

Administrative

Report of the Public Works Department

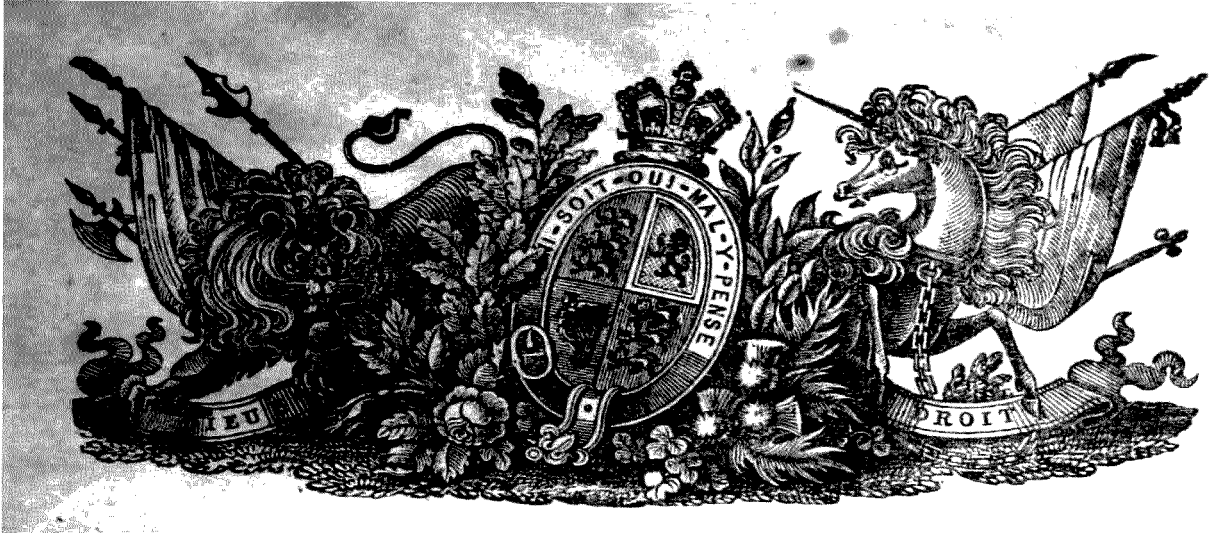
(Irrigation). Bombay Presidency

for the year

1899-1900

Government

1900



ADMINISTRATION REPORT

OF THE

PUBLIC WORKS DEPARTMENT.

(IRRIGATION)

BOMBAY PRESIDENCY,

FOR THE YEAR

1899-1900.

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ADMINISTRATION REPORT
OF THE
PUBLIC WORKS DEPARTMENT
(IRRIGATION)
BOMBAY PRESIDENCY.
FOR THE YEAR 1899-1900.

GENERAL REMARKS.

In the year under report the expenditure on Irrigation Works throughout the Presidency amounted to Rs. 48 lakhs as compared with 42 lakhs in the previous year. This outlay was divided between Sind and Presidency proper in the proportion of 5 to 1 respectively.

2. Of the total outlay Rs. 13,36,495 were expended on repairs in Sind and Rs. 2,24,910 in the Deccan and Gujarát.

DECCAN AND GUJARAT.

Works in progress.

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

4. On the Mutha Canals the Capital expenditure was on altering and improving the lower service mains of the Poona water-supply and on certain minor works, such as constructing canal boundary walls and extending parapets of over-bridges on the Mutha Right Bank Canal, intended for the protection of the canal water from pollution.

5. The work of altering and improving the water-supply mains in the Poona Cantonment was completed during the year, and filtered water from the new filters was, for the first time, supplied to the houses in the Cantonment Bazar.

6. The expenditure on the Bhatghar Dam, was incurred on finishing the extension of the third training wall below the north waste weir commenced in the previous year.

7. The under-sluices were opened for the monsoon on the 9th and 11th July under heads of 36.30 and 14.50 feet respectively, but owing to the unfavourable character of the monsoon they were closed 11 days earlier than in any previous year. Notwithstanding this precaution, the tank filled only up to within half a foot of the weir crest, the top 8½ feet closed by the gates remaining unfilled. The storage impounded was short of the full supply by about 1,700 millions cubic feet, or nearly one-third of the total capacity of the tank. The automatic gates did not come into use during the year.

8. A few minor works were carried out on the main canal and distributaries.

9. An Inspection Bungalow at Nampur in Khándesh was under construction, the expenditure during the year being Rs. 3,444. The work is approaching completion.

10. The only work in the Southern Division on which outlay under the head "Capital" was incurred during the year was the Gokák Canal 1st Section and Storage Works.

11. The expenditure on this canal during the year was Rs. 8,076, and from the commencement of the work has been Rs. 10,75,982.

The items in progress during the year were—

			Rs.
(1) Shindi Nála Extension	...	...	5,496
(2) Constructing Patkaris' Chankis	...	...	1,818
(3) Do. Service Road	...	...	762
Total			8,076

12. 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.	Number of Tanks.	Expenditure during 1899-1900.
		Rs.
Ahmedabad ...	5	2,337
Surat and Broach ...	7	5,422
Belgaum ...	13	9,749
Dhárwár ...	52	44,572
Bijápur ...	3	1,227
Kánara ...	2	632
Ratnágiri ...	2	1,670
Total ...	84	65,639

13. On 1st April 1899 the water in Lake Fife was 18·83 feet above the sill of canal sluices, and the minimum level was reached on 17th June when the depth was 9·75 feet. On the 19th the lake began to rise, and it filled to overflowing on the 30th. The highest flood of the year occurred on the 10th July, when the water rose to R. L. 245·02, or 1·70 feet above crest of waste weir.

14. No floods of importance occurred during the year on the Nira Canal Works.

15. Owing to the unpromising aspect of the season in July 1899 the officers of the Public Works Department were warned, under instructions from Government in the Revenue Department, to be ready for an emergency and to prepare programmes of relief works where they were not already made out. The Executive Engineers were called upon to report, in consultation with the Collectors of the districts concerned, the works they proposed to open, if required to do so, and the order in which they should be started.

16. In the middle of August 1899 a report was submitted by the Superintending Engineer, C. D., to the Commissioner, on the test works proposed in the different Collectorates of his Division.

17. The programmes for 1899-1900 were approved in September 1899 and it was ordered that endeavours should be made to select works of an irrigational nature in preference to any other class, such works, although financially unremunerative, being considered of greater benefit to the country generally, whether in normal or abnormal years, than roads which fall into disrepair for lack of funds.

18. The famine works (irrigation) undertaken during the year in the districts in the Central Division were as shown in the following table, which also shews the expenditure incurred to the end of the year and the highest number of people employed on any one day on each :—

District.	Names of Works.			Expenditure to end of March 1900.	Highest number employed on any one day.
				Rs.	
Khândesh	{	Jalgaon Water-supply	...	38,419	2,835
		Talwâda Tank	...	47,952	4,947
		Jâmda Canal, silt clearance	...	18,139	1,591
		Parmapada Tank	...	17,483	3,425
Nâsik	{	Khirdi Sathe Tank	...	62,394	11,539
		Odal Tank	...	40,508	17,394
		Mâladevi Tank	...	1,79,449	19,986
Ahmednagar	{	Ojhar Left Bank Canal, silt clearance	...	7,030	2,749
		Ojhar Right Bank Canal	...	1,05,726	16,558
		Visâpur Tank	...	1,43,058	12,776
		Bhatodi Tank, silt clearance	...	50,056	6,901
Poona	...	Shetphal Tank	...	81,090	12,142
Sholâpur	{	Pathri Tank	...	21,672	2,817
		Mangi Tank	...	1,63,061	24,732
		Hotgi Tank	...	71,648	11,369
		Wadshivane Tank	...	10,894	7,125
		Budhihal Tank	...	1,53,991	20,762
		Bhamburdi Tank	...	95,940	11,949
		Restoring and widening the dam of the Ashti Tank	...	50,416	8,033

NOTE.—The Mâladevi Tank work, though in the Ahmednagar District, is carried out by the Executive Engineer, Nâsik District.

19. The famine relief works undertaken in the Northern and Southern Divisions are described in the district reports.

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

Area irrigated and assessment.

Serial No.	Names of Works.				Area irrigated.	Assessment.
					Acres.	Rs.
1	Hâthmati Canal	...	...	...	110	868
2	Khari Cut	...	...	...	.....	941
3	Hartâla Tank	...	...	...	4	7
4	Mukti do.	...	...	...	698	3,712
5	Mhasva do.	...	...	...	898	1,815
6	Jâmda Canals	...	...	...	4,515	9,440
7	Parsul Tank	...	...	...	172	862
8	Pâlkhed Canal	...	...	...	1,656	8,306
9	Wadâli do.	...	...	...	401	1,195
10	Ojhar Tambat Canal	...	...	...	463	2,283
11	Ojhar Canal	...	...	...	3,701	5,965
12	Lakh do.	...	...	...	1,054	1,179
13	Bhatodi Tank	...	...	...	870	2,706
14	Mutha Canals	...	...	...	8,725	1,60,166
15	Matoba Tank	...	...	...	1,211	12,576
16	Kasurdi do.	...	...	...	...	...
17	Shirsuphal Tank	...	...	...	400	923
18	Bhadâlwadi do.	...	...	...	826	2,528
19	Nira Canal	...	...	...	27,200	46,952
20	Koregaon Tank	...	...	...	312	659
21	Ekruk do.	...	...	...	4,994	16,971
22	Ashti do.	...	...	...	6,023	12,944
23	Mhasvad do.	...	...	...	13,656	33,116

Serial No.	Names of Works.	Area irrigated.	Assessment.
24	Muchkundi Tank	64	206
25	Krishna Canal	6,511	59,231
26	Yerla River Irrigation Works... ..	4,126	11,757
27	Upper Mán River Works	1,781	5,598
28	Rewari Canal	162	2,961
29	Maini Tank	1,998	5,617
30	Chikhli Canal	45	320
31	Gokák do	8,424	24,787
32	Madag Tank	1,314	2,885
33	Medleri do	138	762
34	Dambal do	239	1,252
35	Asundi do	173	863
Total ..		102,864	5,42,353

The total assessments amount to Rs. 5,42,353, and thus show an increase of Rs. 62,122, or 12·93 per cent., the increase in the area irrigated being 773 acres.

21. The area irrigated compares with the previous five years as follows :—

Years.	Area irrigated.	Rainfall.
	Acres.	Inches.
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
1899-1900	102,864	10·71

22. A statement showing results of run-off from the catchment areas of tanks for 1899 is appended.

SIND.

23. The inundation of 1899 was very poor and compares unfavourably even with that of the previous year, which was itself an indifferent one. In 1898 the fairly good and steady level maintained throughout August and the greater part of September made up to great extent for the low level previously attained, but in 1899 the river fell after the end of July, causing great loss on many of the branch canals and preventing late-sown crops from coming to maturity. The Eastern Nara District was the only one in the Indus Left Bank Division that did not suffer from want of water.

24. The regular rise at the Bukkur gauge commenced on May 9th and 8·50 feet was recorded on the 18th. Falling to 6·50 feet on the 23rd the river again rose slowly and with slight fluctuations, and by the last day of June had attained to 11·60 feet. The 'fair irrigating level' of 13 feet was touched on July 15th, and this height was registered on 23rd, 24th and 25th. Falling to 12·9 feet on the 26th, the maximum of the year—13·40 feet—was reached on the 27th and maintained for three days. The 30th showed 13·30 feet and the 31st 12·80 feet, and throughout August the height varied between 11·50 feet and 10·30 feet. September opened with 9·90 feet, and thereafter the river steadily fell to 5·0 feet on the 30th.

25. At Kotri the river rose in May from 6·80 feet on the 13th to 13·0 feet on the 31st, with a fall to 10·90 feet on the 25th. Throughout June it fluctuated between a minimum of 11·40 feet on the 11th and a maximum of 15·0 feet on the 21st. From the 27th June, with a reading of 13·60 feet, it rose steadily to 17·0 feet on July 11th

and to 18.60 feet, the maximum of the year, on the 29th. This level was maintained until August 2nd, when the fall began. After August 5th, 17 feet was not again recorded, and, with 15.80 feet on the 1st September, began the final fall to 10.0 feet on the 30th.

26. The river was thus at and over 13 feet at Bukkur for 8 days and at and over 17 feet at Kotri for 26 days only. This, coupled with the failure in August and September, stamps the inundation of 1899 as one of the poorest on record.

27. The following table records the river and rainfall figures for the past 20 years :—

Year				Bukkur Gauge, number of days over.			Kotri Gauge, number of days over.			Average Rainfall, inches.
				Feet 12.	Feet 13.	Feet 14.	Feet 17.	Feet 18.	Feet 19.	
1880	...	...	...	60	46	24	3	...	...	2.45
1881	...	...	...	76	41	5	10	...	...	8.73
1882	...	...	...	99	79	56	63	41	28	8.31
1883	...	...	...	53	31	19	14	8	...	5.08
1884	...	...	...	79	53	36	41	22	11	9.28
1885	...	...	...	72	58	41	64	48	22	3.86
1886	...	...	...	79	54	41	73	54	32	4.89
1887	...	...	...	57	45	37	36	27	12	2.93
1888	...	...	...	58	30	12	24	...	...	4.30
1889	...	...	...	81	76	45	66	59	28	4.48
1890	...	...	...	63	37	19	37	23	16	9.16
1891	...	...	...	44	30	18	45	25	23	9.16
1892	...	...	...	44	38	26	41	36	34	1.52
1893	...	...	...	57	44	30	50	43	37	11.59
1894	...	...	...	90	80	69	87	79	73	8.86
1895	...	...	...	41	25	15	27	8	...	5.42
1896	...	...	...	65	49	32	59	43	15	4.64
1897	...	...	...	66	57	51	71	58	48	8.88
1898	...	...	...	42	5	...	48	6	...	3.22
1899	...	...	...	30	8	...	26	19	...	0.81

28. The revenue results will probably show a considerable falling off, except in the Eastern Nara District where in addition to a full kharif area an exceptionally large area of rabi was grown during the year. The bringing into operation of the Fuleli Escape enabled a much larger area of rabi to be cultivated, which will, it is anticipated, go some way towards compensating for the falling off in the kharif area. Extensive remissions are expected, but the high prices ruling owing to famine in other parts of India have, it is thought, more than made up to the zamindars for the short outturn, and the general prosperity has probably not suffered from the poor character of the inundation. There was no rainfall during the season, though it was much needed and great scarcity of fodder resulted.

29. *Begari Canals District.*—The supply to most of the canals was poor to fair. Owing to the low river in August and September the kharif cultivation on high lands generally suffered, especially on the upper part of the Desert Canal, while the rabi crops did not receive their final waterings. The only section of the Kashmor Bund that gave any trouble was the first fourteen miles at the southern end. The Wadhu Dhund commenced eroding here badly, resulting in the destruction of the old front bund and necessitating the construction of a retired loop. The Unbárwáh Regulator was threatened and heavy juckwork was constructed to save it; but the Dhund is evidently cutting past the juckwork and may give further trouble later on.

All the leaks that occurred were closed without difficulty, except one in the Spur Bund on the right bank of the Mirwah, which gave very considerable trouble, and was only eventually closed after 18 hours' work,

The river at the mouth of the Wadhu Dhund is eroding. It has also taken a set against the bund for about 3 miles from Begari Bund, and will probably take the old course of 1896. It is, however, favourable for supplying the Begari Canal, the river now flowing within half a mile from the head regulator.

30. *Shikárpur Canals District.*—The supply to the canals was fair, considering the low inundation, except in the case of the Sind Canal and its branch—the Sind Sanri. The former failed entirely this year owing to its feeder, an old Dhund, having become completely silted on account of excessive erosion at its head. The auxiliary feeder of 1896 was, therefore, opened, but as its section was insufficient, it failed to improve matters much. A new mouth and feeder have this year been made, which, it is hoped, will prove a success.

A breach occurred in the third mile of the Sukkur Begari Bund, but was promptly closed. The river near Kot Shahu in the 23rd and 24th miles showed a tendency to approach the bund, and a new loop is being constructed there. The Kásimpur Bund has remained uninjured.

31. *Ghár Canals District.*—Although the inundation was such a poor one, the supply of water in the Ghár system was on the whole better than last year, owing to there being no erosion at the head of the Ghár. There were, however, a few complaints of deficiency on high lands on its upper reaches, as well as at tail portions of some branches; and the matters were partially made good by encouraging lift cultivation for the former, and rotation of watering on the latter.

The supply in the Fordwah was deficient owing to very active erosion at its Head throughout the inundation. In the middle of August, the old head regulator and about two furlongs of the canal were carried away. There was no rain to assist the deficiency, but owing to an entire immunity from locusts and blight the yield is said to be good and up to the average.

The Rahuja Head of the Sukkur Canal failed to give a sufficient supply on account of the low inundation, and active erosion at the Head of Janu Dhund, and the whole supply of the canal was, therefore, obtained from the old Head which worked most successfully. About the beginning of September complaints were received of insufficiency of water in the Sukkur Canal and Kurs Khairo and Biro, and to remedy this the system of rotation was put in force, which proved satisfactory, resulting in great benefit to kharif crops and rabi floodings.

Owing to the low inundation the water only touched the Saidabad and Jhálí Bunds in a few places, and did not touch the remaining bunds at all.

32. *Western Nára District.*—In spite of the low inundation the supply in the canals of this district was fair. As regards the Nára itself, it had a better supply in June and July than in 1898. This is chiefly due to the favourable change at its Head. Its old Feeder, the Akil Dhund, had for some years been silting up, thereby causing deficiency of supply. In June 1899, a cut was made joining this feeder with what proved afterwards to be the main stream of the river. This gave a good supply, very near to the Nára Mouth and at a higher level. On the whole, it is expected that the kharif cultivation will be rather more than that of last year, but very little rabi is expected.

The contrary is the case on the Munchar. The gauge at Shah Hussien read 4.90 feet, the highest reading recorded this year, on the 2nd September, after which water decreased gradually and did not rise again. Consequently no kharif cultivation was done, but the area under rabi is expected to be as much as that of last year. There was practically no rain to assist crops, nor any hill floods.

With the low level of the river there were no floods, and water did not touch the bunds at all, except in depressions and low grounds. The river is eroding opposite the new Nageshah Loop mile 27½.

No breaches or leaks occurred in the bunds, and a few that occurred in the canals were successfully closed without any trouble.

33. *Karáchi Canals District.*—Owing to the low inundation the supply in the canals was poor, excepting in the Pinyari and the canals in the Delta

where it was fairly good. The Laikpur Canal also worked unsatisfactorily. Probably on the whole the revenue will not exceed one-fourth of last year.

With the low river, the greatest depth of water against the bunds was in almost every case lower than it has ever been before, and certain sections were not even wetted. None of the loops constructed in the previous working season were tested.

On the right bank, in North Jerruck Sub-division, there was a little erosion at the mouths of Nurpur Batho and Bagdad Canals, and in South Jerruck there has been a fair amount of erosion at the Head of the Baghar Uchito Bund. On the left bank, in North Shahbandar, some erosion took place opposite miles 21 and 35 of the bund, but elsewhere there was none of consequence. In South Shahbandar, however, the river continued eroding in miles 53 and 54, and, opposite mile 9/5 of the Kokawari Bund it has approached the 1898 loop.

Floods and accidents, State of supply. Indus Left Bank Division.	34. There were no floods and no breaches of any importance in the Indus Left Bank Division save one in the Makhi Bund in the second furlong from the head regulator of the Mithrau Canal in the Eastern Nara District and this being of positive benefit to the Mithrau Canal was not closed until 2nd October.
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35. *Northern Hyderabad Canals District.*—The erosion of mouths of canals continued, and, combined with the poor inundation, seriously affected the supply, especially in the smaller canals. The mischief was aggravated by the practice in this district of generally postponing irrigation operations until late in June or early in July, so that a low supply in August and September is fatal. The set of the river at the mouth of the Naolakhi Canal changed to the right bank at the end of the season which greatly benefitted the supply in this canal, but it is feared the change is not yet permanent. The Mehrabwah worked fairly well at first, but the crops suffered considerably owing to the early fall of the river and the erosion at the mouth of the feeder dhand. The same was the case with the Nasrat which takes off from the same dhand. The Dad mouth which was threatened with heavy silting owing to the erosion going on above, was kept clear by continuous exertion and the crops in the main canal did well though some of the branches suffered from the short supply. The Ren wah worked well, and the smaller canals fairly well, except those affected by the river erosion.

36. *Central Hyderabad Canals District.*—The canals in this district all suffered from the lowness of the river and its early fall, with the exception of the Great Marak, which worked extremely well and only ceased to flow on 5th December.

37. *Fuleli Canals District.*—The Fuleli Canal flowed this year for the full 12 months, but the supply during the kharif season was insufficient and, as in other districts, there was no rain to assist. Rotation was practised continuously throughout the season but despite this some of the higher lands suffered. The Nareja Regulator practically saved the Hyderabad taluka from an entire failure of crops and has probably paid for its prime cost in this year alone. On the tails of the Gaja heavy remissions are anticipated. The supply is always scanty here, but a project has been prepared for supplying all this area direct from the Indus. The new Escape came into operation during the year.

38. *Eastern Nara District.*—No flood water entered the Nara supply channel during the year, but the district received a fully sufficient supply. On the Mithrao and Thar Canals, the total cultivation will probably be found to be the highest on record, the rabi sowings having been stimulated by the high prices ruling.

39. *River Bunds—Indus Left Bank Division.*—These were subjected to no strain, but erosion continued at the Jamshoro and Hajipur Bunds. In the former case it was not considered safe to risk another inundation with the present bund which is close on the river bank, and a retired bund was sanctioned during the year which will be completed before the river begins to rise. It has afforded useful employment to immigrants, mainly those from Cutch. At Hajipur the

old bund in front of the loop, which was only completed in May 1899, was eroded, and should the encroachment continue at the same pace next inundation, the loop itself will be threatened and heavy expenditure on a retired line of bund will be unavoidable.

40. The principal works in progress in the Indus Right Bank Division were :—

Begari Canals District.—(1) Remodelling the Principal works in progress. Desert Canal, and (2) a contoursurvey of the district.
Indus Right Bank Division.

Shikarpur Canals District.—(1) New mouth and feeder, with escape to the Sind Canal (2) cutting off a bend in the second mile, and (3) extending Channel No. 2 of the Sind Canal, (4) improvements to the Rajib, Chitti and Garang Canals.

Western Nara District.—(1) Improvement to the Rajwah and (2) Masaharwah, (3) extension of Pateji Branch *ex* Pritchard Canal, (4) new mouth to Dingri Wah *ex* Western Nára.

Karachi Canals District.—(1) Improvement of the Laikpur Canal, (2) drainage of Sujawal Dhunds, (3) construction of chaukis, (4) head regulator Shah Punjo Canal, and (5) fencing River Bunds.

Indus River District.—(1) Extending the survey at Kotri, (2) putting down permanent marks and making a complete hydrographic survey of the bifurcation of the Indus, (3) taking soundings at Jerruk and Sukkur, (4) gauging discharges of the river and making silt experiment at the permanent discharge station selected and surveyed below Kotri, (5) recording the changes that occurred in the river during the year, (6) clearing the river throughout its course in Sind of all snags.

41. The principal works in progress in the Indus Left Bank Division were the Principal works in progress. Jamrao Canal and the extension and improvement of the Dádwah. Early in the year, on the completion of the Indus Left Bank Division. head-works, the First and Second Districts of the Jamrao Canal were amalgamated, and the canal was thus divided into two Executive Districts, with the Hyderabad-Umarkot Railway as the dividing line, under the names of the Northern and Southern Jamrao Canal Districts, respectively.

42. The work made excellent progress during the year. In the Northern District, the first 77 miles of the Main Canal and 17 miles of the West Branch with all the works thereon were completed, and the 'Minors' were either finished or so far forward as to allow of water being passed down most of them. The breaking up of the waste areas into villages under the Chenab square system, and the construction of water-courses &c., were commenced and made rapid progress, the water-courses providing suitable and much-needed employment to some 7,000 of the immigrants from the Thar Desert and Márwár who flocked into Sind during this year of famine. A Note by the Colonization officer on the work done by his department during the year is appended to this report.

43. In the Southern (formerly the Third) District quite exceptional progress was made. This district was only organized as a separate charge in December 1898, and by the close of the year under review the excavation of the Main Canal was completed to the tail (40½ miles), that of the West Branch was carried on complete from 17 to 44 miles, while the remaining length was commenced, and the masonry works on both Main Canal and West Branch were in many cases completed, the remaining ones being in forward condition. Twelve 'Minors' were approaching completion and water was being admitted into the old channels, as a temporary measure, for hot weather irrigation. The diversions of old canals were in progress, and other miscellaneous works were well in hand. The large amount of excavation work available was of great value in employing immigrant labour, some 8,000 Tharis and Márwáris finding an ample subsistence on the works for the last five months of the year.

44. His Excellency Lord Sandhurst, Governor of Bombay, visited Jamrao in November 1899 and formally opened the canal, which will come into complete

operation in the approaching kharif season in the Northern District and into partial operation through the medium of the old canals and karias in the Southern District, where the survey work for the water-courses &c., is only lately commenced. A considerable area—10,000 to 12,000 acres—was irrigated by the canal during the hot season and the fodder crops so obtained were a great boon to the zemindárs.

45. The Dád works progressed very satisfactorily during the year. The contour survey referred to in last year's report was completed and all doubts concerning the sufficiency of the land under command to ensure a good return on the Capital expenditure have been set at rest. A modification of the Southern half of the Project involving a new Mirwah, which was referred to in last year's report, was sanctioned during the year and approaches completion, as do the improvements to the Ren branches which are to be incorporated into the Dad system. It is proposed next year to take in hand the widening of the Dadwah so as to render the increased supply available for the kharif of 1901 when a large extension of cultivation may be anticipated. The waste areas are about to be broken up into villages on 'Chenab' lines, the survey numbers being demarcated off into 4 acre squares.

46. A small commencement was made with the Nasrat Improvement Project which will be pushed on with next year on the completion of revised designs for which surveys have been in progress, mistakes having been discovered in the original project.

47. The Fuleli Escape was completed and the banks were raised to a safe height. Water was regularly admitted from the beginning of February with most beneficial results as regards the silt deposits at the end of the Fuleli Canal and boats have since come into the Fuleli from the Puran.

48. The improvements to tow paths for the convenience of the navigation were continued and sanction was accorded to the acquisition of a suitable plot of land close to Hyderabad for a boat bandar.

49. In the Eastern Nára District improvements at the Head Regulator of the Mithráo Canal were put in hand, and preparations were made for the commencement on 1st April of the extension of the Bhaiti Bund as a special work for the employment of distressed immigrant labour.

50. The Indus Left Bank Division was very short-handed during the latter part of the year owing to the exigencies of the famine in other parts of the Presidency.

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

Class of Works.	NEW WORKS.				REPAIRS.			Establishment Proper.	Tools and Plant.	Total under all Heads.
	Capital.	Revenue.	Ordinary Agricultural.	Total.	Works.	Canal Conservancy. Establishment.	Total debitable to Clearance Grant.			
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
Major Works	15,98,212	11,272	...	16,04,484	1,72,562	44,243	2,16,805	3,16,383	13,202	21,50,874
Minor Works, Capital ..	40,709	7,790	...	48,499	2,10,141	41,044	2,51,185	81,506	2,507	3,83,697
Do. Revenue ... ..	...	2,14,624	...	2,14,624	4,42,340	84,823	5,27,162	1,94,816	3,351	9,39,453
Ordinary Agricultural ...	...	...	30,813	30,813	3,06,118	2,8243	3,34,360	98,570	19,428	4,83,171
Total	16,33,921	2,33,686	30,813	18,98,420	11,31,161	1,98,351	13,29,512	6,90,775	38,488	39,57,195
Deposits, Contribution—										
Ordinary ... ..	...	...	6,699	6,699	6,983	...	6,983	10,625	447	24,754
Total	16,33,921	2,33,686	37,512	19,05,119	11,38,144	1,98,351	13,36,495	7,01,400	38,935	39,81,949

GENERAL.

52. The revenue receipts during the year amounted to Rs. 9,64,527, of which Rs. 7,16,065 were on account of works in the Deccan and Gujarát and Rs. 2,48,462 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:—

	1897-98.	1898-99.	1899-1900.
	Rs.	Rs.	Rs.
Major Works—			
Protective Works	1,51,008	1,63,465	1,73,935
Productive „	4,41,257	4,96,983	5,47,027
Total ...	5,92,265	6,60,450	7,20,962
Minor Works—			
Imperial—			
Works for which Capital and Revenue Accounts are kept	1,49,297	1,75,394	1,42,352
Works for which only Revenue Accounts are kept	65,098	74,287	62,939
Agricultural Works—	1,955	2,572	2,911
Provincial—			
Works for which Capital and Revenue Accounts are kept	31,837	31,197	35,363
Total ...	2,48,187	2,83,450	2,43,565
GRAND TOTAL ...	8,40,452	9,43,900	9,64,527

Expenditure.

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

Imperial.

