mentioned in last year's report, was completed at a total cost of Rs. 1,803, the year's outlay being Rs. 3.

208. In order to give a supply to the Ghár Canal in the event of its mouth being silted up entirely, a new cut near Phulpotra dhand joining the Ghár in the 9th mile was commenced and completed during the year at a cost of Rs. 22,302 against the estimate of Rs. 21,448, the excess being due to increased compensation for land taken up.

Supplementary feeder.

209. Owing to the erosion of the river, the present regulator at the head of the Nasrat Canal ex Ghár Canal was left only 55 feet away from the river bank, and it being considered in danger of being washed away, it was proposed to convert the road bridge at mile 2 of the canal into a regulator to serve the purpose, if required. The work is in progress and will be completed before water is admitted into the canal. Payment for the work will be made during 1899-1900.

Regulator.

210. The expenditure on maintenance and repairs of this canal and on the Abkaláni establishment was as follows:—

Sukkur Canal—Maintenance and Repairs.

Repairs	...	...	...	...	Rs.	25,985
Establishment	{	Abkaláni	...	...	Rs.	2,951
		Revenue	...	...	869	
		Works	...	...	2,645	
					<hr/>	6,465
Gardens	...	...	...	...		390
			Total ...	32,840		

Extra clearance, amounting to Rs. 6,333, was done to the old head Sukkur Canal, after the last inundation to get sufficient supply of water for rabi cultivation during the year under review; the cost is included in the above amount.

211. The work of special and ordinary clearance of the Ghár, mentioned in last year's report, was completed during the year at a total cost of Rs. 81,509 against the estimate of Rs. 81,333, of which the year's outlay was Rs. 30,587.

212. The total expenditure on the Ghár Canal maintenance and repairs amounted to Rs. 93,296 as detailed below:—

Repairs	...	...	...	...	...	Rs.
						81,923
Establishment	{	Abkaláni	...	...	Rs.	5,230
		Revenue	...	...		1,458
		Works...	...	...		4,130
						<hr/>
Gardens	...	...	...	...		10,918
						555
						<hr/>
					Total ...	93,296

213. The ordinary repairs were carried out and the usual establishment employed, the expenditure being as follows:—

Repairs	...	...	...	...	...	Rs.
						1,669
Establishment	{	Abkaláni	...	...	Rs.	3,474
		Revenue	...	...		470
		Works...	...	...		1,382
						<hr/>
						5,326
						<hr/>
					Total ...	6,995

214. The nurseries at Lárkhána and Naodero on the Ghár Canal, and Ruk and Arzi Bháto on the Sukkur Canal were maintained. Owing to the erosion at the Ghár mouth some trees had to be cut down; these as well as others likely to fall into the canals were sold. The total receipts under this head from all sources amounted to Rs. 1,801 against Rs. 1,481 during the previous year.

215. The receipts from the sale of fishing rights amounted to Rs. 1,652 as under:—

Ghár Canal	...	...	...	Rs.	1,167
Sukkur Canal	...	...	...		485
					<hr/>
			Total ...		1,652

The decrease of Rs. 417, as compared with the previous year, was due to the low inundation.

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

New Works—					Rs.
Capital Account	...	...	...	...	...
Revenue Account	...	...	...	...	24,892

Repairs—			Rs.	Rs.
Clearance and other works...	...	...	...	1,07,908
Establishment	...	{ Abkaláni ... Revenue ... Works ...	8,181	
			2,327	
			6,775	
				17,283
Gardens	...	...	...	945
Total Capital and Revenue				1,51,028
Agricultural Works—				Rs.
Works	...	...	...	...
Repairs	...	...	...	1,669
Establishment	...	{ Abkaláni ... Revenue ... Works ...	3,474	
			470	
			1,382	
				5,326
Total				6,995
Contributions, ordinary...	...	...	...	415
Total				1,58,438
Add—Cost of regular Establishment and Tools and Plant...				42,916
Grand Total...				2,01,354

The total cost of establishment and tools and plant was Rs. 42,916 and its percentage on the total outlay of Rs. 1,58,438 was Rs. 27.09 as compared with Rs. 24.87 of the previous year.

The total cost of the works establishment was Rs. 22,609 against Rs. 24,045 of the previous year. The decrease is due to the smaller number of beldárs employed during the season.

WESTERN NA'RA.

217. The works connected with this canal have been fully described in previous years' reports. The Karia heads, regulators over main canal at Ghári, lowering pavement of head regulator, Gangroute branch, all of which were in progress last year, were completed at a total cost of Rs. 2,76,241, of which Rs. 2,798 were spent during the year.

218. A full description of the work is given in previous year's report. During the year the following works were completed:—
 Rájwah.—Extensions and Improvements. (1) Widening the Kakole where Rájwah falls into it at mile 9; (2) new tail of Kakolewah; (3) bridge over Rájwah on Mehar and Faridabad road, and Karia heads. Work to the extent of Rs. 21,868 was done during the year.

219. A garden at Manjan on the left bank of the Rájwah in mile No. 9 was laid out for nurseries for the encouragement of growth of trees on the Nára and its branches. Work to the extent of Rs. 334, against the estimate of Rs. 621, was done during the year.

220. As described in last year's report, the work was completed at a cost of Rs. 5,439 against the estimate of Rs. 5,631.

221. This was a large Zamindári Karia of the Western Nára taking off from its right bank at mile 72. It was taken up by Government and cleared before the inundation. The project consists of silt clearance, excavation, setting back old spoil, and regulator and road bridge on the Mehar-Mado road. The first and last works and 2½ miles of excavation were completed and partly paid for during the year to the extent of Rs. 10,000 against the estimate of Rs. 17,742.

222. As the canal passes through low ground and has no sluice at its mouth, a regulator to prevent breaches and keep water at a safe height was taken in hand, consisting of one span of 6 feet, springing level 6' 6" above bed of canal and 1½' above the highest water level of 1897. Regulator 2,000 feet below the head of Meharwah ex Youngwah. Work to the extent of Rs. 699, against the estimate of Rs. 1,372, was done during the year.

223. It is proposed to extend the canal 9,300 feet to irrigate portion of Deh Kathi, Taluka Mehar, which formerly received water from the Pritchard Canal, its branch Youngwah, and the Western Nára and its branch the Kudanwah. The project consists of excavation, regulating bridge on the Nari-Mehar road, and road bridge on the Sita-Mehar road. Work costing Rs. 2,500 was done during the year.

224. Ordinary clearance was carried out and the usual Abkaláni establishment maintained as detailed below:—

				Rs.	Rs.
Repairs	...	...	...	...	8,183
Establishment...	{	Abkaláni	...	1,494	
		Revenue	...	1,233	
		Works	...	1,365	
				<hr/>	4,092
Gardens	...	...	...	...	300
				Total	<hr/> 12,575 <hr/>

225. Ordinary clearance and repairs were carried out and the usual establishment maintained. The expenditure, including that on the Pritchard Canal, was as follows:—

				Rs.	Rs.
Repairs	...	...	...	...	36,373
Establishment...	{	Abkaláni	...	7,374	
		Revenue	...	3,647	
		Works	...	6,222	
				<hr/>	17,243
Gardens	...	...	...	...	452
				Total	<hr/> 54,098 <hr/>

226. Ordinary repairs to the following canals were carried out and the necessary Abkaláni establishment employed.

Dádu Canals—

				Rs.	Rs.
Repairs	...	...	...	...	4,850
Establishment	{	Abkaláni	...	286	
		Revenue	...	121	
		Works	...	294	
				<hr/>	701
				Total	<hr/> 5,551 <hr/>

Phitta Canal—

Repairs	...	...	...	...	683
Establishment	{	Abkaláni	...	275	
		Revenue	...	123	
		Works	...	279	
				<hr/>	677
				Total	<hr/> 1,365 <hr/>

Wáhurwah—

				Rs.	Rs.
Repairs	...	...	...	...	103
Establishment	...	{	Abkaláni	95	
			Revenue	20	
			Works	54	169
				—	169
			Total	...	272

Marviwah—

Repairs	...	...	...	...	108
Establishment	...	{	Abkaláni	107	
			Revenue	17	
			Works	54	178
				—	178
			Total	...	286

Nára Bunds.—Maintenance and Repairs.

227. Ordinary repairs were carried out and fences provided on both sides of bunds. The expenditure was as under :—

				Rs.	Rs.
Repairs	...	...	...	...	9,053
Establishment	...	{	Abkaláni	4,089	
			Revenue	493	
			Works	1,692	6,274
				—	6,274
			Total	...	15,327

228. The receipts from plantations amounted during the year to Rs. 601 as compared with Rs. 677 of the previous year. Rs. 2,380 were realized from sale of timber, &c., in canals and bunds.

229. A sum of Rs. 3,140 was realized from the sale of fishing rights during the year as compared with Rs. 4,236 of the previous year.

230. The following is a summary of the entire expenditure during the year :—

				Rs.	Rs.
Works	...	...	...	...	40,738
Repairs	...	...	...	...	59,358
Establishment	...	{	Abkaláni	13,720	
			Revenue	5,654	
			Works	9,960	29,334
				—	29,334
Gardens	...	...	...	...	782
			Total	...	1,30,212
Contributions	...	...	...	...	2,956
					1,33,168
Add—Regular Establishment and Tools and Plant	...	...	...	...	48,711
			Total	...	1,81,879

The percentage of cost of establishment and tools and plant, Rs. 48,711 to outlay on works, Rs. 1,33,168, was Rs. 36.58 as compared with Rs. 22.49 in the previous year. The increase is due to smaller outlay on works.

The total cost of Abkaláni, Revenue and Works Establishment for the year was Rs. 29,334 as compared with Rs. 32,292 in the previous year.

KARA'CHI CANALS.

231. Under this head a total outlay of Rs. 50,171 was incurred, as compared with Rs. 57,358 in the previous year, on raising river bunds, constructing regulators over canals, the new Laikpur Canal, drainage works, &c.

Extensions and Improvements.

232. The principal works were—(a) raising and strengthening the Mánj-hand bunds, and (b) completion of the Sonda-Hilaya bunds, the total cost being, respectively, Rs. 7,885 and Rs. 2,546; (c) raising the Panah-Baghar bunds, on which Rs. 2,525 were spent during the year against an estimate of Rs. 4,848, the work being in progress; (d) a new bund in the gap between Uterani and Butho bunds, completed at a total cost of Rs. 3,675 against an estimate of Rs. 4,814.

233. The works in progress were the extensions and improvements to the Mulchand-Sháhábunder bunds on which the total outlay was Rs. 17,450, of which Rs. 15,953 were spent during the current year.

The raising of the bunds mentioned above has been entailed by the height to which the river rose in 1897.

Last year the river was extremely low and did no damage. However, new loops had to be constructed at Kotalmo and Machi and near Chagazo on the Kokawari bund; that at Munarki was completed.

234. The regulators at Hajiawah ex Gungro and Saidawah, mentioned in last year's report, were completed at a total cost of Rs. 5,840 and 2,361 respectively. Two sluices in the left embankment of the Baghar at miles 2 $\frac{1}{2}$ and 3 were completed at a total cost of Rs. 1,646, and the work of strengthening the rear curtain wall of the Gungro escape sluice and converting road bridge over Beginah ex Pinyári into a regulator are in progress, the expenditure during the year being Rs. 180 and Rs. 2,277, respectively.

Regulators and Sluices.

235. Besides the above, the work of substituting rolled iron beams for wooden beams of the Pinyári head regulator was completed during the year at a total cost of Rs. 5,318 against the estimate of Rs. 5,839.

236. This canal, mentioned in last year's report, was in progress. The total outlay was Rs. 39,722, of which the year's expenditure was Rs. 5,590. It is now proposed to revise the estimate in order to provide for a larger duty of water and area to be irrigated, subsequently found necessary, and for a better system of distribution from "Rajbuhas."

Laikpur Canal.

237. Work in connection with the drainage of Sujával dhands was carried out to the extent mentioned in last year's report. As a preliminary measure the survey of the lines for the project was carried out and completed during the year at a cost of Rs. 167.

Drainage Works.

238. For the preparation of certain projects the survey of the Baghar Branch canals was taken in hand during the year and is in progress. The expenditure during the year was Rs. 90.

Survey

239. The expenditure under this head was Rs. 1,84,530 as compared with Rs. 1,48,316 in the previous year. The following are the details:—

Maintenance and Repairs.

	Rs.
(a) Special repairs to bunds	54,490
(b) Ordinary repairs to river bunds	21,537
(c) Ordinary repairs and clearance of canals	74,104
(d) Canal establishment	33,176
(e) Maintenance of gardens	1,223

1,84,530

240. The following are the details of (a) special repairs to bunds :—

	Rs.
(1) Constructing a new loop at mile $2\frac{7}{8}$ Bápli Aghamani-Baghar bund.	966
(2) Do. do. Baghar on Varjo Goth ..	99
(3) Do. do. in Deh Kathor	87
(4) Constructing a new loop between $6\frac{5}{8}$ and $8\frac{4}{8}$ miles of the Mulchand Sháhábunder bunds	3,174
(5) Do. do. $18\frac{7}{8}$ and $20\frac{3}{8}$ do. ...	818
(6) Do. do. $31\frac{1}{8}$ do. ...	2,639
(7) Do. do. $39\frac{4}{8}$ do. ..	2,779
(8) Do. do. 53 to 56 do. ...	38,677
(9) Do. do. near the village of Buno in North Sháhábunder Sub-division	352
(10) Do. do. in 10th mile of the Kokawari bund ...	2,135
(18) Do. Kot-Almo loop	1,030
(12) Do. Belo-Machi loop	1,037
(13) Do. in 10th mile of Kokawari bund	647
	54,490

241. Of the above items all were completed during the year except items Nos. 8, 11, 12 and 13, which were in progress.

242. The expenditure under (b), Rs. 21,537, is distributed as under—

	Rs.	Rs.
Right Bank	13,190	
Left Bank	8,347	
	21,537	
and under (c)—		
Right Bank	31,225	
Left Bank	42,879	
	74,104	

243. The usual Abkaláni establishment was maintained at a cost of Rs. 33,176 as compared with Rs. 38,747 in the previous year, the decrease in cost being due to low inundation of the year. The details are as follows :—

For Embankments.

	Right Bank.	Left Bank.	Total.
	Rs.	Rs.	Rs.
Abkaláni	3,641	7,025	10,666
Revenue	363	523	886
Work	1,293	1,570	2,863
	5,297	9,118	14,415
Cost of previous year	6,947	11,800	18,747

For Canals.