	Rs.	Rs.	Rs.
Capital—			
Major Works—			
Protective Works	1,34,084		
Productive „	* 18,66,865		
		20,00,949	
Minor Works and Navigation—			
Works for which Capital and Revenue Accounts are kept		† 1,68,010	
Revenue—			
Major Works—			
Protective Works	63,108		
Productive „	4,20,865		
		4,83,973	

† Inclusive of Expenditure in England and Exchange Rs. 83,291
Do. do. and Exchange 4,488

Minor Works and Navigation—

	Rs.	Rs.	Rs.
Works for which Capital and Revenue Accounts are kept ...	4,33,019		
Works for which only Revenue Accounts are kept ...	11,01,810		
		15,34,829	

Agricultural Works—

Works for which neither Capital nor Revenue Accounts are kept ...	* 5,33,025		
Contribution Works ...	33,414		
Total, Imperial ...		47,54,200	

Provincial.

Capital—

Minor Works and Navigation ...	9,999
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Revenue—

Minor Works and Navigation ...	5,434
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Total, Provincial ...	15,433
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Grand Total ...	47,69,633
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54. The total expenditure is classified as follows:—

	Deccan and Gujarāt.	Sind.	Total.
	Rs.	Rs.	Rs.
Works ...	(a) 2,82,252	(b) 19,05,119	21,87,371
Repairs ...	(c) 2,24,910	(d) 13,36,495	15,61,405
Establishment ...	2,66,846	7,01,400	9,68,246
Tools and Plant...	9,463	38,935	48,398
Suspense Account ...	3,675	538	4,213
Total ...	7,87,146	39,82,487	47,69,633

55. 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.

56. Maps showing the position of the principal irrigation works in the Gujarāt and the Deccan and the province of Sind are attached.

* Inclusive of Expenditure in England and Exchange	Rs.
(a) Exclusive of Rs. 57	15,451
(b) Do. 171	
(c) Inclusive of " 589	
Do. " 709	
(d) Do. " 31	

Receipts on Capital Account,
(c) Compensation,
Refunds of Revenue.
Do.

GUJARAT AND THE DECCAN.

GUJARAT.

AHMEDABAD DISTRICT.

The rainfall during the year at Parántij was 3·69 inches against 42·33 inches of the preceding year and an average of 32·95 inches for the ten years ending 31st December 1899.

Háthmati Canal.

2. The total area irrigated was 110 acres (all kharif) against 4,280 acres (1,800 kharif and 2,480 rábi) for the preceding year, the serious decrease being due to the almost complete failure of rain. The revenue amounted to Rs. 868 against Rs. 11,414 of the previous year.

3. The cost of maintenance and repairs was Rs. 4,400, including clearance of silt, against Rs. 4,987 in the previous year.

4. Only one moderate flood occurred in the Háthmati River on the 20th June 1899 when the water rose to 1·30 feet above the crest of the weir.

5. The works referred to in the report for 1896-97 for diverting experimentally the Háthmati Canal water into the Bhujwa Channel were completed during the year at a total cost of Rs. 2,827 against the estimated cost of Rs. 2,962.

6. A project for making a channel in the bed of the Bhujwa Nála for turning the water of the Háthmati into the Khari River was prepared and sanctioned by Government. The object of this work is to utilize the surplus water of the Háthmati River, which in rainy season runs to waste, for irrigation on the Khari Cut. The channel takes off from the Háthmati Canal at the end of the 5th mile near Bhujwa and carries the water to the Khari River, from which the Khari Cut receives its supply. The work was commenced in the year under report and a sum of Rs. 1,862 expended against the estimated amount of Rs. 5,984.

7. During the year under report there was no irrigation on this canal owing to the failure of the rains, while the area irrigated last year was 2,805 acres (2,800 kharif and 5 rábi). There was consequently no realization of water-rates, but a sum of Rs. 941 was realized on account of plantation and other canal produce against a total revenue of Rs. 15,720 in the previous year.

8. The cost of maintenance and repairs was Rs. 2,972 compared with Rs. 3,107 for the previous year.

9. A project for extending the Narol Branch of the Khari Cut Canal was sanctioned by Government at a cost of Rs. 8,387, and comprised the following works:—

I.—Extending the Narol Branch;

II.— Do. Distributary No. I,

III.—Constructing Distributary No. 4 to Narol Branch,

IV.—Channel from Lambha Village to Vir Tank,

and a sum of Rs. 2,750 was spent during the year on the above-mentioned works,

10. A sum of Rs. 1,040 was spent during the year on account of making survey and preparing a project for the extension of the Khari Cut against the estimated cost of Rs. 1,396.

11. The cost of maintenance amounted to Rs. 896 as against Rs. 925 in the previous year, while Rs. 698 were spent on ordinary repairs to the sluices against Rs. 1,276 in the previous year.

Khari Irrigation Sluices.

12. During the year a sum of Rs. 2,914 was spent on silt clearance from Pinglaj to Sluice No. 17, the total expenditure incurred on the work up to 31st March 1900 being Rs. 3,792 against the sanctioned estimate of Rs. 4,652.

13. A cross sluice across the flood or escape channel near the Peed Tank of Naika in Mátar Táluka was sanctioned at a cost of Rs. 927, and a sum of Rs. 202 was spent in completing the concrete, and the balance of the allotment was surrendered on account of famine.

14. During the year under report repairs to five irrigation tanks in the Dholka Táluka were undertaken from Imperial Funds, assisted by contribution from villagers, and a sum of Rs. 2,367 was spent thereon.

15. A sum of Rs. 121 was spent on making surveys of irrigation tanks in Sanand and Dholka Tálukas, and a further sum of Rs. 198 was spent on survey for a proposed drainage channel from Checkla to Rodh river in the Sanand Táluka.

16. This work, described in last year's report, was completed during the year under report at a total cost of Rs 17,011, out of which Rs. 5,496 were spent during the year, the sanctioned estimate being Rs. 26,106.

17. This was the first work opened for famine relief in the Ahmedabad District. It consisted of deepening the tank, an average depth of 5 feet, to increase its capacity from 16 millions cubic feet to 19½ millions cubic feet. The tank will be used as a service reservoir for the Khári Cut. Work was started on 11th September 1899 and closed on 26th January 1900. The approximate quantity of excavation done was 5,873,617 cubic feet, and the total expenditure Rs. 56,827, against the sanctioned estimate of Rs. 57,851, the cost of the earth-work being about 1½ times the normal rate.

18. This tank is the principal service reservoir of the Khári Cut, and the work consisted of extending the area of the tank by about 35 acres, removing silt and strengthening the existing embankment to raise the full supply level by 2 feet. These improvements have increased the capacity of the tank from 57 millions cubic feet to 89 millions cubic feet. The work was commenced on 21st September 1899 and completed on 10th March 1900, the total expenditure being Rs. 56,605 against the sanctioned revised estimate of Rs. 56,318, and the cost of the earth-work being approximately 1½ times the normal rate.

19. This was started as a relief work on the 6th December 1899 and completed on 1st April 1900. The bed slope was increased from 1·00 feet per mile to 1·62 feet to raise the velocity from 1·72 to 2·33 feet per second and enable the canal to carry a larger discharge and supply the Bhujwa Nála for the benefit of the Khári Cut. The total quantity of earth-work carried out was approximately 5,563,079 cubic feet, the expenditure being Rs. 39,261 against the sanctioned estimate of Rs. 38,885.

20. The work was in progress during the year and consists of the following items:—

(1) Making a cut from the Kankeria Tank to the Chandola Tank, to make the former available as a storage reservoir for the system.

(2) Constructing a channel two miles long and twelve feet wide at bottom from the Chandola Feeder near Ghodásár to Wátwa.

(3) Constructing a channel 8½ miles long and 8 feet wide at bottom from Wátwa to Bidáj.

(4) Making a channel 6 miles long and 8 feet wide at bottom from Wátwa to Giramtha. These works will, it is expected, increase the irrigation power of the canal from 3,000 acres to over 10,000 acres, the additional water being obtained from the Háthmati Canal *via* the Bhujwa Nála. The expenditure during the year was Rs. 41,284 against the sanctioned estimate of Rs. 1,36,078, the approximate quantity of earth-work done during the year being 5,368,366, at a cost of Re. 0-10-4 per 100 cubic feet. The normal estimate includes a sum of Rs. 41,500 for masonry works to be carried out as funds permit after the famine is over,

21. During the year 16 works of improving and deepening Irrigation Tanks were opened in the Daskroi, Sānand and Dholka Tālukas at the villages shown in following list. The amounts spent on each and approximate quantity of earth-work excavated is shown, as also the proportion of cost to normal rates of the district. In four cases the works were completed at end of the year, and in others were still in progress, the amounts expended in each case being shown in following statement.

The tanks are all more or less used for irrigation :—

No.	Names of Tanks.	Amount of Famine Abstract Estimate.	Total Earth- work done.	Cost per 100 cubic feet of work done.	Normal cost per 100 cubic feet.	Expendi- ture during the year.	Remarks.
	<i>Daskroi Tāluka.</i>	Rs.	C. ft.	Rs. a. p.	Rs. a. p.	Rs.	
1	Improving the Village Tank at Ash- lali	42,000	3,183,443	1 1 5	0 10 0	39,435	Completed.
2	Do. the Saker and Dhedki Tanks near Kankeria at Rājpur- Hirpur	20,966	1,406,207	0 10 4	0 10 0	10,552	Do.
3	Excavating Village Tank at Ghodasār.	18,832	1,503,014	0 12 10	0 10 0	16,632	In progress.
4	Improving the Tank at Lambha ...	82,144	3,403,664	0 15 11	0 10 0	37,986	Do.
5	Do. Gam talao at Sahijpur ...	20,185	713,759	0 11 6	0 10 0	6,342	Do.
6	Do. the Man Tank at Ode ...	37,978	2,536,912	1 0 0	0 10 0	29,198	Do.
7	Do. Khan and Gangajai Tanks at Shahvādi	11,341	332,522	1 8 4	0 8 0	6,645	Do.
	Total, Daskroi Tāluka ...	2,33,446	13,079,521	...	...	1,46,790	
	<i>Sānand Tāluka.</i>						
8	Improving the Kanjao Tank at Ma- kerba	4,191	231,373	0 15 3	0 8 0	2,312	In progress.
9	Excavating the Makerba Tank at Sur- khej	42,189	2,437,952	1 0 9	0 10 0	28,574	Do.
10	Do. village Tank Malkavi at Surkhej	5,027	535,571	0 12 5	0 8 0	4,210	Completed.
11	Do. Bedar Tank do. ...	10,655	736,836	0 11 10	0 8 0	5,887	In progress.
12	Improving Kanjeshari Tank at Chan- godar	8,978	137,233	0 15 7	0 10 0	1,386	Do.
13	Do. Tank at Shia- wada	58,065	1,280,550	0 13 1	0 10 0	16,628	Do.
14	Excavating the village Tank Shekri at Surkhej	12,256	984,197	1 0 10	0 8 0	10,491	Completed.
	Total, Sānand Tāluka ...	1,41,364	6,343,712	...	...	68,888	
	<i>Dholka Tāluka.</i>						
15	Improving the Irrigation Tank at Bhalla	45,194	3,923,046	0 14 6	0 10 0	43,439	In progress.
16	Excavating Do. do. at Kocheria	10,500	355,755	0 15 2	0 8 0	3,627	Do.
	Total, Dholka Tāluka ...	55,694	4,278,801	...	...	47,066	
	Grand Total—Irrigation tanks Ahmed- abad District... ..	4,30,504	23,702,034	...	...	2,62,744	

Measurements and rates given are approximate only.

22. This consists of widening the first ten miles of the drainage channel, from an average width of 20 feet to 50 feet. The work was undertaken because experience had shown that the original width was too small for the speedy discharge of flood water. The work was opened on 12th September 1899, and completed on 19th March 1900, the expenditure amounting to Rs. 39,541 against the estimate of Rs. 44,900. The total quantity of earth-work done was approximately 6,744,829 cubic feet at about normal rates.

23. This drain is intended to provide an outlet for the large quantity of water which comes from the Kadi Prant of the Baroda State, and floods the lands near Viramgām. It is about 6 feet 8 inches bottom width by 4 to 5 feet deep and starting at Panar runs in a south-westerly direction, past the villages of Chanotia,

Panar Dedāsar Drainage
Channel, Viramgām Tāluka.

Dessaipura and Dhakdi to join a natural nala which empties itself into the Runn of Cutch. The total length of the drain is $14\frac{1}{2}$ miles. It was commenced as a famine relief work on 25th October 1899, and was in progress at the end of the year. The expenditure of the year was Rs. 1,49,888, against a sanctioned estimate of Rs. 1,97,673. The quantity of earth-work done during the year was about 25,057,102 cubic feet at one and a half times the normal rates.

24. This channel was constructed in 1898-99, to feed the Ghoda Tank from the Narsingpura drain, its length being $11\frac{1}{2}$ miles with a bottom width of 7 feet; a number of other villages having applied for water to be supplied to their tanks from the feeder, it has now been widened to 20 feet. Work was commenced on 22nd November 1899, and completed on 19th January 1900. The expenditure was Rs. 15,199 against an estimate of Rs. 14,856, the quantity of earth-work done being about 2,009,559 cubic feet at nearly normal rates.

25. This was started as a relief work on 15th October and completed on 6th December 1899. The length of the channel is $3\frac{1}{2}$ miles and its bed width 20 feet. It is intended to drain water coming from the Kadi District of Baroda into "Doig's Ditch." The lower section from Soklai to Doig's Ditch was constructed some years ago, the upper section Narsingpura to Soklai having been postponed pending settlement of a question of increasing the water-way of a railway culvert under which the drain passed. The total earth-work done was approximately 1,063,182 cubic feet at slightly over normal rates. The total expenditure was Rs. 6,884 against the estimate of Rs. 7,952.

SURAT AND BROACH DISTRICTS.

26. The Ora-Vichiad-Badalpur drainage channel in the Vagra Taluka was in progress, as described in the previous year's report, and the main channel was completed. The total expenditure was Rs. 17,053 against the estimated amount of Rs. 48,475, the expenditure in the year being Rs. 4,294.

Old Works.

27. Repairs to seven tanks were carried out during the year at a total cost of Rs. 5,422.

Wagrej Protective Works.

28. The breaches and eroded portion of the embankment were repaired at a cost of Rs. 1,029.

29. Under this head nine tanks were started as famine relief works; of these eight were in Surat and one in Broach Districts. The capacity and drainage area of the majority of these works were large and they were thus specially suited for relief purposes. Their estimated cost as well as the amounts spent on each of them are given in the following statement:—

Item No.	Name of Tank.	Amount of Estimate.	Date of Commencement of Work.	Amount of expenditure incurred.	The purpose for which the work is utilised.	REMARKS.
		Rs.		Rs.		
1	Deepening Tank, R. S. No. 1 and 7 at Amalsar in Surat District.	1,40,813	14th Feb. 1900...	11,947	Irrigation and domestic purposes.	It was stopped on 26th May 1900.
2	Deepening Gam Tank, R. S. No. 676 at Pardi in Surat District.	1,99,321	18th Jan. 1900...	17,864	Do.	
3	Deepening Dhed Tank, R. S. No. 188 at Pallen, Bulsar Taluka, Surat District.	1,99,975	5th Feb. 1900...	12,592	Do.	
4	Enlarging Dhed Tank, R. S. No. 408 at Hond, Chikhli Taluka, Surat District.	82,769	25th Jan. 1900...	19,699	Do.	
5	Deepening Motu Tank, R. S. No. 258 of Barbodhan, Olpad Taluka, Surat District.	1,91,197	19th Dec. 1899...	33,720	Do.	Apart from its utility to the villagers and their cattle, this work is expected to provide ample supply of water to the existing irrigation which is about 104 acres.

Item No.	Name of Tanks.	Amount of Estimate.	Date of Commencement of Work.	Amount of expenditure incurred.	The purpose for which the work is utilized.	Remarks.
		Rs.				
6	Excavating Gam Tank, R. S. No. 188 of Karanj, Mándvi Táluka, Surat District.	9,641	15th Feb. 1900...	4,102	Irrigation and domestic purposes.	
7	Deepening the Nava Tank, R. S. No. 190 of Karanj, Mándvi Táluka, Surat District.	32,767	8th Dec. 1899...	29,910	For irrigation purposes only.	
8	Deepening Dharamnu Tank, R. S. No. 98 of Bhutvada, Bádoli Táluka, Surat District.	30,946	22nd March 1900.	8,483	Do.	
9	Improving Gam Tank Chanchwell, R. S. No. 207, Vágna Táluka of the Broach District.	70,119	7th Dec. 1899...	50,794	Irrigation and domestic purposes.	Completed on 20th March 1900.
	Total ...	9,57,548		1,84,111		

30. The project consists of an earthen embankment (with the necessary sluices and waste weir) constructed to reclaim about 1,200 acres of lands in the village of Asarsa, Jambusar táluka. The scheme has been under consideration since 1875 and is on the famine programme. This work was opened on 24th September 1899 as a relief work, only the embankment being taken up. Precautions were taken to prevent the tides over-topping the embankment while under construction, by throwing up a protection bank of salty earth scraped off the surface where the embankment was to be constructed, but in spite of this, an unexpectedly high tide on 18th October 1899 breached the spoil earth and work had to be stopped in the low portion for about a fortnight. The labourers were employed during this period on high ground which was reserved for such a contingency. Only about 1,500 labourers could be employed on this work as ramming was necessary and the earth-work had to be executed in nine inch layers. Expenditure amounted to Rs. 30,717, against the sanctioned estimate of Rs. 33,063, the sluices, &c., being left to be executed as ordinary works.

31. A large tract of land which was submerged by tidal flow and consequently unfit for cultivation, has been reclaimed by throwing up a line of earthen embankment. The masonry sluices required for completing the scheme will be taken up as an ordinary work when sanctioned. Reclaiming certain lands in the Hásot Petha Mahál, Anklesvar Táluka. The earth-work was commenced on 20th November and completed on 8th March 1900, at a total cost of Rs. 72,655, against the sanctioned estimate of Rs. 1,47,513.

32. This channel forms part of a complete system of drainage works for the Broach Collectorate, sanctioned in 1886, but not carried out through being considered insufficiently remunerative to Government; there is no doubt, however, that the works will be beneficial to large areas of occupied lands which are now more or less water-logged, and the present opportunity has been taken to excavate this useful channel. It has been completed with the exception of a sluice which will be carried out as an ordinary work. The length of the main channel is 4 miles 1,518 feet, while its width varies from 7 feet 3 inches to 22 feet 3 inches, the length and width of its branches being 2 miles 3,174 feet and 14 feet respectively. The work was commenced on 28th September and completed on 9th December 1899, at a total cost of Rs. 11,556, against the sanctioned estimate of Rs. 15,459. Excavating Nobar Umra Kotesar Drainage Channel, Jambusar Táluka.

33. The remarks on the Nobar Umra Channel also apply to this. The channel is two miles and 1,871 feet in length and its width varies from 8 to 10 feet. The work has been completed. It was commenced on 16th October and completed on 2nd December 1899, at a total cost of Rs. 2,826, against the sanctioned estimate of Rs. 3,450. Rohad Drainage Channel.

34. The object of the channel is to drain certain water-logged lands of Kolwan and Itola, the holders of which had once offered a contribution for the work, but owing to successive bad years could not fulfil their promise. The work has now been carried out as a relief work. The length of the channel is nearly Kolwan Itola Drainage Channel in A'mod Táluka.

3½ miles, while its width varies from 8 to 14 feet. The work was commenced on 19th October and completed on 15th November 1899 at a total cost of Rs. 4,760, against the sanctioned estimate of Rs. 5,591.

35. This work was in progress up to September 1899 from the ordinary budget grants at ordinary rates of wages and then at the request of the Collector of Broach it was converted into a famine relief work and completed as such. The length of the main channel is 10 miles 4,915 feet and its width varies from 24 to 30 feet. The channel has three branches as follows:—

				Length. Miles.
(1) Mosam Branch	...	...	...	3
(2) Keshwan Branch	...	...	...	7
(3) Chanehwell Branch	...	...	...	2½

The work was commenced on 4th September and completed on 27th October 1899 at a total cost of Rs. 28,324, against a sanctioned estimate of Rs. 36,367.

36. The object of the channel is to drain certain water-logged lands of Wagusan, Tralsamadh, and Poguthan villages. It commences from the boundary of Halderwas and Lumera and following the road from that village to Wagusan crosses the B. B. & C. I. Railway culvert No. 509 to the west of the Railway, and runs parallel to it up to Railway culvert No. 508 whence it proceeds towards Poguthan and Tralsamadh along an existing channel which finally joins the Bhuki Khadi a little to the west of Tralsamadh. The total length of the channel is 8 miles 5,255 feet. The work was commenced on 28th September and completed on 31st December 1899, at a total cost of Rs. 17,379 against a sanctioned estimate of Rs. 13,527. A revised estimate is under preparation.

KAIRA AND PANCH MAHA'LS DISTRICTS.

37. The A'nand-Mogri Drain was maintained throughout the year, as usual, at a total cost of Rs. 395; also a sum of Rs. 648 was spent in making special repairs to the drain.

38. The object of this work is to relieve certain lands of the Mátar Táluka from flood water in times of heavy rain. Under the scheme, channel No. 4, eleven miles in length, has been completed; channel No. 5, ten and a half miles in length, has been excavated as far as Traj limits and the remaining portion will be completed by the end of April 1900. The estimate is under revision, the expenditure during the year being Rs. 37,972.

39. This work had been under contemplation for more than 30 years and was held over for a famine. The channel passes through British, Baroda and Cambay State villages, its total length including branches being 29 miles, of which the portion up to the village of A'mod was completed during the year. It is expected that the main channel will be completed before the rains. The expenditure during the year was Rs. 37,762 against a sanctioned estimate of Rs. 68,917.

THE DECCAN.

KHA'NDESH IRRIGATION DISTRICT.

Major and Minor Works.
Works for which Capital and Revenue Accounts are kept.

40 The Revenue expenditure on these works has been as under:—

Productive Public Works.

				Rs.
1. Lower Pánjhra River Works	...	...	...	2,777

Irrigation Minor Works.

				Rs.
1. Jámda Canals	...	...	...	3,549
2. Hartála Tank	...	...	...	71
3. Mhaswa Tank	...	...	...	286
4. Parsul Tank	...	...	...	330

All these works with the exception of the Jámda Canals were completed, and the completion reports have been submitted.

41. There has been no Capital expenditure on the Jámda Canals during the year. The Revenue outlay on the Lower Pánjhra River Works includes the cost of construction of a new hut (Rs. 182) for the chaukidár at the Mukti Tank and the completion of the repairs to the Japi Channel. All other expenditure has been for ordinary repairs and arrangements for the distribution of water to irrigation, &c.

42. The amounts spent on the Improvements and Repairs to these works in Khándesh and Násik Collectorates in the Tápti River Catchment from Imperial Revenues were as under:—

			IMPERIAL.			PATFALLA.		
			Khándesh.	Násik.	Total.	Khándesh.	Násik.	Total.
			Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
Improvements	...	...	15,325	8,782	24,107	329	465	794
Repairs	...	...	2,416	126	2,542	90	111	201
Total	...	...	17,741	8,908	26,649	419	576	995

43. These sums represent the expenditure incurred on completing the unfinished works of the previous year, and putting in hand projects sanctioned during the year. The principal projects in Khándesh were the Kására and Dhadna commenced during previous years, and the Malpur and Jirethal Ashtana Projects sanctioned during the year under report. The last mentioned work is completed.

44. In the Násik Collectorate the following works were completed. Repairs and Improvements to:—Kandhana Channel in Báglan Táluka, Gángwan Bhadvan in Kolwan Táluka, Dabhadi Patna in Málegaon Táluka, and Wagdordi in Chándor Táluka. The Satána Channel Improvements remained in abeyance, pending the revision of the project, for providing a pipe syphon in place of a concrete duct across the Sukad Nála. Not only the revision of this project, but the surveys for Improvements and Repairs to important channels had to be put off. The expenditure on Patfalla was with a view to use up the balance remaining on hand after the abolition of the cess.

45. The rainfall in the district gauged during the monsoon at the principal Irrigation works was unfavourable as compared with that of the previous three years:—

				1896-97.	1897-98.	1898-99.	1899-1900.
				Inches.	Inches.	Inches.	Inches.
Hartála Tank	...	...	...	19.28	20.74	24.43	36.66
Mhaswa	...	...	...	27.53	26.65	20.18	9.98
Parsul	...	...	...	19.00	27.85	15.37	6.90
Mukti	...	...	...	22.43	20.20	24.40	4.20
Jámda Canals	...	...	...	27.29	23.61	25.62	9.48

46. This abnormally scanty rainfall was an indication of the impending famine. During the year under report, none of the tanks filled, water had to be very economically issued, and a strict rotation system had to be enforced on new irrigation works which caused great anxiety and trouble to those concerned in the administration. It was very difficult to satisfy the irrigators who were anxious to have water for themselves without any regard to the interests of their neighbours. The service done by these irrigation works may be briefly summarised thus:—

47. No benefit worthy of mention was derived from the Hartála Tank.

48. The Mhaswa Tank supplied water to 899 acres, the largest area watered since its construction. Its storage lasted till the 15th of May.

49. The Parsul Tank Storage sufficed for the kharif irrigation of 172 acres only, and then the tank became empty. No rabi crops could be watered.

50. The Mukti Tank delivered water to 698 acres only of dry-crop land over and above the 1,900 acres of Kayam Bágáyat. As the water-supply has to pass down the river, to be picked up by a series of Bundharas, rigid economy and strict control is not altogether practicable. The storage was very much exhausted before the Rabi season, in which water to dry-crop land could not be given.

51. The Jámda Canals which are fed by the natural discharge of the Girna River maintained 2,919 acres of kharif irrigation and 1,596 of rabi. The area in the latter season was very limited, not even half of what it was in 1896-97, as the river discharge began rapidly to fail, and sufficient supply could not be sent down to the lower reaches of the canals.

52. On the whole, the Irrigation Works did great service in assisting the cultivation of food-grain, sugar, fodder, &c.

53. In the tracts of country covered by the old irrigation works, the irrigated crops, although limited, afforded employment to working classes who were kept from seeking refuge on famine works till the season advanced and the operation of sugar-cane crushing was finished.

54. Whilst the distribution of water on new works was thus engaging attention, the necessity arose of starting the projects ready to be put in hand for relief purposes, and of drawing up others fit for the same. The Jalgaon Water-supply Improvements and the Talwáda Tank Projects were commenced, and the Purmapada, Dudhala, Dahiwel and Manad Tank Projects were discussed and finally disposed of. The first two have been sanctioned, and the last two finally condemned as unsuitable for relief purposes. The Chankápur Tank Project mentioned in last year's report has been disposed of by the Government of India, who have called for some information and professional details, which will be supplied as soon as the present famine pressure is over. The work is, however, taken in hand by the Executive Engineer, Násik, as a Famine Relief Work.

55. The ordinary expenditure on this work was Rs. 329 for maintenance of buildings and Rs. 194 for land compensation, Girna Left Bank Canal.

56. The Inspection bungalows and subordinates' quarters and store and office rooms on works in operation were maintained along with the works.

57. No repairs to the buildings at Sakri were needed during the year under report. Rs. 118 were spent on the repairs to the Irrigation Office at Málegaon.

53. The construction of an Inspection bungalow at Nampur estimated to cost Rs. 4,095 was sanctioned from the Minor Works Grant for Works for which only Revenue Accounts are kept, and commenced. The expenditure during the year amounts to Rs. 3,444. The work is approaching completion; similarly a chauki on the Talwáda Tank from the grant for Agricultural Works, estimated to cost Rs. 2,452, has been sanctioned and commenced. The expenditure during the year was Rs. 433. The work is in progress, and will be useful for shelter during the approaching rains.

59. The discharge of the river Bori at Pur as well as the rainfall in the catchment of the river was gauged at a cost of Rs. 137, and the Parmapada Tank Project has been surveyed and the Famine Abstract, amounting to Rs. 4,64,624, has been submitted for sanction, and the work is taken in hand for relief purposes. A complete project will be drawn up and submitted for sanction in due course.

60. With the advent of the season, the numbers on metal-breaking famine works rose enormously and it was deemed necessary to find suitable tank sites in Khândesh to concentrate and employ Famine labour. A special Executive Engineer for Irrigation was appointed to prospect the district with a sum of Rs. 4,732 at his disposal for the purpose. The expenditure incurred by him up to the end of March 1900 amounted to Rs. 258.

61. The rainfall was scanty, and there were no floods requiring mention.

62. The Mukti Tank was first replenished on the 11th of June. On the 13th it rose to its highest level (R. L. 917.20), that is 9.30 feet below the crest of the waste-weir. The tank never rose to its full supply level this year. The greatest rainfall occurred on the 12th of August, which was gauged 1.10 inches at Dahiana and 0.90 inches at Surgaon, in the tank catchment, but the run off was small.

63. This tank was first replenished on the 9th of June. It rose to its highest level on the 19th of June, 2.05 feet only below full supply level. The tank level never rose to the crest of the waste-weir during this year. The greatest rainfall occurred on the 9th of June. It was gauged at 2.62 inches and gave a run off between the 9th and 11th June estimated at 83 per cent. of the fall on the catchment area.

64. The level of water in this tank never rose even to the level of the sill of the sluice during the year. The total rainfall was 6.66 inches only. The greatest rainfall, 1.80 inches, occurred on the 18th of June.

65. Water commenced entering into this tank on the 11th of June, and a depth of 2.70 feet was reached on the 18th of the month, rising to R. L. 1853.23, which was the highest level of water in the tank during the year, being 23.15 feet below the full supply level. The greatest rainfall, 1.62 inches, occurred on the 10th of September. An examination of the rainfall and its effects gives a run-off of nearly 10 per cent. from 10th to 12th September 1899.

66. The following statement shows the amounts spent on the works started for famine relief purposes after the close of the rains:—

No.	Name of work.	Amounts.	NUMBER OF LABOURERS EMPLOYED.		
			Relief workers.	Non-workers.	Total.
1	Jalgaon Water-supply	38,419	2,035	800	2,835
2	Talwada Tank	47,952	2,972	1,975	4,947
	<i>Jamda Canals.</i>				
3	Silt clearance	18,139	1,191	400	1,591
4	Parmapada Tank	17,483	2,825	600	3,425

67. The first is a Municipal work for the improvement of water-supply of the important trading town of Jalgaon in Khándesh. The second will be a useful irrigation tank in a tract of the country where water-supply is scarce. The third is the clearance of the canals in operation, a very desirable work, and one which would not have been done in the ordinary course, owing to the small revenue of the canals. The fourth is an irrigation tank on the Bori river, which will subsequently irrigate a large tract of country in the rich plains of the Tápti and in the vicinity of prosperous towns like Dhulia and Amalner.

68. The percentage of work establishment on the expenditure of the year was Rs. 5-12-3 on ordinary works, and Rs. 3-8-10 on famine works.

NA'SIK DISTRICT.

Kádwa River Works.

69. These works are situated in the Niphád and Dindori tálukas, and comprise the following:—

- 1—Waghad Tank.
- 2—Páلكhed Canal.
- 3—Wadáli Canal.
- 4—Ojhar-Tambat Canal.

70. A sum of Rs. 1,532 was spent and debited to Capital Account of the work as noted below:—

	Rs.
Survey for ascertaining Waghad Tank area and fixing boundary pillars (by Revenue Department) ...	70
Survey for revised canal project of Ojhar-Tambat Canal ...	4
Inspection bungalow at Ojhar-Tambat ...	1,458
Total ...	<u>1,532</u>

71. 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.

72. A temporary dam was constructed as usual towards the end of the monsoon, in the low-level portion of the waste-weir, the sill level of which is R. L. 110 and the water-level in the tank rose to R. L. 114·25 on 5th October 1899, when the storage was 266·849 millions cubic feet.

73. The sill of the outlet is at R. L. 80·00. Water as required was passed down to Páلكhed Canal during the year from 3rd April 1899 to 13th June 1899, and from 6th October 1899 to 17th March 1900.

74. The tank and the bungalow at Waghad were maintained at a total cost of Rs. 674.

75. This starts from a weir across the Kádwa River, about 14 miles below the Waghad Tank, and is supplied from 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 in order to safely pass down the maximum calculated discharge of 75 cubic feet at the head.

76. The canal was maintained and repaired at a cost of Rs. 1,911. The charges for establishment, excluding direction and collection, were:—

	Rs.
Executive ...	7,148
Revenue ...	564

The cost of repairs per mile was nearly Rs. 75.

77. The following table gives the irrigated area, assessment, and the rainfall from June to January for the last three years :—

Years.	Area irrigated.	Assessment.	Rainfall at Pálkhed.
	Acres.	Rs.	Inches.
1897-98	2,077	8,611	21.73
1898-99	1,863	8,594	29.36
1899-1900	1,656	8,306	16.53

78. The canal was closed four times (22 days in all) during the year as usual for clearance of silt and weeds. The area at present under command of the canal is 9,837 acres, which will be increased to 23,466 acres eventually.

79. The area commanded by this canal can also be irrigated by the Pálkhed Canal, but an old weir across the Kádwa, situated about 10 miles below the Pálkhed head-works, picks up the river water and so supplies Wadáli Canal which has been improved and extended. The canal is $5\frac{1}{2}$ miles long and was maintained at a cost of Rs. 467.

80. The charges for establishment, excluding direction and collection, were—

				Rs.
Executive	...	...	...	1,785
Revenue	...	...	...	222

The cost of repairs per mile was Rs. 89.

81. 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 Níphád.
	Acres.	Rs.	Inches.
1897-98	452	1,671	25.37
1898-99	341	1,187	20.90
1899-1900	401	1,195	3.95

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

83. This canal takes off above a weir across the Bánganga River and is situated about 7 miles south-east of the Pálkhed Head 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 Pálkhed Canal and the Ojhar-Támbat Distributary. This promises to be the most paying part of the Kádwa system, and extension of the canal and its distributaries are very necessary. Special Repairs to an aqueduct on the Ojhar-Támbat Distributary were executed at a cost of Rs. 959.

84. The expenditure on maintenance and repairs during the year was Rs. 525. The charges for establishment, excluding direction and collection, were :—

				Rs.
Executive...	...	...	...	5,383
Revenue ...	...	...	...	166

and continued in 1896-97, was again undertaken as a Famine Relief Work. It is expected that the whole work with the exception of the outlet (which is to be left open for the present) will be completed during the present famine.

90. Famine Relief Work was also started on the Máladevi Tank in the Akola Táluka of the Ahmednagar District. This work, which is in connection with the Pravara River Irrigation Scheme, was undertaken as a Relief Work during the famine of 1896-97 when portion of the puddle trench on the left bank was excavated and partly filled.

91. A third irrigation tank was commenced as a relief work, viz., the Odal Tank in the Chándor Táluka. The catchment area is nearly 39 square miles and the tank when completed will command a large area of rich land in the Niphád Táluka.

92. The following table gives the quantity executed and the normal value of each of the above works :—

No.	Name of Work.	Quantity of work done to end of March 1900.	Normal rate.	Normal value.	Remarks.
1	2	3	4	5	6
	<i>Ndsik District.</i>		Rs. a. p.	Rs.	
1	Constructing Khirdi Sáthe Tank— <i>Dam Embankment.</i>				
	Sand excavation	61,680	0 4 0	154	
	Soil excavation... ..	6,570	1 0 0	66	
	Rock excavation	925	8 0 0	74	
	Gauged concrete	8,460	20 0 0	1,692	
	Embankment	421,400	1 8 0	6,321	
	Pitching... ..	21,950	6 0 0	1,317	
	<i>Outlet.</i>				
	Approach Channel Excavation...	12,550	1 8 0	188	
	<i>Waste weir.</i>				
	Concrete... ..	1,854	15 0 0	278	
	<i>II.—Waste Weir Channel.</i>				
	Murum excavation	8,040	1 8 0	121	
	Rock excavation	25,690	2 0 0	514	
	<i>III.—Flood Embankment.</i>				
	Flood embankment	19,980	1 0 0	200	
	Total ... ..	.....	.....	10,925	
	<i>Ahmednagar District.</i>				
	Constructing Máladevi Tank—				
	Excavation of puddle trench ...	461,540	1 8 0	6,923	
	Filling puddle trench	4,345	1 8 0	65	
	Excavation of waste weir	23,40,530	1 0 0	23,405	
	Black-soil collected for puddle trench and embankment ...	2,45,010	0 14 0	2,144	
	Collecting rubble stones	84,250	2 0 0	1,685	
	Breaking metal	3,445	3 0 0	103	
	Total ... ..	.....	.....	34,325	

No.	Name of Work.	Quantity of work done to end of March 1900.	Normal rate.	Normal value.	Remarks.
1	2	3	4	5	6
	<i>Nasik District.</i>		Rs. a. p.	Rs.	
3	Constructing Odal Tank, Puddle Trench—				
	Excavation in soil	66,020	1 8 0	990	
	Excavation in hard murum ...	68,730	3 0 0	2,062	
	Collecting black-soil for puddle filling	256,550	1 0 0	2,565	
	Drainage work Gravel filling (collection only)	48,560	2 0 0	971	
	<i>Waste weir.</i>				
	Tail and approach channel Excavation	54,110	1 0 0	541	
	Total ... ..	.....	.....	7,129	

93. The following statement shows the highest number of relief labourers employed on irrigation relief works and the expenditure incurred on them during the year under report:—

No.	Name of work.	Highest number of relief labourers.	Date on which the highest number of relief labourers mustered.	Estimated cost of work as per sanctioned Famine abstract.	Outlay incurred up to 31st March 1900.	Remarks.
	2	3	4	5	6	7
	<i>Nasik District.</i>					
1	Constructing Khirdi Sath Tank	11,539	17th February 1900.	1,59,865	62,394	
	<i>Ahmednagar District.</i>					
2	Constructing Maladevi Tank...	19,986	29th March 1900.	1,96,342	1,79,449	
	<i>Nasik District.</i>					
3	Constructing Odal Tank ...	17,394	31st March 1900.	1,46,277	40,508	

Note:—Column 3 includes non workers.

AHMEDNAGAR DISTRICT.

Ojhar Left Bank Canal. 94. Nineteen miles of main canal and 21 miles of distributaries were maintained at a cost of Rs. 2,757.

A temporary earthen bund was thrown over the weir in October 1899 to increase the storage, but the supply proved altogether insufficient to meet even the ordinary requirements of the cultivators. On the 31st March 1900 the discharge of the river was 1.49 cubic feet per second against 10.73 on the same date in the previous year.

95. During the rabi season an intermittent supply to the first seven miles of the canal was given. This was stopped on the 1st February 1900 and silt clearance by famine labour commenced,

96. Twenty-three miles of main canal and 9.37 miles of distributaries were maintained at a cost of Rs. 2,775.
 Lakh Canal.

97. The river supply was not sufficient to meet the requirements of the cultivators during either the khárif or the rabi season. The river discharge began to fall off rapidly at the end of September 1899 and on 13th November the river ran dry.

98. The tank and canal, $4\frac{1}{2}$ miles in length with $5\frac{1}{2}$ miles of distributaries, were kept in proper working order at a cost of Rs. 1,249.
 Bhatodi Tank.

99. The supply was entirely insufficient for the rabi crops and the tank ran dry on the 24th November 1899. The water did not reach the waste weir crestlevel during the year.

100. Rs. 169 were spent on surveying the canal from the Visápur Tank and Rs. 274 on surveying a proposed canal from the Godáviri River with a view to starting these works for famine relief purposes. The opening of the Visápur Station Feeder Road in addition to the Visápur Tank has obviated the necessity of starting the Visápur Canal, while the Godavari Canal Project has proved to be not worthy of further investigation. These surveys were both in progress at the end of the year.
 Surveys.

101. The silt clearance of this canal was undertaken for relief purposes. It is a single bank canal and was constructed during the seventies with a bed width of 18 feet, a fall of 6 inches per mile and a depth of 4 feet. Being not far removed from the Gháts the water it carries is silt laden. The nálas which enter it are also a great source of silt deposit. The original width of 18 feet had never been maintained and had gradually become reduced to 7 feet with a depth of from $2\frac{1}{2}$ to 3 feet. As the river supply failed altogether in February 1900 the opportunity of restoring the canal to its original section was seized and certain minor improvements in the way of embankments, nála clearances, &c. have also been effected, more especially the excavation of a large Nála (No. 28) in mile 16 of the canal, the water of which has on several occasions topped the canal aqueduct; also the training of Nála No. 8 in mile 5, where the aqueduct has for years stood in danger of being flanked. The work was still open at the end of the year. The sanctioned famine abstract estimate amounted to Rs. 62,089, while the expenditure was Rs. 7,030. The highest number of workers on any one day was 2,749 on the 30th March 1900.
 Famine Relief—Ojhar Left Bank Canal.

102. This is an adjunct to the Maládevi Tank Project. The head works will be immediately opposite to those of the Ojhar Left Bank Canal already in operation. The new canal will have a length of about 37 miles. It reaches the ridge between the Pravara and Mula Rivers in the 25th mile and follows that ridge for the remainder of its course. A distributary running towards the taluka town of Rahuri can be constructed if necessary. The work was commenced for famine relief purposes on the 1st Section of 10 miles on the 10th December 1899. The 2nd Section, also of 10 miles, was opened on the 20th January 1900. The alignment originally followed has only been slightly deviated from in the first 20 miles. Below this point considerable changes have been introduced, involving a couple of deep cuttings but reducing by some 6 miles the original length of the main canal and avoiding a 4 feet vertical fall in embankment. Two rest-houses, one at Songaon and the other at Deoláli, have been sanctioned in connection with the project. The canal will run within double banks and over aqueducts. It starts with a bed width of 14 feet and a depth (full supply) of 5 feet and has a fall of 1 foot to the mile for the first 12 miles. The largest number of relief workers on Section I. was 8,747 on the 3rd February 1900, and on Section II. 9,039 on the 29th March 1900. On the combined sections the maximum of 16,558 workers was reached on the 29th March 1900. Since the close of the year, work on the 3rd section has commenced. The sanctioned famine abstract estimate amounts to Rs. 5,44,202 and the expenditure to the close of the year was Rs. 1,05,726.
 Famine Relief—Ojhar Right Bank Canal.

103. This tank was originally proposed in the famine of 1896-97 when a beginning was made on the puddle trench and an expenditure of Rs. 34,003 incurred, but the work then done had since almost disappeared. The tank was reopened this famine on the 7th December 1899. In view of the scarcity of water on this work and the importance of concentrating the largest numbers possible thereon, it was considered advisable, having regard to the fact that the puddle trench excavation could not take on more than a certain number and that the puddle filling and bank work needed more water than was available, if all seeking relief were to be employed, to alter the design and position of the waste weir, which was originally proposed to be a masonry wall 1,600 feet long with a clear overfall. The dam itself has been now carried over half this length and the weir converted into a channel 1,000 feet wide in full cutting with a maximum depth of 12 feet in hard murum and a fall of 1 in 100. This change has permitted of the employment, since January last, of 5,000 or more workers on the weir channel alone. The total quantity of cutting involved in the channel is 7,377,185 cubic feet. Of 12,500 workers the remainder were employed in digging and filling the puddle trench and on comparatively short lengths of the embankment itself. The maximum depth reached in the puddle trench was about 25 feet. Either rock or hard murum was met with in all the lengths completed. The total length of trench, all of which was opened out, is 7,100 feet. The width at bottom is 10 feet. There was only a moderate amount of water met with and advantage of the dry season was taken to excavate the trench for the concrete wall to be laid across the river bed. The dry stone cross drains under the outer toe of dam were also put in hand and were nearly completed. Stones for them have been obtained at a low rate. The maximum number of workers employed was 12,776 on the 12th March 1900 and the expenditure to the end of the year, Rs. 1,43,058. The approximate famine abstract estimate amounts to Rs. 13,23,000.

104. The silt clearance was undertaken for famine relief purposes. The work was commenced on 4th January 1900 and the maximum number of workers was reached on the 7th March 1900, when 6,901 were employed. The sanctioned Famine Abstract Estimate amounts to Rs. 1,21,944 and the expenditure to the close of the year was Rs. 50,056. The work consisted in digging out the tank bed and throwing the excavated material beyond the F. S. L. contour. The tank had silted up to heads of the outlet sluices.

POONA IRRIGATION DISTRICT.

105. During the year under review the expenditure under Capital amounted to Rs. 20,864, viz., Rs. 6,439, on altering and improving the lower service mains of Poona water-supply and Rs. 14,425, on minor works, such as constructing canal boundary walls and extending parapets of overbridges on the Mutha Right Bank Canal, intended for the protection of canal water from pollution up to Poona.

106. On the 1st April 1899 the water in Lake Fife was 18.83 feet above the sill of canal sluices and the minimum level was reached on 17th June when the depth was 9.75 feet. On the 19th the lake began to rise and it filled to overflowing on the 30th. The highest flood of the year occurred on the 10th July when the water rose to R. L. 245.02 or 1.70 feet above crest of waste weir.

107. The standards and planks were fixed on the weir in the middle of September and on the 29th September the water stood at 3.10 feet above the crest. The draw-off from the storage commenced on 2nd October, about a month earlier than usual, and on 31st March 1900 the level of the water was 15.53 feet above the sill of the sluices, or 3.46 feet lower than on the same date in the previous year.

108. The Right Bank Canal was closed for 16 days and the Left Bank Canal for 17 days during the year for silt and weed clearance. The rainfall of the

year at Poona amounted to 12·37 inches, the average for the last 50 years being 29·39 inches.

109. The canal and the Poona water-supply works were maintained in an efficient state throughout the year at a total cost of Rs. 22,812, as detailed below:—

	Rs.
Mutha Canals	15,165
Poona Water-supply	7,647

110. In addition to this a sum of Rs. 5,385 was expended on Establishment charged to Works in the case of the Mutha Canals and Rs. 6,543, for the Poona water-supply.

111. The work of altering and improving the water-supply mains in the Poona Cantonments was completed during the year and filtered water from the new filters was for the first time supplied to houses in the Cantonment Bazar.

112. This tank received no replenishment during the year under report. It was dry on the 1st April 1899 and remained so till 31st March 1900. The rainfall was 6·19 inches. During the year a sum of Rs. 164 was expended on maintenance and repairs of the tank and Rs. 84 on work establishment.

113. On the 1st April 1899 the water level stood at 16·34 feet above outlet or 0·06 feet lower than on same date in 1898. The tank commenced to be replenished from 5th June and on 18th September the level was 19·15 feet above sill of outlet. On the 29th November the level of water was only 4·00 feet above outlet sluice. In December and up to 15th January, the tank was replenished from Lake Fife.

The expenditure on maintenance and repairs amounted to Rs. 779 and that on establishment charged to works Rs. 420.

114. On the 1st April 1899 the water level stood at R. L. 72·73, i.e., 12·73 feet above outlet or 3·77 feet lower than on same date in 1898. Slight replenishments were received in June and September 1899 and the highest level reached was R. L. 76·00 on the 14th June 1899. The tank became dry on 22nd November 1899.

The dam and canal as far as 7th mile were kept in good repair. The expenditure incurred was Rs. 1,425 on works and Rs. 252 on account of establishment.

115. On the 1st April 1899 the water level stood at R. L. 45·60 or 12·40 feet above sill of outlet, and 10·90 feet lower than in the previous year. Slight replenishments were received in April and June 1899 and the tank became dry on 7th August 1899 and remained so till 11th September 1899 when fresh replenishments occurred. The highest level reached was on 19th September 1899 when the water stood at R. L. 55·20 or 22 feet above sill level. Deducting 10 feet of silt the depth of water available for irrigation was 12 feet, corresponding to a storage of about 64 millions cubic feet. This supply lasted for 4½ months, viz., till 25th December 1899 when the tank again became dry.

The dam and the canals were maintained in good repair at a cost of Rs. 942 for works and Rs. 252 on account of establishment.

116. The total expenditure on Capital Account on Bhátghár Dam during the year was Rs. 1,924, incurred in finishing the extension of the third training wall, below the north waste weir, commenced in the previous year.

117. Before the monsoon set in, arrangements were made to ensure that the gates were in proper working order, the usual number of counterweights being taken out, cleaned and rehung.

The under sluices were opened for the monsoon on the 9th and 11th July under heads of 36·30, and 14·50 feet respectively.

The flood level while the under sluices were open never rose higher than 14.50 feet, the highest level previously attained under similar circumstances being 64.60 feet in 1894.

Owing to the unfavourable character of the monsoon, the under sluices were closed 11 days earlier than in any previous year.

Notwithstanding this precaution the tank filled only up to within half a foot of the weir crest, the top $8\frac{1}{2}$ feet closed by the gates remaining unfilled. The storage impounded was short of the full supply by about 1,700 millions cubic feet or nearly one-third of the total capacity of the tank. The automatic gates did not come into use during the year.

118. The water level in the reservoir on 31st March 1899 was 64.40 feet above sill level of under sluices and 5.15 feet higher than on the same date in the previous year.

The draw-off for irrigation from the upper sluice commenced from 9th October 1899 as against 25th October in the previous year. The intermediate sluice was first opened on 17th November 1899.

The volume of water discharged from the catchment of 123 square miles from the beginning to end of monsoon was 14,084 millions cubic feet equal to a run off of 47.36 inches against 140 inches of the previous year. The total rainfall of the year at Bhátghar was 26.91 inches.

119. No floods of importance occurred during the year. The canal and distributaries were maintained in efficient order at an outlay of Rs. 17,042 on works and repairs, and of Rs. 7,575 on establishment charged to works.

120. The following were the principal Capital Account works executed along the canal during the year :—

Fixing mile and half mile stones on the upper bank along the whole length of canal.

Constructing a distributary in mile No. 46.

Constructing two blocks of huts for Inspectors and Patkaries, one at Haturna and the other at Boura Chauki.

Constructing a regulator at end of Distributary No. 59 and covering the banks with murum and pitching the side slopes of Awasari Branch.

The total expenditure on Capital Account, including Bhátghar Dam, was Rs. 3,107.

121. The Kara and Kajad banks were puddled during the year and much of the waste by leakage at these places was stopped.

Owing to deficiency of water-supply, every effort was made to pick up the percolation water running through nálas for irrigation.

The area irrigated by leakage was treble that usually irrigated from the same source in previous years.

122. This work was reopened for famine relief on 27th November 1899. It was first carried on as a test work till 3rd January 1900 when it was converted into a regular famine relief work.

Work was carried on partly on piece-work system and partly on the code system of the task work. The total famine expenditure was :—

	Rs.
Works	78,571
Establishment—	
Charged to works	2,519
Total	81,090

The principal items of work carried out were :—

			Cubic feet.
Puddle filling	...	...	85,252
Earthen Dam	...	...	2,615,338
Excavation in rock	...	...	13,692

The greatest number of persons employed at one time was 12,142. The necessary sanitary arrangements were maintained and there was no epidemic during the four months the work was in progress.

Ganges. 123. Rain and canal gauges were maintained in the Poona District as usual and observations regularly recorded.

Registers of heights of water were kept for all tanks and diagrams recorded.

SHOLAPUR DISTRICT.

Mhasvad Tank. 124. The Capital Account of the work stands as under :—

			Rs.
Estimated amount	...	...	16,09,890
Previous expenditure	...	...	15,83,171
Allotment for 1899-1900	...	...	1,700
Expenditure during 1899-1900.	...	...	Nil
Total expenditure ...	...	...	15,83,171

There were no original works carried out during the year under report. The dam and canals were repaired and maintained at a cost of Rs. 5,758. This amount includes Rs. 678 spent in completing the removal of silt and debris from canal No. I, the tunnel and its approaches, and Rs. 508 in repairing approach banks of aqueducts of nálas Nos. 20 and 38 on canal No. I. The repairs to aqueduct on nála No. 38 were completed, and those to aqueduct on nála No. 20 will be completed during 1900-1901.

The waste weir of the tank began to overflow on 13th September 1899, and the maximum depth of water on the waste weir was 1.70 feet on the same date. The lowest water-level reached in the year was R. L. 1919.00, that is, 3.78 feet above sill of outlet sluice. This was on the 8th September 1899.

125. The Capital Account of this tank was closed in 1885. The only original work sanctioned during the year was that of fixing two self-registering rain gauges in the catchment of the tank. These gauges are intended to furnish more reliable data regarding run-off, &c. At present there is only one rain gauge on the tank, and that near the dam. The rainfall registered at the present gauge is, therefore, not of much use in run-off calculations. Of the two self-registering gauges sanctioned, only one was fixed during the year, as the other was not available at the Mathematical Instrument Dépôt in Calcutta. The expenditure incurred in providing the self-registering rain gauge was Rs. 150 against the sanctioned estimate of Rs. 248. The dam and canals were repaired and maintained in an efficient order at a cost of Rs. 4,248, including special repairs to the dam, which consisted of raising it to the original level where it had sunk down, and widening it to 6 feet where it had worn down to a smaller top width. There were no extraordinary floods during the year. The tank did not fill on account of the failure of late rains. The maximum depth of water in the tank was R. L. 194.35 on 19th September 1899, *i. e.*, 28.60 feet above the sill of the low-level canal. The minimum depth was R. L. 185.30 on 31st March 1900, *i. e.*, 19.55 feet above the sill of the low-level canal.

126. The Capital Account of this tank was closed in 1893. No original work was executed during the year. The dam and canals were repaired and maintained in an efficient order at a cost of Rs. 2,404. This amount includes Rs. 791 spent on silt clearance of the Right Bank Canal and of the Right Bank Branch Canal.

The cut in the waste weir began to overflow on 17th September 1899, and the maximum depth of water on the cut in the waste weir was 1.60 feet on 19th September 1899. The lowest level of water in the tank was R. L. 220.12, that is, 10.12 feet above the sills of outlets, which was reached on 31st March 1900.

127. The Capital Account of this tank was closed in 1892. No original works were carried out during the year. The dam and the channel were repaired and maintained in an efficient order at a cost of Rs. 289.

The waste weir did not overflow during the year. The highest level of water reached was R. L. 87.80 on 18th September 1899, which shows a depth of 7.80 feet above the sill of Right Bank Channel. The tank-water went below the sill of the channel on 19th January 1900.

33—Famine Relief Works. 128. The following tank-works were started as famine relief works during the year :—

- (1) Páthri Tank in Barsi Táluka.
- (2) Mangi Tank in Karmala Táluka.
- (3) Hotgi Tank in Sholápur Táluka.
- (4) Wadshivne Tank in Karmala Táluka.
- (5) Buddihal Tank in Sangola Táluka.
- (6) Bhamburdi Tank in Malsiras Táluka.
- (7) Widening and raising Ashti Tank dam in Madha Táluka.

129. All the new tank-works, started for famine relief purposes, are to have earthen embankments thrown up at suitable sites across the feeder rivers or nálas, with a waste channel at one end; each tank is to have one masonry outlet. The dimensions of the earthen dams are to be as follows :—

Top width—8 feet.

Front slopes—3 to 1 up to highest flood level, and 2 to 1 from highest flood level to top.

Rear slope—2 to 1.

The front slope is to be pitched with dry stone from 2 feet below outlet level to 3 feet above highest flood level.

Each tank dam is to be provided with concrete and puddle trenches carried down to impervious strata, and also with longitudinal and cross drains for facilitating surface drainage of the seat of the dam.

Of the seven works mentioned above, the first two tanks were commenced and partially constructed during the famine of 1896-97. Work was resumed and continued on them during the present famine.

130. Work was re-opened on 19th October 1899. The work has been described in the Administration Report for Irrigation Works for 1897-98. The following are the details of the principal items executed during the year :—

Items.					Quantity.
<i>Dam.</i>					
Clearing site of dam	...	...	...	Square ft.	47,162
Excavating concrete trench	...	...	...	Cubic ft.	24,000
Breaking metal	...	...	...	"	24,776
Collecting lime kunker	...	...	...	"	550
Embankment of dam	...	...	...	"	1,113,486
Collecting earth and muram for embankment	...	...	...	"	321,759
Earth-work in slope repairs	...	...	...	"	8,138
Road berm at the toe of embankment	...	...	...	"	11,412
<i>Outlet.</i>					
Superstructure, coursed rubble masonry	...	...	...	Cubic ft.	802

The expenditure during the year was Rs. 21,672, exclusive of gratuitous relief and Engineering Establishment. The highest number of relief workers and dependents employed on the work was 2,817 on 9th November 1899.

131. This work, which has been described in the Administration Report for 1897-98, was re-opened as a famine relief work on 27th November 1899, to give relief to the population in the Karmala Táluka.

Mángi Tank.

The puddle trench excavation and filling and dam embankment were resumed and continued during the year. It has now been decided to construct only one outlet to the tank. The space left for the second outlet on the left bank side of the Kanola River has, therefore, been closed. The excavation for waste weir was also continued during the year. The following table shows the quantities of the main items of work executed during the year :—

Items.					Quantities.
<i>Dam.</i>					
Excavation for clearing site of dam	...	...	...	Cubic ft.	106,491
Do. for puddle trench	...	...	...	"	142,411
Filling in puddle	...	...	...	"	57,681
Embankment of dam	...	...	...	"	2,853,204
Collecting stone for pitching	...	...	...	"	31,855
<i>Waste Weir.</i>					
Excavation of waste weir	...	...	...	Cubic ft.	1,348,404
<i>Outlet.</i>					
Excavation for foundations	...	...	...	Cubic ft.	2,240

The total expenditure during the year was Rs. 1,63,061, exclusive of gratuitous relief and Engineering Establishment, and the highest number of workers and dependents employed on the work was 24,732 on 17th March 1900.