	Right Bank.	Left Bank.	Total.
	Rs.	Rs.	Rs.
Abkaláni	3,344	5,748	9,092
Revenue	1,210	1,272	2,482
Work	3,294	3,893	7,187
	7,848	10,913	18,761
Cost of previous year	9,737	10,263	20,000

244. During the year the receipts from plantations amounted to Rs. 160 as compared with Rs. 147 during the previous year.

245. The following is a summary of entire expenditure in the Karáchi Canals District :—

			Rs.	Rs.
Extensions and Improvements	...	..	...	50,171
Maintenance and Repairs	...	...	...	1,50,131
Establishment	...	{ Abkaláni Revenue Work	...	19,758
			...	3,368
			...	10,050
				33,176
Gardens	...	...	...	1,223
			Total	2,34,701
Contributions	...	...	...	339
				2,35,040
Add—Regular Establishment and Tools and Plant	...	...	...	49,582
Mathematical Instrument Depôt Establishment (Mechanist)	...	...	...	916
Do.	Do.	Tools and Plant	...	—3,122
				2,82,416

The percentage on cost of establishment and tools and plant, Rs. 49,582, on the outlay of Rs. 2,35,040 was Rs. 21·09 as compared with 27·7 during the previous year.

INDUS RIVER DISTRICT.

246. The work of erecting survey and bench marks at Kotri and Sukkur Survey and Bench Marks. was taken in hand and 34 at the former and 8 at the latter station were completed during the year at a cost of Rs. 197 against the estimate of Rs. 210.

247. A large scale survey of the Indus for two miles above and below the Kotri Railway bridge was made. Sections of the Indus at Jerruk and across the Uchitto and Haidari rivers were also taken. The work was completed at a cost of Rs. 407 against the estimate of Rs. 300.

248. This building is for the accommodation of the Executive Engineer's Office Godown and Workshop. Office and for the stores of the Conservancy Department and the S.S. "Jhelum." The work was executed by the Executive Engineer, Karáchi Canals, and the cost adjusted with the Indus River District. The cost of the building was Rs. 6,258 against the estimate of Rs. 6,547, of which Rs. 3,273 were contributed by the Indus Conservancy Funds.

249. Under this head the expenditure during the year was Rs. 1,219 against the estimate of Rs. 2,545. This was confined to the cost of chartering the "Jhelum," and purchase of coal and stores for the steam launch "Maud." The first was done at a cost of Rs. 1,440, of which Rs. 1,351 will be adjusted in the accounts for March 1899.

250. The expenditure under this head was Rs. 6,829 against the estimate of Rs. 10,524. The principal works were the thorough clearance of the course of the River Indus from the Delta to Kashmir. 128 trees which caused serious obstructions to navigation were removed at a cost of Rs. 3,271.

251. Some additions and alterations were made to the steam launch "Maud" at a cost of Rs. 250 and Rs. 3,273 were contributed towards the construction of office of the Executive Engineer and godowns and workshop for the Conservancy Department and the S.S. "Jhelum"—*vide* paragraph 248 *ante*.

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

Agricultural Works.

					Rs.
Works	...	...	...	...	3,589
Repairs	...	...	...	...	1,219
					<hr/>
Add—Establishment, Tools and Plant	...	...	...	...	4,808
					16,227
Total					21,035
Deposits, Contributions—					
Excluded Local Funds—					
Works	...	...	...	...	3,273
Repairs	...	...	...	...	3,556
					<hr/>
Total					6,829
Add—Establishment, Tools and Plant	...	...	...	...	8,000
					<hr/>
					14,829
					<hr/>
Total under all heads					35,864
					<hr/>

EASTERN NARA DISTRICT.

253. No flood water entered the Nára Supply Channel during the season.

254. The expenditure on Capital Works was limited to Rs. 602 spent in completing three minor regulators on Mithrao branches.

255. The usual Abkaláni, Revenue and Works establishments were maintained and ordinary repairs done at a cost of Rs. 13,508, and to this was added the extraordinary flood expenditure as under, being balance of last year's estimates :—

Irrigation Major Works—
Productive Public Works,
Nára Canal—Revenue Ac-
count—Maintenance and
Repairs.

					Rs.
(a) Closing breaches and repairing Bakhora-Bakar Bund—Completed	...	...	...	...	2,880
(b) Do. do. Nára Bunds	...	...	...	...	4,352

Irrigation Major Works—
Productive Public Works,
Mithrao Canal—Revenue Ac-
count—Maintenance and
Repairs.

256. The usual Abkaláni, Revenue and Works establishments were maintained and ordinary repairs done at a cost of Rs. 33,124, and to this was added the extraordinary flood expenditure, repairing Makhí Bund (balance of last year's estimate), of Rs. 326.

Irrigation Major Works—
Productive Public Works,
Thar Canal—Revenue Ac-
count—Maintenance and
Repairs.

257. The usual Abkaláni, Revenue and Works establishments were maintained and ordinary repairs done at a cost of Rs. 9,498.

Establishment charged to
Works.

258. No such establishment was engaged as there was no necessity for it.

Summary of Expenditure.

259. The following is a summary of the total expenditure incurred in this district :—

		Rs.	Rs.
New Works—			
Capital expenditure	...	602	
Revenue expenditure	...	...
Ordinary Agricultural Works	..	...
		<hr/>	602
Repairs —			
Clearance	...	5,405	
Other works	...	40,600	
Maintenance of gardens	...	667	
		<hr/>	46,672

		Rs.	Rs.
Establishment	{ Works ...	5,920	
	{ Abkaláni ...	11,986	
	{ Revenue ...	8,344	
		<hr/>	26,250
Add—Regular Establishment Charges	...	...	36,850
„ —Tools and Plant	...	...	724
		<hr/>	
Total under all heads		...	<u>1,11,098</u>

The average expenditure of three previous years on Establishment charged to the maintenance grant was Rs. 25,816.

FIRST DISTRICT, JAMRAO CANAL.

260. The work had been nearly completed the previous season according to the plans, but the junction of the Head Regulator and the Canal Right Bank seemed weak, and additional pavement was sanctioned. The additional pavement and pitching to the bed and sides of the canal were completed during the year. The work was mainly below spring water level; the quantity of water met was larger and the work more troublesome than had been expected.

261. The rolled iron beams for closing the openings of the Head Regulator and the lifting gear for working these beams were brought down from Rohri by boat during the inundation and erected and placed in position. The rolled beams are of three sections, are thickened by teak timber to a uniform width of six inches and the different sections are painted different colours. The timber was bolted to the beams and the painting finished.

262. The Head Regulator was thus completed and made ready for use during the year.

		Rs.
The expenditure during the year was	...	36,919
Total up to date	...	1,34,244

263. The arches of the under-sluices had been completed the previous season; during the year the parapet walls were built up, and the treble cast iron grooves for the gates erected. The ironwork for the under-sluice gates and the lifting gear for these gates had been ordered from England, but owing to delay in the supply of the articles they were not received during the year and the final completion of the work is awaiting their arrival.

		Rs.
The expenditure during the year was	...	23,781
Total up to date	...	2,61,859

264. The lower weir had been commenced and was in progress at the end of March 1898; the work was pushed on vigorously, extra efforts were made during the heat of April and the beginning of May, and before the arrival of the inundation water on the 9th of May the whole of the masonry of the first bay had been completed, and the second or remaining bay of 260 feet length had been nearly completed, about eleven thousand cubic feet of work only remaining. The lower weir is separated from the upper weir by a divide wall founded on wells; this line of wells was sunk, piles driven to close the spaces between the wells and the masonry work of the lower weir built over the wells of the divide wall. The unfinished end of the work was thus reasonably safe from scour during the inundation season.

265. The engines and pumps for this work were in an exposed position on banks in the river bed; means for withdrawing them were prepared and work was continued until the arrival of the water, when the engines were hauled away to high ground on the right bank.

266. Simultaneously with the construction of the lower weir the east abutment of the weir was carried on and by energetic work during the heat of April and May was built up above flood level before the arrival of the inundation, and the engine and pump removed to high ground. This east abutment linked up with the left upstream and left downstream training banks described in paras. 275 and 278 below, form the left flank of the weir, and the whole was constructed to a height secure against floods before water reached them.

267. The efforts thus made during the hot season of 1898 combined with the similar effort in the hot weather of 1897 at the undersluice pavement rendered it possible to complete the head works during the season of 1899.

268. The weir, partially finished as above described, withstood the inundation successfully, and in October when the water began to fall, excavation was commenced at the eastern portion of the weir and the spoil thrown into the river to divert the stream on to the work of the lower weir built as described above; this diversion was successfully effected and maintained until the completion of the weir.

269. Pumping wells were then sunk at the extreme downstream edge of the work and two sets of engines and pumps were started. The total length of weir remaining to be done was 760 feet, too great an area to be kept dry by the two pumps; the work was therefore commenced at the eastern end, and as portions of the weir were completed similar additional lengths were excavated towards the western end. The pumps and engines were passed on to new pumping wells as the work proceeded.

270. The work was executed without accident or interruption, the ground met with being pure sand throughout without any troublesome clay or mud or any buried trees being met. A large body of labour was employed, the materials, mainly lime and bricks, had been prepared, the progress was rapid and the last brick of the crest of the weir was laid on the 28th March 1899.

271. The lower weir is fitted with falling shutters of iron four feet high. These were made in Karáchi, conveyed to Jamrao, and erected during the year. The upper weir has fittings for iron falling shutters, but at first wooden ones 2 feet in height are to be tried. The fittings were prepared in Karáchi and the construction of the wooden shutters was in progress.

272. The whole weir is divided into five bays, of which 3 bays are on the upper weir and two on the lower weir. The division is made by observation towers of masonry, and the upper weir is further separated from the lower by a dividing wall eight feet high.

273. A wire tramway is to be carried across the weir.

The standards for this tramway were made in Karáchi, conveyed to Jamrao, and placed in position on the top of the observation towers.

274. The weir was thus during the year almost completed, the little work remaining being masonry in the upper part of the towers and east abutment, the fixing of wooden falling shutters on the upper weir and the supply and erection of the wire rope. This remaining work has been completed by the date of writing this report with the exception of the wire rope, the supply of which from England has been delayed.

			Rs.
The expenditure during the year was	...	...	1,74,458
Total up to date	...	...	4,76,663

275. The left upstream training bank was well advanced in the preceding year; it was practically completed and joined on to the east abutment of the weir before the arrival of the inundation water in May 1898.

The Left Upstream Training Bank.

276. The closing embankment on the left flank which is included in the estimate for the left upstream training bank is four thousand feet long with top width 15 feet, front slope 5 to 1, and rear slope 3 to 1 and from twelve

to fifteen feet high. It is constructed of sand covered with good earth, and, as good earth was very scarce, for the present 6 inches only were put on as a covering. The flood water will deposit silt near the bank, and if a greater thickness be found necessary the pure earth can then be obtained more cheaply than now.

277. The bank extends from the left or east abutment of the weir to the Sihuri sand hill and closes that passage from floods. The work was commenced and completed during the year, but for a length of 500 feet across the Sihuri channel the top is purposely left at a level one foot only above highest estimated flood in order to form a safety escape, should a flood rise higher than estimated, and so to relieve the strain on the more important banks on the right flank.

				Rs.
Expenditure during the year	...	...	...	40,288
Total up to date	...	...	...	65,560

The Left Downstream Training Bank. 278. Similarly the left downstream training bank was practically completed and joined on to the east or left abutment of the weir.

				Rs.
Expenditure during the year	...	...	...	13,741
Total up to date	...	...	...	37,821

279. These works with the east abutment give a continuous line of protection to the east or left flank. The left flank of the weir was thus safe from inundation, the east abutment having been built up to maximum flood level, but left unfinished at this level for convenience of disposal of some of the spoil from the excavation of the weir.

The Right Upstream Training Bank. 280. The right upstream training bank had been far advanced in the preceding year, all the difficult work being completed before the end of March 1898; the upper part of the bank was finished during the year.

281. The cost of excavating an approach channel to the canal and under-sluices is included in the estimate, and channels with bed width 200 feet wide and 100 feet wide were excavated leading to the under-sluices and head regulator.

282. The development of this approach channel must be watched and, if necessary, assisted next year, and funds for this are available.

				Rs.
Expenditure on the work during the year	...	...	...	27,415
Total up to date	...	...	...	62,080

The Right Downstream Training Bank. 283. The right downstream training bank was the most difficult item of the head-works of the Jamrao Canal. Like the one upstream, it is a bank 29 feet high with top width 15 feet, the toe liable to scour being protected by an apron of rubble stone 30 feet wide and 3 feet thick, laid 8 feet below water level, and the face of the bank being protected by dry stone pitching strengthened by bands of brick and lime at intervals; the length of the bank is 2,000 feet, and in addition, the end like the other training banks, is formed into a large circular bastion with the rubble stone apron carried round the base.

284. The bank was designed to divert the main channel of the Nára and to force the stream away from the right flank and the main canal. The alignment crossed the main channel obliquely, about one thousand feet (or from 250 to 1,250 feet) being in the bed of the main channel, the length from 1,250 to 2,000 feet and the bastion at the end being on the left bank of the main channel. The surface level of the ground on the left bank was a little above ordinary inundation level, and during the inundation this ground is an island, for a branch of the Nára on the left of the weir is then full of water and flowing; during the cold weather this branch is dry.

In addition to the inherent difficulty of constructing the work and getting in the rubble stone apron, the diversion of the main channel of the Nára had to be managed.

285 The bank commences from the end of the downstream flank wall of the under-sluices, and before the arrival of the inundation of 1898 the first 250 feet of this bank had been constructed up to the right edge of the main channel and the unfinished end temporarily protected by loose stone.

The construction of this short length rendered the right flank and main canal safe for the season 1898 against any ordinary flood in spite of the changes which had been made in the river by the construction of the works, and it was executed in the last week of April and beginning of May by hard work.

286. The manner in which the remainder of the bank was constructed was as follows :—

The trench for the rubble stone apron was excavated to water level for the whole length of the bank on the left of the channel of the river, and in continuation of the trench a channel 100 feet wide and 3,600 feet long was cut through the island to the left branch of the river. This channel is to induce scour along the line desired for the new course of the river; its cost was Rs. 8,829, but it greatly facilitated the construction of the training bank and has been charged to that work for the present.

An 8-inch centrifugal pump and engine were first placed at the extreme end of the training bank and arranged to discharge down the scour channel; pumping was then commenced, the wet sand excavated, and the stone apron and pitching laid. When the apron and pitching of the massive bastion at the end had been successfully put in below water level, the pump and engines were moved on and another length of the apron constructed. The lengths so constructed were about 300 feet each.