132. This work was started on 28th November 1899. The site of the tank is situated about 5 miles to the south-east of the town of Sholápur. The tank is to be formed by throwing an earthen embankment, 5,550 feet in length, across the Kumbhari Nála, about $1\frac{1}{2}$ miles to the north-west of the village of Hotgi, in Sholápur Táluka. The maximum height of dam is to be 43 feet. The waste weir is to be at the right end of the dam and 500 feet in length. The catchment area is 23 square miles. The tank will command a large area of good culturable land. The outlet is to be on the left side of the nála. The contents of the tank, above the sill of the outlet, are calculated to be 321 millions of cubic feet. The cost of the work, at normal rates, is roughly estimated at Rs. 3,90,842.

The following are the quantities of the main items of work executed during the year under report :—

Items.					Quantity.
Clearing site of dam	...	...	...	Cubic feet...	888,177
Embankment	...	...	...	"	132,848
Excavation for puddle trench	...	...	...	"	1,609,185
Filling in puddle	...	...	...	"	247,641
Excavation for waste weir	...	...	...	"	2,994,873
Collecting metal for concrete	...	...	...	"	11,694
Do. earth and muram for dam	...	...	...	"	15,487

The expenditure during the year was Rs. 71,648, exclusive of gratuitous relief and Engineering Establishment, and the highest number of workers and dependents employed on the work was 11,369 on 29th March 1900.

133. This tank was surveyed in December 1899. Rough plans and estimates were then framed and submitted for sanction. The cost of the rough scheme, at normal rates, amounts to Rs. 1,94,169. The catchment of the tank is hilly and favourable to a good run-off, its area being $15\frac{1}{2}$ square miles.

Work was actually commenced on 5th March 1900, and the highest numbers employed on it were 5,556 workers and 1,569 dependents on 31st March 1900. The tank is situated about 3 miles to the west of the Kem Railway Station, and is to be formed by throwing an earthen dam, 3,700 feet in length, across the Jagdura Nála, above the village of Wadshivne. The dam will be 50.25 feet high at the crossing of the feeder nála. The waste weir is to be at the left end of the dam, and is to be 400 feet in length. The tank commands a large area of good land. The outlet is to be on the right side of the feeder nála. The available contents of the tank are calculated to be 172 millions of cubic feet.

The following table shows the quantities of the principal items of work carried out during the year:—

Items.					Quantity.
<i>Dam.</i>					
Clearing site of dam	...	...	...	...Cubic feet...	297,989
Excavation of puddle trench in soil	...	...	...	... „ ...	117,788
Do. in soft and hard muram	...	...	...	... „ ...	35,700
Excavation for concrete trench	...	...	...	... „ ...	1,450
Metal for concrete	...	...	...	... „ ...	3,549
Embankment of dam	...	...	...	... „ ...	96,266
Excavation in black soil and muram for waste weir	...	...	...	... „ ...	185,430
Do. for cross drains below and outside dam	...	...	...	... „ ...	4,250
Sloping nála bank	...	...	...	... „ ...	58,950

The expenditure during the year was Rs. 10,894, exclusive of gratuitous relief.

134. This tank is situated in Sângola Táluka, 16 miles to the south-west of the town of Sângola, and is to be formed by throwing up an earthen dam, 9,975 feet in length, across the Budhihal River. The maximum height of the dam is to be 64.04 feet. The waste weir is to be at right end of the dam and 1,200 feet in length. The catchment area of the tank is 141 square miles. The tank will command good culturable land. The outlet is to be on the left side of the river. The available contents of the tank are calculated to be 1,234 millions of cubic feet. The cost of the project, according to a rough estimate, is Rs. 7,90,675 at normal rates. The work was started as famine relief work on 17th October 1899. The highest number of relief workers employed was 17,083 workers and 3,679 dependents on 30th March 1900.

The expenditure during the year was Rs. 1,53,991, exclusive of gratuitous relief.

The following table shows the quantities of the main items of work carried out up to 31st March 1900:—

Items.				Quantities.
Excavation for the waste weir	...	...	...Cubic feet...	494,805
Do. for puddle trench	...	...	... " ...	1,759,529
Collecting boulders	...	...	... " ...	19,998
Clearing site of dam	...	...	...Square feet...	261,914
Collecting metal	...	...	...Cubic feet ...	38,095
Filling in puddle trench	...	...	... " ...	463,646
Excavating side gutters	...	...	... " ...	21,137
Do. seat of dam	...	...	... " ...	377,101
Filling in gutters with boulders	...	...	... " ...	13,600
Excavating black soil for filling in puddle trench	...	...	... " ...	343,461
Filling in seat of dam	...	...	... " ...	19,900
Embankment of dam	...	...	... " ...	35,850
Excavating red soil for puddle	...	...	... " ...	5,748
Digging out sand	...	...	... " ...	9,743
Excavation for concrete trench in river bed	...	...	... " ...	106,591

135. This tank is situated in the Malsiras Táluka, 5 miles to the south-west of the town of Malsiras. It is to be formed by throwing up an earthen dam, 9,249 feet in length, across the Bhamburdi Nála. The maximum height of the dam is to be 48.91 feet. The waste weir is to be 1,900 feet in length, and is to be at the right end of the dam. The catchment area is 51 square miles. The tank commands a sufficient extent of good irrigable land. The outlet is designed to be on the left side of the nála. The available contents of the tank are calculated to be 421 millions of cubic feet. The cost of the project, at normal rates, is roughly estimated at Rs. 3,81,864.

The work was started as a famine relief work on 30th November 1899. The highest number employed was 9,375 workers and 2,574 dependents on 9th February 1900. The expenditure up to 31st March 1900, exclusive of gratuitous relief, is Rs. 95,940.

The following are the quantities of the main items of work executed during the year :—

Items.				Quantities.
Clearing seat of dam	...	...	...Square feet ..	3,452
Excavating puddle trench	...	...	...Cubic feet...	1,062,461
Collecting muram for puddle trench	...	...	... " ...	30,422
Do. earth for puddle trench	...	...	... " ...	89,060
Filling in puddle trench	...	...	... " ...	84,222
Excavating longitudinal and cross drains	...	...	... " ...	18,089
Embankment	...	...	... " ...	87,500
Collecting earth for embankment	...	...	... " ...	9,755
Do. muram for embankment	...	...	... " ...	58,112
Collecting metal for concrete	...	...	... " ...	17,487
Excavation for waste weir	...	...	... " ...	54,468

136. The Ashti Tank Dam, as originally constructed, had its top at R. L. 244 and a top width of 6 feet. By weathering, subsidence and wear and tear, the top width became reduced to 3 feet and the top of dam sank from 6 inches to 15 inches below the original level in several places. The rear slope also became worn down and steeper than originally constructed.

It was, therefore, proposed to repair the dam, to widen it at the top from 6 feet to 8 feet and to restore the original top level, giving a uniform rear slope of 2 to 1. The estimate of repairs and improvements, at normal rates, amounts to Rs. 41,975. The work was started as a test work for Madha Táluka on 30th October 1899. As the famine became more intense, it was converted into a regular relief work. The highest number of workers and dependents employed

was 8,033 on 1st March 1900. The expenditure during the year was Rs. 50,416. The quantities of work executed up to 31st March 1900 were as under:—

Items.						Quantities.
Excavating, conveying and stacking earth for embankment	...	Cubic feet...				1,306,042
Excavation of old dam	...	...	...	...	"	43,262
Excavating gutters.	...	...	...	...	"	23,555
Excavating, conveying and stacking muram	...	...	...	...	"	516,259
Conveying muram	...	...	...	...	"	124,987

137. Further survey was undertaken during the year for the preparation of complete projects for the following tanks:—

- Surveys.
- (a) Irrigation tank at Hutgi.
 - (b) Do. Budhihal.
 - (c) Do. Bhamburdi.
 - (d) Do. Nimbgaon.

The surveys could not, however, be completed, as the establishment engaged on them had to be removed for employment on famine relief works.

It was thought, at the commencement of the present famine (1899-1900), that the numbers on famine works in this district would rise to 250,000 in the hot weather. To meet this contingency new tank sites were prospected and the following were selected:—

- (a) Wadshivne Tank in Karmala Taluka.
- (b) Hingni Tank in Bársi Taluka.
- (c) Jawala Tank in Sàngola Taluka.
- (d) Sanand Tank in Sàngola Taluka.

Sites (a) and (b) were surveyed during the year and rough plans and estimates were prepared for the same. Work was actually commenced on site (a) on the 5th March 1900. Surveys of sites (c) and (d) were commenced during the year. They will be completed in 1900-1901.

The total expenditure incurred on the above survey work during the year was Rs. 1,318.

BIJA'PUR DISTRICT.

138. 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. A drain under the canal at the Railway crossing near Bágalkot was provided at a cost of Rs. 474. The tank was repaired and maintained at a cost of Rs. 192.

The rainfall gauged at the tank was 23·07 inches against 23·05 inches in the previous year. From June to December 1899, 19·25 inches fell as compared with 19·67 inches for a similar period in 1898-99.

The highest level of water in the tank was 14·37 feet above the sill of sluice as compared with 10·30 feet in 1898.

139. An expenditure of Rs. 1,227 was incurred on 2nd Class Revenue works as detailed below during the year under report, Rs. 148 being recovered as contribution from the rayats interested in the tanks concerned:—

Second Class Revenue works.

	Rs.
1. Survey for repairs to the Sankeri Tank at Timsagar, Bádámi Táluka ...	12
2. Repairs to the Dhelikhan Vazir's Tank at Kumatgi, Bijápur Táluka ...	93
3. Repairs to the Dodkeri at Timsagar, Bádámi Táluka ...	1,122
Total ...	<u>1,227</u>

Agricultural works, works for which neither Capital nor Revenue Accounts are kept, original works.

140. An expenditure of Rs. 4,546 was incurred on these works as detailed below :—

	Rs.
1. Survey of the proposed tank at Hullur, Mudebihál Táluka	107
2. Sinking trial pits in connection with the Sangogi Tank project ...	2,215
3. Rents for temporary occupation of land in connection with the Sangogi Tank work during the Famine of 1896-97 ...	2,066
4. Rents for temporary occupation of land in connection with the Hullur Tank work during the Famine of 1896-97 ...	158
Total ...	<u>4,546</u>

141. An outlay of Rs. 26,707 was incurred during the year under report on Sangogi Tank work, which was opened as a famine relief work under a special Executive Engineer during February 1900,

Famine works.

SATARA DISTRICT.

Krishna canal,

142. There was no Capital expenditure during the year on this canal.

The canal was maintained in working order at a cost of Rs. 11,263 as per details given below :—

	Rs.
Ordinary Repairs ...	4,087
Special Repairs, ...	6,650
Plantations, ...	526
Total ...	<u>11,263</u>

143. The area irrigated this year was 6,511 acres, and the assessments amounted to Rs. 59,231 as compared with Rs. 44,797 in 1898-99.

144. Rs. 38 were spent in aloe fencing on both sides of the Burli Branch Channel and Rs. 6,611 in removing silt from the canal during the year under report.

145. The revenue has increased owing to water having been taken for bájri, arqud, &c., on account of deficient rainfall which crops usually do not require water and to improved condition of the canal due to removal of silt.

146. Besides the Krishna Canal there are in the Sátára District 5 other works for 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. Mání Tank.
5. Chikhli Canal.

There was no Capital expenditure during the year on these works.

147. Special Repairs to Lodhowda weir, debitable to the Upper Mán River Works, were completed during the year under report at a cost of Rs. 1,218, of which Rs. 438 were spent during the year.

All the five works were maintained in good order at the cost noted below:—

No.	Works.	Extension and Improvements.	Maintenance and Repairs.	Special Repairs.	Plantation.	Total.
1	Yerla River Irrigation Works.	...	2,445	808	400	3,653
2	Upper Mán River Works ...	...	1,938	438	240	2,616
3	Bewári Canal... ..	...	1,050	...	39	1,089
4	Maini Tank ... ..	...	1,179	...	106	1,285
5	Chikhli Canal ... ..	...	388	139	38	565

148. The irrigation and assessments of the year as contrasted with those of the previous year are as under:—

No.	Works.	1898-99.		1899-1900.	
		Area.	Assessment.	Area.	Assessment.
		Acres.	Rs.	Acres.	Rs.
1	Yerla River Irrigation Works ...	3,859	12,070	4,126	11,757
2	Upper Mán River Works ...	1,570	5,148	1,781	5,598
3	Bewári Canal	1,567	8,207	162	2,961
4	Maini Tank Canal	1,551	4,302	1,998	5,617
5	Chikhli Canal	468	2,424	45	320
	Total ...	9,015	32,151	8,112	26,253

149. The following surveys were taken in hand and expenditure noted below was incurred on them during the year under report:—

Surveys.	Rs.
1. Surveying Ambowda Tank	1,848
2. Do. Goregaon Tank	2,972
3. Making survey of the Joshi Nalla	101

150. The work was commenced as a famine relief work in January 1900. By the end of January 1900 the number rose to about 1,700, by the end of February it rose to about 2,000, and by the end of March 1900 it rose to about 3,000. The estimate for the work amounted to Rs. 34,212 and the expenditure during the year to Rs. 13,605.

151. This work was commenced as a famine relief work on 12th March 1900 and by the end of March 1900 the number rose to about 2,400. The estimate for the work amounted to Rs. 77,933 and the expenditure during the year amounted to Rs. 516.

Famine relief.—Making a berm in rear of Pingli Dam.—Upper Mán River Works.

Yerla River Irrigation Works.—Making a berm to Nehr Tank.

152. This work was commenced as a relief work in March 1900 and by the end of March 1900 the number rose to about 650. The estimate for this work amounts to Rs. 24,102 and the expenditure during the year amounted to Rs. 1,234.

153. This work was commenced as a test work on the 10th February 1900 and the number on the work by the 20th of February was about 190. The work was commenced as a regular famine work on 12th March 1900 and by the end of that month the number rose to about 1,200.

154. This work was commenced as a famine relief work on 18th March 1900 and the number by the end of that month rose to about 900. The expenditure during the year amounted to Rs. 430.

BELGAUM DISTRICT.

155. 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. 2,008.06 or 27 feet above the bed of the river.

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

157. The Capital expenditure during the year was Rs. 8,076 as under :—

	Rs.
Shindi Nala extension	5,496
Constructing Patkaris' Chaukis	1,818
Do. Service Road	762
Total	8,076

158. From the commencement of the work, the Capital outlay has been Rs. 10,75,982 as detailed below :—

As per Completion Report.

	Rs.
First Section	3,21,376
Storage Works	7,01,241
Total	10,22,617

Open Capital Account.

	Rs.
First Section	8,381
Storage Works	44,984
Total	53,365
Grand Total	10,75,982

159. The working expenses amounted to Rs. 2,896 against Rs. 2,898 in the previous year.

160. Owing to the unprecedented failure of the rains the storage was exhausted for the first time since the construction of the weir on the 16th April 1900, on which date the level of the water fell at once from 6.77 in the morning to 2.06 in the evening above the sill of the undersluices, and on the 18th April the tank was run dry, with the exception of pools isolated from the channel leading to the undersluices by banks of silt. There is practically no storage below R. L. 1992, the last 6 feet depth of storage above the sill of undersluices having been lost by the silting in the bed of the reservoir.

161. The tank overflowed on the 14th June and the maximum flood of the year occurred on the 17th June 1899 when the water level rose to 1.84 feet above the present weir crest, the discharge being estimated at 24,000 cubic feet per second, equal to a run-off of 0.034 inch per hour from the whole catchment basin (1,080 square miles).

162. The total discharge of the river between 1st July and 31st October 1899 amounted to 33,154 millions cubic feet, representing a run-off of 13 inches from the catchment basin.

163. The storage was first drawn upon on the 24th November 1899. Only one freshet occurred on the 12th January 1900, which was calculated to have replenished the storage to the extent of about 14½ millions of cubic feet.

164. The area irrigated was 8,424 acres, as compared with 6,455 acres during the previous year, showing an increase of 1,969 acres or 30 per cent., due to the increased demand for water and large increase of area irrigated during the Rabi season owing to the failure of the monsoon rainfall.

165. The water-rate assessment amounted to Rs. 24,787, being an increase of 23 per cent. over the previous year, due to the large area irrigated during the Rabi season.

166. 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.

167. The average monthly consumption of water by the Southern Mahratta Railway Company was 1,39,300 gals. and the charges for the year under report amounted to Rs. 209.

168. A rain gauge was maintained at Dhupdal near the head works of the Gokak Canal. The fall registered here for the whole year was 16.14 inches, as compared with 25.13 in the previous year.

169. The management of this tank is vested in the Revenue Department. Petty repairs to the extent of Rs. 98 were carried out by this Department during the year under report.

170. 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	2	839
Do. and completed during the year ... ..	...	.....
Do. but not completed during the year	8	7,628
Total	10	8,467

171. 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	1	164
Do. and completed during the year ... ..	...	.....
Do. but not completed during the year	2	1,118
Total	3	1,282

Surveys. 172. The expenditure incurred on surveys was Rs. 750 against an allotment of Rs. 748. The survey work done was as under :—

	Number.
Tanks newly surveyed	6
Tanks formerly surveyed, but surveys now completed and checked	15
	<u>21</u>

173. The work of surveying the tank at Yadwad, sanctioned in Government Resolution No. 104 A. I.-801, dated 11th May 1898 and taken in hand in December 1898 was completed during the year under report at a cost of Rs. 512.

174. 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. 146. Orders for the abandonment of the project have been issued in Government Resolution No. 43-W. I.—622, dated 21st April 1899.

The expenditure incurred to the end of March 1900 on fencing the puddle trench at Taosi was Rs. 80 against an allotment of Rs. 230.

DHARWAR IRRIGATION DISTRICT.

Capital Expenditure. 175. There was no expenditure during the year chargeable to the Capital Account.

175. There are four works of this class in this district, *viz.*, Madag, Medleri, Asundi and Dambal. In addition to these there is the Mavinkop Tank, which lies on the western border of the Dhárwar District. This tank irrigates lands which are situated in the Haliyál Táluka of the Kánara Collectorate and is under the management of the Revenue Department.

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

Tanks.	Maintenance and Repairs.	Special Repairs.	Plantations.	Total.
	Rs.	Rs.	Rs.	Rs.
Madag	506	...	91	597
Medleri	241	...	...	241
Asundi	274	1,676	...	1,950
Dambal	243	...	...	243
Mavinkop	...	...	...	...
Total	1,264	1,676	91	3,031

Madag, Medleri, Asundi, Dambal. 177. The expenditure is less than that of the previous year.

178. The project owing to certain changes was revised. The estimate amounted to Rs. 5,717. The expenditure to end of the year was Rs. 3,953.

179. A project for a new sluice and channel was sanctioned in Government Resolution No. 133-W. I.—1544, dated 3rd November 1897, but no funds were allotted.

180. The water level in the tank stood at R. L. 48·80 *i.e.*, 3·80 feet above the outlet sill on 1st April. During the months of April and May the tank received slight replenishments. It received further large replenishments subsequently and the waste weir overflowed several times. A fair supply of water was maintained until towards the close of the year when it was insufficient.

Madag Tank—
Replenishments.

181. The water level in the tank stood at R. L. 172·52, *i.e.*, 7·52 feet above the outlet sill on 1st April. The tank received no replenishment till 8th September and it was dry from 12th August to 8th September. During the month of September the tank received some replenishments. The tank was again dry towards the close of the year. On the whole the supply was quite insufficient.

Medleri Tank.

182. The water level in the tank stood at R. L. 102·92, *i.e.*, 5·92 feet above tank bed on 1st April. During the months of April and June the tank received slight replenishments. It received further replenishments subsequently, but the tank was dry from 26th November. The supply of water was insufficient.

Asundi Tank.

183. The water level in the tank stood at R. L. 140·45, *i.e.*, 6·45 feet above tank bed on 1st April. During the month of April the tank received a replenishment. It received further replenishments subsequently and the waste weir overflowed several days, but the tank was dry from 4th March. The supply of water was insufficient.

Dambal Tank.

184. Rain gauges were maintained during the year throughout the district. The rainfall gauged at Madag, Medleri, Asundi and Dambal shows a very large decrease as compared with the figures of the previous year.

Rain gauges.

185. The following tables give details of second class works carried out and expenditure incurred on them:—

Second Class Revenue Works.

Particulars.				Number of tanks.	Expenditure during the year.
					Rs.
<i>Large Tanks irrigating over 50 acres, repaired or improved.</i>					
Commenced in the previous year	...	...	...	20	13,373
Do. and completed during the year	...	...	...	3	2,328
Do. but not completed during the year	...	...	...	24	27,912
Total				47	43,613
<i>Smaller Tanks irrigating less than 50 acres repaired or improved.</i>					
Commenced in the previous year	...	...	...	3	387
Do. and completed during the year	...	...	...	...	.....
Do. but not completed during the year	...	...	...	2	572
Total				5	959
Grand Total				52	* 44,572

* Includes Rs. 764 debited to miscellaneous advances owing to non-receipt of L. B. contribution for Hattimattur Tank works.

The total expenditure incurred on the Second Class works amounted to Rs. 44,572 inclusive of contribution outlay, Rs. 1,850.

Dharma and Naregal
Canals System.

186. The supervision exercised by the Irrigation Department over the distribution of the water of these canals was beneficial.

The river supply was far less than usual and was insufficient for the irrigation, especially towards the tail of the canal. The proposed improvement to the Dharma Canal is urgently required and will be a most useful work. The project is well advanced.

Detail of expenditure:

			Rs.
Maintenance and Repairs	...	...	560
Supervising distribution of water	...	...	493
Providing mile and furlong stones	...	...	31
Total			1,084

RATNA'GIRI DISTRICT.

Second Class Revenue Works.—Tank at Pat. 187. 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.
- (3) Repairing the dam where necessary and
- (4) Repairing chunam pointing of the sluice. The outlay on account of the above amounted to Rs. 53.

Tank at Warad. 188. 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) Tarring wooden railing. The outlay on the above items amounted to Rs. 80.

Special repairs were also made to this tank at a cost of Rs. 1,537, of which the ryots contributed Rs. 154, and consisted of:—

- (1) A pitched masonry waste-weir 140 feet long and 2 feet wide.
- (2) Raising the dam 2 feet throughout above the highest flood level.

KOLA'BA DISTRICT.

189. The repairs to this dam consisted of:—

- | | |
|--|---|
| Agricultural Works.—
Masonry dam at Borvi in Pen
Táluka. | (1) Repairing and tarring wood-work of gates; and |
| | (2) Chunam pointing and renewing pitching where necessary. The outlay amounted to Rs. 36. |

KANARA DISTRICT.

190. During the year under report repairs to the following tanks were taken in hand with the object of giving relief to the people in distress in the Haliyál Táluka, and Rs. 632 were spent as detailed below:—

			Rs.
(1) Tank at Hullati	...	...	360
(2) Do. at Murakwad	...	...	272
Total			632

SIND.

BEGA'RI CANALS DISTRICT.

191. The remodelling of the Desert Canal Project was sanctioned in Government Resolution No. W. I.-211, dated 31st January 1900, and work was commenced in that month.

Rs.

Estimate—Works only	...	...	10,87,020.
Expenditure to 31st March 1900.	...	...	1,50,306

192. This canal was first projected 40 years ago for political reasons, to induce the roving predatory Baluch tribes of the Upper Sind Frontier to take to peaceful agricultural pursuits.

193. Nothing, however, was done until 1870 when, after survey, an estimate amounting to Rs. 12,55,256 was prepared for a canal 82 miles in length, 32 being in Khelat Territory. In 1873 the estimate was sanctioned for Rs. 9,57,388, the saving of nearly 3 lakhs of rupees being secured by the omission of five masonry falls and consequent increase of gradient, and by lowering the rates for excavation.

194. During construction the extension of 32 miles into Khelat Territory was given up, two branches—the Uch and the Manuti—being substituted. But even these were found impracticable owing to disputes among the zamindárs, who eventually were allowed to take off independent distributaries from the Main Canal. The latter was extended to Salami or 68 miles from the Head Regulator at Kashmor, and from just above this regulator a large canal, called the Muradwah, was taken off 32 miles in length with branch to Kandkot, all in British Territory.

195. The revised estimate amounting to Rs. 12,56,184 was sanctioned in 1882, and as the result of the expenditure had proved so satisfactory, in a financial sense, the Secretary of State approved of the canal being classed as a Productive Public Work.

196. The canal was originally designed for a discharge of 1,698 cubic feet per second, which it was considered would be sufficient for 33,300 acres in Khelat and 61,200 acres in British Territory or 94,500 acres in all at a duty of 55½ acres to the cubic foot per second.

197. As completed in 1887—93 its discharge was 2,100 cubic feet, or with the Muradwah a discharge of 2,450 cubic feet. The area to be supplied was taken at 94,500 acres for the Desert Canal and 15,000 for the Muradwah, giving a duty of nearly 45 acres to the cubic foot.

198. The lengths of the Main Canal and Branches as completed were as follows :—

			Miles.
Main Canal	...	...	75
Muradwah	...	...	30
Kandkot Branch	...	...	10
Tcj Rajwah	...	...	6
New Fall Rajwah	...	...	25
Old do.	...	...	6
Bugti do.	...	...	17
Burdi Rajwah	...	...	5
Ahmed do.	...	...	7
Manjhi do.	...	...	6
Tharu do.	...	...	5

199. The head or mouth of the canal has always been troublesome, and from 1882-83 to the present time no less than Rs. 1,22,245 have been expended on opening new mouths, which with additional clearances somewhat impaired the financial success of the canal.

200. The omission of the falls was unfortunate, for the velocities in the Main Canal have proved greater than the soil can stand, and heavy erosion between miles 10 and 23 and between miles 37 and 47 has been the result.

A Rajwah called the Bugti, which was made by zamindárs and taken over by Government, has proved very difficult to work as it passes across a Dhoro and has no berms.

201. The karias (or water courses) of the Khelat zamindárs which take off in a bunch at the 57th mile silt heavily at their heads, owing to wrong alignment and they threaten to be entirely closed owing to the difficulty of clearance.

The working of the tail of the Main Canal has always been difficult, owing to bed level being too low.

202. The discharge of the canal has only once reached the designed supply of Rs. 2,100 cubic feet, and the average duty for the five years in which the supply has been over 1,700 cubic feet works out to 47·40.

203. As regards the zamindárs of Khelat, the political results looked for have been fully attained, but as regards the zamindárs of British Territory the canal has been less successful. This is due to the fact that the lands in the upper reach of the canal are high and suffer from a low level of supply due to erosion. The zamindárs will not take to lift cultivation, and as they are not good cultivators a good supply of flow must be provided if they are to cultivate at all. Of 2,87,550 acres which have been given out, one-third or 95,850 acres ought to have been cultivated annually, but the actual cultivation has only been about 60,000 acres, partly because the supply is deficient, and partly because the land is not fully commanded. It is therefore necessary to remodel the canal in order to attain the object for which it was originally made, and also to make provision in it for other culturable areas under command. The estimate, for Works only, amounts to Rs. 10,87,020.

204. I. The original mouth and supply channel to be widened to a bed width of 83 feet, to give the discharge of 2,602 feet
General description of proposed improvements. now proposed (completed).

II. An escape which is situated above the Head Regulator to pass off the surplus supply, and to pass over the channel the floods of the Shori Nai (completed).

III. Three spans of 10 feet to be added to Head Regulator. Bed to be raised by one foot, normal full supply being unaltered (completed).

IV. The high lands now on the right bank down to the 18th mile are to be transferred to a new canal, the Adiowah. The bed widths of the Main Canal are redesigned throughout in accordance with the discharges required.

V. The gradient of the Main Canal to be 75 foot per mile from the mouth to Drakhán Regulator.

In the original design the gradient from the mouth to Head Regulator was 83 foot per mile and from Head Regulator to Drakhán 622 foot per mile. The object of the change is to prevent the silting which now occurs annually below the Head Regulator, and to render easier the clearance above the Head Regulator now made difficult by the level of sub-soil water being above the bed level, and to render the supply more assured by lowering the level of normal full supply at the mouth.

VI. Owing to excessive velocity much scour has taken place in the bed of the canal between miles 10 and 23; a new fall has been provided at mile 19 with four openings of 10 feet each, the fall in water surface being 3·25 feet, the hydraulic gradient is therefore reduced from 1·10 feet per mile to 856 foot per mile between Drakhán and the fall.

VII. A new fall has been provided at mile 44½ with three openings of 7 feet, and with 3·25 feet fall of surface.

205. The table given below shows the bed gradients of the Main Canal from mouth to tail before and after the proposed remodelling:—

DESERT CANAL.

Mileage.	Original gradient.	Bed gradient after remodelling.	Remarks.
From Mouth to Head Regulator.	.83 foot per mile.	.75 foot per mile.	
Head Regulator to Drakhán622 " "	.75 " "	From Drakhán to 19th mile Fall. From 19th mile Fall to 27th mile Fall. From 26½ mile to Fall at mile 44½. From Fall at mile 44½ to Tail.
Drakhán to mile 26½ ...	1.10 " "	.856 " "	
26½ mile to 47th mile ...	.864 " "	.90 " "
47th mile to 56½ mile ...	1.83 " "	.815 " "	
56½ mile to Tail ...	.95 " "	.95 " "

206. The regulator at Drakhán is to be widened, 3 spans of 10 feet being added to it, (completed). The road bridges at Mastoi, Mahar, Toj and Kuba are all to be widened. A new Regulator of 2 spans of 10 feet is provided at mile 53½ to maintain the gradient required.

207. *Muradwah and Kandkot Branch.*—The working of this branch has always been unsatisfactory. There is little cultivation on the first 8 miles, while the draw-off and waste owing to absorption and evaporation is excessive. Land has been given out on the Kandkot Branch which is too high to receive water under the present arrangement. It is proposed to give up the first 8 miles of the Muradwah, and to provide a new head from the Main Canal at mile 8½. A new head 6 miles in length from the 15th mile of the old Muradwah is provided for the Kandkot Branch. A length of 7½ miles of the Muradwah below the new head of the Kandkot Branch is retained for the supply of lands in and above the Bele Dhoro. The portion of the Muradwah between miles 22½ and 24½ is to be given up, and the tail of the Muradwah is to be transferred to the Toj Branch.

208. *New Frontier Rajwah.*—This branch is designed to supply Khelat land on the right bank of the Desert Canal, and to take the place of the old Bugti Rajwah, which has always been unsatisfactory and will eventually be given up except for the first 4 miles. The proposed branch takes off above the Fall at mile 19 of the Main Canal, and taking a north-westerly direction reaches the Khelat boundary at mile 10½, from thence it runs along the boundary passing through some very low Dhoro land, and finally tails into a zamindari karia. It has a total length of 23 miles, and will command much high land that cannot be commanded by the Bugti.

209. *New Toj Rajwah.*—The Toj Rajwah, a small branch 5½ miles in length, has always worked unsatisfactorily, partly owing to erosion of the Main Canal at its head, and partly owing to insufficient draw-off at the tail owing to the land being high there.

The construction of the Fall at mile 19 will remedy the first fault, and the latter will be remedied by extending the canal to supply the tail of the Muradwah; other minor improvements are also proposed.

The New Toj Rajwah will be 18½ miles in length.

210. *New Fall Rajwah.*—There is little to be done to this branch. It is proposed to raise and strengthen the banks, and also to regrade the bed so as to command all the land on it.

211. *Bugti Rajwah.*—This canal, except for the first 4 miles, will cease to exist as a Government branch.

212. *Burdi and Fall Branch.*—The Fall Branch is about 6 miles in length and takes off at the 27th mile above the Fall. The Burdi Rajwah takes off at the 34th mile. It is proposed to extend the Fall Branch to supply the Burdi Rajwah. The extension will be about 23½ miles in length,

The Head Regulator and Branch will be widened to carry the extra discharge.

213. *Ahmed Rajwah, New Manjhi, Old Manjhi and Tharu Rajwah*—Alterations are not of importance. Only minor improvements will be effected.

214. *New Thariri Branch*.—This small branch is to supply land on the left bank of the Main Canal below the 45th mile Fall. It will be 4 miles long and will take off just above the Fall.

215. *Uch Rajwah*.—The zamindárs of Khelat, when water was first given to their lands, were allowed to take off seven large karias of a total width of 67 feet from the 57th mile, the bed width of the canal at this point being 43 feet. These zamindárs being enterprising clear their karias several times in the season, and the supply in the tail of the canal below their karias is insufficient and very irregular, and heavy silting is thus caused. These karias being very close together, there is no space for depositing the silt taken out from them, and the spoil banks between the channels are now over 20 feet high. The only satisfactory solution is the construction of the new Uch and Manuti Branches.

The Uch Rajwah will be 32 miles in length and will take off from the Main Canal above the 45th mile Fall. The first two miles will be in British Territory, and the remainder in Khelat. The branch will skirt the sand hills to the north of the Dhoru, formed by the meeting of the hill and river slopes, which was the main line of river floods before the Kashmor Bund was made.

216. *Manuti Branch*.—This branch runs along a ridge. It takes off from the 52nd mile of the Main Canal and will be $10\frac{1}{2}$ miles in length.

217. *Adiowah*.—There is a large area of land on the right bank of the Desert Canal near and below Kashmor, which was annually flooded before the construction of the Kashmor Bund, and is too high to be commanded from the Desert Canal. The Adiowah, a new canal, is designed to supply these lands. It will take off from the river at a point about 3 miles above the original mouth of the Desert Canal. It will cross the Kashmor Bund in the 47th mile, and is then taken on the highest line, on which it will command the land it passes through. For four miles at the commencement and also from miles $9\frac{1}{2}$ to mile 13 it passes through land belonging to the Punjáb. Its length will be $18\frac{1}{2}$ miles, and it will tail into a zamindári karia. In connection with this branch it is proposed to construct bunds to prevent the Shori Nai floods from entering the canal.

218. On the Main Canal and on all its branches, with the exception of the Kandkot Branch and a portion of the Muradwah, provision is made for supplying annually one-third of the whole area commanded.

219. The normal full supply levels now proposed at the mouths of the Desert Canal and new Adiowah correspond early in the season, and before heading up in the Bukkur Pass has commenced, with a reading of about 11 feet on the Bukkur gauge.

220. The normal full supply level throughout the system is designed to give a depth of about 6 inches on all land commanded, with a fair Fall in the karia supplying it.

A maximum full supply of 2 feet over normal has been taken down to the regulator at mile $53\frac{1}{2}$, and below that 1 foot over.

In the branches generally it has been taken 2 feet over at the head, and 1 foot at the tails.

221. The programme for the working season of the year 1899-1900 was as under :—

MAIN CANAL.

Earth-work.

	Rs.
Widening Main Canal from mouth to head Regulator	50,428
Do. from head Regulator to Drakhan	62,591
Do. from Drakhan to 19th mile Fall	1,01,077

Masonry Works.

	Rs.
Head Regulator	22,056
Baulkshed	392
Drakhan Regulator	8,949
Baulkshed	664
Widening Road-Bridge at mile 10½	5,411
Do. do. do. 16½	5,964
Fall at mile 19	24,912
Baulkshed	664
Baulkshed at mile 26½	664

BRANCHES.

Earth-work.

Excavating New Frontier Rájwáh partially ...	50,000
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Masonry Works.

Head Regulator on New Frontier Rájwáh ...	5,859
Baulkshed	392
Fall at mile 9½	6,640
Baulkshed	392
Bench Marks	1,000
Compensation for land	1,000
Head Quarter Office at Jacobabad ...	3,228

Total ... 3,52,283

222. Of the widening of the Main Canal from the mouth to head regulator, a distance of 5 miles, out of a total quantity of 40 lakhs cubic feet, 35 lakhs were completed during the year at a cost of Rs. 15,235. This portion of the canal has been scoured very considerably since the cross-sections were taken in 1896, resulting in a large saving on the estimate, amounting roughly to Rs. 33,000.

223. The widening of this portion is 6½ miles in length, the total earth-work excavated amounted to 97,24,000 cubic feet, and the expenditure of the year was Rs. 43,546. The canal in this length passes through low ground called the Rupp Dhoro, about 3 miles in length, and here it was considered necessary to thoroughly ram the excavated earth deposited in layers behind the old banks.

224. This portion is 12 miles long, and the bed was badly scoured in long lengths. The scoured bed was brought up to within a foot of the designed new bed levels by earth from the side excavations, laid down in thin layers and carefully rammed. The total quantity of excavation was 153½ lakhs cubic feet, and the ramming of the bank work was 17 lakhs cubic feet. The expenditure during the year was Rs. 64,824 against the estimate of Rs. 1,01,077.

225. The work began very badly as the contractors could not command sufficient labour at the rates tendered by them; the work was given out to piece-workers and to zamindár contractors. Progress was very slow, and out of an estimated quantity of 101 lakhs cubic feet of earth (including extra earth required for banks) only 21 lakhs of cubic feet of earth was completed. Excavation was going on in 480 Takis out of 607. The soil was extremely hard and water was bad and difficult to obtain. Owing to the surface being badly fissured and broken, it was thought desirable to dig a key trench 1½ feet × 1 foot in the centre of the banks. The trench was filled with earth and well rammed. In the Dhora portion, where the canal bed was above ground, pits were made which, it is hoped, will keep the channel in the centre.

226. The Head Regulator was widened by three spans of 10 feet each. The masonry of abutments, piers, wing, and return-walls was raised to springing level. Steel beams for regulating apparatus were fixed. The expenditure of the year was Rs. 7,601 against the estimate of Rs. 22,056.

227. This regulator was widened by three spans of 10 feet each. The masonry work was raised to within 3 feet of springing level. Steel beams were fixed. The expenditure during the year was Rs. 2,594 against the estimate of Rs. 8,949.

228. The Road Bridge was widened by 2 spans of 18 feet each. Piers were raised to springing and abutments 10 feet above the foundation level. Curtain walls were completed in 3 spans. The expenditure of the year was Rs. 609 against the estimate of Rs. 5,411.

229. This bridge was widened equally by 2 spans of 22 feet each on each side, which necessitated the demolition of both abutments. Abutments were raised to springing and curtain walls completed in all spans. The expenditure during the year was Rs. 1,762 against the estimate of Rs. 5,964.

230. The excavation gave considerable trouble owing to sand coming below a thick layer of hard earth. As fast as it was taken out, it fell back again. Kacha mud walls were tried, but were not very satisfactory, and the difficulty was eventually got over by widening the excavated portion. All concrete below main structure and masonry weir was completed; and the masonry of abutments, splayed wings and return-walls was carried up to 5 feet above top of concrete. Down stream curtain wall was nearly completed. The expenditure during the year was Rs. 2,628 against the estimate of Rs. 24,912.

231. The masonry of this regulator was raised to 1 foot below road level. The expenditure during the year was Rs. 119.

232. The concrete work under main structure was completed at a cost of Rs. 20.

233. The sheds at Fall 19 Head Regulator, New Frontier Rájwah and Fall 9½ were raised to roof level. At Fall at mile 26½, the excavation of foundation was done. The outlay during the year was Rs. 530.

234. This work included the addition of a new verandah on the south front, the conversion of Thermantidote room and power room into a record-room, enlarging office, and the conversion of old record-room into drawing office, together with the addition of a new verandah on the northern side for a portion of its length. All floors of the additional work were provided with brick on edge, and all new roofs, iron rails and burnt bricks. The whole work was practically completed, but the expenditure shown in the accounts during the year was only Rs. 9.

235. The contour survey mentioned in the last year's report was continued, but owing to establishment being diverted to the famine in the Presidency, progress was slow. That portion of the district to the west of Jacobabad is now complete, and a strip 15 miles in width to the east has been set out in blocks and partially levelled. The total expenditure up to date was Rs. 6,560 against the estimate of Rs. 9,897, the outlay of the year being Rs. 2,187.

236. The Dhund having cut through the front bund in two places, it was necessary to construct a loop bund having a length of nearly 2½ miles starting from mileage VI-1 of the existing bund and joining it again at mile VIII-4. This work is well in hand, and will be completed before the inundation. The outlay of the year was Rs. 28,974 against the estimate of Rs. 53,228. This loop passes through salt soil for a portion of its length and a sand core is provided, and a sand trench is allowed

for the whole length. The amount spent during the year was Rs. 8,000 against the estimate of Rs. 13,033.

237. The work mentioned in last year's report was brought up to full section throughout. The total expenditure up to date was Rs. 3,96,045 against the estimate of Rs. 4,13,580, the outlay of the year being Rs. 5,084. This loop leaked badly in miles 5·6 and 7 during the last inundation owing to the salt soil of which the bund was made in this portion. Leaks were cut out and re-filled, and for a length of 3½ miles a sand core was provided. The whole work is well in hand, and will be completed before the inundation.

The sluice in mile 12 of the Kashmor Bund was completed at a cost of Rs. 6,912 against the estimate of Rs. 7859.

238. Cutting out leaks and re-filling with sand were carried out in loop G. H. Channels at miles 5, 12 and 14 of the Kashmor Bund were constructed in order to flood the compartments properly. They were finished before the last inundation.

239. The ten gardens in this district were maintained at a cost of Rs. 644, and the receipts were Rs. 60 as compared with Rs. 62 in the previous year.

240. The usual establishment was maintained and the ordinary clearance and repairs executed at a cost of Rs. 43,670. The details of expenditure were as follows :—

			Rs.	Rs.
Repairs ...	...	...	...	37,136
Establishment {	Abkālani	...	3,114	
	Revenue	...	1,593	
	Work ...	...	1,745	
			<hr/>	6,452
Maintenance of Gardens...	...	...	...	82
			<hr/>	
		Total ...	43,670	

241. The ordinary maintenance and repairs were carried out and establishment maintained at a cost of Rs. 23,910. The details of expenditure were as under :—

			Rs.	Rs.
Repairs ...	...	...	...	18,823
Establishment {	Abkālani	...	2,945	
	Revenue	...	868	
	Work ...	...	1,164	
			<hr/>	4,977
Maintenance of Gardens	...	...	...	110
			<hr/>	
		Total ...	23,910	

242. The usual establishment was maintained and the ordinary clearance and repairs executed at a cost of Rs. 86,105. The details were as follows :—

			Rs.	Rs.
Repairs ...	...	...	...	78,010
Establishment {	Abkālani	...	3,986	
	Revenue	...	2,217	
	Work ...	...	1,837	
			<hr/>	8,040
Maintenance of Gardens	...	...	...	55
			<hr/>	
		Total ...	86,105	

Kashmor Bund.
Maintenance and Repairs

243. The usual establishment was employed and the ordinary repairs executed at a cost of Rs. 42,214. The details were as follows:—

		Rs.	Rs.
Repairs	...	...	32,015
Establishment	{ Abkalani	...	7,214
	{ Revenue	...	642
	{ Work...	...	1,946
			9,802
Maintenance of Gardens	...	...	397
			<hr/>
Total	..	42,214	

Summary of expenditure.

244. The following is the summary of the entire expenditure in this district:—

		Rs.	Rs.
Works...	{ Capital	...	1,50,306
	{ Revenue	...	2,817
			<hr/>
			1,53,123
Repairs	{ Clearance	...	90,342
	{ Other Works	...	1,38,575
	{ Maintenance of Gardens	...	644
			<hr/>
			2,29,561
Establishment	{ Abkalani	...	17,258
	{ Revenue	...	5,320
	{ Work	...	6,692
			<hr/>
			29,270
Add—Regular Establishment charges	...	...	52,174
„ Tools and Plant	...	...	4,262
			<hr/>
Total, under all heads	...	4,68,390	

The average expenditure of three previous years on establishment charged to maintenance grant was Rs. 31,585.

SHIKARPUR CANALS DISTRICT.

245. Masonry sluices at the head of these karias were constructed during the year at a total cost of Rs. 1,684 against the estimate of Rs. 1,690. Of this sum, Rs. 845 were contributed by the zamindars interested.

Sluices over Karias Lalwah and Pirwah as Koraiwah.

Sluices over Allahwarayo's karias as Mangirwah.

246. Three sluices were constructed at the heads of zamindars' karias at a total cost of Rs. 997 against the estimate of Rs. 1,073. Rs. 461 were met from private contribution.

247. The work which was described in the previous year's report was completed at a cost of Rs. 4,000 against the same amount of the estimate. The expenditure of the year was Rs. 46.

Umarnas Wah.

Excavating a karia from mile 2/6 of Channel No. 1 as Sind Canal.

248. This karia was found necessary to give a good water-supply to the lands given to pensioners; the work is in progress. The expenditure of the year was Rs. 727 against the estimate of Rs. 1,866.

249. The present supply feeder to this canal, and old dhund, having been silted up during the inundation of 1899, a new feeder with escape was sanctioned and commenced. The expenditure during the year was Rs. 45,116 against the estimate of Rs. 1,24,460.

New Feeder and Escape to the Sind Canal.

250. The head portion, two miles and one furlong, of the Sind Sanri was fed from the Sind Canal. The supply became unsatisfactory a few days after the opening of the canal owing to the heavy deposit of silt caused by the bund at the tail. To remedy this it was proposed to feed the Sind

Extending Channel No. from its present tail to mile of Sind Sanri.

Sanri through an extension of Channel No. 2 of the Sind Canal. The expenditure on excavation during the year was Rs. 7,000 against the estimate of Rs. 18,452.

251. This work was fully described in the last year's report. The work was completed during the year, only compensation for land remains to be paid :—

	Rs.
Amount of estimate	6,447
Expenditure during the year	4,332
Do up to date	5,332

252. The work was described in the report for 1896-97. During the year the work done on the Chitti Canal consisted of widening and deepening the Chitti, fixing bed and tally stones, constructing fall regulator, karia head sluices, landhi for Subordinates and embankment above the fall regulator. On the Rajib, Chitti and Garang. Improvements to. the Rajib, a Fall Regulator and karia head sluices were constructed. Teak needles for the Jafferabad Bridge were provided for improving Garang Canal. The work of providing needles to the existing Regulator bridges, one over Chitti near Jamra and the other over Rajib near Chak was carried out. The expenditure during the year was Rs. 52,999 and that up to date was Rs. 1,07,079 against the estimate of Rs. 1,14,602. The only work now remaining to be done is of embankments on the Rajib Canal and the construction of crossings for light traffic. Compensation for land also remains to be paid.

253. The work as described in the last year's report was completed at a total cost of Rs. 4,388 against the estimate of Rs. 4,390, the outlay of the year being Rs. 3,388.

254. During the year a sum of Rs. 800 was realized by the sale of trees along the canals and bunds as compared with Rs. 2,591 of the previous year.

255. The usual establishment was maintained and the clearance and repairs were executed. The outlay under this head is as follows :—

	Rs.
Canals	63,131
Bunds	79,707
Rs.	
Establishment ... { Abkalani	11,771
Revenue	1,769
Work... ..	5,349
	<hr/> 18,839
	<hr/> 1,61,727

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

	Rs.
New Works—	
Revenue Expenditure	1,11,595
Ordinary Agricultural	3,388
Repairs—	
Clearance	28,333
Other Works	1,14,505
Rs.	
Establishment ... { Abkalani	11,771
Revenue	1,769
Work... ..	5,349
	<hr/> 18,889
Deposits Contribution Ordinary	1,388
Add—Regular Establishment Charges	29,888
Tools and Plant Charges	958
Total, under all heads	<hr/> 3,08,944

The average expenditure of three previous years on establishment charged to maintenance grant was Rs. 20,954.

GHAR CANALS DISTRICT.

Ghár Canal—Revenue Account—Extensions and Improvements.

257. The conversion of the road bridge on the Nasrat Canal at mile 2nd, described in last year's report, was completed at a cost of Rs. 1,558 against the estimate of Rs. 1,600.

Sukkur Canal—Maintenance and Repairs.

258. The usual establishment was maintained and the ordinary repairs were executed. The expenditure was as follows :—

Repairs	...	...	...	...	Rs.	23,969
Establishment	...	{	Abkaláni	...	Rs.	2,852
			Revenue	...		845
			Work	...		2,580
Gardens	...	...	...	...		6,277
						405
Total						30,651

259. Extra clearance amounting to Rs. 6,304 was done to the old head, Sukkur Canal, and also to the supply channel above the Head Regulator after the last inundation, in order to get sufficient supply for rabi cultivation. Rs. 394 were also spent on special repairs to the chaukis at Bagarji and Ruk on the Sukkur Canal.

Ghár Canal—Maintenance and Repairs.

260. The ordinary repairs were carried out and the usual establishment was maintained. The total expenditure was as follows :—

Repairs	...	...	...	...	Rs.	1,06,900
Establishment	...	{	Abkaláni	...	Rs.	6,137
			Revenue	...		1,385
			Work	...		4,135
Gardens	...	...	...	...		11,657
						535
Total						1,19,092

Ghár Bunds—Maintenance and Repairs.

261. The usual establishment was maintained and the ordinary repairs executed. The details were as under :—

Repairs	...	...	...	...	Rs.	2,581
Establishment	...	{	Abkaláni	...	-Rs.	2,89
			Revenue	...		50
			Work...	...		1,47
						4,873
Total						7,454

262. The nurseries on the Ghár Canal at Larkána and Nædero and on the Sukkur Canal at Ruk and Arzi Bhuto were maintained during the year at a cost of Rs. 940. The trees cut at the time of erosion at Ghár mouth were sold and those which were likely to fall in the bed of the canal were also cut and sold. The receipts from the sale-proceeds of trees and other canal produce coming under this head amounted to Rs. 2,774 against Rs. 1,801 in the previous year.

263. The receipts from the sale of fishery rights during the year amounted to Rs. 2,620 as under, against Rs. 1,652 in the previous year :—

					Rs.
Ghár Canal	...	...	...	...	1,975
Sukkur Canal	...	...	...	...	645
Total					2,620

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

					Rs.
Works—					
Capital expenditure	...	...	...	...	...
Revenue	„	...	...	...	1,558
					Rs.
Repairs—					
Clearance	...	...	...	1,14,091	
Other Works...	...	...	...	19,359	
Maintenance of Gardens	...	...	...	940	
					1,34,390
Establishment ...	{	Abkaláni	...	11,883	
		Revenue	...	2,736	
		Works	...	8,188	
					22,807
Deposits Contribution Ordinary—					
Works	...	...	...	34	
Repairs	...	...	...	81	
Establishment	...	...	...	9	
					124
Add—Regular Establishment Charges	...	...	...	33,065	
„ Tools and Plant Charges	...	...	...	592	
Total, under all heads					1,92,536

The average expenditure of three previous years on establishment charged to maintenance grant was Rs. 24,064.

WESTERN NARA DISTRICT.

265. The works connected with this canal were described in the report for 1896-97. During the year the following works were completed at a cost of Rs. 5,933 :—

Rajwah—Extensions and Improvements.

- (1) Earth-work for embankments.
- (2) Do. for road diversion.
- (3) Do. for embankment of new tail Kakolewah.
- (4) Constructing road and demarcation of boundary.
- (5) Sheds for Beldars.
- (6) Construction of mile stones, including fixing in masonry.
- (7) Karia Heads.

The whole project is now complete with the exception of the payment for compensation for land.

266. The work described in last year's report was completed at a total cost of Rs. 619 against the estimate of Rs. 621, the expenditure of the year was Rs. 278. Beds were prepared, plants and cutting were put down and ground was levelled.

267. A full description of the work was given in last year's report. Clearing and improving Masaharwah. During the year the following works were completed at a cost of Rs. 6,878 :—

- | | | |
|---------------------------------------|--|-------------------------------|
| (1) Jungle cutting. | \| | (4) Sloping banks. |
| (2) Setting back old spoil. | | (5) Landhi for establishment. |
| (3) Excavation (removing bad curves). | | |

The whole work was completed with the exception of the payment for compensation for land taken up.

268. As described in the last year's report, the work was completed at a cost of Rs. 1,220 against the estimate of Rs. 1,372. The expenditure of the year was Rs. 521.

269. This work was fully described in last year's report. The excavation and embankments of the extension commenced last year were finally completed. During the year the following works were also completed at a cost of Rs. 6,437, the total expenditure up to date was Rs. 8,937 against the estimate of Rs. 9,636.

Extension of the Pateji Branch ex Pritchard Canal.

- (1) Regulating bridge on Nari Mehar Road.
- (2) Bridge on Sita Mehar Road.
- (3) Karia Heads.

270. The regulating bridge consists of two openings each 5 feet in width, depth of foundation 4 feet, height of abutments and pier up to springing line 7 feet 6 inches, width of road-way 15 feet. Masonry throughout was of burnt brick and lime mortar. The road bridge consists of one opening 8 feet, depth of foundation 4 feet and height of abutments up to springing line to be 6 feet 6 inches. Masonry throughout was of burnt brick and lime mortar. 5 karia heads were also constructed, of which 4 were of one design. It consisted of one opening of 2 feet, height of springing 3 feet 9 inches above pavement and rise of arch 9 inches and thickness of arch 1 foot, depth of foundation 3 feet. The other karia head consisted of one opening 2 feet 6 inches and in other respects it was similar to the four described above. Masonry throughout was of burnt brick and lime mortar.

271. For many years the zamindárs on this branch were complaining of the deficiency of water-supply and were asking for the construction of a Regulator across the Nara at Kamal-khan in order to have the water shut off for a certain number of days and thus get an extra supply down this branch. In consequence of the above a conference was held at Bubak on 3rd January 1899 and it was decided that the regulator asked for could not be constructed without inflicting injury on other zamindárs lower down but that the excavation of a new mouth would be recommended as the present mouth was not favourable.

New mouth to the Dingri ex Western Nara.

272. The project comprises the following works :—

- (1) Excavation of a new cut to the Dingri mouth.
- (2) Bridge over new cut to Dingri on Bhan and Johi Road.
- (3) One karia head.

The road bridge consists of one opening 15 feet, depth of foundations 4 feet and height of abutments from the bed of canal to springing line 10 feet, rise and thickness of arch 4 feet and 1½ feet respectively, width of road-way over the bridge 15 feet and its height above present top of road-way 7.75 feet. Masonry throughout was of burnt brick and lime mortar. The works were completed during the year at a cost of Rs. 5,299 against the estimate of Rs. 5,737, only compensation for land remained to be paid next year.

273. The kacha roof of the landhi being eaten away by white ants was removed and reconstructed. It consists of old iron rails, T iron rafters and square tiles. A staircase to the landhi was provided to give access to the roof. The work was completed at a cost of Rs. 485 against the same amount of the estimate.

Construction of pukka roof over Baulkshad at Juberji.

274. As the kacha roofing was dangerous owing to the attacks of white ants, it was substituted with corrugated iron sheets on iron rails and overlaid with grass, mats, bhan, &c., and mud plastered. The roofs of north and south verandahs, dressing room, west store room and privy were renewed. The work was completed at a cost of Rs. 542 against the estimate of Rs. 547.

275. Some compensation for land being still due an allotment was granted and the sum of Rs. 623 was paid against the estimate of Rs. 899. As regards the balance of Rs. 276 of the estimate, one zamindár did not accept compensation in money, but in land instead, as intimated by the Collector.

The matter was therefore reported completed.

276. As the section of the river bund was somewhat weak it was proposed to raise and strengthen it in places from end of mile 10 to 13/5, 16/6 to 19/7, 20/4 to 21/6, 22/1, and 22 3 to 22/6, the crest of the bund being raised to 4 feet above H. F. L. of 1894, which was the highest on record. The works were :— (1) Earth-work including ramming; (2) construction of beldars' sheds; (3) construction of cross bunds across the front borrow pits; (4) removing the trestle bridge and substituting a bund instead opposite mile 4/6 in front of the Abad Bund.

Work to the extent of Rs. 4,500 was done.

277. In 1895 when the section of the bund was increased to withstand the annual high river floods, the karias in question were closed, and the land dependent on them was settled on another karia named Sanhro taking off from the Wahur between these two karias. But the river not being favourable at the mouth of the Wahur, the Sanhro could not get sufficient water to irrigate the land properly. After the two karias were closed, the karia Sanhro only once irrigated 20 acres of the land which measured in all 275 acres. Under the above circumstances it was found necessary to allow the karias Jaro and Lundi to be opened, in the interests both of the zamindárs and of Government, with pukka sluices through the bund line. Both the sluices are of the same design, of one opening of 3 feet. The height of springing above pavement is 10 feet, rise and thickness of arch, 1 foot, and pavement level is kept 3 feet below the present bed of karia, to allow for subsequent improvements that may be made to the Wahur from which the karias take off. The depth of foundations is in all 5 feet. Old rails were used as wales. Masonry throughout was of burnt brick and lime mortar.

Work to the extent of Rs. 1,500 against the estimate of Rs. 3,638 was done during the year.

278. The amount was provided in the original estimate for compensation, but it lapsed. Consequently a fresh estimate amounting to Rs. 9,165 was submitted for sanction and allotment. The allotment was granted and amount to the extent of Rs. 8,463 was paid during the year.

279. The receipts from plantations during the year amounted to Rs. 684 as compared with Rs. 601 of the previous year. In addition, Rs. 105 were realized from the fruit trees along the canal banks. Rs. 1,224 were also realized by sale of timber, &c., on canals and bunds.

280. During the year Rs. 3,430 were realized from the sale of fishing rights as compared with Rs. 3,140 of the previous year.

281. The usual establishment was maintained and the ordinary clearance of canals and repairs to bunds were carried out. The expenditure was as follows :—

			Rs.	Rs.
Repairs ...	...	...	...	87,054
Maintenance of Gardens	...	...	...	754
Establishment.	{ Abkaláni	...	12,224	
	{ Revenue	...	5,403	
	{ Work	...	9,130	
			<hr/>	26,757
Total ...				<hr/> 1,14,565 <hr/>

Summary of expenditure. 282. The following is a summary of entire expenditure incurred in this district :—

New Works.

			Rs.	Rs.
Revenue Expenditure	...	...	26,996	
Ordinary Agricultural	...	...	14,463	
			<hr/>	41,459

Repairs.

Clearance ...	...	...	42,073	
Other Works	...	...	44,981	
Maintenance of Gardens	...	...	754	
			<hr/>	87,808
Establishment	{ Abkaláni	...	12,224	
	{ Revenue	...	5,403	
	{ Works	...	9,130	
			<hr/>	26,757
Add—Regular Establishment charges	...	...	...	47,624
„ —Tools and Plant charges	...	...	...	829
				<hr/>
Total under all Heads	...	...	...	<hr/>2,04,477 <hr/>

The average expenditure of three previous years on establishment charged to maintenance grant was Rs. 30,734.