287. The rubble apron acted like a big drain, water travelled freely through the layer of stones, and it was necessary to cut off the water in the finished part of the apron from the length under construction; to effect this, at the end of every length a concrete wall was built across the rubble apron, a thin layer of concrete was put on the face of the bank behind the dry stone pitching, and then a sand embankment was thrown across the trench on the top of the rubble stone, one toe of the bank resting on the concrete wall and the end abutting on the pitching with concrete backing. It was found that if the water was allowed to rise above the top of the stone apron, before commencing to construct these banks for cutting off the water, then the sand filtered down between the stones and stopped the flow of the water.

288. Whilst the far half of the training bank was thus being constructed some of the spoil from the excavation for the weir was being thrown into the river about 1,000 feet above the site for the training bank; much of this spoil was carried down by the current and formed a sand bank in the river, facilitating the construction of the training bank.

289. By the end of February when the supply to the Nára was shut off at Rohri, it being no longer required for the Mitrao Canal, about 1,000 feet length of bank had been constructed on the left of the Nára and 500 feet on the right bank, a gap of 500 feet remaining to be done.

290. The reduction of the water facilitated the construction of this 500 feet length and the work was pushed on from the left bank until the stream of the Nára was confined to so small a channel that it began to scour the sides. The rubble stone aprons on the left and right had then been advanced to within 112 feet of each other.

Pumping was then stopped; the banks across the ends of the trenches to keep the river out were then cut away and excavated to a little below the level of the water which had by this time fallen so low that the level reached was not more than 5 feet above the ordinary bottom level of rubble stone apron.

The rubble stone apron was then laid at this higher level, but the width was increased from 30 to 60 feet to compensate for the higher level of the bed.

A gap was still left for the diminished stream to flow through, and the bed of this was generally down to foundation level. Preparations were then made for the final closure, earth being piled up on either side of the gap.

291. On the closure of the gap the lowest passage then available for the river water would be the scour channels which had been cut ready as mentioned in para. 286 above and the water would have to rise about 5 feet, or a little over the top of the crest of the upper weir. Such a rise would interfere with the work of the weir, and the closure could not be made until the weir work was finished.

292. This was one of the difficulties which had presented itself from the beginning and the work had been timed to suit, so that the training bank was ready for closure almost precisely as the crest of the weir was finished, the bank being a few days in advance. The last brick of the crest of the weir was laid on the evening of the 28th March and the training bank was closed on the morning of the 31st March.

293. The closure was effected as follows:—

The lower weir, as described in para. 271, is fitted with falling shutters 4 feet high; these had been fixed in position and were available for use. The upper weir was banked off and also the crest was a little higher than the water level in the river.

The use of these shutters for the closure of the bank had been foreseen and the water of the river had not been diverted through the under-sluice channel, but confined to the lower weir; thus it was now possible by raising the shutters on the lower weir to temporarily stop the flow of the river entirely.

On the afternoon of the 30th, most of the shutters were raised, some 30 only being left down for the passage of the water. On the early morning of 31st these remaining 30 shutters were raised, the spaces between were closed by puddle and the water absolutely stopped, the slope of the weir being quite dry.

In about an hour's time the flow through the gap in the training bank had also ceased and the gap was closed without difficulty; gangs of men were kept on by turns to raise the closure bank 7 feet, or high enough to force the water through the scour channel.

294. The pitching of the slope of the bank had also to be provided for, and in the place of the ordinary concrete toe with dry brick pitching, a solid toe of rubble stone was formed and backed with earth; similarly, in the place of 15' dry brick pitching 2 feet thickness of rubble stone pitching was laid. This rubble stone pitching was brought up by evening to the height to which the water should rise when the shutters were lowered,

In the evening one of the shutters was lowered and the water allowed to fill in the pool below the weir during the night, and next morning with water about equal heights on both sides of the weir the remaining shutters were lowered

295. All difficulties with this work were thus passed by the end of the year, and the work has since been completed; the two feet of stone pitching, mentioned in para. 294 above, was carried up for the whole height so that the position of the closure is marked by this difference in the pitching.

			Rs.
The expenditure during the year was	...	...	1,6,102
Total up to date	...	...	1,34,230

296. The excavation of the main canal was completed during the year, the wet excavation in the first mile of the canal being taken out and the hard knots of earth in portions of 14th to 17th miles removed; a little cleaning up of the bed only remaining to be done at the end of the year, and some bills to be paid:—

			Rs.
The expenditure was during the year	...	...	1,02,725
Total up to date	...	...	7,65,319
Total earthwork up to date	...	...	C. ft. 130,633,139

297. A stop bank has been left across the canal at 14 chains to prevent flood water from flowing down the canal and to relieve the head regulator of the undue strain of flood water in the Nára river with the canal bed empty.

298. The stop bank is necessarily substantial and contains nearly $4\frac{1}{2}$ ákhs of cubic feet of earth, and due notice will be required of the time for removal of the bank.

299. The Falls at $7\frac{1}{4}$ miles of the main canal had been far advanced the preceding year and were completed during the year under reference.

	Rs.
The expenditure was during the year	14,190
Total up to date	88,258

300. The Jám Sáhib Minor plans were approved and sanctioned during the year. The Minor is of an unusual character; the outlet is situated $\frac{1}{4}$ th of a mile above the Falls and the minor channel is carried across a shallow depression necessitating banks and is guided through passes in a line of sand-hills, until it reaches the plain country beyond. There are $5\frac{1}{2}$ miles of main channel, and then two branches, the Jám Sáhib branch, an additional $3\frac{1}{4}$ miles, and the Ahmedabad branch, an additional $1\frac{1}{2}$ miles, so that the total length of channel is $10\frac{1}{4}$ miles.

301. An outlet or head regulator, a double regulating bridge at $5\frac{1}{2}$ miles and 3 bridges at other places and two sets of double quarters for establishment are the works for the Minor.

302. The area commanded is about 10,445 acres by flow and 6,938 acres by low lift.

303. The work was commenced and far advanced towards completion during the year, being almost finished at the time of writing this report.

The expenditure was Rs. 23,041.

Buildings. 304. The buildings were maintained in good order at a cost of Rs. 311.

The expenditure on Works Establishment was Rs. 1,740.

305. The inundation was a normal one and there was no flood, the water being maintained at steady level by the Rohri Head Regulator of the Nára. In the incomplete stage of the works there was a back current at the groyne wall between the weir and under-sluices and six feet depth of silt was deposited at the under-sluice end of the weir and 8 to 9 feet depth in the under-sluice channel against the groyne wall.

306. Alongside the Canal Head Regulator and flank walls the deposit of silt was less, as there was a small channel and current directing along this wall. The development and maintenance of a channel leading to the canal is the main work for next season; the falling gates are mainly intended for this, and their use in the early cold season or falling inundation will greatly help in the maintenance of such a channel.

307. At the same time that eight to ten feet of silt, as mentioned above, were deposited in the discharge channel of the under-sluices against the groyne wall, there was scour on the weir side at one portion, the end, of the wall, owing to an eddy; when the water fell to a low level in the hot weather the silt remained against the wall on the under-sluice side and the wall was thus subjected to a thrust of actually about 8 feet of silt, and it was seen that it might possibly have been 10 feet.

308. The normal condition of the groyne wall is one with equal pressure on both sides, and this deposit of silt on one side only is a very interesting example of excessive and improbable strain on a work; special provision had, however, been made for such improbabilities, and the wall stood the strain without difficulty.

309. In the works described, the quantities of work laid from commencement of the works up to date for the principal items are a little over $7\frac{1}{2}$ lakhs of cubic feet of brick masonry in lime, 4 lakhs of cubic feet of concrete, thirty thousand cubic feet of ashlar, 6 lakhs of cubic feet of rubble stone apron, and over two lakhs of cubic feet of dry brick pitching, whilst 480 wells from 7 to 15 feet in depth have been sunk and piles driven to close the spaces between, and a row of sheet piling, 1,290 feet long and 7 feet deep, has also been driven. The greater part of this work had to be executed below water level in fine sand and the main difficulty of the work has been pumping the water out of the foundations, for the water percolated freely through the sand and on any stoppage of pumping the water immediately rose in the foundations; pumping had therefore to be carried on incessantly and four engines of 12 to 13 horse power and 4 pumps of 8" to 10" delivery were at work night and day throughout the season.

310. Photographs have been taken of the works from time to time, showing the progress made and to provide a photographic record that the work has been done, as most of it will always be under water unless pumped dry at great expense.

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

				Rs.
New Works—				
Capital expenditure	...	...	...	5,86,256
Revenue expenditure	...	...	...
Repairs—				
Clearance to canals	...	...	...
Other works	...	...	...
Maintenance of gardens	...	...	...
Establishment	...	{ Works	...	...
		{ Abkaláni	...	...
		{ Revenue	...	...
Add—				
Regular establishment charges	...	...	...	43,848
Tools and Plant charges	...	...	...	890
Total charges under all heads				6,30,934

SECOND DISTRICT, JAMRAO CANAL.

312. This district, as mentioned in previous reports, comprises sixty miles of the Main Line Jamrao Canal, from mile 17 to 77, and 17 miles of the West Branch, from its head to 17th mile.

All the minor branches which take off from the above sections are also in the district.

313. The district was at the outset divided into two sub-divisions, *viz.* : (1) Shahdádpur Sub-division, comprising the area extending from mile 17 to $42\frac{1}{2}$, Main Line, and the distributaries taking off from this length; (2) Mirpur Khas Sub-division, comprising the area extending from mile $42\frac{1}{2}$ to 77, Main Line Head to 17th mile West Branch, and the distributaries taking off from these sections.

314. A third sub-division was formed in January 1898 called the 'Survey sub-division. The work carried out by the establishment of this sub-division was the laying down of the base line squares on the system adopted on the Chenáb Canal over the land to be commanded by the Jamrao Canal. Later on the same establishment was entrusted with the "Contour Survey" on which the fixing of village boundaries and the alignment of water-courses will depend.

Buildings at Head-quarters
of District.

315. The "Head-quarters Buildings," which were completed in the previous year, were maintained in repair at an expenditure of Rs. 667 during the year.

316. The land required for the Main Line has been acquired in previous years. During the year it was proposed by the Superintending Engineer to acquire some additional width of land, in places where the canal passes through Government waste, to be utilised for "plantations" in charge of this Department. The only extra cost will be that of the necessary measuring and demarcating by Revenue subordinates.

317. In this district there are five regulators over the Main Line at miles 17, 31, 46, 56 and 65. Those at miles 46 and 65 were completed in previous years; at miles 17 and 31 the works have been completed departmentally, the contractors having failed. The remaining one at 56th mile is a triple regulator, combining (1) regulator at 56th mile Main Line, (2) regulator at head of West Branch, and (3) regulator at head of Kapri Minor. This work has been completed by contractors and finally paid for during the year.

318. The only work and expenditure remaining under this head is for the "Regulating apparatus," which has not yet arrived from England; otherwise the five regulators are complete.

319. The syphon at 39th mile of Main Canal, designed to pass the Shahuwah, would have been completed before the coming inundation had the iron work been received from England.

All the material, such as bricks, sand and broken bricks for concrete, are ready at site and sufficient. Hydraulic lime has been prepared to complete the work.

320. As much of the masonry work as possible has been completed and the expenditure so incurred up to end of March is Rs. 9,384 against the sanctioned estimate of Rs. 28,221.

The completion of work will now have to be delayed until the next cold working season.

321. Two iron foot-bridges are provided for in this district, one at mile 20 and the other at mile 28 Main Line. The former has been completed and the latter is nearing completion, the total outlay on it to end of March being Rs. 3,060 against Rs. 3,784, the estimated cost.

322. There are seven bridges on the Main Line in this district, viz., at miles 23½, 35½, 38¾, 42½, 51, 60 and 72.

Those at miles 38¾, 42½, 60 and 72 had been completed in previous years, and the rest which were left in an incomplete state have been finished up departmentally during the year at the cost of the contractors.

323. Under this head the following were sanctioned for the Main Line for the use of officers and subordinates :—

- 5 Inspection chaukis with servants' quarters and stables to each, at miles 24, 39, 56, 72 and at Mirpur Khas.
- 2 Upper Subordinates' quarters with cook-houses at miles 39 and 72.
- 1 Clerk's quarters at 39th mile.
- 2 Lower Subordinates' quarters at 24th and 56th miles.

All these with the exception of one of the lower subordinates' quarters at mile 24, which was left uncommenced by the contractor, had been completed last year. The work of the lower subordinates' quarters was carried out departmentally at the risk and expense of the contractor and finally completed during the year.

324. Quarters for sluice establishment and shed for needles have been provided for at each regulator.

Three of these were completed by contract last year and the remaining two this year by departmental labour, owing to the contractor who had undertaken the work having failed to carry it out.

325. There are three quarters for Sazawalkars to be constructed on the Main Line which have been sanctioned, *viz.*, 31st, 47th and 64th mile.

326. The sites of these have since been changed with approval of the Superintending Engineer to that of the regulators on certain Minors where some establishment for the regulation of supply of water will be necessary when the canal is flowing.

327. The quarters will now be built at—

1. Rawatiani Minor	...	...	11th mile.
2. Sinjhero Minor	...	...	3rd mile.
3. Doso Dahrero Minor	...	...	6th mile.

Their construction will be undertaken during the present Abkaláni season.

328. Thirteen Mukádams' quarters on the Main Line are provided for, and five of these were completed to end of March. The work of four others has been taken in hand, and it is hoped that all will be completed during the inundation.

329. The sinking of two wells for the chaukis at 24th and 39th miles that remained to be done during the year under report have been completed.

For the other two chaukis at miles 56 and 72, the wells will be sunk after the water has come into the canal, as at present the sites where borings have been made have yielded very brackish water, unfit for drinking purposes.

330. The store-room at 39th mile which was under construction last year has been departmentally completed during the year, the contractor having absconded.

331. The total outlay on the buildings during the year was Rs 7,072.

332. The total quantity of earthwork done during the year under report was 55,655,256 c. ft., and the expenditure incurred

Earthwork.	Rs. 3,12,394.
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This expenditure includes the cost of jungle-cutting, nicking out the boundaries, and maintaining the service road, including several katcha bridges over the old canals that are crossed. The excavation has been wholly done by contract this year. The work contracted for by the Sind Convict Gang was completed in the middle of March, and the gang has since been removed to the Third District works.

333. Under this head an expense of Rs. 73 was incurred during the year for purchase of some fruit trees for the garden at Mirpur Khas, and this, with that at 39th mile, has been maintained throughout the year at a cost of Rs. 1,051 and 330 respectively.

Plantations.	
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334. The fixing of the mile and indicator stones was done in previous years, but the position of several will have to be altered before the canal is opened.

Mile Bed and Indicator Stones.	
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Bed stones were fixed in part of the Shahdádpur Sub-division, and the work is proceeding. The expenditure under this head during the year was Rs. 128.

335. Some additional strips of land in Government waste along this canal have also to be acquired as in the case of the

Land—West Branch.	main line.
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336. There are two regulators in the section of the canal in this district: one at the head, which is combined with that at 56th mile main line, and the other at the 8th mile of the branch. This latter is also a triple regulator, combining (1) at 8th mile West Branch, (2) at head of Bhitaro Minor, and (3) at head of Dosowah.

Regulators.	
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The head regulator was completed by the contractor during the year.

For the combined regulator at 8th mile, the contractor left the work after excavating the foundations, and it was consequently carried out, departmentally at his expense and was completed during the year.

Bridges. 337. Three masonry and one railway bridge cross the canal within the seventeen miles of this district.

The masonry bridges have all been departmentally completed, as the contractor who has undertaken the works failed to carry them out. The Railway bridge still remains to be constructed.

Buildings. 338. The buildings along the branch in this district are—

- (1) Second Class Chauki with out-houses at 8th mile.
- (2) Sluice establishment quarters at do.
- (3) Mukádams' quarters at miles 3, 11 and 17.

The work of the Second Class Chauki that was left by the contractor undone has been completed departmentally as also the sluice establishment quarters.

The work of two of the Mukádams' quarters was started in the middle of March and has since been completed. The remaining one at 17th mile will be proceeded with and completed during the Abkaláni.

339. A well at 8th mile, left incomplete, was also finished departmentally during the year.

340. All the earthwork on this branch had been practically completed last year. The dressing of banks that was left for the year under report has been done. The total quantity of earthwork done in the length allotted to this district is 22,272,643 cubic ft. Of this 41,93,923 cubic ft. were for extra earth for banks and the rest canal excavation.

341. The total expenditure incurred on this work in the Second District is Rs 93,661 against an estimate of Rs. 84,468.

342. There has been no expenditure under this head during the year. The levelling for bed stones was commenced at the end of March, and arrangements have since been made for carrying and fixing them in places.

Mile, Bed and Indicator Stones.

343. The Rawatiani Minor, as designed and sanctioned, is according to the line laid down in the project. The Minor is 18 miles in length, and from the 11th mile a feeder takes off into the Dimwah, which canal will be absorbed into the Jamrao System.

Distributaries, Main Line. Rawatiani and New Head to Dimwah.

The land for this Minor which runs chiefly through Government waste was taken up during the year, the expenditure incurred being Rs. 176.

Two regulators have been provided for on this Minor, one at the head and the other at the junction of the new head to Dimwah. The expenditure on the former was Rs. 4,560 against the sanctioned amount, Rs. 5,647, and that on the latter Rs. 2,540 against Rs. 6,375.

The head regulator has since been completed and the other one is progressing. Both have been given out on contract, the materials being supplied by Government.

Bridges at miles 3, 6½, 11 and 14½ of the Rawatiani Minor and at mile 4 of the new head to Dimwah have been sanctioned.

Materials have been collected and the work of construction is given out on contract.

The earthwork has been in active progress and it is hoped will be completed before the end of the coming inundation. The total quantity executed was 7,920,768 cubic ft. during the year against the total estimated quantity of 12,727,693, and expenditure incurred was Rs. 29,035.

Some of the mile, bed and indicator stones were fixed during the year at the cost of Rs. 34.

344. The line as sanctioned for this Minor varies considerably from the project design, as the latter was not found to be practicable. The discharge is only 50 cusecs against 112 in the project owing to its being found advisable to leave out from the Jamrao System a considerable area of land which has a very good supply from the present Hyderabad canals.

Rs. 19 were spent on preliminary operations during the year on this Minor.

There are two regulators to be constructed on this Minor, one at the head and the other at 20,000 feet. The work on the former is in progress and superstructure to three feet above floor was completed to end of March. The amount expended on this was Rs. 2,526, while the sanctioned estimate amounts to Rs. 2,958. The materials required for the regulator at 20,000 feet are all collected at the site.

A fall at 16,000 feet is provided for on this Minor, and for construction of this work materials to the value of Rs. 568 have been departmentally collected. The work of construction has been given out and is in good progress. It will hardly take a month to complete.

Some materials have been collected for a tail sluice. This is, however, a very small work and its construction will probably be deferred until the alignments of the water-courses in the vicinity have been determined, as it is designed to discharge into two or more of these.

The total earthwork to be done is 1,177,325 cubic ft., and that done to end of March was 919,580 cubic ft. The expenditure incurred was Rs. 3,063 against the estimated amount of Rs. 4,461. The remaining work has since been completed.

Some of the mile and indicator stones were fixed at the cost of Rs. 13.

345. This Minor is an addition not appearing in the project design. It takes off in the 28th mile of the main line and has a discharge at head of 50 cusecs.

Kabri Minor.

The only masonry works provided for are regulator at head and tail sluice.

Some materials for these were collected during the year at a cost of Rs. 990 and Rs. 64, respectively.

The excavation on this Minor is 1,192,216 cubic ft. and the quantity done was 9,65,055 cubic ft. The amount expended was Rs. 3,335, the estimate being Rs. 4,380.

Huzurwah new cut.

346. This feeder takes off from the Shahuwah and is 1,232 feet in length.

The object is to supply the Huzurwah, a canal of the Central Hyderabad system, which previously received a supply from the Shahdádwah Lándbi. The latter canal has been cut through by the Jamrao main line. This has been decided upon, as the land commanded by the Huzurwah will get a good kharif supply from it *ex* Shahuwah.

A regulator at the head of this feeder has been sanctioned at a cost of Rs. 358, but was not commenced during the year under review.

The excavation work has been practically completed; only some slight dressing of banks remains to be done.

347. This Minor follows more or less the course intended for it in the project design. It is at present 15 miles in length, but a survey has been made to tail it into the low land of Deh Thulho Junejo, which it has to supply, and this will probably increase its length to 18 miles.

Dalor Minor.

Owing to a discrepancy found out in the levels since the plans and estimates for earthwork were submitted and sanctioned, considerable saving is

expected, and a revised estimate will be shortly submitted, including the proposed extension.

On preliminary operations about Rs. 203 were spent during the year.

The work of the regulator at head of the Dalor Minor is in progress and Rs. 3,005 were expended. The amount sanctioned is Rs. 3,976.

Two road bridges and one tail sluice have been provided for. It is intended to carry out these works departmentally during the inundation when water is available, and bricks are now being burnt.

The earthwork done on this Minor during the year was 3,548,301 cubic feet and that remaining to be done is 3,068,535 cubic feet. The expenditure incurred was Rs. 14,553 and that sanctioned Rs. 30,061. The work is proceeding rapidly.

Some of the mile and indicator stones were fixed on this Minor to the value of Rs. 71.

348. The project line has also been adhered to in respect to this Minor. Patoi Minor. The same remark as regards levels applies to this work, which was surveyed at the same time as Dalor Minor, so that a slight saving will probably result. If saving is sufficient, it is proposed to utilize it in converting one of the bridges sanctioned into a regulator, there being no regulator at present between the head and the 15th mile, where the Minor will tail off into village water-courses.

The charges on preliminary operations during the year on this Minor were Rs. 188.

The regulator at head of the Minor is in progress and Rs. 1,471 were spent on this head.

Three bridges to carry roads have been provided on this Minor and the work of their construction will be taken in hand shortly. Bricks are being burnt.

The quantity of excavation completed is 4,221,643 cubic feet and that remaining to be done is 1,908,867 cubic feet.

349. The works in connection with this Minor have been very lately taken in hand, the Superintending Engineer's sanction to commence them being received only at end of February. The progress, however, has been extremely rapid. The masonry works will be all carried out departmentally; lime-stone has been ordered, and arrangements for burning bricks and surkhi have been made. Doso Dahrero Minor.

Total expenditure on the regulator at head of this Minor incurred during the year was Rs. 105.

Some mile and indicator stones have been carried to the site of the works and the amount spent on this head during the year was Rs. 178.

350. Some extra land on this was acquired during the year. Mirpur Minor.

The regulator at the head was in progress and Rs. 1,212 out of Rs. 3,965 were spent.

The other masonry works in connection with this Minor are —

- (1) Regulator at head of Piruwah.
- (2) Do. do. Kahuwah.
- (3) Road bridge at 40,800 feet, Mirpur Minor.
- (4) Fall at 30,000 feet.

These works were started towards the end of this year and will be dealt with in the next report.

The excavation was commenced in September last and the progress has been very satisfactory.

The value of earthwork done on the Minor during the year was Rs. 9,181. The sanctioned amount is Rs. 19,167, which includes Rs. 4,580 for raising banks, &c., of old Lethwah.

351. This does not appear in the project design, but was sanctioned in conjunction with the Mirpur Minor, as the latter was curtailed. It is designed to supply the land at the tail of the present Naowah and Sanrowah of Hyderabad Canals system.

Sanro Minor.

Masonry works consist of head regulator and two road bridges. The former is given out on contract; the bricks are ready at site, but no water is available until the Abkalani.

The excavation work of this Minor is practically completed; the amount spent to end of March was Rs. 1,515 against Rs. 7,656, which, however, includes Rs. 4,820 for raising banks, &c., in old Sanrowah.

Distributaries—West Branch. 352. Only two Minors take off from this branch in this district, viz., Kapri and Bhitaro Minors.

The head regulator on the former is combined in the triple regulator at 56th mile, main line, as described in para. 317, and that on the latter is also a combined one, described in para. 343.

353. Two more regulators have been provided, one for the Ranwak, which is crossed by the Bhitaro Minor, and the other at the head of the present Lethwah, which it is designed to convert into the tail of Ranwakwah. The expenditure on the regulator at head of Ranwakwah was Rs. 622 for lime and bricks and on regulator at the junction of Ranwak with the Lethwah Rs. 357 for the same. Both regulators will be started when the water comes into the old canals.

354. The earthwork in the Kapri Minor was done in previous years, and that in the Bhitaro was completed during the year at a cost of Rs. 6,658 against Rs. 11,656. The balance has to be utilized on strengthening the banks of the old canals, and this work has been commenced departmentally.

355. There are two bridges on these Minors —

- (1) 5th mile, Kapri Minor.
- (2) 4th mile, Bhitaro Minor.

The expenditure incurred on these was, respectively, Rs. 307 and 396 against Rs. 705 each.

356. The object and method of carrying out this survey were explained fully in the Administration Report for 1897-98. The expenditure incurred during the year was Rs. 7,216 against an allotment of Rs. 6,386. Some of this, however, will have to be written back for work done in the Third District.

Square Survey.

The work was interrupted, owing to some uncertainty as to how the already settled lands were to be dealt with, and orders on this point are still awaited. Practically the whole of the Second District, however, has been "squared," the mileage surveyed being 654, while 451 miles were nicked out.

357. This is the second contour survey of the district; the former was undertaken for the purpose of aligning the Main Canal and Minors. It was unfortunately not completed in time to be of much use as regards the main line in this district, but it has been of inestimable service in the designing of the Minors, and the work was so thoroughly well done that in every case where a Minor has been laid down as suitable on the map, the subsequent field work has always agreed with the contour levels.

Contour Survey.

358. The present contour survey is in very much greater detail and it is designed to answer the same purpose in the aligning of the village water-courses.

359. Levels are being taken at the corners and middle points of the sides of the 840 feet squares, that is to say, the lines of levels are 420 feet apart, running

east and west through the entire district, and on these lines levels are taken 420 feet and 840 feet on alternate lines, as it is noted the levels are *not* taken in the centres of the 840 feet squares, but only at corners and centres of sides. These reduced levels will be entered on the "square" maps, and on them the demarcation of the village boundaries and alignment of the water-courses will be determined. The work was only commenced on 20th February, but, in spite of the trying time of the year, has progressed very favourably, and, up to end of March, 32 square miles of levelling had been completed. Progress will not be very rapid until the cold season, when the establishment will be increased, and the survey will be kept well ahead of the demarcation and water-course arrangements.

360. The expenditure incurred to end of March was Rs. 1,736 against the estimate of Rs. 30,470.

361. In connection with this square system, the boundary between the Jamrao system and the Mithrao and Hyderabad Canals systems has been fixed for the Second District in conjunction with the Colonization Officer.

362. The works on the Main Canal and branches consist of the following :—

- | | | |
|---|--|--------------------------------|
| 1. Regulators.
2. Syphon.
3. Bridges. | | 4. Buildings.
5. Earthwork. |
|---|--|--------------------------------|

All these, with the exception of the syphon, have been practically completed.

363. The work of the syphon, as previously noted, could not be completed for want of the iron pipes ordered from England. This work will have to be started again during the next cold weather.

364. The earthwork, with the exception of the existing canal and road and karia crossings, will be completed, certainly, by the end of June.

365. The works on all the distributaries in this district were started during the year, with the exception of the Berani and Kahu Minors; for the former plans and estimates have been submitted; it is, however, the smallest and the least expensive of all, and for the latter, only a regulator is necessary, the existing small canal being utilised as the distributing Minor.

The progress of these works has been most satisfactory; a very large amount was done in the closing months of the year, and the progress continues to be good.

366. The plans and estimates for the Bhojar Diversion, consequent on the Jamrao crossing it in the 52nd mile, are in preparation, and will be submitted shortly.

367. The average daily strength of the labour employed during the year, including the average daily number (250) of the Sind Convict Gang, was 3,548, besides the donkeys and carts. It was, as before, mostly imported.

Summary of Expenditure. 368. The following is a summary of all irrigation expenditure in this district :—

	Rs.
New Works—	
Capital expenditure	4,70,308
Revenue expenditure ... ..	...
Repairs—	
Clearance of canals ... ..	...
Other works ... ..	...
Maintenance of gardens ... ..	...
Establishment ... {	
Works ... ..	...
Abkaláni ... ..	...
Revenue ... ..	...
	* 4,70,308
Add—Regular Establishment Charges ...	56,025
„ Tools and Plant Charges ...	2,468
Total Charges under all Heads ...	5,28,801

* This includes Rs. 1,381 on account of maintenance of gardens in this district.

THIRD DISTRICT, JAMRAO CANAL.

369. This district became a separately constituted Executive charge only in December 1898.

370. It comprises $40\frac{1}{2}$ miles at the lower end of the Main Canal from mile 77 to $117\frac{1}{2}$, and 47 miles of the West Branch from mile 17 to 64, besides the several minor branches taking off from the above.