KARA'CHI CANALS DISTRICT.

283. The total outlay incurred under this head during the year was Rs. 60,670 as compared with Rs. 50,171 in the previous year. The amount was spent on improving and raising River Bunds, Chaukis, Sluices, Regulators, and Bridges on Canals, the Laikpur Canal, Drainage Works, &c.

284. The principal works under this class were :— (a) Construction of Darogah's Landhi on the Butho Uterani Bund, completed at a total cost of Rs. 116 against the estimate of Rs. 122 ; (b) raising the Panah Baghar Bund, also completed at a cost of Rs. 4,775 against the estimate of Rs. 4,848 ; (c) Inspection Chauki at Lakha, Butho Uterani Bund was in progress during the year, the expenditure was Rs. 1,500 ; (d) Rs. 103 were paid for compensation for land for Sonda Hilaya Bund and other improvements.

285. The works completed during the year were— (a) raising and strengthening Mulchand Shahbandar Bunds miles 0—19, the total cost was Rs. 2,783 ; (b) improvements to Mulchand Shahbandar Bunds, the total cost was Rs. 16,094 ; (c) extensions and improvements to Mulchand Shahbandar Bunds, miles 50, 52, 55 and 63, the total cost was Rs. 3,221 ; (d) raising and strengthening Mulchand Shahbandar Bunds, miles 50—63, the total cost was Rs. 900 ; (e) sluice over Chakarwah in Mulchand Shahbandar Bunds, mile 54—7, the total cost was Rs. 1,006. The works in progress were— (a) raising and strengthening the Kokawari Bund, miles 0—15, the outlay of the year was Rs. 3,434 against the estimate of Rs. 4,846 ; (b) sluice at mile 13—4 Kokawari Bund, Rs. 300 were spent against the estimate of Rs. 6,031.

The raising of the bunds mentioned above has been entailed by the height to which the Indus rose in 1897. Last year the river was extremely low and caused no damage in this respect.

Fencing River Bunds. 286. The expenditure on this work during the year was Rs. 2,800 against the estimate of Rs. 7,741. The work is in progress.

Survey. 287. The survey for the restoration of the Virah Bund completed at a total cost of Rs. 114 against the estimate of Rs. 255. The survey of canals and bunds in this district was in progress, the expenditure of the year being Rs. 951. The survey of the Baghar branch canals described in last year's report was completed at a total cost of Rs. 91 against the estimate of Rs. 188.

Chaukis. 288. The following chaukis were in progress during the year—first class inspection chauki at Mirpur Sákro, Dari, Mirpur Batoro, and Jati; the expenditure of the year on each was Rs. 1,998, 1,001, 1,015 and 2,450 respectively.

Landhis. 289. The following landhis were completed during the year:—

	Total Cost.	Amount of Estimate.
	Rs.	Rs.
Subordinate's Landhi and out-houses at Mirpur Sákro ...	740	741
Do. on Baghar Bank in Deh Agemani and Kothar.	249	239
Do. at Ladium ...	741	748

Regulators. 290. The conversion of road bridge over Beginahwáh *ex* Pinyari into a regulator was completed at a total cost of Rs. 621 against the estimate of Rs. 800. The Head Regulator to Shahpunjo Canal was in progress, the outlay of the year being Rs. 1,000 against the estimate, Rs. 1,850.

Sluices. 291. The sluices over Haji Mahomed and Poshan's karia and Jhandulo zamindár's karia from left and right bank Baghar were completed at a total cost of Rs. 122 and 123 against the estimate of Rs. 247 and 250 respectively. The sluice over Ramzan-ali's karia from Khanto right embankment was also completed at a cost of Rs. 138 against the estimate of Rs. 151. Rs. 69 were contributed by the zamindár interested. Three sluices over karias of Sheik Memonshah from Nasirwáh 37/6 *ex* Baghar were in progress, the outlay of the year was Rs. 553 against the estimate of Rs. 1,203.

Gauging Stations. 292. The construction of the gauging stations on Kalri and at Purijan and Mirpur Sákro on Baghar and on Pinyari were completed at a total cost of Rs. 119, 334 and 126 against the estimate of Rs. 125, 336 and 130 respectively.

Pinyari Canal Extensions and Improvements. 293. The lengthening of the wings of Rájwáh 52/30 through aqueduct and strengthening rear curtain of the Gungro escape sluice were completed during the year at a total cost of Rs. 618 and 4,212 against the estimate of Rs. 592 and 4,242 respectively. The construction of bund and excavating channel at tail of Gungro were in progress, the outlay of the year being Rs. 191 against the estimate of Rs. 381.

Laikpur Canal. 294. This canal was fully described in the report for the year 1896-97. The total outlay up to date was Rs. 47,053 against the estimate of Rs. 44,522, the expenditure during the year being Rs. 7,331. Another estimate for remodelling the canal was submitted and the outlay on this during the year was Rs. 7,331. It provides for the further cost entailed by increasing the duty of water allowed and for a better system of distribution by Rajbhuas. The widening of the canal and its branches was nearly completed during the year.

Drainage Channels. 295. The Sujáwal Dhunds Drainage Project provides for the drainage of an extensive series of Dhunds for the improvement and enlargement of the Mahomedwáh and for the

diversion of the Hajiawáh. During the year good progress was made on the Mahomedwáh works, the expenditure up to date was Rs. 30,394 against the estimate of Rs. 75,037, the expenditure of the year was Rs. 21,000. The work of the Falak Changani Muradpur Drainage Channels was in progress, the expenditure of the year was Rs. 525 against the estimate of Rs. 1,272.

296. The total expenditure under this head was Maintenance and Repairs. Rs. 1,74,499 as compared with Rs. 1,84,530 in the previous year.

	Rs.
(a) Special Repairs to River Bunds	23,249
(b) Ordinary Repairs do.	24,198
(c) Do. and clearance of canals	96,947
(d) Canal Establishment	28,837
(e) Maintenance of Gardens	1,268
Total	1,74,499

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

	Rs.
(1) Constructing Machara Loop, 1900, Baghar-Uchito Bund	2,000
(2) Do. loops in miles 6/5 and 8/4 of Mulchand Shahá-banalar Bunds	4
(3) Do. Kot Almo Loop,	4,113
(4) Do. Rájwáh Loop, 1900	5,004
(5) Do. Belo Machi Loop	6,561
(6) Do. Belo Loop, 1900	2,000
(7) Do. Loop in miles 53-56, Mulchand Sháhbandar Bunds	1,062
(8) Do. Loop in mile 10 of the Kokawari Bund	1,404
(9) Do. Chogazo Loop No. 3	1,001
Total	23,249

The Kot Almo and Belo Machi Loops begun last year were completed before the inundation season. The Muchara, Rájwáh, Belo and Chogazo Loops were commenced at the close of the year under report, and good progress was made on them owing to the abundance of labour furnished by distressed immigrants from Cutch.

298. The expenditure on ordinary repairs to River Bunds was Rs. 24,198 as under:—

	Rs.
Right Bank	12,516
Left Bank	11,682
Total	24,198

Last year the expenditure was Rs. 21,537.

299. The expenditure on ordinary repairs and clearance of canals was Rs. 96,947 as compared with Rs. 69,936 in the previous year; Rs. 33,52 on Right Bank and Rs. 63,195 on Left Bank.

300. The usual Abkaláni, Revenue and Work Establishment for maintenance was entertained at a cost of Rs. 28,837 as compared with Rs. 33,176 in the previous year; the decrease in cost was due to the low inundation of the year. The details are as follows:—

For embankment.			
	Right Bank.	Left Bank.	Total.
	Rs.	Rs.	Rs.
Abkaláni	2,616	5,183	7,799
Revenue	378	480	858
Work	1,244	1,512	2,756
Total	4,238	7,175	11,413
Cost of previous year	5,297	9,118	14,415

<i>For Canals.</i>			
	Right Bank.	Left Bank.	Total.
	Rs.	Rs.	Rs.
Abkaláni	... 3,090	4,613	7,733
Revenue	... 1,103	1,341	2,450
Work	... 3,243	3,998	7,241
Total	... 7,442	9,982	17,424
Cost of previous year	... 7,848	10,913	18,761

301. The receipts from the plantations during the year was Rs. 220 as compared with Rs. 160 in the previous year. The expenditure was Rs. 1,268 as compared with Rs. 1,223 in the previous year.

Plantations.

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

Summary of expenditure.

			Rs.	Rs.
Extensions and Improvements	...	...	...	60,670
Maintenance and Repairs	...	...	...	1,44,394
Establishment	{ Abkaláni	...	...	15,532
	{ Revenue	...	...	3,308
	{ Work	...	...	9,937
Gardens	...	...	...	28,837
				1,268
		Total	...	2,35,169
Add—Regular Establishment charges	...	...	...	56,334
„ —Tools and Plant charges	...	...	...	672
Mathematical Instrument Depôt	{	Establishment	...	1,159
		Tools and Plant	...	9,485
Deposits Contribution, Ordinary	...	...	...	874
		Total	...	3,03,693

The average expenditure of three previous years on establishment charged to maintenance grant was Rs. 34,302.

INDUS RIVER DISTRICT.

303. The work mentioned in last year's report was completed at a total cost of Rs. 209 against the estimate of Rs. 210. The outlay of the year was Rs. 12.

Survey and Bench Marks.

304. The survey at Kotri was extended one mile above and one mile below the last survey, thus making the whole length 3 miles above and 3 miles below the Kotri Railway Bridge. Cross sections were taken on last year's lines and extended up to the two ends of the survey. A gauging station was fixed at the lower end of the survey, the position of which was permanently fixed by means of survey pillars 3 feet square and 4½ feet deep. Six such pillars were built (3 on the Right and 3 on the Left Bank) and these fix the position of the new cross sections on the down stream side of Kotri, and serve as permanent bench marks. Angle iron posts were also fixed on both banks to demarcate the positions of all new cross sections. Discharges were taken and silt experiments were made at the gauging stations. Silt experiments were also made below the Kotri Bridge. Cross sections were also taken of the Indus at Sukkur and Jerruck, and in the Delta across the Haidari at the same places taken last year. Silt experiments were also made at the above stations and in the Delta also. The position of the section taken between the river Haidari and Ochito during the year 1898-99 was permanently fixed by means of angle iron posts, and connected with certain

Survey of the Indus.

fixed points of the Riverain Survey. A fresh survey of the bifurcation of the Indus was made and connected with certain fixed points of the Riverain Survey. The work was completed at a cost of Rs. 1,512 against the estimate of Rs. 1,500.

305. The trellis work in the front verandah of the office room, a rear verandah with bath-room to the office rooms, an out-house for two office servants, and paving the godown with stone were completed during the year at a cost of Rs. 3,125 against the estimate of Rs. 3,202. Rs. 1,562 were contributed by the Indus Conservancy Department.

306. Coal and stores were purchased for the Steam Launch *Maud* used for taking cross sections and discharges of the Indus and in conveying the Executive Engineer and subordinates from place to place on the river for the above purpose. The expenditure of the year was Rs. 1,293 against the estimate of Rs. 2,292.

The repairs to the Beacons Nos. 7, 9, 11, 17, 18, 20, 21, 24, and 29, and renewal of Beacon No. 14 were carried out by the Port Engineer, Karachi, the bills were paid by the Executive Engineer, Indus River District. The expenditure during the year was Rs. 1,254 against the estimate of Rs. 1,200. Rs. 627 were contributed by the Sea Pilotage Fund.

307. The repairs and renewals to the survey pillars, &c., were completed during the year at a cost of Rs. 193 against the estimate of Rs. 197.

308. The River Indus from Kashmor down to the sea was cleared of all snags dangerous to navigation. The work was practically completed, but some bills on account of fuel remained to be paid. The outlay of the year was Rs. 2,709 against the estimate of Rs. 4,428.

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

Agricultural Works.

	Rs.
Works	3,087
Repairs	2,113
Establishment and Tools and Plant ...	26,070
Total ...	31,270

Deposits Contribution—Excluded Local Funds.

	Rs.
Works	1,599
Repairs	3,577
Establishment, Tools and Plant ...	11,062
Total ...	16,238

Total under all heads ... 47,508

EASTERN NA'RA DISTRICT

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

311. The expenditure from 'Capital' was incurred on the following works :—

(1) Clearing and aligning the extension of the Bhaiti Bund, Rs. 2,102. Completed.

(2) Widening the Khipra Canal up to 7 miles, Rs. 2,042. Completed.

312. The usual Abkaláni, Revenue and Work establishments were maintained, and ordinary repairs done at a cost of Rs. 16,239.

Irrigation Major Works—Productive
Public Works—Nára Canal—Revenue
Account—Maintenance and Repairs.

313. Rs. 8,455 were spent during the year on work done and on collecting materials for the improvement of Head Regulator of the Mithrao Canal at Bakhora, sanctioned in Government Resolution No. 664, ddaed 20th March 1900, estimated to cost Rs. 14,417. The work will be completed before the new supply is admitted into the canal (10th May 1900).

314. The usual Abkaláni, Revenue and Work establishments were maintained and the ordinary clearance and repairs were executed at a cost of Rs. 34,484.

Irrigation Major Works.—Productive Public Works—Mithrao Canal—Revenue Account—Extensions and Improvements.

315. The usual Abkaláni, Revenue and Work establishments were maintained and ordinary repairs done at a cost of Rs. 7,114.

Irrigation Major Works.—Productive Public Works—Revenue Account—Dim Canal—Maintenance and Repairs.

316. The usual Abkaláni, Revenue and Work establishments were maintained and ordinary repairs done at a cost of Rs. 2,671.

317. One Maistry at Rs. 50 was engaged to help in supervising the work of improvement of Head Regulator, Mithrao Canal, the outlay on the work during the year being Rs. 8,412 and on establishment Rs. 44; the percentage of the latter is Rs. 52

Summary of expenditure.

318. The following is a summary of the total expenditure incurred in this district.

			Rs.	Rs.
Extensions and Improvements—				
Capital expenditure	...	...	...	...
Revenue expenditure	...	...	8,455	...
Ordinary Agricultural Works	...	...	...	...
				8,455
Repairs—				
Clearance	...	...	14,074	...
Other works...	...	...	28,629	...
Maintenance of gardens	...	...	884	...
				43,537
Establishment	{ Works	...	5,718	...
	{ Abkaláni	...	10,931	...
	{ Revenue	...	8,125	...
				24,774
Add - Regular Establishment Charges	...	...	...	35,773
Tools and Plant	...	...	...	951
				1,13,490
Total under all heads				...

The average expenditure of three previous years on establishment charged to the maintenance grant was Rs. 26,210.

NORTHERN DISTRICT, JÁMRÁO CANAL.

319. The first and second districts of the Jámrao Canal being nearly completed were early in the year combined under the title of the Northern District, Jámrao.

The district extends from the Head-Works to the Hyderabad-Umarkot Railway and includes 77 miles of the Main Canal, 17 miles of the West Branch, together intended to irrigate an area of 378,500 acres.

320. In November, His Excellency Lord Sandhurst, the Governor of Bombay, accompanied by the Commissioner in Sind visited Jámrao and opened the Head Works of the canal and from that date water has been constantly running in the Main Canal and circulated in the various Minors for the convenience of works. As the year was one of famine and want of forage, irrigation was allowed

from the canal where practicable without serious inconvenience to works in progress. The Executive Engineer has no returns of acreage at present to quote, but believes the area irrigated to have been about 10,000 acres.

321. The Head Works had been practically completed during the preceding year and in the early months of the year under report were finished. The principal expenditure was as mentioned below.

322. This closed the Main Channel of the Nára, the closure was made on the 30th of March 1899 and the bank completed without trouble.

				Rs.
Expenditure during the year	...	...	...	11,339
Total up to date	...	...	...	1,45,669

323. On the Weir the observation towers were completed and the wire-rope received from England and erected for the wire tramway and the materials at site transferred to the Reserve Stock as mentioned in paragraph 325, hence a credit appears to the weir.

				Rs.
Expenditure during the year	...	...	...	17,763
Total up to date	...	...	...	4,59,162

324. On the under-sluices the sluice gates and winches for lifting them were received from England and brought down the Nára by boat and erected in position and the work completed except painting of iron-work.

				Rs.
Expenditure during the year	...	...	...	43,372
Total up to date	...	...	...	3,05,281

325. When the training banks were completed the reserve stock of stone was stacked along the top of the banks and at convenient places so that it is readily available if the banks are under-scoured at any place and it is necessary to throw in more stone to protect them.

The stone had previously been borne on the list of materials for the weir and the cost was transferred to this head. The spare bricks and other materials were similarly transferred to this head.

				Rs.	a.	p.
Expenditure during the year	...	...	...	37,303	10	8

326. The principal work on the Main Canal was the completion of the siphon at the 39th mile to carry the Shahuwáh under the canal. The delay in the delivery of the iron-work from England made it necessary to wait until the irrigation of the inundation season from the Shahuwáh had completely ceased, the Shahuwáh was working well and did not stop flowing until November. Meanwhile dire distress and famine had intensified in the part of India to the east, and immigrants in search of work came into Sind, and it became a matter of urgency to complete the siphon and to pass water down the canal to supply drinking water to the people to be employed on various works. A European Engineering firm at Karáchi were therefore engaged to complete the erection of the iron-work rapidly and fulfilled their contract to time.

A competent Subordinate was placed specially on the siphon to complete the masonry work urgently and water was passed down the Main Canal beyond the siphon on the 26th December 1899.

				Rs.
The expenditure during the year was	...	...	...	18,021
Total up to date...	...	...	...	32,421

The work is completed as designed; but a little additional protective work has been found necessary.

327. The iron-work for the lifting gear for the regulators on the Main Canal was received from England and erected during the year.

328. The Railway bridges over the Main Canal at 77½ miles and over the West Branch at 17 miles were constructed during the year by the Railway Department.

329. The close contour survey and the system of providing a separate water course for each village showed that an extension of the two branches of this Minor was necessary; the excavation for this work was carried out during the year mainly by distressed people from the famine districts.

			Rs.
The expenditure during the year on excavation was	...	...	14,526
Total up to date	...	...	32,816

The area supplied by this Minor is 10,342 acres.

The masonry works on this Minor and the progress made on them are as follows:—

Name and progress.	EXPENDITURE	
	During the year.	Up to date.
	Rs.	Rs.
Head Regulator, practically completed ...	1,819	5,670
Regulating bridge, Ahmedabad Branch, practically completed ...	721	880
Regulating bridge, Jam Sahib Branch, practically completed ...	771	872
Regulating bridge, at 7 miles Jam Sahib, practically completed ...	804-13	804-13
Double Mukadam's quarters at Head Regulator, practically completed ...	522	949
Double Mukadam's quarters at 5½ miles, practically completed ...	725	940

330 The earthwork of the Rawatiani Minor and new head to the Dimwáh was completed during the year and water admitted to the Minor. The Rawatiani Minor is 18 miles long and commands 32,163 acres and the new head to the Dim takes off at the 11th mile and is itself 5½ miles long. The Dim Canal supplies an area of 48,337 acres.

				Rs.
Expenditure during the year was	...	...	...	22,838
Total up to date	...	...	...	51,822

The masonry works on this Minor and the progress made on them are as follows:—

Name and progress.	EXPENDITURE	
	During the year.	Up to date.
	Rs.	Rs.
The head regulator, the masonry of which was nearly completed last year ...	1,364	5,924
Bridge at 3 miles, completed ...	1,481	1,638
Bridge at 6½ miles, completed ...	1,494	1,570
Junction Regulator at new head to Dimwáh, masonry work completed ...	4,798	7,338
Bridge at 11 miles, completed ...	921	965
Bridge at 14½ miles, in progress...	60	99
Bridge at 4 miles on new head to Dim, completed ...	1,091	1,261

331. This Minor was at first called the Khabri Minor but the name was changed to Rind Minor as it was liable to be confused with the Kapri Minor at 56th mile.

Rind Minor. The area supplied is 12,840 acres.

The earthwork was completed during the year and water admitted to the Minor for a depth of about $1\frac{1}{2}$ feet.

	Rs.
The expenditure during the year was	1,366
Up to date	4,701

The Head Regulator of the Rind Minor was commenced and the masonry completed during the year.

	Rs.
Expenditure during the year	2,809
Up to date	3,799

There are no other masonry works on this Minor at present except outlets.

332. The Khadro Minor was required to irrigate an area of about 5,156 acres of ground by the Main Canal which could not be reached conveniently from other Minors.

Khadro Minor.

The head regulator is situated in the 22nd mile of the canal.

The earthwork was completed during the year, the expenditure being Rs. 968.

The masonry of the head regulator was completed during the year, the expenditure being Rs. 237.

333. The Sinjhora Minor supplies 6,679 acres and takes off the Main Canal at the regulator in the 31st mile.

Sinjhora Minor. The earthwork was completed during the year.

	Rs.
The expenditure during the year was	947
Total up to date	4,010

A fall was constructed at 16,000 feet on this Minor at a cost of Rs. 1,713.

334. The Dalor Minor, Patoi Minor and Berani Minor take off from the Main Canal at the Regulator at the 46th mile, the Berani being on the right bank and the others on the left.

Dalor Minor.

The Dalor Minor supplies an area of 48,547 acres.

The earthwork for the first 15 miles was completed during the year, the expenditure being Rs. 13,797.

From the detailed contour survey the best line for the extension of the Minor was selected and the Minor laid out for another 8 miles, so that the total length is $23\frac{1}{2}$ miles, and the earthwork was commenced.

Water was admitted to the Minor during the year.

	Rs.
The expenditure during the year was	13,105
Total up to date	33,658

The masonry of the head regulator was completed during the year.

	Rs.
The expenditure during the year	1,396
Total up to date	4,401

The Minor passes through a waterless tract, and, as soon as water was admitted, brick making was commenced for the regulating bridge at $10\frac{1}{2}$ miles and the regulator at 16 miles.

335. The Patoi Minor supplies an area of 32,174 acres. The earthwork for 15 miles was completed during the year, and the alignment of the tail to $17\frac{1}{2}$ miles finally selected from the close contour survey.

Patoi Minor.

	Rs.
The expenditure was during the year	12,469
Total up to date	26,494

The masonry of the head regulator was completed during the year.

The other masonry works on this Minor and the progress on them are as follows :—

Name of work.	Progress.
Bridge at 31,200 feet on Berani road ...	... Nearly completed.
Regulator at 52,400 feet, Ding. ...	... Do.
Suzawalkar's quarters at 52,400 feet ...	... Completed.
Bridge at 68,000 feet (Patyoyun) ...	... In progress.
Suzawalkar's quarters at regulator 16 miles, Sanghar road ...	... Do.

336. The excavation was completed during the year at a cost of Rs. 3,031.

The Berani Minor.

Name.	Expenditure.	
	During the year.	Up to date.
	Rs.	Rs.
The Head Regulator was completed Cost...	2,511	2,511
A small regulator at 3½ miles was completed during the year Cost...	99	99

337. The Bhobherwáh Inlet is at 50 miles, and is designed to admit the waters of the Bhobher Canal, which is here crossed by the Main Jámráo Canal.

The maximum surplus is estimated at some 120 cusecs only, and it is expected this will be used up in extension of irrigation on the Bhobher Canal; meanwhile the inlet takes the surplus.

	Rs.
The expenditure was during the year	690
Total up to date	690

338. The Kapri Minor takes off from the Main Canal at the 56th mile regulator, and was completed in previous years, except a bridge at 5 miles which was completed this year.

Kapri Minor.

	Rs.
On the bridge the expenditure during the year was ...	526
Total for bridge	833

339. The Doso Dharoro and Mirpur Minors take off at the 65th mile regulator on the Main Canal.

Doso Dharoro Minor.

The Doso Dharoro in the left bank is designed for a discharge of 150 cusecs at the head, and is 9½ miles long, with a branch and regulator at 5½ miles to supply a portion of the old Dosu Canal. The earthwork was practically completed.

	Rs.
The expenditure during the year was	15,568
Total up to date	15,746

The masonry works on this Minor and the progress on them are as follows :—

Name and progress.	Expenditure.	
	During the year.	Up to date.
	Rs.	Rs.
The Head Regulator, completed ...	4,101	4,277
Regulator at 5½ miles, half completed ...	2,066	2,066
Bridge at 6½ miles, practically completed	692	692
Bridge at 8½ miles, practically completed	765	765
Bridge on the Dosu, practically completed	836	836

Mirpur Minor. 340. The Mirpur Minor is on the right bank, and supplies an area of 27,889 acres.

The earthwork of the length of the Minor to be excavated was completed, the expenditure being:—

				Rs.
During the year ...	...	...	...	3,975
Total up to date ...	...	...	...	13,156

The masonry works on this Minor and the progress on them are as follows:—

Name and progress.	Expenditure.	
	During the year.	Up to date.
	Rs.	Rs.
The Head Regulator, masonry completed.	3,202	4,414
Fall at 4½ miles, practically completed ...	1,571	1,571
Bridge at 7½ miles, completed ...	718	718
Branch regulator to Pirwáh at 2½ miles, practically completed ...	784	803
Branch regulator to Kahuwáh at mile 6½, practically completed ...	1,111	1,121

Kahu Minor. 341. The Kahu Minor takes off the Main Canal on the left bank in the 73rd mile. The Head Regulator was commenced. The expenditure was Rs. 124.

Bhitaro Minor. 342. The Bhitaro Minor taking off from the West Branch was excavated previously and the expenditure during the year was on

	During year.	Up to date.
Regulator for the Ranwakwah	834	1,457
Bridge at mile 4 ...	250	646

343. During the hot weather the strong wind usual in this part of Sind rose to a gale and blew with extra force for some months and drift sand was blown into some of the canals and Minors in places and had to be removed.

The worst places were—

Mileage.	Cost of removal.
	Rs.
The Main Canal in the 1st and 2nd miles ...	3,521
The Sinjhora Minor in the 2nd mile ...	240
The Dalor Minor in miles 1 to 5, 10 to 13 and again in miles 14 to 15 ...	2,710
The Patoi Minor, 1st and 2nd miles, 10, 14 and 15 miles	479

Endeavours are to be made to grow a screen of trees to protect the canal and Minors at these places. The worst place of all was the Dalor Minor at 3½ to 4½ miles, where the drift filled up the 'Minor' level with the top of the spoil banks in a few places, and here planting operations are in progress.

344. Cultivation of the land will stop this drift in most places.

Contour Survey. The close contour survey for the Northern District was completed during the year, the expenditure being—

				Rs.
During the year ...	...	...	...	16,894
Up to date ...	...	...	...	21,988

345. The close contour survey showed that the area it was proposed to irrigate by the old canals supplied from the Bhitaro Minor could be better irrigated by a new Minor along the central high ground; this was called the Lakhaki Minor and takes off at the triple regulator on the 7th mile of the West Branch.

The minor irrigates 17,200 acres. The earthwork was practically completed during the year, the expenditure being Rs. 5,496.

The masonry works and progress are as follows:—

Regulator at mile 3.	} Completed.
Regulator at mile 6½.	
Bridge at 4¾ miles.	
Bridge at 7¼ miles.	
Tail Sluice.	

346. For the efficient distribution of the water it was finally decided to construct a separate water-course for each new village to be colonised and branch water-courses to lead the water to each man's fields. In the lands already occupied the boundaries of villages do not correspond with the natural boundaries of water-courses, but the system of limiting the area supplied by each water-course to 2,000 acres or under, and of taking a channel to each holding was adhered to for the occupied lands.

347. The distressed immigrants driven into Sind by the famine at first found employment in harvesting the kharif crops, but when the harvest was finished were in need of work. The water-courses afforded suitable work and were commenced at the end of December 1899; the news of the work being available was circulated throughout the surrounding districts, seven thousand people quickly came and were employed on piece-work at the usual departmental rates; the numbers of Tharis employed did not increase much above 7,000 but remained steadily at about this number throughout the season, the maximum being 7,196. At first the people were paid twice a week but in a short time they grouped themselves under leading men and the ordinary piece-work or petty contract work system with payments in cash met all requirements.

The main water-courses are of 3-feet bed width and the branch water-courses of 2 feet. From the end of December to the close of the year under reference 660 miles of these water-courses were constructed at a cost of Rs. 74,383 for earthwork only; and the whole of this sum was earned by the people, the work being done at the estimated rates and the people worked contentedly and kept well.

In addition to excavation, the water-courses and also roads and drains had to be aligned and set out, jungle cleared and other items executed; the expenditure on these was also mainly received by distressed people. The total expenditure on water-courses during the year was Rs. 98,837.

348. Each water-course is to be provided with a masonry outlet from the distributary. The size of the opening of these outlets is fixed so that when the distributary is running full the water-course will receive a supply equivalent to one cubic foot per second for every 300 gross acres of the area served. Except in special cases, where the head is greater than usual, there will be no regulation at the outlets to water-courses, the regulation will be on the distributaries, at the head and at the intermediate regulators.