Extent of the District.

The head-quarters of the district have been fixed at Digri, which is conveniently central.

371. The principal works carried out in previous years were a contour survey of the district and the construction of a first class chauki at Digri, and a second class chauki at Jhuda, with subsidiary and other buildings connected with them. Contracts for the excavation work on the Main Canal were given out in the first 11 miles, 77 to 88, but the work done amounted to only about Rs. 6,000.

Progress of the work in previous years.

372. The survey of all the Minors taking off from the Main Canal and the West Branch and of the West Branch itself were made during the year under report. All of them were realigned, the centre lines nicked out, and relevelled, at a cost of about Rs 1,000.

Preliminary Expenses

373. Some of the land required was nicked out, both on the Main Canal and the West Branch, but no compensation has yet been paid. A great deal of land is yet to be acquired and measured for the several Minors and for the West Branch.

Land.

374. In the project estimate only two regulators are provided for on the Main Canal, one in the 78th mile and the other in the 84th mile, but it will be necessary to construct also a third regulator at the 95th mile, the plan and estimate for which are under preparation. Materials have been collected for the first two of these regulators. No steps have yet been taken for the construction of the two regulators on the West Branch or for those on the Minors.

Regulators.

375. Of the diversions of the old canals which cross the Main Jamrao Canal and the West Branch, work has been started on the Sangro Wah only. Some work at both ends has been given out on contract, and a length of about five miles in the centre has been reserved for the Sind Convict Gang which arrived at the site of the work about the 20th of March, and have commenced constructing landhis, &c., for shelter. A paka masonry well has been constructed for them at Sajnoh at a cost of about Rs. 1,600.

Other Canals—Drainage works.

376. Five bridges are to be constructed on the Main Canal, and the contracts for all of them have been given out. Work has not yet been started, but materials have been collected. Seven bridges are to be constructed on the West Branch, at miles 23, 29, 38, 43, 49, 53 and 59. No arrangements for their construction have yet been made.

Bridges.

377. Three escapes are to be constructed in this district, two on the Main Canal at the 84th mile and at tail, and the third on the West Branch in mile 52. The work on the first escape has been started. Excavation of the channel has been given out on contract, and at the close of the year work to the extent of about Rs. 6,300 had been done. Materials have also been collected for the sluice to the value of about Rs. 1,200.

Escapes.

378. In paragraph 371 above it is stated that the buildings at Digri and Jhuda have been completed. These are the following :—

Buildings.

At Digri.

1. First class 'chauki.
2. Servants' quarters.
3. Stables.
4. Upper Subordinates' quarters.
5. Detached cook-house for Upper Subordinates' quarters.
6. Clerks' quarters and office (3 rooms).
7. Detached Cook-house for Clerks.
8. Store-room.
9. Latrines.
10. Well.

At Jhuda.

1. Second class chauki.
2. Servants' quarters.
3. Stables.

379. The well at Jhuda has been commenced, but as the water tapped was found to be brackish, the work was suspended.

380. Of the buildings on the Main Canal those at the 84th mile, which include a Second Class Chauki with out-houses and stables, Lower Subordinates' quarters, Sluice Establishment quarters, and Needle Shed, have been started and are well advanced. They should have been practically completed by the end of the year, but the iron work which was indented for from England in September 1898 has not yet been received. Some materials have been collected for the Second Class Chauki at 102 mile of the Main Canal.

381. As the spring water is found to be brackish everywhere both on the Main Canal and the West Branch, it is proposed not to sink the wells until the Jámrao Canal flows.

382. In the year under report all the remaining earth-work on the Main Canal was given out on contract. The sanctioned amount in the project estimate for the portion of the Main Canal in this district is Rs. 2,30,332, and the expenditure up to the end of March was Rs. 1,88,990. The work has been practically completed since that date and beyond the dressing of the banks, side slopes, &c., there remains little to be done.

383. The excavation work of the West Branch from mile 17 to the tail, i.e., for the portion in this district was all given out on contract in January 1899. Progress has been very satisfactory, the total value of the work done to the end of March 1899 being about Rs. 7,000.

384. Detailed estimates for the earth-work of the Minors have been prepared and submitted for sanction, and these works should shortly be in progress. During the year under report service roads have been constructed along the Main Canal and the West Branch.

385. A nursery garden was established at Digri at a cost of Rs. 350, and Rs. 250 was expended during the year in maintaining it. The garden is not in a flourishing condition at present as the water-supply is insufficient and of inferior quality, so that little can be expected until the water is flowing in the canal.

386. The mile, bed and indicator stones for the Main Canal were purchased long ago, but they have not all been fixed. Arrangements are being made to obtain the stones for the West Branch and for all the Minors.

Mile, Bed and Indicator
Stones.

397. The estimated amount (revised estimate) for the works comprised in this district is Rs. 11,96,939, out of which only Rs. 50,339 had been expended to the end of 1897-98. Rs. 2,13,008 were spent in the year under report, making the total expenditure of Rs. 2,63,347 to the end of March 1899. There remains a balance of Rs. 9,33,592 yet to be spent to complete all the works.

Summary of Expenditure. 388. The following is a summary of all irrigation expenditure incurred in this district:—

	Rs.
New Works—	
Capital expenditure	2,13,008
Revenue expenditure ... ..	..
Repairs—	
Clearance to canals ... ..	..
Other Works ... ..	..
Maintenance of gardens ... ..	..
Establishment... { Works ... ..	..
{ Abkaláni ... ..	..
{ Revenue ... ..	..
Add—Regular Establishment Charges	13,521
" Tools and Plant Charges	1,365
	2,27,834
Total Charges under all Heads ... *	2,27,834

NORTHERN HYDERABAD CANALS.

Productive Public Works
Capital Account, Dád Canal—
Head Works, Head Regulator over Dád.

389. This work, referred to in last year's report, was practically completed. The expenditure during the year was Rs. 2,981, and the total expenditure from commencement to end of 1898-99, Rs. 76,084. A few payments only remain to be made.

Balkshed and Quarters
for Establishment.

390. These works, as described in last year's report, were begun in 1897-98, and completed during the year under review at a cost of Rs. 2,053 and Rs. 973, respectively.

391. An estimate for Contour Survey expenses amounting to Rs. 5,805 (including Rs. 1,185 sanctioned in Government Resolution No. 11-W. I.—145, dated 30th February 1896) was sanctioned in Government Resolution No. 1729, dated 22nd November 1898. The object of the survey is to ascertain what lands will be commanded by a supply from the Dádwah. The lines of levels have been run from east to west at intervals of a mile with a central line from north to south. The work of levelling will be finished by the end of May 1899.

Regulators.

392. The following two regulators and a sluice, referred to in last year's report, were completed during the year.

	Rs.
(1) Regulator over Reharji where it takes off from Subagan ... Cost ...	1,477
(2) Do. at head of Surat where it takes off from Subagan. do. ...	992
(3) Sluice over Ghati do. ...	992

393. The following four bridges, which were begun in the last year and are referred to in the report for 1897-98, were completed during the year at the cost shown opposite each.

	Rs.
1. Bridge over Suhagan Surat on Road from That to Daulatpur to Kazi Ahmed (identical with one on Road from That to Government well)	1,624
2. Bridge over Suhagan Surat on Road from Daulatpur to Kazi Ahmed	1,644
3. Do. on Road from That to Kazi Ahmed	1,244
4. Do. Baderwah (New Branch to Dád) on Road from Daulatpur to That	1,106

* This includes Rs. 250 on account of maintenance of garden in this district.

Materials to the value of Rs. 4,554 were transferred from Head Regulator, Dadwah, to bridge over Dadwah, on Road from Sahra to Farid-Dero.

Buildings. 394. The work of the following two chaukis is nearly completed, the expenditure being as noted below:—

1. Second Class Chauki at Sahra, Rs. 675, and the total cost to date was Rs. 8,541.
2. Second Class Chauki at Surat Suhagan Line at Jhunghan, Rs. 236, and the total cost to date Rs. 4,980.

In the first chauki a compound-wall, and in the second a well still remains to be built; contract for the latter has been given out.

The work of the Third Class Chauki at Mitho Khoso in the 9th mile of the Dád was completed during the year under report at a total cost of Rs. 3,960.

395. The following works in connection with Dádwah itself were commenced during the year and are yet in progress. Earthwork—Dádwah. These are being carried out with a view to pass water for 94,000 acres of cultivation, as required by Government Resolution No. 120-W.I.—1539, dated 10th October 1898.

1. Removal of spoil in 1st mile.
2. Making a new cut from mile 4-4,040' to mile 5-3,480.'
3. Making a new cut from mile 7-4,825' to mile 14-4,265.'
4. Widening Dádwah from mile 21-6,000' to mile 22-1,210.'
5. Making a new cut from mile 23-3,226' to mile 25-2,860.'
6. do mile 26-490' to mile 27-1,210.'

The length of cut from mile 4-4,040 ft. is 4,720 ft., mean bottom width 59.25 feet, average depth 10.5 ft, and side slopes 1 to 1.

Cut from mile 7-4,825 ft. is 6 miles, 4,720 ft. in length, mean bottom width 57 feet, average depth 9 feet and side slopes 1 to 1.

Widening is being done on the left bank of canal in a width of 20' at the bottom.

New cut from mile 23 is 1 mile, 4,920 feet in length, mean bottom width 46 feet, average depth 11' 1½" and side slopes 1 to 1.

New cut from mile 26 is 3,600 feet in length, with mean bottom width 47 feet, average depth 14 feet 10½ inches, and side slopes 1 to 1.

Rs. 58,357 were spent during the year, and total expenditure from commencement is Rs. 1,35,821 against an estimate of Rs. 5,91,098.

396. The embankments were strengthened during the year, wherever breaches were caused by rain water, at a cost of Rs. 5,944. Surat—Suhagan Extension.

The canal is still being improved and will be opened for the first time this year. A description of it was given in last year's report.

The total cost to end of 1898-99 is Rs. 1,02,431 against an estimate of Rs. 1,24,838.

397. This branch was designed originally to take off at the tail of the present Mirwah. The last portion of the line only was commenced and is in progress. The whole line, with the exception of the last few miles, requires changing; a new line has been fixed and approved of by the Superintending Engineer. Plans and estimates are under preparation and will be submitted as soon as the figures for land commanded by the new lines, as ascertained by contour survey, are approved by the Collector. The expenditure during the year was Rs. 14,253. Mirwah Extension.

398. Improvements to these canals in the shape of removal of old spoil and taking out roots from berm, making inspection paths and jungle-cutting in the 7 and 7½ miles, respectively, were carried out during the year. The berm Yakhtiarwah and Rajwah Bayati.

has been made 2 feet above H. F. L. and the inspection path not more than 5 feet above F. S. L. The expenditure during the year 1898-99 was Rs. 1,483 and Rs. 437, respectively.

399. On these canals also improvements, consisting of (1) removal of old spoil, (2) taking out roots and stumps from berm, and (3) making inspection paths, were carried out in the miles shown opposite each, and are complete :—

Mubarakwah, Chakarwah
and Aliwah.

	Miles.	Cost during the year. Rs.	Estimated Cost. Rs.
Mubarakwah...	... 9½ to 17 = 7½	12,133	40,653
Chakarwah ...	... first 6½ miles	5,443	12,106
Aliwah ...	... 8½ to 16 = 7½	3,690	64,977

The berm has been kept 2 feet above F. S. L. and the inspection path not more than 5 feet above F. S. L.

Works for which Capital
and Revenue Accounts are
kept—Maintenance and Re-
pairs.

400. The usual maintenance works such as clearance and repairs to banks of Mehrabwah, the only canal under this head in this district, were carried out, and call for no special remarks.

The expenditure against the repairs grant was as follows :—

	Rs.	Rs.
Repairs ...	...	2,357
Establishment ...	{ Abkalani ...	452
	{ Revenue ...	181
	{ Works ...	414
	—	1,047
Total ...		3,404

401. A new mouth to Fatimawah, as described in the last year's report, was completed during the year under review at a cost of Rs. 1,099 against an estimate of Rs. 1,235.

Works for which only Re-
venue Accounts are kept.

402. The work of constructing a regulator at the head of Bhortiwah, fully described in the last year's report, was completed during 1898-99 at a cost of Rs. 2,640 against an estimate of Rs. 3,269.

403. In July 1898 a sand bank commenced to be formed at the mouth of the Dád owing to active erosion of the river above, and as it threatened to choke the canal, it was proposed to excavate another head in order to save the then existing cultivation. With the aid of the neighbouring zemindárs and of the Revenue Department the work down to 6½ feet above the full required depth was completed within 16 days. The new mouth was not, however, opened as the water in the river went down and a better supply was running through the old head than could have been got through the new one with its higher bed. The bed is now being lowered as sanctioned in Government Resolution No. 515, dated 30th March, at an estimated cost of Rs. 21,971, including the work already carried out. The new mouth was excavated from a point on the river about ¾ mile above the old mouth and about ½ a mile above the head regulator. The length of the cut is about a mile, bottom width 40 feet and bed 6½ feet above the sanctioned bed, and side slopes 1 to 1. The expenditure during the year was Rs 9,921.

404. The river during the progress of its erosion carried away a portion of the canal, and as it was feared that further erosion might take place a new mouth was given to it by widening a zemindari karia. The work was begun and completed during the year at a cost of Rs. 238 against an estimate of Rs. 338.

Widening a Karia to serve as
a new Head to Mirwah Sahro.

405. The work of repairs to right bank Bhorti, as described in the last year's report, was practically completed at a cost of Rs. 4,155. Only payment of Rs. 475 for land compensation has to be adjusted in the supplementary accounts for March 1899.

Maintenance and Repairs.

406. The out-houses at Mitho Khoso Chauki, which had fallen down owing to flood water having passed over the ground, were re-built at a cost of Rs. 645 against an estimate of Rs. 656. The old materials of the out-houses were utilised in the construction.

407. A large pit having formed by scour on the down-stream side endangering the pavement and wing walls, it was filled and the whole protected by dry pitching 1' thick in a length of 38' 6", breadth 40', with a curtain wall 4' 6" deep. The side slopes were also protected by dry pitching 2' thick with a slope of 1 to 1 in a length of 40 feet.

Estimated amount	...	...	Rs. 1,462
Expenditure	...	...	„ 1,387

408. Owing to heavy deposit of silt in the Dádwah in the first $6\frac{1}{2}$ miles clearance up to $2\frac{1}{2}$ feet above the sanctioned bed was carried out in a width of 40 feet at head and 20' at the 5th mile, the estimate being Rs. 23,000. This work has absorbed more than 1-3rd of the clearance grant of the whole district. A channel 40' wide has also been cleared through the sand bank at the mouth in order to supply the canal with water. The remaining works, consisting of ordinary clearance and repairs to banks, call for no special remarks.

409. The total expenditure against the repair grant was as follows :—

		Rs.	Rs.
Repairs	...	...	59,681
Establishment...	{ Abkaláni	...	4,979
	{ Revenue	...	1,607
	{ Works	...	4,091
		—	10,677
	Total		70,358

Works for which neither Capital nor Revenue Accounts are kept—Raising and strengthening Naolákhí-Bhorthi Bund.

410. This work, as described in the last year's report, was practically completed during the year under review. The total cost is Rs. 28,117, including sluices, but excluding the amount of compensation for land, which will be adjusted in the supplementary accounts for March 1899.

411. Owing to the Indus having carried away the high land on its left bank above the mouth of the Dád Canal the water overflowed in 1897, but was checked by the Zamindárs who erected a small embankment for the purpose. This small embankment, consisting at the time of wet clay, was practically useless, and as it was feared that many villages and an extensive area of country might be submerged by spill during a high inundation, a small bund from a point 6,400 feet from the mouth of the Mirwah Sahro Canal to the Dád Canal at half a mile below the head was constructed and practically finished during the year at a cost of Rs. 2,180, excluding compensation for land which has to be adjusted in the Supplementary Accounts for March 1899. As the bund was constructed partly for protecting cultivation and partly to prevent villages from being submerged, a contribution of Rs. 1,000 from villages and Local Funds combined was promised by the Collector of Hyderabad. Rs. 500 have been recovered and the remaining sum, it is stated, will be paid during May 1899.

412. The construction of this bund was already under contemplation—*vide* para. 10 of Government Resolution No. 456, dated 11th March 1898; but as no great damage was anticipated the work was not sanctioned. In July 1898, however, when the river rose to 13 feet at Bukkur, water was only a foot below the banks of the Dhoro between the tail of the Bhorthi and village of Kanderó Bhurt, a temporary bund to check the spill of the river was found necessary and constructed at a cost of Rs. 148.

This temporary bund having not been found sufficient to fully withstand the force of water, an estimate, amounting to Rs. 2,189, was sanctioned to strengthen it, and work was completed during the year at a cost of Rs. 1,693. Its top width is 6 feet, slope of 3 and 2 to 1 and a height 3 feet above the H. F. L. of 1897.

413. Four topographical stations were marked permanently, with the approval of Superintending Engineer, by means of iron rails 8' long, fixed in a block of concrete and projecting 5'-9" above ground level, at a cost of Rs. 57 against an estimate of Rs. 66.

Permanently marking 4 topographical survey stations in the Sakrand Táluka.

414. Ordinary repairs to Indus Survey marks and Naolákhí Bhorti Bund were carried out and the usual establishment maintained. The expenditure against repairs was as under :—

				Rs.	Rs.	
Repairs	...	...	...	...	328
Establishment	...	{	Abkaláni	1,491		
			Revenue	64		
			Works			
				<u> </u>	1,555	
Total	...				<u> </u>	1,883

415. The gardens at Bhour and Sahra were maintained during the year at a cost of Rs. 467 and 405 respectively. The receipts were 179 and 78 compared with 171 and *nil* respectively in the previous year.

Plantations.

416. Rs. 2,068 were realized by sale of fishery rights and lotus fruit and Rs. 123 by sale of timber, bábul pods, &c.

417. On the new works in connection with the Dád Canal, one Sub-Engineer 1 Overseer, 2 Land Measurers, 1 Maistry and a few Daroghas and Mukádams were employed according to requirements. The total expenditure was Rs. 5,057, giving a percentage of 4.04 of the expenditure on 'Works.'

Works Establishment.

418. The average expenditure of three previous years on establishment charged to the maintenance grant was Rs. 12,857.

419. The following is a summary of the total expenditure incurred during the year in this district.

Summary of Expenditure.

				Rs	Rs.	
New Works—						
Capital expenditure	...	...	...	1,29,984	
Revenue expenditure	...	...	...	13,085	
Ordinary agricultural	...	...	...	17,016	
				<u> </u>	1,60,085	
Repairs—						
Clearance	...	...	...	52,034	
Other works	...	...	...	10,332	
Maintenance of gardens	...	...	...	872	
				<u> </u>	63,238	
Establishment	...	{	Works	4,505		
			Abkaláni	6,922		
			Revenue...	1,852		
				<u> </u>	13,279	
Add—Regular Establishment charges				...	54,027	
,, Tools and Plant				...	1,702	
Total under all Heads				...	<u> </u>	2,92,331

420. The average expenditure of three previous years on establishment charged to the maintenance grant was Rs. 12,857.

CENTRAL HYDERABAD CANALS DISTRICT.

Works for which Capital and Revenue Accounts are kept. Capital Account—Construction of a Regulator over the Shahwah or Great Mârak.

421. The estimate, amounting to Rs. 11,256, for this work was sanctioned under Government Resolution No. 30-W.I.—374, dated 25th February 1898, and a revised one of the same amount approved under Superintending Engineer's No. 2394, dated 30th June 1898.

The work was commenced during 1897-98 and completed this year.

					Rs.
Expenditure, 1897-98 ...	...	...	...	...	2,000
Do. 1898-99 ...	...	...	...	...	9,113
Total ...					<u>11,113</u>

The regulator consists of a boat opening of 15 feet and 3 spans of 8 feet. total clear waterway being 39 feet.

Revenue Account—Maintenance and Repairs.

422. The usual maintenance works, such as clearance and repairs to banks, &c., were carried out, and call for no special remarks.

423. The expenditure against the repair grant was as follows:—

					Rs.
Works ...	...	...	...	...	30,826
Establishment ...	...	{	Abkalâni ...	...	2,217
			Revenue ...	...	999
			Works ...	...	2,195
			<u>5,411</u>		
Total ...					<u>36,237</u>

Works for which only Revenue Accounts are kept. Maintenance and Repairs.

424. Ordinary clearance and repairs to banks, &c., were carried out during the year. The total expenditure against the repair grant was as follows:—

					Rs.
Works ...	...	...	...	...	36,007
Establishment ...	...	{	Abkalâni ...	...	3,073
			Revenue ...	...	1,458
			Works ...	...	3,512
			<u>8,043</u>		
Total...					<u>44,050</u>

425. The improvement of the Ghâro Mahmûda is under consideration. The report called for in connection therewith will be made after the ensuing inundation season.

Works for which neither Capital nor Revenue Accounts are kept. Constructing Permanent Bench Marks in the Central Hyderabad Canals District.

426. The work was commenced during 1897-98 and completed this year.

					Rs.
Estimate ...	...	...	...	...	439
Expenditure during 1897-98	...	...	...	...	152
Do. do. 1898-99	...	...	...	...	245
Total...					<u>397</u>

Connecting Permanent Bench Marks in the Central Hyderabad Canals District.

427. The work was commenced and completed during the year at a cost of Rs. 420 against the estimate of the same amount.

Erecting old iron rails to fix permanently the stations traversed by the Survey of India in the Central Hyderabad Canals District.

428. The work was commenced and completed during the year at a cost of Rs. 265 against the estimated amount of Rs. 357.

Plantations.

429. There are no gardens in this district.

430. The average expenditure on establishment charged to the maintenance grant can be given for two years only, as the district was formed from 1st October 1897. It was Rs. 14,640.

Deposit Contributions—
Ordinary. 431. The work of bunding the head of Kario Jhand *ex* Alibahar Kacheri was done on behalf of Danak and other zamindárs at an expenditure of Rs. 5-8-0.

432. An expenditure of Re. 1 was incurred in behalf of Shek Azizala of Purano Hala for throwing a "chab", or temporary bund, across the head of Kario Aligang, a branch of Gháro Mahmuda.

433. Kacha sluices were constructed at the heads of karias taking off from Shahawah *ex* Great Márak on behalf of zamindárs at a cost of Rs. 108-13-6.

434. A breach which occurred in a "khuada", or well for Persian wheel, was closed on behalf of Dostali Jalalkhan Kaloi, zamindár, at an expenditure of Rs. 11-7-2.

435. The sum total of the above, amounting to Rs. 126-12-8, was recovered during the year as arrears of land revenue through the revenue authorities.

Summary of Expenditure.

436. The following is a summary of the total expenditure incurred during the year in this district :—

			Rs.	Rs.
New Works—				
Capital expenditure	...	...	9,113	
Revenue expenditure	...	...	...
Ordinary Agricultural	...	...	930	
			<hr/>	10,043
Repairs—				
Clearance	...	...	40,896	
Other works	...	...	27,586	
Maintenance of gardens	...	...	...
			<hr/>	68,482
Establishment	...	{ Works ...	5,707	
		{ Abkaláni	5,294	
		{ Revenue	2,457	
			<hr/>	13,458
Add—Regular Establishment charges	...	...	...	36,650
„ Tools and Plant charges	...	...	...	2,867
			<hr/>	<hr/>
Total under all Heads	...	...	...	1,31,500

437. The average expenditure of three previous years on establishment charged to maintenance grant was Rs. 19,914.

FULELI CANALS DISTRICT.

Irrigation Minor Works and Navigation. Works for which Capital and Revenue Accounts are kept. Capital Account. Constructing an escape to the Fuleli.

438. This escape, which was described in the Administration Report for 1896-97, was in progress during the year and is ready for use in the Abkaláni season of 1899, if required. It will enable the Fuleli to be kept open in the next cold season, when it is usually bunded up. A regulator at its mouth was completed during the year.

			Rs.
Estimate	...	...	1,95,548
<hr/>			
Expenditure in 1896-97	...	...	39,768
Do, 1897-98	...	...	99,666
Do, 1898-99	...	...	30,366
<hr/>			
Total	...	...	1,69,800
<hr/>			

439. As the old mouth of the Sanhi Guni was cut off from the Fuleli by the escape, a new mouth has been provided taking off about a quarter mile above the escape. It is provided with a head regulator, with two openings one of 15 feet for boat traffic, and the other of 10 feet.

Providing a new mouth and constructing a head sluice over the Sanhi Guni at Fuleli.

			Rs.
Estimate	...	...	9,632
<hr/>			
Expenditure in 1897-98	...	...	5,000
Do, 1898-99	...	...	4,632
<hr/>			
Total	...	...	9,632
<hr/>			

440. The bed of the Fuleli at this bridge has been scoured out, so that the bottom of the well foundations is only 3.3 feet below the lowest point of the bed. The foundations will be protected by a curtain wall, 15 feet below the down stream ends of the wells, and founded 2.5 feet below their bed. The curtain wall will be 7 feet in depth, and a dry stone pavement will be provided under the bridge.

Protecting the foundations of the Local Fund Bridge over the Fuleli at Matli.

			Rs.
Estimate ...	...	...	2,075
Expenditure in 1898-99	...	...	645

441. The clearance work was of the usual description. Two gardens were maintained during the year at a cost of Rs. 459. The receipts were Rs. 113.

In progress.—Maintenance and Repairs, Fuleli Canal No. 1, Clearance.

442. As the old chauki was in danger, owing to erosion of the river, it was demolished and a new one constructed behind the new Hajipur loop. It has one room 16' x 14' and two side rooms 14' x 8' with a verandah 8' wide in front and back.

Works for which only Revenue Accounts are kept.—Extensions and Improvements.—Pulling down the Sub-overseers' Chauki at Hajipur and rebuilding one at Vasi.

			Rs.
Estimate ...	...	...	1,280
Expenditure in 1898-99	...	...	1,223

Works for which only Revenue Accounts are kept.—Extensions and Improvements. Extension of the Hasanaliwah into the Gajawah.

443. As there is no escape for the excess water at the tail of the Hasanaliwah, its head regulator has to be partially closed for several months nearly every year.

To allow of this canal being run at a higher level, it has been extended, and now tails into the Gajawah, which will be assisted by the surplus water.

				Rs.
Estimate	...	...	...	9,879
				<hr/>
Expenditure in 1897-98	...	...	...	1,001
Do. 1898-99	...	...	...	8,755
				<hr/>
Total			...	9,756
				<hr/>

The work has been nearly completed.

Maintenance and Repairs—Other
Canals on River Indus. 444. The canals taking off direct from the Indus were cleared, and the following works were carried out:—

1. Raising and strengthening the Hájipur Bund,

				Rs.
Estimate	...	...	...	13,965
				<hr/>
Expenditure in 1897-98	...	...	...	2,515
Do. 1898-99	...	...	...	8,554
				<hr/>
Total			...	11,069
				<hr/>

2. Constructing a new loop to the Hájipur Bund between Mirwah and Nurwah,

445. This loop was found necessary on account of the excessive erosion of the river between the Mirwah and the Nurwah,

				Rs.
Estimate	...	...	...	24,894
				<hr/>
Expenditure in 1898-99	...	...	...	10,000
				<hr/>

Works for which neither Capital nor Revenue Accounts are kept. Constructing permanent Bench Marks in the Fuleli Canals District.

446. Bench marks have been fixed at convenient places throughout the district.

				Rs.
Estimate	...	...	...	365
				<hr/>
Expenditure in 1897-98	...	...	...	271
Do. 1898-99	...	...	...	35
				<hr/>
Total			...	306
				<hr/>

Making permanent marks left by the Topographical Survey Party.

447. In order to preserve some of the stations fixed by triangulation, two stations in the Hyderabad Taluka, and one station in the Dehro Mohbat Taluka, have been marked by iron rails fixed in the ground,

				Rs.
Estimate	...	...	...	51
				<hr/>
Expenditure in 1898-99	...	...	...	46
				<hr/>

Works for which neither Capital nor Revenue Accounts are kept—Repairs.

Strengthening the Jamshora Bund and protecting it from further erosion by the river.

448. The bund was raised to a height of 3 feet above highest flood level of 1894, with a top width of 8 feet, and slopes of 3 to 1 and 2 to 1, in front and rear.

				Rs.
Estimate	...	...	...	5,833
				<hr/>
Expenditure in 1897-98	...	...	...	3,000
Do. 1898-99	...	...	...	2,444
				<hr/>
Total			...	5,444
				<hr/>

Making a loop bund and protecting a portion of the Gidu Bundar Bund at the Mir's Tando.

449. A small bund as described in report of 1897-98 was constructed.

			Rs.
Estimate	...	...	8,072
Expenditure in 1897-98	...	...	2,040
Do. 1898-99	...	...	5,357
Total			7,397

Summary of Expenditure.