The construction of these outlets was commenced and the following expenditure incurred:—

					Rs.
Constructing outlets for	1st portion of Jam Sahab Minor	...	...	...	655
Do.	do.	2nd portion	do.	...	140
Do.	do.	Rawatani Minor	...	...	1,130
Do.	do.	New head to Dim	...	...	9
Do.	do.	Khadro Minor	...	...	11
Do.	do.	Dalor Minor	...	...	348
Do.	do.	Patoi Minor	...	...	19
Do.	do.	Mirpur Minor	...	...	115
Do.	do.	Between Main Line and West Branch	...	...	65
Do.	do.	Kahuwah	...	...	2
Do.	do.	Kapri Minor	...	...	37
Do.	do.	Bhitro Minor	...	...	117
Total					2,648

349. The inundation in the Nára was a normal one and there was no flood at the head-works. The main channel of the Nára had been closed by the right downstream training bank which was finished early in the year or just before the arrival of the inundation water, which was thus diverted down the West Branch of the Nára and down a new cut; the water took the course desired and widened and deepened both of these channels, the main stream taking the line of the new cut which is in continuation of the line of the trench excavated for the stone apron of the right downstream training bank.

350. After the inundation season when the water began to fall, the shutters on the weir were regulated to direct the discharge on the silt deposited on the weir crest; the two bays of the lower weir and the greater portion of the upper weir were easily swept clear of silt, the place not cleared being the middle bay of the upper weir where there was a high sand bank before the weir was constructed. The area cleared and the ease with which it was effected was very satisfactory.

351. The approach and discharge channels of the under-sluices had also to be cleared and the silt here contained little sand and was more tenacious than on the weir. The discharge channel which was blocked by stiff silt 8 feet deep was swept entirely clear and a good channel was also maintained through the approach channel along the face of the Head Regulator of the canal.

The shutters, under-sluices, gates and gear, and the gear for the head regulator all worked satisfactorily.

352. When the silt had all been scoured from the discharge channel below the under-sluices it was found that if a set of three gates of an archway were all opened the force of the current was felt beyond the limits of the protecting apron of concrete blocks causing scour of the river bed, and that it was better to pass the discharge by opening the top gates only of several archways.

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

Summary of expenditure.

				Rs.
New Works—				
Capital expenditure ...	...	...	...	5,20,587
Revenue expenditure	...	...	...	...
Repairs—				
Clearance to canals ...	...	...	..	...
Other Works ...	...	...	...	...
Maintenance of gardens	...	...	...	...
Establishment... { Works	...	...	...	...
{ Abkaláni	...	...	...	...
{ Revenue	...	...	...	...
Add—Regular Establishment Charges	...	...	...	67,614
Tools and Plant Charges	...	...	...	9,007
Total Charges under all heads				5,97,208

SOUTHERN DISTRICT, JAMRAO CANAL.

354. This district which was originally called the third District, Jamrao Canal, has been named the Southern District, Jamrao Canal from the 1st of July 1899, after the head works as well as the other works comprised in the first Executive District were completed, and the First and the Second Districts were amalgamated and formed into one district called the Northern District, Jamrao Canal. The Hyderabad Umarkot Railway line was roughly fixed to be the boundary line between the two districts, and consequently the Sanro Minor, which was till then included in the old Second District, was transferred to this district, being situate to the south of the Railway line.

355. The district comprises 40½ miles at the lower end of the main canal from mileage 77 to the tail and 46½ miles of the West Branch from mileage 17 to the tail, besides the several minor branches taking off from the same.

356. The district was only started practically in December 1898, but very little work having been done while it was in charge of the Executive Engineer old second district, the lower half of the project has been re-surveyed and wholly re-designed. Detailed plans and estimates for all Minors, bridges, regulators, buildings, &c., were prepared and submitted for the sanction of Government.

357. No regular sub-divisions were formed, but for the proper and convenient execution of the works, each Subordinate was given charge of a number of works over a large area under the direct supervision of the Executive Engineer. In February last, however, the following sub-divisions were constituted :—

- (1) Digri Sub-division.
- (2) Jhudo Sub-division.
- (3) 84th Mile Jāmrao Canal Sub-division,
- (4) 95th Mile Jamrao Canal Sub-division.
- (5) Bhugia Sub-division.
- (6) 27th Mile West Branch Sub-division.
- (7) 32nd Mile West Branch Sub-division.

Progress of Works.—Main
Canal.
Contour Survey.

358. A general contour survey of the district was made in previous years, at a cost of Rs. 11,634. No expenditure was incurred under this head, during the year under report.

359. The survey of all the Minors taking off from the Main Canal was made during the previous year. All of them were Preliminary expenses. re-aligned and the centre lines nicked out and re-levelled. No expenditure was incurred under this head, during the current year, the outlay up to date being Rs. 2,325.

360. The land required on the Main Canal had been nicked out in previous years, but during the current year owing to additional Land. land being required on both sides of the canal for plantations, the nicking was re-done along the whole line, at a cost of Rs. 180. The several statements of the land required were prepared and sent to the Revenue authorities, and the land was accordingly acquired, but no compensation has yet been paid.

361. In the project estimate only 2 regulators were provided for, at the 78th and 84th miles. But two more were found to be necessary, one at the 95th mile, and another at the 113th mile. The plans and estimates for these were accordingly submitted and sanctioned. The regulator at the 113th mile was substituted in place of the road bridge at mileage 112, for which there was provision in the project estimate. The regulators at the 78th and 84th miles, some materials for which were collected last year, were practically completed during the year, and so also those at the 95th and 113th miles.

362. The only old canal intercepted by the Main Jamrao Canal is the Other Cross Drainage Works. Nasirwāh Jhudo *ex-Fuleli* Canal. It has been diverted to the south; and the following works were found to be necessary on the diversion.

- (1). Escape Sluice at the tail.
- (2). Road Bridge in mile 2.
- (3). Road Bridge in mile 6.

The plans and estimates for the diversion were prepared and submitted for sanction. The whole diversion was surveyed and lined out, some materials were collected for the Escape Sluice, and the bed stones were fixed. The earth-work was carried out partly by contract and partly by piece-work, by the Thar immigrants. The work on the bridge was not commenced. The total expenditure on the diversion during the year amounted to Rs. 9,824 Rs. 9,511 being on the earth-work alone.

363. In the project estimate 5 bridges were provided for at miles 89½, 91, 100, 106 and 112; but it was found necessary to construct only 4, respectively at miles 88, 93, 99 and 105, as in place of that at mile 112 was constructed a regulator and bridge combined at mile 113, *vide* paragraph 361 *ante*. During the last year the contracts for these bridges had been given out and materials collected. Owing to the scarcity of water at mile 105, the progress of the bridge there was greatly hampered but all the other bridges were practically completed during the year. The work on the bridge at mile 105 had also made fair progress.

Bridges.
364. Two escapes have been provided on the Main Canal, one at mile 84 and the other at the tail. The work on the first was commenced during the last year and the excavation of the channel was done to the extent of about Rs. 6,300, and the materials for the Escape Sluice collected up to about Rs. 1,200 only. During the current year the detailed revised estimates for these escapes were prepared and sanctioned. The land required was marked out and acquired, and the mile, bed and indicator stones were fixed along the Escape Channel. The channel was wholly completed and the sluice very nearly so. The old Silorewáh was to be utilized for the Escape Channel at the tail, and there was very little earth-work to be done; it was not therefore commenced, but the construction of the Escape Sluice was started early and approached completion. The gates for both the sluices were ordered locally, at the end of the year.

Buildings.
365. The first class chauki at Digri and the second class chauki at Jhuda both with the subsidiary buildings and out-houses were completed before 1897-98, as reported last year. The work of sinking the well at Jhuda, which was suspended owing to the spring-water having been found brackish, was resumed. The buildings at the 84th mile Jamrao Canal including the second class chauki which were commenced last year were practically completed. Instead of building the second class chauki at mile 102, as provided for in the project, it was built in mile 99, as that situation was found to be more central and convenient. All the other buildings, *i. e.*, quarters for the Upper and Lower Subordinates, the Suzawalkars, the Mukadams and the Sluice Establishment were commenced as far as possible all along the canal and they made satisfactory progress during the year.

Earth-work.
366. The earth-work of the canal, which was far advanced at the end of the last year, was practically completed during the year, the uncut portions of the karias, &c., having been removed, at a cost of Rs. 29,716. The total outlay up to date under this head amounts to Rs. 2,18,706 against the sanctioned amount of Rs. 2,30,332. The side banks in low places yet require to be strengthened, which work is shortly going to be commenced, and the balance of the estimated amount may be required for this.

Plantation.
367. The establishment of two gardens, one at Digri and the other at Jhuda was sanctioned under Government Resolution No. 1664 dated the 4th December 1896. Accordingly the garden at Digri was started immediately and completed, at a cost of Rs. 3,501 before the end of 1898-99. It is now in course of development, but is not yet in as satisfactory a condition as it should be. Every endeavour is however being made to improve it by planting various fruit and timber trees. The soil is poor and impregnated with salt, and the water-supply has hitherto been deficient in quantity and brackish in quality; but now that the West Branch is brought into operation, the prospects are hopeful. At present the garden is being irrigated by means of a persian wheel from the old Sarfrazwáh, but as soon as the watercourses are constructed there will be channels made for flow irrigation. The other garden, *viz.*, that at Jhuda, could not be started up to now for want of good sweet water in the neighbourhood, the spring water that was tapped in the well that was being sunk was found to be salt, and the work thereon was suspended, *vide* paragraph 365. A few trees have however been planted to form avenues in the plot surrounding the second class chauki and a regular garden and nursery will be started there shortly.

No expenditure was incurred on establishing gardens during the year.

368. The mile, bed and indicator stones for the Main Canal were purchased long ago, but had not all been fixed. The work was therefore commenced during the current year and an expenditure of Rs. 336 was incurred thereon, the total outlay being Rs. 1,289.

Mile, Bed and Indicator stones.

369. The work of laying out the base lines for the square survey in this district was commenced by the Executive Engineer, Northern District Jamrao Canal, and the expenditure of Rs. 478 incurred by him was subsequently debited in transfer to this district. An additional expenditure of Rs. 636 was also incurred under this head and the work was completed during the year.

Square Survey.

370. The buildings at Digri and Jhuda and the nursery garden at Digri that had been completed in the previous years were maintained during the year, the former at a cost of Rs. 432 and the latter at Rs. 940. A chaukidar was entertained at Jhuda to watch the 2nd class chauki and the out-house there, but none was maintained for the buildings at Digri, as they were all occupied. Petty repairs were also carried out, as required, to all the buildings.

Maintenance.

Distributaries.
Main Canal.

371. The Minors taking off from the Main Canal south of the Railway line are nine in number, as under:—

(1) Bareji Minor.	(6) Juaresar Minor.
(2) Sanro Minor.	(7) Daleri Minor.
(3) Dangan Minor.	(8) Silore Minor.
(4) Puran Minor.	(9) Bagi Minor.
(5) Dabko Minor.	

372. This Minor takes off at the 78th mile, Jamrao Canal, and is about 12 miles in the length. The detailed estimates for the following works were duly sanctioned during the year.

The Bareji Minor.

Regulator and bridge combined at head.
Regulator and bridge combined in mile 7.
Road bridge in mile 11.
Mukadams' quarters in mile 7.
Earth-work.
Karia heads.

The line was marked out where necessary and the mile, bed and indicator stones fixed as far as possible. The land where required was also nicked out and acquired. The regulators and the bridges made fair progress. The earth-work was completed and the strengthening of the banks, &c., is in progress.

373. This Minor takes off at the 78th mile Jamrao Canal and was originally included in the old 2nd District but on the amalgamation of the upper two districts and the fixing of the Hyderabad-Umarkot Railway line as the boundary between the two newly formed Northern and Southern Districts, it was transferred to this district, *vide* paragraph 354. As originally designed, it provided for—

The Sanro Minor.

(1) Earth-work.	(3) Bridge at mile 7.
(2) Bridge at mile 3.	(4) Regulator at head.

It was however found desirable to alter the alignment from mile 2 so as to locate it on high ground as far as possible; and accordingly revised plans and estimates providing for the following works were prepared and duly sanctioned. The length of the Minor is about 6 miles.

Regulator at head.
Regulator and bridge combined at mile 4.
Mukadams' quarters at mile 4.
Earth-work.
Karia heads.

The earth-work of the Minor in accordance with the previous estimate was completed by the Executive Engineer, Northern District, Jamrao Canal, at a cost of Rs. 2,475. But it had to be re-done according to the altered design and it was entrusted to the Deputy Commissioner, Thar and Parkar, as a test work

for the employment of the Thar immigrants. It was completed during the year under report but the dressing of the banks and side slopes &c., and the strengthening of the banks remained to be done. A little expenditure was incurred in lining out and demarcating the boundary lines for the land required for the Minor. The work on the regulator at the head was commenced and nearly half done, and arrangements were also made to collect materials for the regulator and bridge combined at mile 4.

The Dangan Minor. 374. This Minor takes off at the 84th mile and is about 18 miles in length. It provides for the following :—

Regulator and Bridge combined	at head,
Do.	do, in mile 12.
Road Bridge in mile 4.	
Do.	do. 15.
Do.	do. 18.
Mukadams' quarters in mile 12.	
Earth-work.	
Karia heads.	

The line was nicked out last year but the mile, bed and indicator stone were fixed during the year under report. The boundaries of the land required were also demarcated where necessary. The regulator and bridge combined at head and the road bridge in mile 4 were almost completed. The other regulator and the bridges made fair progress. The earth-work also progressed very well and was approaching completion.

The Puran Minor. 375. This Minor takes off at the 84th mile, Jamrao Canal, and is about 29 miles in length. The line was marked out last year.

The revised estimates providing for the following works, &c., were duly sanctioned :—

Regulator and bridge combined	at head.
Do.	do. in mile 10.
Do.	do. in mile 18.
Road bridge in mile 5.	
Do.	do. 14.
Do.	do. 24.
Do.	do. 28.
Mukadams' quarters in mile 10.	
Earth-work.	
Karia heads.	

The line was nicked out and the mile, bed and indicator stones fixed as far as possible. The land required was also nicked out and acquired. The earth-work was carried out very vigorously and nearly completed. The dressing of the banks and side slopes, &c., and the strengthening of the banks yet remain to be completed. The work on the regulator and bridge combined at head was commenced and it had made good progress to the end of the year; and also materials were collected for the other works to the extent possible.

376. The Dabko Minor was originally designed to take off at the 6th mile of the Puran Minor. It was however afterwards found necessary to locate it so as to take off at the head. Accordingly detailed plans and estimates for the following works were prepared and duly sanctioned :—

Regulator and bridge combined	at head,
Road bridge in mile 4.	
Earth-work.	
Karia heads.	

The Minor is about 8 miles in length. Wherever necessary the land was nicked out and acquired and the mile, bed and indicator stones fixed where possible. The masonry works were commenced and are nearing completion. The earth-work was wholly completed and the strengthening of banks is in progress.

377. There was no provision for this Minor in the project estimate, but as there was a vast tract of land below the 95th mile to the east which could not be well commanded either by the Dangan Minor or the Jamrao Canal itself, this Minor was designed and the plans and estimates were duly sanctioned. It takes off at the 95th mile Jamrao Canal and is about 18 miles in length. The following are the works sanctioned in connection with it:—

Regulator and bridge combined at head.
Do. do. in mile 9.
Road bridge in mile 4.
Do. in mile 14.
Mukadams' quarters in mile 9.
Earth-work.
Karia heads.

The line was nicked out and the land demarcated and acquired where necessary. The mile, bed and indicator stones were also fixed as far as possible. The works of the regulator and bridge combined at the head and the bridge in mile 4 were almost completed. Arrangements were made for the collection of materials for the other masonry works. The earth-work also made good progress and was almost completed.

378. This Minor takes off at the 95th mile Jamrao Canal and is about 7 miles in length. The detailed estimates for the following works were sanctioned:—

Regulator and bridge combined at head.
Road bridge in mile 4.
Earth-work.
Karia heads.

Wherever necessary the boundaries of the land required were nicked out and the mile bed and indicator stones fixed where possible. The masonry works were commenced during the year and are nearing completion. The earth-work was wholly completed and the strengthening of banks in low places is in progress.

379. There was no provision for the Minor in the Project. It takes off at the 113th mile and is 12 miles in length. Originally it was proposed to improve the Silorewah *ex* the Nasirwah Jhuda, a branch of the Fuleli Canal and to utilise it as a Minor, with a regulator at the head. But it was found desirable to project a new Minor altogether instead. The estimates and plans for the following works were accordingly prepared and duly sanctioned:—

Regulator and bridge combined at head.
Do. do. in mile 6.
Road bridge in mile 4.
Mukadams' quarters in mile 6.
Earth-work.
Karia heads.

The line was marked out and the mile, bed and indicator stones fixed as far as possible. The regulator and bridge combined at head was almost completed and the earth-work was very nearly so. Arrangements were made for the collection of materials for the remaining masonry works.

380. In the project estimate it was proposed to utilize a portion of the old Bagiwah with its branch, the Chaugazowah, giving it a new head 2 miles long as a Minor, with a regulator, but it was found desirable to project a new Minor altogether, taking off from the tail of the Jamrao Canal. It is 6 miles in length and the works provided for on it are:—

Regulator and bridge combined at head.
Road bridge in mile 3.
Mukadams' quarters in mile 3.
Earth-work.
Karia heads.

The regulator and bridge combined at head was almost completed and so also the earth-work; and arrangements were made for the collection of materials for the road bridge in mile 3.

381. The Puran Dhoru which runs almost due north and south in the middle of the tract to be irrigated by the Jamrao Canal and throws an arm towards the west branch, which crosses it in mile 32, was wholly reconnoitered, and arrangements were made to level it with a view to provide overflow channels, where it is obstructed by road embankments to enable surplus water to drain off to the sea. Proposals to this end will be submitted in due course.

4—Drainage and Protective Works.

The Puran Dhoru.

West Branch.
Preliminary Expenses.

382. The whole alignment of the West Branch up to the tail was completed during the year and the expenditure incurred amounted to Rs. 346.

The land required was nicked out and acquired where necessary, but no compensation has been paid.

383. In the project estimate there was provision for only two regulators, one at mile 32 and the other at the tail. But two more were found necessary, at miles 42 and 52, and were accordingly sanctioned in place of the bridges at miles 43 and 53, which were dispensed with. Until February last, the construction of these regulators as well as of the other masonry works could not be taken in hand, as no sweet water was obtainable in the neighbourhood. Some kutchra wells were sunk, but the water tapped was found to be very salt; arrangements were, however, made for the collection of materials while the inundation canals were flowing, and as the West Branch flowed early in February the construction of all the masonry works was started then, and the progress since made has been very satisfactory.

Regulators.

384. There was provision for 6 road bridges in the project estimate at miles 23, 29, 38, 43, 53 and 59 and for a foot-bridge at mile 49. But instead of the road bridges at miles 43 and 53, regulators were constructed at miles 42 and 52, *vide* paragraph 383; a road bridge in mile 47 was substituted for the foot-bridge in mile 49, and the sites for those at miles 38 and 59 were shifted to miles 36 and 58. The revised plans and estimates for all these were prepared and duly sanctioned. The construction could not be started until February 1900 owing to the scarcity of water, but some materials were collected. The works, however, made fair progress during the last two months of the year after the water flowed down the West Branch.

Bridges.

Escapes.

385. An escape is provided at mile 32. The channel has been excavated and the sluice has made fair progress.

Buildings.

386. Some changes were found to be necessary in the project arrangement of the buildings, and the following were sanctioned :—

- 2 Second Class Chaukis with out-houses and wells at miles 32 and 42.
- 1 Upper Subordinate's quarters with detached cook-house at mile 32.
- 1 Lower Subordinate's quarters at mile 58.
- 2 Suzawalkar's quarters at miles 32 and 42.
- 2 Sluice Establishment quarters at miles 32 and 42.
- 5 Single Mukadam's quarters at miles 20, 36, 52, 58 and tail.
- 1 Double Mukadam's quarters at mile 28.

Work was started on almost all the buildings in February and they have made good progress since.

Other cross drainage works.

387. The West Branch intercepts the following old canals :—

- The Sangrowah at mile 10.
- The Ghaluwah at mile 27.
- The Sarfrazwah at mile 44.
- The Imamwah at mile 52.

It was therefore necessary to divert them and accordingly plans and estimates for the following works were prepared and submitted, but are not yet sanctioned with the exception of those for the Sangrowah diversion :—

The Sangrowah Diversion.

Syphon in mile 18 of the West Branch to pass the diversion underneath it.
Road bridge in mile 2 of the diversion.
Road bridge in mile 9 of the diversion.
Railway bridge in mile 8.
Karia heads.

The Ghaluwah Diversion.

Syphon in mile 27 of the West Branch to pass the diversion underneath it.

The Sarfraswah Diversion.

Regulator and bridge combined in mile 11.

Materials were collected for all the masonry works as far as possible and the work was started in February, i.e., after the West Branch flowed, and good progress was made during the last two months of the year under report. The earth-work of the Sangrowah diversion was carried out partly by contract and partly by the Sind Convict Gang, and that of the remaining three diversions by piece work by the Thar immigrants, and was almost completed.

388. The whole earth-work was given out on contract to one contractor early in January 1899 and the work done in the previous year amounted to about Rs. 7,000 only. During the year under report it was pushed on very vigorously and almost completed. The outlay up to the end of the year amounted to Rs. 1,32,493 against the project provision of Rs. 1,49,221. The dressing of the banks and side slopes, &c., as well as the strengthening in low places remained to be done, and is in progress.

Mile, bed and indicator stones.

389. The mile, furlong and bed stones were purchased and carried to the site and the bed stones were fixed as the canal excavation was finished, the total outlay being Rs. 1,019.

Distributaries.—West Branch.

390. The distributaries as provided for in the project estimate were :—

- (1) The Gorchani Minor,
- (2) The Digri Minor,
- both taking off at mile 32.
- (3) The Sarfraswah with its branch, the Muridwah.
- (4) The Imamwah.

The first two were to be new distributaries, but their alignments had to be modified somewhat so as to locate them on high ground as far as possible; the last two were to be simply the tails of the old canals cut off by the West Branch, viz., the Sarfraswah with its branch, the Muridwah, and the Imamwah, improved to serve as Minors. It was found desirable, however, to project a new Minor altogether, taking off at mile 42 of the West Branch, and accordingly the proposals were submitted to Government and duly sanctioned. The new Minor has been named the Murid Minor. Later on it was found that another small Minor, taking off at about mileage 22 of the West Branch, was required to command the waste land in the neighbourhood and it has accordingly been aligned. Plans and estimates are in course of preparation and will be submitted shortly. The Minors taking off from the West Branch are accordingly as follows :—

- | | |
|--------------------------|---|
| (1) The Gorchani Minor. | } Taking off at mile 32 of the West Branch. |
| (2) The Digri Minor. | |
| (3) The Murid Minor. | |
| (4) The Daulatpur Minor. | |
| | Do. do. 42 do. do. |
| | Do. do. 22 do. do. |

The plans and estimates for the first three have been submitted for sanction but the earth-work was started during the year in anticipation.

The works provided for on each Minor are as under :—

The Gorchani Minor.

Regulator and bridge combined at head.
Fall, regulator, and bridge combined at mile 4.
Road bridge at mile 7.
Mukadam's quarters at mile 4.
Earth-work.
Karia heads.

The Digri Minor.

Regulator and bridge combined at the head.
Fall, regulator, and bridge combined at mile 7.
Regulator and bridge combined at mile 18.
Road bridge at mile 4.
Do. do. 12.
Mukadam's quarters at mile 7.
Earth-work.
Karia heads.

The Murid Minor.

Fall, regulator, and bridge combined at the head.
Regulator and bridge combined at mile 8.
Road bridge at mile 5.
Do. do. 13.
Mukadam's quarters at mile 8.
Earth-work.
Karia heads.

These Minors were surveyed and levelled and the alignment completed early during the year. The land required was marked out and acquired where necessary. The mile, bed and indicator stones were fixed as far as possible, and the earth-work, which was commenced in the month of October, was pushed on vigorously and almost completed. The masonry works could not be started for want of good sweet water; but materials were collected and they have made very good progress since the water flowed down the West Branch.

391. The telegraph line, which was previously laid between Mirpur Khas and the Jamrao head, was extended to the south, and the following connections were made during the year :—

	Miles.
Mirpur Khas to the regulator in the 78th mile ...	8.25
From the regulator in 78th mile to the regulator in the 84th mile...	13.65
From the regulator in the 84th mile to the regulator in the 95th mile...	18.40
From the regulator in the 95th mile to the tail near Jhuda via 118th mile regulator ...	30.88
From the regulator in the 95th mile to Digri ...	18.20
From Digri to the regulator in the 42nd mile West Branch...	8.18
From the regulator in the 42nd mile West Branch to the regulator in the 32nd mile West Branch ...	10.58
Total miles ...	<u>103.14</u>

There are only six telegraph stations to be established, at the regulators in the 84th, 95th miles and the tail as well as Digri and at the regulators in the 42nd and 32nd miles West Branch. The telegraphic instruments and bells were to be put in position by the 15th May 1900, as they were not wanted immediately.

392. Owing to the large number of work-people employed in the district, and the influx of Thar and Marwari immigrants later on, it was found necessary to maintain a dispensary at Digri, and accordingly the dispensary that was established at Khadro in mile 24 of the Jamrao Canal, being no longer required there, was transferred, and the Hospital Assistant arrived at Digri with all the medicines, instruments, furniture, &c., on 14th June 1899, and has been of very great assistance.

393. It will be observed from the foregoing that the district was only started practically in December 1898, and that within 15 months the whole of the lower portion of the Jamrao Canal, south of the railway, was re-surveyed and re-designed on improved lines detailed plans and estimates prepared for all works, and most of them actually executed. A rough idea of the work done will be obtained, if it be considered that in that short period 165 miles of Minors,

47 miles of West Branch,
40½ miles of diversions of old canals,
2½ miles of escape channels,

Total ... 255 miles of canal lines were aligned and estimated for with all the subsidiary works thereon, and were mostly executed. The progress made was so striking that it was at once decided to bring into operation the whole of the Jamrao Canal and the West Branch and all the Minors taking off from them, in the coming inundation season, i.e., full one year earlier than the forecast already made. It may be thought that the famine conditions that were established in the Thar and Párkar Districts, and the adjoining Native States, by the failure of the last monsoon enabled such rapid progress being made; but it was not truly so, as though the labour was somewhat cheap and abundant it was wholly inefficient and weak and required much looking after; while the transportation of the several materials required for the masonry works, such as lime-stone, sand, &c., became much more expensive and difficult owing to the loss of draught-cattle for want of fodder.

The work in the district throughout the year was of a very arduous nature and was carried out under unfavourable circumstances. The Superintending Engineer, Indus Left Bank Division, at the conclusion of his extensive tour through the district thoroughly recognized the conditions and remarked that he had been fairly astonished at the amount of the work done in so short a time and more than satisfied with its quality.

The pressure exerted upon the Subordinates employed in the district which has so long been a dismal desert in achieving the above result, was incessant and heavy and it may not be considered superfluous to note here their willing and cheerful assistance at all times. The office work was specially heavy, both correspondence and accounts, and the manner in which it was carried on reflects great credit on the staff, as has been briefly summed up in the remark made by the Examiner, Public Works Accounts, Bombay, in his late inspection, viz., "the accounts work in this office is in excellent order generally and well up to date and this is all the more creditable as the charge is practically a newly formed one and the clerical staff more or less consists of new hands."

Summary of expenditure.

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

					Rs.
New Works—					
Capital expenditure	...	...	...	...	5,56,698
Revenue expenditure	...	...	...	...	...
Repairs—					
Clearance to Canals	...	...	...	...	...
Other works	...	...	...	...	...
Maintenance of gardens	...	...	...	...	...
Establishment	...	...	...	...	...
	{ Works	...	...	...	...
	{ Abkaláni	...	...	...	...
	{ Revenue	...	...	...	...
Add—Regular establishment charges		...	...	...	48,399
Tools and plant charges	...	...	...	...	3,964

Total, charges under all heads... 6,09,061

A note on the work done by the Colonization Officer's Department, Jámrao Canal, during the financial year 1899-1900.

395. During March and uptill the 15th April when the field season closed survey work was continued in the Northern District of the canal. At the close of the field season a reduced establishment prepared the maps and other paper work connected with the survey. The Amins engaged in this work were also put through a course of survey instruction. During the season 1898-99 a total of 316,921 acres and 16 gunthás were surveyed and demarcated into squares at a total cost of Rs. 73,286-10-0.

396. The field season of 1899-1900 opened on 15th September 1899 when the Survey of a small tract in the Northern District remaining over from the previous field season was undertaken. On the 1st October, the whole establishment of 130 Amins moved into the Southern District. The whole of the area undertaken, viz.: 295,031 acres and 38 gunthás were surveyed and demarcated into squares before the close of the year under report, and the total expenditure amounted to Rs. 60,239-13-1.

397. At the same time, the work of demarcating the new villages in the Northern District was undertaken and was still in progress when the year closed.