450 The following is a summary of the entire expenditure incurred in this district:—

			Rs.	Rs.
New Works—				
Capital expenditure	...	...	34,998	
Revenue expenditure	...	..	10,623	
Ordinary agricultural	...	..	149	
				45,770
Repairs—				
Clearance	...	...	1,14,361	
Other Works...	..	...	39,397	
Maintenance of Gardens	...	..	459	
				1,54,217
Establishments...	{	Works...	7,965	
		Abkaláni	6,894	
		Revenue	5,280	
				20,139
Add—Regular Establishment Charges	...	...	...	47,878
„ Tools and Plant Charges	...	...	...	1,205
Total under all Heads			...	2,69,209

451. The average expenditure of 3 previous years on establishment charged to maintenance grant was Rs. 25,272.

APPENDIX A.

Statement showing the entire Expenditure incurred during the financial year 1898-99 on Irrigation Works, Repairs and Establishment in the Province of Sind.

Service.	Works.	Repairs.	Total.
	Rs.	Rs.	Rs.
PRODUCTIVE PUBLIC WORKS.			
MAJOR WORKS.			
<i>49.—Capital Account.</i>			
Works	14,37,710	.....	14,37,710
Establishment	2,12,798
Tools and Plant	7,207
Total	16,57,715
<i>42.—Revenue Account.</i>			
Extensions and Improvements	3,587	.....	3,587
Maintenance and Repairs	1,97,305	1,97,305
Establishment	77,599
Tools and Plant	1,579
Refunds of Revenue
Total	2,80,070
43 —IRRIGATION MINOR WORKS AND NAVIGATION WORKS FOR WHICH CAPITAL AND REVENUE ACCOUNTS ARE KEPT.			
<i>Capital Account.</i>			
Works... ..	43,977	.....	43,977
Establishment	9,852
Tools and Plant	537
Total	54,366
<i>Revenue Account.</i>			
Extensions and Improvements	25,537	.....	25,537
Maintenance and Repairs	1,91,183	1,91,183
Establishment	77,827
Tools and Plant	2,951
Refunds of Revenue
Total	2,97,498
WORKS FOR WHICH ONLY REVENUE ACCOUNTS ARE KEPT.			
<i>Revenue.</i>			
Extensions and Improvements	1,45,139	.....	1,45,139
Maintenance and Repairs	4,83,201	4,83,201
Establishment	1,93,095
Tools and Plant	4,002
Refunds of Revenue
Total	8,25,437
WORKS FOR WHICH NEITHER CAPITAL NOR REVENUE ACCOUNTS ARE KEPT.			
Works and Surveys	29,507	.....	29,507
Maintenance and Repairs	3,22,970	3,22,970
Establishment	89,383
Tools and Plant	9,536
Refunds
Total	4,51,396
DEPOSITS.			
<i>Contributions, Ordinary.</i>			
Works... ..	4,982	.....	4,982
Repairs	2,367	2,367
Establishment	49
Tools and Plant
Total	7,398
Total under all Heads	*35,73,880

Note.—Expenditure exclusive of Establishment and Tools and Plant Rs. 28,57,465
 Cost of Establishment and Tools and Plant " 6,86,415
 Percentage of Establishment and Tools and Plant on Outlay " 23-77
 * Exclusive of Suspense " —2,651

A P P E N D I X B.

B.

debitable to the Canal Clearance Grant in 1898-99 in the Province of Sind.

REPAIRS TO RIVER EMBANKMENTS.		SPECIAL WORKS IN CONNECTION WITH RIVER EMBANKMENTS.		Protecting Slopes of Embankments and Canals.	Miscellaneous.	Arrears.	Contingencies.	Extraordinary Abkalaní Expenditure and closing breaches.	Total Works.	ESTABLISHMENT.				Total Works and Establishment.
Cubic feet.	Cost.	Cubic feet.	Cost.							Abkalaní.	Revenue.	Works.	Total.	
15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
	Rs.		Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
...	...	...	...	...	2,593	...	634	1,542	36,742	3,339	1,586	1,684	6,609	43,351
...	...	...	...	...	3,571	...	680	694	22,459	2,964	874	1,163	5,001	27,460
...	...	...	...	...	2,333	...	500	2,116	50,652	4,264	2,188	1,776	8,228	58,880
3,865,257	80,194	3,116,078	19,300	...	3,684	...	1,925	14,714	79,766	6,656	647	1,895	9,193	88,964
...	...	...	...	453	349	...	448	25	19,300	2,325	800	2,268	5,393	24,693
223,444	1,062	...	...	...	...	...	30	2	1,134	265	54	152	471	1,605
...	...	...	...	693	106	...	359	122	37,124	1,771	578	1,722	4,071	41,195
...	...	...	...	...	29	...	...	...	1,863	242	55	165	462	2,325
...	...	...	...	...	19	...	...	...	1,227	258	59	176	493	1,720
995,007	13,190	10,662,466	47,979	...	7,561	...	457	44	70,495	5,499	258	731	6,458	76,983
...	...	...	...	119	...	...	38	...	3,536	161	53	149	363	3,949
249,000	1,876	...	...	...	384	...	3	...	3,315	1,731	101	309	2,141	5,456
...	...	...	...	841	2,086	...	...	55	30,973	7,374	3,647	6,222	17,243	48,216
...	...	...	...	211	198	...	1	...	5,882	...	...	...	...	5,882
...	...	...	...	...	322	...	...	4	8,463	1,494	1,233	1,365	4,092	12,575
...	...	...	...	...	63	...	...	...	4,850	286	121	294	701	5,551
...	...	...	...	...	2	...	...	...	688	275	123	279	677	1,365
...	...	...	...	...	8	...	...	...	103	95	20	54	169	272
...	...	...	...	...	22	...	...	...	108	107	17	54	178	286
683,994	4,318	...	...	348	3,483	...	...	87	9,053	4,089	493	1,692	6,274	15,327
...	...	...	...	...	1,044	...	15	...	26,375	2,951	869	2,645	6,465	32,640
...	...	...	...	...	3,732	...	195	...	82,478	5,230	1,458	4,130	10,818	93,296
141,310	688	...	...	...	743	...	60	...	1,669	3,474	470	1,382	5,326	6,995
...	...	...	...	...	154	...	-610	...	3,601	385	121	381	887	4,483
...	...	...	...	...	301	...	16	...	4,612	433	212	341	936	5,598
...	...	...	...	155	294	...	-780	...	8,534	614	378	1,107	2,099	10,633
...	...	...	...	...	698	...	407	...	14,663	1,912	499	1,465	3,876	18,539
...	...	...	...	...	18	...	...	...	165	...	...	...	...	165
...	...	...	...	...	159	...	611	...	3,156	171	95	248	514	3,670
...	...	...	...	77	176	...	-85	...	1,535	72	36	103	211	1,746
...	...	...	...	...	1,840	...	-2,451	...	26,927	4,574	916	2,880	8,370	35,297
...	...	...	...	...	45	...	-72	...	2,956	44	...	...	44	3,000
...	...	...	...	...	173	...	-551	...	4,367	260	112	331	703	5,070
...	...	...	...	...	29	...	-860	...	1,935	274	74	212	560	2,555
...	...	...	...	...	...	...	-325	...	671	71	19	59	149	820
...	...	...	...	...	7	...	-260	...	1,145	282	20	60	362	1,507
1,593,824	7,663	...	1,152	126	3,549	...	-772	...	14,342	3,641	363	1,293	5,297	19,639
1,207,898	4,792	9,778,422	48,990	...	958	3,999	...	...	61,685	7,025	523	1,570	9,118	70,803
...	...	...	...	...	...	1,000	...	...	1,000	...	...	...	...	1,000

Names of Canals.	CLEARANCE PROPER IN CANALS.		Jungle cutting.	Re-moving Tudds.	IMPROVING CANAL HEADS.		SIDE SLOPING AND REPAIRING CURVES.		Buildings and Gardens.	Regulators, Bridges and Sluices.	REPAIRS TO CANAL BANKS.		Removing spoil banks and inspection paths.
	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.
Indus River District.	Charting S. S. "Jhelum".	...	...	...	...	...	...	...	...	...	...	...	...
	Coal and Stores for the Steam Launch "Maud."	...	...	...	...	...	...	...	...	...	...	...	...
Eastern Nara.	Nara Supply Channel	...	...	...	...	...	...	...	545	1,321	8,115	962	...
	Eastern Nara	...	...	439	...	...	...	...	...	231	...	...	...
	Mithrao Canal	881,408	3,611	2,283	1,511	432,420	1,988	...	810	6,874	778,090	3,121	...
	Diwah	155,102	621	113	626	...	...	...	...	227	...	...	...
	Heranwah	...	...	193	...	...	...	...	...	...	...	...	...
	Khupra	188,343	639	...	...	...	...	...	8	...	...	...	...
	Tharwah	177,002	514	...	...	...	...	118	2,776	291,627	966	...	
Northern Hyderabad Canals.	Nasrat	418,265	1,618	...	210	...	...	...	488	1	198,825	820	...
	Naolakh	1,902,094	7,559	6	2,120	...	...	...	...	32	478,544	1,428	85
	Dambro	532,981	2,007	43	331	...	...	...	...	4	395,579	1,689	...
	Dadwah	8,120,336	32,735	10	299	...	...	...	405	112	1,50,946	2,927	...
	Renwah	35,079	96	81	498	...	...	...	...	85	112,010	474	...
	Other Canals	1,532,401	5,855	130	36	...	...	...	...	10	193,871	752	...
	Mehrāwah	556,549	2,641	...	191	...	...	...	...	-5	...	...	...
	Special repairs to Dambro Regulator...	...	...	...	...	...	...	...	...	1,387	...	...	...
	Right Bank of Bhorti	...	...	42	...	...	...	...	...	16	1,073,382	4,000	...
	Reconstructing the Out-houses of the Chowki at Mithoo Khoso	...	...	...	...	...	...	...	645	...	...	...	...
	Naolakh Bhorti Bund	...	...	...	...	...	...	...	...	...	...	...	...
	Repairing Indus Survey marks in Moro Sub-division	...	...	...	...	...	...	...	...	...	...	...	...
Repairing Indus Survey marks in Naushāro Sub-division	...	...	...	...	...	...	...	...	...	...	...	...
Bund between the Dad and Mirwah Sahro Canal in Moro Taluka	...	...	...	...	...	...	...	...	...	...	...	...
Central Hyderabad Canals.	Ghāro Mahmuda	3,564,840	13,674	113	1,942	226,033	904	...	...	2	393,018	1,822	...
	Kari Shumāl	1,232,512	5,911	13	588	...	...	...	...	...	31,632	137	26
	Nasir	1,353,874	6,195	...	143	...	...	...	...	...	210,467	926	...
	Other Canals	258,226	371	...	50	...	...	...	...	...	142,801	725	...
	Alibhar Kacheri	216,874	859	...	425	...	...	...	...	...	143,735	687	...
	Great Marak	2,579,550	10,110	1,918	2,478	...	...	...	...	101	1,247,229	5,508	508
	Sarfrāz	1,371,886	3,576	93	133	...	...	...	...	...	87,227	857	290
	Bund to check spill in Hala sub-division	...	...	...	...	...	...	...	...	...	...	...	...
Fuleli Canals.	Fuleli Canals	24,895,186	91,363	1,367	1,511	...	...	...	588	2,687	2,515,201	10,909	1,399
	Other Canals	5,817,356	22,998	201	688	...	...	...	...	1,302	550,739	1,460	...
	Hyderabad Bunds	...	...	...	...	...	...	...	...	...	...	...	...
Begāri Canals District	20,180,241	66,066	1,127	1,167	...	...	96,780	433	6,368	14,780	3,287,971	14,091	...
Shikārpur Canals District	9,783,805	40,754	1,231	2,919	321,818	1,284	177,850	496	3,287	1,920	2,382,510	9,502	903
Ghār Canals District	17,642,070	87,909	45	3,263	38,600	154	20,091	40	3,167	3,060	1,301,078	5,883	524
Western Nāra District	7,158,524	26,429	1,360	2,660	...	...	3,790	12	4,358	3,382	2,132,020	8,072	1,798
Karāchi Canals District	8,934,927	34,219	1,251	1,239	787,954	2,798	...	...	2,974	9,831	7,766,692	27,300	521
Indus River District	...	...	...	...	...	...	...	...	...	...	...	...	...
Eastern Nara...	1,401,955	5,405	3,033	2,137	432,420	1,988	...	...	1,511	10,629	1,077,532	5,049	...
Northern Hyderabad Canals	13,097,710	52,034	415	3,705	...	...	...	...	1,538	1,642	3,303,057	12,000	85
Central Hyderabad Canals...	0,577,712	40,896	2,137	5,739	226,033	904	...	...	...	103	2,257,003	13,217	524
Fuleli Canals...	30,712,542	1,14,361	1,571	2,199	...	...	...	...	588	3,889	2,865,040	12,209	1,399
Total	1,19,487,485	4,68,073	12,170	25,078	1,806,825	7,128	298,511	931	23,789	49,236	26,364,103	1,06,840	6,057

B—continued.

REPAIRS TO RIVER EMBANKMENTS.		SPECIAL WORKS IN CONNECTION WITH RIVER EMBANKMENTS.		Protecting slopes of Embankments and Canals	Miscellaneous.	Arrears	Contingencies.	Extraordinary Abkālāni Expenditure and closing breaches	Total Works	ESTABLISHMENT.				Total Works and Establishment.
Cubic feet.	Cost.	Cubic feet	Cost.							Abkālāni.	Revenue	Works.	Total.	
15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
	Rs.		Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
...	...	...	...	...	89	...	...	...	89	...	...	...	...	89
...	...	...	...	...	1,130	...	...	...	1,130	...	...	...	...	1,130
...	...	...	...	...	...	...	31	...	2,859	...	1,965	...	1,965	4,824
1,741,349	6,638	...	...	...	776	...	75	1,292	9,441	6,945	1,935	2,419	11,299	20,740
333,171	1,624	...	...	...	2,301	...	...	1,811	25,739	3,099	2,370	2,242	7,711	33,450
...	...	...	...	...	...	...	...	551	2,138	268	112	312	692	2,530
...	...	...	...	...	18	...	...	...	211	...	...	...	...	211
...	...	...	...	...	...	...	20	122	809	248	192	120	560	1,360
57,500	201	...	...	...	682	...	120	668	5,475	1,426	1,770	827	4,023	9,498
...	...	...	...	...	442	...	...	16	3,588	484	215	443	1,142	4,750
...	...	...	...	92	634	...	...	314	11,249	821	346	774	1,941	13,190
...	...	...	...	...	147	...	...	2	4,195	430	148	405	983	5,178
...	...	...	...	1	608	...	...	176	27,856	1,697	422	1,129	3,248	31,104
...	...	...	...	...	248	...	...	44	1,437	769	317	867	1,953	3,390
...	...	...	...	...	343	...	...	1	6,107	773	159	473	1,410	7,517
...	...	...	...	...	81	...	...	...	2,357	452	181	414	1,047	3,400
...	...	...	...	...	...	...	...	...	1,387	...	...	...	...	1,387
...	...	...	...	...	10	...	53	...	4,089	...	...	...	...	4,089
...	...	...	...	...	...	...	...	...	645	...	...	...	...	645
...	...	...	...	...	310	...	...	...	310	1,411	64	...	1,475	1,785
...	...	...	...	...	13	...	...	...	13	...	...	...	...	13
...	...	...	...	...	5	...	...	...	5	...	...	...	...	5
...	...	...	...	...	...	...	...	...	...	80	...	...	80	80
...	...	...	...	...	1,110	...	...	9	19,576	1,430	739	1,789	3,958	23,534
...	...	...	...	...	229	...	...	...	6,904	765	411	967	2,143	9,047
...	...	...	...	...	610	...	...	243	8,097	667	289	705	1,661	9,758
...	...	...	...	...	84	...	...	...	1,430	211	19	51	281	1,711
...	...	...	...	...	263	...	...	...	2,234	356	212	460	1,028	3,262
...	...	...	...	...	522	...	...	112	24,312	1,387	526	1,185	3,098	27,410
...	...	...	...	...	519	...	...	22	4,990	474	261	550	1,285	6,275
...	...	...	...	...	...	...	...	...	229	4	...	...	4	233
...	...	...	...	1,665	831	...	560	3,621	1,16,399	5,749	4,654	6,787	17,190	1,33,589
25,000	100	...	...	2,919	204	...	12	100	29,887	1,145	626	1,178	2,949	32,836
...	...	...	...	...	...	...	...	...	*7,981	...	...	...	...	7,981
3,865,257	30,194	3,116,078	19,300	...	12,181	...	3,939	19,066	1,89,619	17,223	5,295	6,518	29,036	2,18,655
1,467,451	16,128	10,662,466	47,979	1,265	8,448	...	1,335	193	1,38,044	12,252	1,958	5,672	19,882	1,57,926
141,310	688	...	...	...	5,519	...	270	...	1,10,522	11,655	2,797	8,157	22,609	1,33,131
653,994	4,318	...	...	1,400	6,204	...	1	146	60,140	13,720	5,654	9,960	29,334	89,474
2,801,722	12,455	9,778,422	50,142	358	8,430	-733	...	456	1,51,354	19,758	3,368	10,050	33,176	1,94,530
...	...	...	...	...	1,219	...	...	...	1,219	...	...	...	...	1,219
2,137,020	8,463	...	...	...	3,767	...	246	4,444	46,672	11,986	8,344	5,920	26,250	72,922
...	...	...	...	93	2,841	...	53	553	163,238	6,922	1,852	4,505	13,279	76,517
...	...	...	...	...	3,337	...	...	386	67,772	5,294	2,457	5,707	13,458	81,230
25,000	100	...	...	4,584	1,035	...	573	3,721	1,54,217	6,894	5,230	7,965	20,139	1,74,356
11,121,754	72,316	23,556,966	1,17,421	7,700	52,381	-733	6,416	28,965	9,82,797	1,05,704	37,005	64,454	2,07,163	11,89,960
As per Booked Accounts ..									9,87,039	1,05,856	37,081	64,683	2,07,620	11,94,650

* No details available.

† The Executive Engineer, Northern Hyderabad Canals, has shown Rs. 11,811 as arrears; those have not been shown in the detail column.

‡ Exclusive of outlay on Deposits Contribution. Difference due to omission of certain works in Fuleli District and adjustments in supplementary accounts for March 1399.

APPENDIX C.

Statement showing the Expenditure incurred on Work Establishment employed in the Deccan Districts during the year 1898-99, 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.	Rs.	
1	Mutha Canals ...	...	...	...	8,347	12,982	21,329	21,329	2,106	2,917	5,023	23.55	The result seems to be satisfactory as compared with the last year.
2	Poona Water-supply ...	...	...	...	25,553	8,594	34,147	34,147	1,188	4,888	6,076	17.79	
3	Nira Canal ...	...	...	...	7,542	15,495	23,037	23,037	2,386	5,304	7,690	33.38	
4	*Other Poona Irrigation Works ...	...	...	...	14,353	4,208	18,561	18,561	945	3,084	4,029	21.71	Increased percentage due to less Capital expenditure having been incurred on the Shetphal Tank.
5	†Sholapur Irrigation Works ...	...	1,509	1,509	1,57,264	12,869	1,70,133	1,71,642	2,513	3,404	10,917	6.36	
6	Ahmednagar Irrigation Works ...	...	...	...	202	2,918	3,120	3,120	3,222	...	3,222	103.27	High percentage due to the increase in the pay of Chaukidars and patkarier, &c., by whom most of the repair work is done.
7	Khandesh Irrigation Works ...	...	...	...	33,056	11,816	44,872	44,872	1,218	1,576	2,794	6.3	
8	Dharwar Irrigation Works ...	...	16,952	16,952	297	12,531	12,828	29,780	1,861	1,373	3,254	10.93	The percentage is only slightly higher than that for 1897-98.
	Total ...	...	18,461	18,461	2,46,614	81,413	3,28,027	3,46,488	15,459	27,546	43,005	12.41	

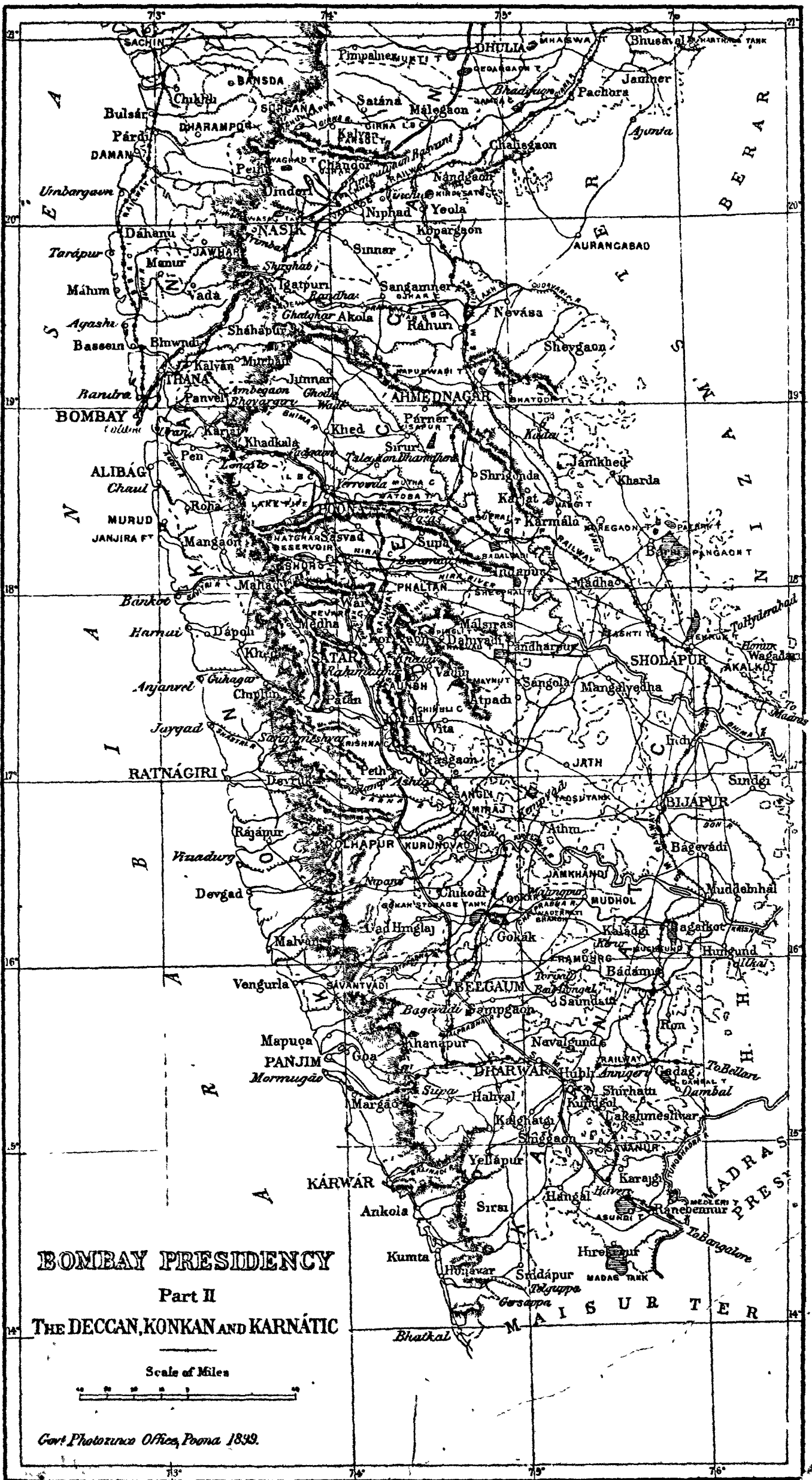
* Includes Shetphal Tank.

† Includes Pathri and Mangi Tanks.

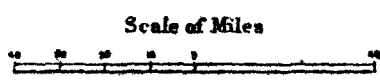
Note.—The figures of expenditure for works in the Nasik District are given in Appendix C to the Administration Report of Civil Works of this Department for 1898-99 (General Branch).

Statement showing the results of Run-off from catchment areas of Tanks in the Deccan for the year 1898.

District.	Name of Work.	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
Khandesh ...	Mukti Tank ...	1898 ...	34.20	21.03	1,670.90	153.22	.092	The tank was at its lowest level on the 10th June and filled up to overflowing on 11th September 1898. Rainfall is taken between these dates. It is an average of two gauges, Dahiana and Dargaon.
	Mhaswa Tank ...	Do. ...	13.4	19.59	609.85	76.82	.126	The tank was at its lowest level on 10th June and filled up to contour 128.36 M. C. ft. on the 29th September 1898. Rainfall is taken between these dates. The tank did not fill up to F. S. L.
	Hartala Tank ...	Do. ...	6.8	14.81	233.96	17.72	.075	The tank was at its lowest level on 24th July and reached its highest water level on 1st October 1898. Rainfall is taken between these dates. The tank did not reach its F. S. level this year.
Nasik ...	Parsul Tank ...	Do. ...	17.75	14.18	584.74	86.66	.148	The tank was at its lowest level on 9th June and filled to overflowing on 18th September 1898. Rainfall is taken between these dates.
	Waghda Tank ...	Do. ...	29	15.61	1,051.52	238.42	.226	Rainfall is from 9th June to 12th July, both days inclusive. Water first passed over waste weir on July 13th.
Ahmednagar ...	Bhatodi Tank ...	Do. ...	44	17.75	1,814.42	300.17	0.17	Rainfall from 10th June to 28th September 1898, on which date the waste weir commenced to overflow.
Poona ...	Bhadalwadi Tank ...	Do. ...	13.0	17.68	944.70	121.71	.129	These tanks did not overflow this year
	Shirsuphal Tank ...	Do. ...	23.5	15.26	833.12	182.69	.219	
	Mhaswad Tank ...	Do. ...	480	* 16.05	17,897.93	8,364.31	0.467	
Sholapur ...	Ekrak Tank ...	Do. ...	159	29.10	10,749.21	1,449.0	.135	*Average of four stations in the catchment. Rainfall from 9th June to 4th October 1898. The tank did not fill to the waste weir level during the year.
	Ashti Tank ...	Do. ...	92	† 18.95	4,050.27	454.34	0.112	Rainfall from 6th June to 10th September 1898. The waste weir began to overflow on 10th September 1898.
	Koregaon Tank ...	Do. ...	4.40	17.55	179.40	115.98	.646	†Average of two stations in the catchment. Rainfall from 7th June to 10th September 1898. The waste weir began to overflow on 10th September 1898.
Bijapur ...	Muchkundi ...	Do. ...	26	3.65	220.472	12.921	.058	From 2nd September to 10th September. The tank did not fill during the season.
	Do. ...	Do. ...	26	6.10	368.460	130.777	.355	
	Do. ...	Do. ...	26	18.34	1,107.795	193.801	.175	
Dharwar ...	Asundi ...	Do. ...	23	4.66	249.00	95.722	.384	From 23rd September—the date on which the tank was at its lowest water level—to 26th September on which date the tank filled to overflowing.
	Do. ...	Do. ...	23	17.74	947.912	110.482	.117	From 1st June to 26th September.
	Dambal ...	Do. ...	43	3.47	346.644	46.566	.134	From first rainfall—3rd June to 6th June.
	Do. ...	Do. ...	43	5.17	516.470	94.698	.183	From 2nd September to 12th September.
	Do. ...	Do. ...	43	12.97	1,295.672	187.629	.145	From 1st June to 28th September, on which date the tank filled to overflowing.
	Medleri ...	Do. ...	11	4.60	117.554	19.067	.162	From first rainfall—30th May to 5th June.
Satara ...	Do. ...	Do. ...	11	2.20	56.221	8.902	.158	From 6th September to 9th September.
	Do. ...	Do. ...	11	4.62	118.065	30.510	.258	From 23rd September to 25th September.
	Do. ...	Do. ...	11	20.22	516.726	69.817	.135	From 1st June to 29th September, on which date the tank filled to overflowing.
	Majni ...	Do. ...	54	1.24	155.561	55.716	.36	From 1st rainfall—30th May to 10th June.
	Do. ...	Do. ...	54	6.13	769.025	123.793	.17	From 25th July to 9th September, on which date the tank filled to overflowing.
	Do. ...	Do. ...	54	14.33	1,797.738	876.652	.49	From 1st June to 31st October.
	Nehr ...	Do. ...	59.50	3.16	436.808	152.160	.35	From 1st June to 16th June.
	Do. ...	Do. ...	59.50	20.73	2,865.516	1,265.306	.44	From 1st June to 31st October. The tank filled up to the level of the temporary cut in the waste weir channel on 8th September.



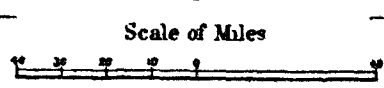
BOMBAY PRESIDENCY
Part II
THE DECCAN, KONKAN AND KARNATIC



Govt. Photodup. Office, Poona, 1899.



BOMBAY PRESIDENCY
Part III
SIND AND CUTCH



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Karack	—
Jamrao	—
Har	—