398. As soon as the boundaries of the new villages had been planned, the intricate work of re-settling the old holdings on the square system was commenced. The work met with no opposition from the Zamindárs and was well forward before the end of March. It has at the time of writing been completed in the Northern District. Operations in the Southern District will commence next field season.

399. Though colonization proper can scarcely be said to have commenced when the year closed, a large number of allotments had been made to inhabitants of Sindh. A deputation of Punjabi colonists visited the tracts reserved for Punjabis in February and after inspecting the land showed every willingness to settle there. Unfortunately the publication of the conditions under which the land is to be given out was delayed so long that no further steps could be taken to bring the colonists actually on the ground. But at the time of writing a number of Marwaris and Catchis are being settled on the ground in time to begin cultivation in this kharif.

400. Water was admitted into the canal in January last and a large area of hot weather crops have been cultivated, producing large quantities of much-needed fodder.

NORTHERN HYDERABAD CANALS DISTRICT.

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

401. Only payment for a crane for lifting needles and other petty miscellaneous items was made.

Surveys.

402. The contour survey referred to in the last year's report was completed during the year.

403. There existed formerly a natural escape from the Dád about a mile above the point where the escape has now been made. This was closed in 1893. The closing of this and other escapes although greatly improving the supply in the canal during periods of deficiency, tends to increase the silt deposit in the head of the canal. By means of the new escape, the velocity in the canal above will be increased and the necessity for closing the head regulator in some cases avoided and silt removed by scour.

Constructing an Escape
Sluice and Channel below the
Head Regulator of the Dád
Canal.

The sluice consists of 3 spans each 10 feet wide and 15 feet high up to springing. The channel has a bed width of 20 feet and side slopes of 1 to 1 and will discharge into a dhand, having communication with the river.

The work is practically completed: the cost during the year was Rs. 9,223.

404. The works mentioned in the previous report were practically completed, the cost during the year being Rs. 74,659 and the total expenditure from the commencement Rs. 2,10,480 against an estimate of Rs. 5,90,717.

405. As described in the previous reports, the remaining work of strengthening embankments was finished and paid for. The canal was not opened for some years, the sand and rain-water had therefore spoiled the bed of the canal. This was remedied and canal opened; the expenditure during the year was Rs. 9,156 and the total cost to date is Rs. 1,11,747.

406. Improvements as described in the last year's report were practically completed during the year, the expenditure being Rs. 7,107 and 13,188 and the total cost to date Rs. 8,590 and 13,625, respectively.

407. Mirwah and Mir extension of the Dád Project of 1893 are replaced by the New Mirwah for which plans and estimates were sanctioned in Government Resolution No. 2033, dated 29th November 1899. It takes off about 34 chains above the present tail of Gowerwah, a branch of the Dád Canal, and cuts the present Mirwah in the first mile.

The total length of the canal is 26.4 miles and the work is nearly completed except two miles near Pirjo Gote and two miles at the Dhoro crossing. These will be taken in hand as early as possible.

Its bottom width is 56 feet at head with a discharging capacity of 1,774 cubic feet per second and 10.30 feet depth of water. Width at tail is 20 feet and the depth of cutting varies from 11 feet to 8 feet. Rs. 1,51,163 were spent during the year.

408. This branch takes off from the New Mir wah at the 4th mile and tails into the low lying lands near Nawabshah; the length of the canal is about 20 miles with bottom width at head 13 feet giving a discharge of 298 cubic feet per second. The depth of cutting varies from 11 feet to 4 feet. A minor distributary has been opened from the branch with a view to irrigate lands on the south-west of the branch. Its length is 9 miles, bottom width 5 feet at head and 2 feet at tail and depth of cutting varies from 10 to 3 feet. This is nearly completed. The expenditure during the year on the above canal was Rs. 51,148 only.

409. The improvements described in the last year's report were completed during the year under report at a cost of Rs. 21,752, 8,086 and 21,235, respectively, the expenditure during the year being Rs. 9,619, 2,643 and 17,545, respectively.

410. Some earth-work only was carried out by petty contract. A diversion in order to ease off the bend of the canal at the end of the 2nd mile was made. The length of the diversion is 10 takis depth of cutting 9 feet and bottom width 30 feet. The spoil 5 feet above F. S. L. on the right bank in about $\frac{1}{2}$ a mile was also removed. The expenditure during the year was Rs. 3,362 only.

411. Spoil was removed partly and an inspection road made from mouth to 8th mile on both sides and its banks were strengthened from 8th to 16th mile. The cost during the year was Rs. 9,593.

412. The right bank of the canal was strengthened and bends removed from taki No. 67 to 156. The expenditure during the year was Rs. 5,643 only.

413. 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. Also the work of new mouth to Landi dhand, which feeds the canal, was commenced during the year and is in progress. The expenditure against the repair grant was as follows :—

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

					Rs.	Rs.
Repairs...	...	...	...	...	...	9,497
Establishment	...	{	Abkaláni...	...	399	
			Revenue ...	...	139	
			Works ...	...	432	
					<hr/>	970
						<hr/>
						10,467

Works for which only Revenue Accounts are kept.— Extensions and Improvements.

Cutting a new head for the Dád Canal.

414. As described in the last year's report, the work was practically completed. The expenditure during the year was Rs. 6,864.

Payments for land taken up have yet to be adjusted in the Supplementary Accounts for March 1900.

Constructing a Sluice over Bhorthi old at junction with new.

415. Only materials to the extent of Rs. 400 were collected during the year, and the work will be completed before the next inundation.

416. The work of heavy clearance to Dád, as described in the last year's report, was completed, also ordinary clearance and repairs to banks, including making inspection paths, were carried out during the year, and call for no special remarks. The total expenditure against the repair grant was as follows :—

Maintenance and Repairs.

					Rs.	Rs.
Repairs	...	...	...	...	...	58,946
Establishment	..	...	{	Abkalani	... 5,340	
				Revenue	... 1,744	
				Works...	... 4,356	
					<hr/>	11,440
						<hr/>
					Total...	70,386

Works for which neither Capital nor Revenue Accounts are kept. Original Works.

Constructing a Sluice in Naolakhi Bhorthi Bnd at Kadero village.

417. Only materials to the value of Rs. 250 were collected, and the work will be completed during the next inundation.

Repairs.

418. The usual establishment was maintained during the year.

The expenditure against repairs was as under :—

			Rs.	Rs.
Repairs	...	...	...	140
Establishment	...	{	Abkaláni	...
			Revenue	...
			1,112	
			84	
			<hr/>	1,176
			Total	1,316

419. The gardens at Bhour and Sehra were maintained during the year at a cost of Rs. 510 and 444, respectively ; the receipts were Rs. 237 and Rs. 77 compared with Rs. 179 and Rs. 78, respectively, in the previous year.

Plantations.

The garden at Bhour has realized more than anticipated, while that at Sehra is yet in its infancy. Rs. 1,759 were realized by sale of fishery rights, lotus fruit, etc., and Rs. 678 by sale of timber, babul pods, etc.

420. On the new works in connection with the Dád Canal, the necessary number of Darogas and Mukádamas were employed and so also on Nasrat new works. The total expenditure on Dád and Nasrat was Rs. 1,780 and Rs. 278, giving a percentage of 54 and 141 on the expenditure on works, respectively. The high percentage on Nasrat work is due to the scattered position of the works carried out.

Summary of expenditure.

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

			Rs.	Rs.
New Works—				
Capital expenditure	...	...	3,51,253	
Revenue	...	...	7,264	
Ordinary Agricultural Works	...	...	—243	
				3,58,274
Repairs—				
Clearance	...	...	48,710	
Other Works	...	...	19,873	
Maintenance of Gardens	...	...	914	
				69,497
Establishment	...	{ Works ...	4,788	
		{ Abkaláni	6,851	
		{ Revenue	1,947	
				13,586
Add—Regular establishment charges	...	...	...	52,917
" Tools and Plant charges	...	...	...	3,373
		Total under all heads	4,97,647	

The average expenditure of three previous years on establishment charged to the maintenance grant was Rs. 13,695.

CENTRAL HYDERABAD CANALS DISTRICT.

Works for which Capital and Revenue Accounts are kept Revenue Account.

Extensions and Improvements.

Survey in connection with the utilisation of the Lohano Dhoro as an escape. Great Marak.

422. The survey was commenced and completed at a cost of Rs. 143 against the estimate of Rs. 161.

423. One minor work, *viz.*, constructing a three-feet sluice at taki No. 221, Shahuwah, right bank—Great Marak, was carried out during the year at a cost of Rs. 1,015 against the same estimated amount.

424. The usual maintenance and repairs, such as clearance, repairs to banks, etc., were carried out, and call for no special remark.

Works for which only Revenue Accounts are kept.

Maintenance and Repairs.

Survey in connection with the Renwah Project.

425. The survey was commenced and completed during the year at a cost of Rs. 1,382 against the estimate of Rs. 1,634.

Survey in connection with the revision of the Gharo Mahmudo Project.

426. The survey was commenced in February 1900, outlay on it being Rs. 208 against the estimate of Rs. 305.

427. Ordinary clearance and repairs to banks were done during the year.

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

428. Ordinary repairs to Bund to check spill in Hala Sub-division and Indus Survey Marks were carried out during the year.

There are no gardens in this district.

Deposits, contribution, ordinary.

429. The sum of Rs. 165 was recovered and spent on constructing kacha sluices over zemindári karias, etc

Summary of expenditure. 430. The following is a summary of the expenditure in the district under all heads:—

				Rs.	Rs.
New Works—					
Capital Expenditure	...	...	...	1,158	
Revenue	...	...	...	1,590	
Ordinary Agricultural	...	...	...	...
					2,748
Repairs—					
Clearance	...	...	...	80,471	
Other Works	...	...	...	22,697	
Maintenance of Gardens	...	...	...	...
					1,03,168
Establishment	...	{ Works	...	6,206	
		Abkalani	...	5,106	
		Revenue	...	2,393	
					13,705
Total Works and Repairs	...	...	...		1,19,621
Contributions...	...	...	...		165
Add—Regular establishment charges	...	...	...		40,507
Tools and Plant charges	...	...	...		650
Total under all heads	...				1,60,943

The average expenditure of three previous years on establishment charged to maintenance grant was Rs. 16,686.

FULELI CANALS DISTRICT.

431. The Escape was described in the Administration Report for 1896-97. It will save the Bádin Táluka from floods, and will enable the Fuleli to flow all the year through. This will benefit all garden cultivation and also navigation. Now even in very low seasons boats and steam launches will be able to ply throughout the year, and rice will be carried to the Hyderabad market from the southern parts of the district within a month or two of its being reaped. Formerly it was necessary to store it till the following June. It deteriorated much in store, and this, of course, affected the price.

				Rs.
Amount of estimate	...	...	...	2,16,883
Expenditure to end of 1898-99	...	...	...	1,69,970
Expenditure in 1899-1900	...	...	...	28,864
Total	...			1,98,834

The work has been completed.

432. A distributary, now called the Aduwah, has been constructed to feed the karias originally taking off from Sani Guni and Sherwah small, which were cut by the Fuleli Escape. The Aduwah has its mouth from the Aliwah large, and runs parallel to the Escape for a length of 7.04 miles. Its bed width is 6 feet, the gradient of bed is 1 in 7,000, and the F. S. L. gives a discharge of 35 cusecs.

A head sluice has been provided at the mouth; and at mile 3.8, where it is crossed by the Nindo Shahr-Duari road, a culvert has been constructed.

Six distributary channels have been constructed, running parallel to the Aduwah, and the cultivators connect the mouths of their karias with these. The advantages of these distributaries are—(1) to facilitate the distribution of water, (2) to prevent wastage and damage to the banks of the main canal.

Screw gate sluices, of one wall pattern, 4 feet span and 4 feet high, have been constructed over the mouth of each distributary to facilitate the rotation of water for cultivation.

Sanctioned amount of estimate	Rs.
...	14,082
Expenditure during the year under report	...
Total outlay on the works	...
...	13,764

433. The Kamal (old) runs through higher ground than the Jamwáh and gives all its supply by lift, so that when the water falls a little, there is a constant complaint from the zemindars of insufficiency of water in the Kamalwáh, even although there is a good supply in the feeder channel and in the Jamwáh.

Constructing a sluice at the mouth of Jamwáh. In order to distribute the supply more fairly between the Jamwáh and Kamalwáh a sluice has been constructed at the mouth of the Jamwáh. It has one span of 15 feet and is 10 feet high. The regulating apparatus is of the usual pattern steel girders and teak needles.

Estimate ...	...	...	...	Rs.
Expenditure	...	...	...	1,393
				1,382

The work has been completed.

434. As the mouth of the zemindari karia *ex* Mulchand which takes off at taki No. 154 had no sluice at its head, a masonry one of 2 feet span with springing line 7 feet above pavement has been constructed during the year.

Constructing a sluice over a zemindari karia *ex* Mulchandwah in Dero Mohbat Taluka. The Zemindar concerned has paid half the estimated cost through the Manager, Encumbered Estates.

Estimate ...	...	...	...	Rs.
Expenditure	...	...	...	269
				251

The work has been completed.

435. As the mouth of the karia was dangerous a puka sluice of 2½ feet opening was constructed during the year. The Zemindar concerned has paid half the estimated cost.

Estimate ...	...	...	...	Rs.
Expenditure	...	...	...	257
				238

The work has been completed.

436. The Escape from the 8th mile runs through land much of which is cultivable, but it is lying waste for want of water. Therefore a few openings have been made in the Escape banks, at convenient places (and only where the Escape channel is in cutting) in order to irrigate land for rabi with water which would otherwise run to waste in the Dhoro Puran and eventually to the sea.

Revenue Account.—Extensions and Improvements. Constructing temporary distributary channels for irrigation from the Fuleli Escape. The openings have been strongly “jucked” on both sides.

These openings supply distributary channels which run parallel to the Escape and all karia heads take from these distributaries as in the Aduwáh. This avoids weakening the Escape.

Estimate ...	...	...	...	Rs.
Expenditure	...	...	...	976
				976

The work has been completed.

437. This work was fully described in the last Administration Report. It was completed during the year at the total cost of Rs. 2,072.

Estimate ...	...	...	...	Rs.
				2,075
Expenditure in 1898-99	...			Rs.
Expenditure in 1899-1900	...			645
				1,427
				2,072

The work has been completed.

Constructing Head Sluice over a zemindari karia ex Mirwáh Talhar, mile 10 in Badin Táluka.

438. As the mouth of a zemindari karia ex Mirwáh Talhar mile No. 10 was dangerous owing to a new diversion cut at the place, the old mouth was closed and a new mouth made with a puka head sluice.

The sluice has a 3 feet span, the springing line is 6 feet 6 inches above pavement.

				Rs.
Estimate ...	...	...	...	283
Expenditure	...	...	...	253

The work has been completed.

Constructing a single wall pattern sluice over karia from the Wadhuwáh Extension at chainage 2700 feet.

439. The sluice has been constructed over the karia that takes off at chainage 2,700 feet to facilitate rotation of water for rabi cultivation in the Wadhuwáh extension. The sluice is of one span 3 feet in width and 4 feet 6 inches in height and of single wall pattern.

				Rs.
Estimate ...	...	...	...	154
Expenditure	...	...	...	145

The work has been completed.

440. The old bridge being a skew one and of one span 10 feet wide was very low and narrow and did not allow a free flow of water. The obstruction was so great as to cause a loss of head of nearly a foot. A new bridge of 20 feet span has therefore been built. The bridge is of iron girders on brick abutment with plank floor.

Constructing a new bridge over Wadhuwáh on road from Hyderabad to Jamshora.

				Rs.
Estimate ...	...	...	...	771
Expenditure	...	...	...	663

The work has been completed.

441. The existing bunder adjoining the stone bridge over the Fuleli at Hyderabad being small and far away from the Railway line, it is proposed to make a new one near the Railway bridge over the Fuleli. The object is to facilitate the booking of goods by railway for through traffic. All the grain from the four southern tálukas comes up the Fuleli by boat to Hyderabad and much is again exported from there by rail. At present the grain often changes hands in Hyderabad. But no doubt merchants will soon find out the advantage of being able to deliver grain straight from the boats into the trucks.

Making a Boat Bunder for boats plying in the Fuleli Canal.

No work has been done yet, the land is being acquired.

				Rs.
Estimate ...	...	...	...	1,918
Expenditure	...	...	...	1

The work is in progress.

Works for which only Revenue Accounts are kept. Extensions and Improvements.

Extension of the Hassanali wáh into the Gajawáh.

442. This work, which was described in the last Administration Report, was completed at a total cost of Rs. 9,800.

			Rs.	Rs.
Estimate ...	...	...	...	9,879
Expenditure in 1898-99	...		9,726	
Expenditure in 1899-1900	...		74	
			<u> </u>	<u>9,800</u>

Maintenance and Repairs. Constructing a loop to the Hajipur Bund.

443. The loop as described in the last report, was found necessary on account of the erosion of the river between the Mirwáh and Nurwáh.

			Rs.	Rs.
Estimate...	...	...	...	24,894
Expenditure in 1898-99	...	...	10,000	
Expenditure in 1899-1900	...	...	10,868	
				<u>20,868</u>

The work has been completed.

Works for which neither Capital nor Revenue Accounts are kept. Original works. 444. The sluice has been constructed of one opening 3 feet wide and 6 feet 6 inches high up to springing. It is built of stone to give water to the fields lying to the south of the Mulh Bund.

Estimate ...	...	...	...	Rs.
Expenditure	...	...	...	412
				423

The work has been completed.

Constructing a new bund between Jamshora and Gidu Bunder. 445. Owing to the encroachment of the river towards the Jamshora Bund a new bund along the right bank of the Wadhuwáh to the sand-hill by the shortest line has been found necessary.

The existing right bank of the Wadhuwáh was strengthened and raised in the first two miles and then a new bund was constructed running through cultivable land skirting the Public Works Department Forest.

A sluice at the mouth of the Fasadiwáh will be constructed to irrigate land between the bund and the river.

Estimate ...	...	...	...	Rs.
Expenditure	...	...	...	18,971
				9,000

The work is in progress.

Works for which neither Capital nor Revenue Accounts are kept. Repairs. 446. In order to prevent erosion of the Jamshora Bund the loop bund that was constructed in 1897-98, chainage 9,200 to 12,900, was extended so as to join the main bund at chainage 13,600 near Detha's village.

The top width of loop has been made 5 feet with slopes 2 to 1 as in the part previously made.

The stone groins that had fallen in places were repaired.

Estimate ...	...	...	...	Rs.
Expenditure	...	...	...	809
				808

The work has been completed.

Summary of expenditure. 447. The following is a summary of the total expenditure incurred during the year in this district :—

New Works—			Rs.	Rs.
Capital expenditure .....	...	...	45,412	
Revenue expenditure .....	...	...	2,410	
Ordinary agricultural.....	...	...	9,685	
				<u>57,507</u>
Repairs—				
Clearance ...	...	...	1,23,715	
Other Works	...	...	39,733	
Maintenance of Gardens...	...	...	623	
				<u>1,64,071</u>
Establishment...	{ Works	...	8,448	
	{ Abkalani	...	6,611	
	{ Revenue	...	4,667	
				<u>19,726</u>
Add—Regular establishment charges	...	...	...	49,542
Tools and plant charges	...	...	...	1,591
				<u>2,92,437</u>

The average expenditure of 3 previous years on establishment charged to maintenance grant was Rs. 23,984.

APPENDIX A.

Statement showing the entire Expenditure incurred during the financial year 1899-1900
on Irrigation Works, Repairs and Establishment in the Province of Sind.

Service	Works.	Repairs.	Total.
PRODUCTIVE PUBLIC WORKS.			
MAJOR WORKS.			
<i>49.—Capital Account.</i>			
Works	15,93,212	.....	15,93,212
Establishment	2,63,095
Tools and Plant	10,875
Total	18,67,182
<i>42.—Revenue Account.</i>			
Extensions and Improvements	11,272	.....	11,272
Maintenance and Repairs	2,16,774	2,16,774
Establishment	53,288
Tools and Plant	2,327
Refunds of Revenue	31
Total	2,83,692
43.—IRRIGATION MINOR WORKS AND NAVIGATION.			
WORKS FOR WHICH CAPITAL AND REVENUE ACCOUNTS ARE KEPT.			
<i>Capital Account.</i>			
Works	40,709	.....	40,709
Establishment	9,267
Tools and Plant	650
Total	50,626
<i>Revenue Account.</i>			
Extensions and Improvements	7,790	.....	7,790
Maintenance and Repairs	2,51,185	2,51,185
Establishment	72,239
Tools and Plant	1,857
Refunds of Revenue
Total	3,83,071
WORKS FOR WHICH ONLY REVENUE ACCOUNTS ARE KEPT.			
<i>Revenue.</i>			
Extensions and Improvements	2,14,624	.....	2,14,624
Maintenance and Repairs	5,27,162	5,27,162
Establishment	1,94,316
Tools and Plant	3,851
Refunds of Revenue
Total	9,89,453
WORKS FOR WHICH NEITHER CAPITAL NOR REVENUE ACCOUNTS ARE KEPT.			
Works and Surveys	80,813	.....	80,813
Maintenance and Repairs	3,34,360	3,34,360
Establishment	98,570
Tools and Plant	19,428
Refunds
Total	4,83,171
DEPOSITS.			
<i>Contributions, Ordinary.</i>			
Works	6,699	.....	6,699
Repairs	6,983	6,983
Establishment	10,625
Tools and Plant	447
Total	24,754
Total under all Heads	* 39,81,949

Note.—Expenditure exclusive of Establishment and Tools and Plant Rs. 32,41,614
Cost of Establishment and Tools and Plant 7,40,335
Percentage of Establishment and Tools and Plant on Outlay 22.84
* Exclusive of suspense, Rs. 538.

A P P E N D I X B.

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

Names of Canals.			CLEARANCE PROPER IN CANALS.		Jungle cuttings.	Re- moving Tudor.	IMPROVING CANAL HEADS.		SIDE SLOPING AND REPAIRING CURVES.		Build- ings and Gardens.	Regu- lators, Bridges and Sluices.	REPAIRS TO CANAL BANKS.		Remov- ing spoil banks and mop- pion 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.
Begari Canals District.	Desert Canal	5,795,142	28,240	911	172	...	...	...	...	1,878	1,256	790,755	3,136	...	
	Unharwah	2,271,437	9,274	532	...	...	...	...	...	828	1,169	1,065,825	4,218	...	
	Begari Canals	10,594,197	52,528	800	74	...	...	167,000	689	2,457	4,498	4,050,575	12,857	...	
	Kashmor Bund	75,000	300	257	...	...	...	...	...	1,586	7,272	50,819	241	...	
Shikarpur Canals District.	Canals in Rohri	4,155,554	13,411	369	881	3,307,537	10,955	11,898	151	2,094	...	651,613	2,806	197	
	Bunds do. ... ..	...	...	47	...	...	...	...	...	...	...	...	...	...
	Sind Canal	2,934,277	13,667	240	148	1,528,540	4,483	...	...	449	927	1,176,500	3,286	540	
	Rajbwah	21,868	87	72	15	...	...	...	...	...	...	219,879	995	60	
	Chittiwah ... ..	...	...	242	110	...	...	...	...	...	...	147,793	637	60	
	Garangwah... ..	308,636	1,168	60	228	...	...	...	...	...	...	270,779	513	120	
	Kasimpur Bund ... ..	...	...	...	...	...	...	...	...	519	725	...	...	...
Ghar Canals District.	Sakkur-Begari Bund ... ..	...	...	124	...	...	...	...	...	...	27,069	...	...	...
	Sukkar Canal	2,667,196	13,481	...	861	1,336,600	6,025	...	...	1,246	390	249,660	1,161	...	
	Ghar Canal	24,710,302	1,00,610	...	1,072	...	...	...	...	1,256	280	496,793	1,835	...	
Western Nara District.	Ghar Bunds ... ..	...	...	...	...	...	...	...	...	88	38	...	...	...
	Western Nara	9,767,801	32,843	1,176	2,766	...	...	71,147	225	5,117	3,658	2,808,289	11,287	1,436	
	Pritchard Canal	321,153	1,099	83	516	...	...	...	...	958	232	452,660	1,457	93	
	Dadu Canals	1,510,346	5,297	98	53	...	...	...	...	140	60	101,109	325	30	
	Phitta Canal	239,780	842	49	393	107,550	363	...	...	658	82	31,458	119	98	
	Wahur	141,215	441	24	...	240,751	753	...	...	...	...	18,904	71	...	
	Marvi	517,227	1,551	20	...	...	...	...	...	56	...	...	...	...
Karachi Canals District.	Nara Bunds ... ..	...	...	...	...	...	...	...	...	1,553	138	...	...	...
	Canals, North of Kotri	809,978	3,169	44	107	...	...	48,963	193	72	26	92,601	101	171	
	Canals in Tatta Sacra and Ghorabari	1,982,490	6,929	28	246	...	...	...	...	...	404	82,792	429	...	
	Kalaji	1,915,881	6,729	85	86	244,847	1,091	5,248	19	...	52	45,208	341	24	
	Baghar	1,995,288	6,268	2	230	...	...	...	...	326	38	1,176,138	4,545	...	
	Uchito	44,739	147	...	...	...	...	...	...	...	...	960	1	...	
	Pinyari	3,681,165	19,224	654	723	...	...	236,315	1,069	1,022	626	4,196,599	16,169	62	
	Canals in Mirpur Batoro	1,819,625	5,964	127	175	...	...	...	...	...	...	47,965	393	39	
	Canals in Sujawal... ..	1,004,159	2,720	132	90	...	...	...	...	...	...	48,816	156	...	
	Canal in Jati	356,973	961	...	6	...	...	79,000	236	...	...	281,552	874	...	
	Satta	3,113,151	9,209	18	270	615,715	2,155	37,000	102	...	...	38,866	112	240	
	Khanta	397,471	1,202	...	107	...	...	212,200	575	8	25	164,589	509	...	
	Canals in Shabbander	128,314	345	93	108	...	...	...	158	...	23	228,282	614	74	
	Kokawari	250,684	723	...	6	...	...	...	...	...	...	73,550	228	...	
	Bunds, Right Bank ... ..	...	...	248	...	...	...	59,400	152	1,614	379	...	...	...
	Bunds, Left Bank... ..	...	...	143	...	...	...	...	...	817	999	...	...	...	35

B.

Debitable to the Canal Clearance Grant in 1893-1900 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 Abkalanani Expenditure and closing breaches.	Total Works	ESTABLISHMENT.				Total Works and Establishment.
Cubic feet.	Cost.	Cubic feet.	Cost.							Abkalanani.	Revenue.	Work.	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.
...	...	...	...	...	608	...	135	887	37,218	3,114	1,593	1,745	6,452	48,670
...	...	...	...	...	2,624	...	10	278	18,933	2,945	868	1,164	4,977	23,910
...	...	...	...	...	1,713	...	1,163	1,286	78,065	3,986	2,217	1,837	8,040	86,105
3,128,662	24,001	6,241,161	40,203	...	5,231	...	1,860	12,614	96,345	7,218	612	1,946	9,801	1,05,146
...	...	...	...	661	234	...	228	38	32,025	2,953	749	2,342	6,049	38,074
213,167	877	...	...	...	...	...	...	...	924	392	54	169	615	1,539
...	...	...	...	1,046	624	...	195	233	25,838	1,571	478	1,424	3,473	29,311
...	...	...	...	20	24	...	6	...	1,279	293	57	164	514	1,793
...	...	...	...	...	38	...	...	...	1,027	269	53	151	473	1,500
...	...	...	...	...	...	...	9	...	2,038	318	62	178	558	2,596
77,314	352	...	...	33	29	...	190	...	1,790	1,834	102	288	2,224	4,014
1,243,060	13,503	8,475,009	37,637	699	3,015	...	497	277	77,917	4,136	214	633	4,983	82,900
...	...	...	...	...	1,674	...	36	...	24,374	2,852	845	2,580	6,277	30,651
...	...	...	...	...	2,208	...	174	...	107,435	6,137	1,385	4,135	11,657	1,19,092
877,779	1,733	...	...	...	659	...	63	...	2,581	2,894	506	1,473	4,873	7,454
...	...	...	...	1,215	2,227	...	...	82	62,032	8,350	4,539	6,990	19,929	81,961
...	...	...	...	117	551	...	...	9	5,115	...	...	...	...	5,115
...	...	...	...	...	31	...	...	...	6,034	255	122	282	659	6,693
...	...	...	...	...	9	...	...	40	2,651	253	129	282	664	3,315
...	...	...	...	...	30	...	...	...	1,319	63	18	57	143	1,462
...	...	...	...	...	48	...	...	...	1,675	95	28	54	177	1,853
360,133	1,427	...	...	327	5,349	...	...	188	8,982	3,203	517	1,465	5,185	14,167
...	...	...	...	...	72	678	...	...	4,633	383	106	396	885	5,513
...	...	...	...	...	88	239	...	...	7,833	442	150	363	955	8,783
...	...	...	...	...	210	300	...	...	8,337	591	333	1,130	2,104	10,441
...	...	...	...	...	309	586	...	...	13,132	1,674	470	1,354	3,498	16,630
...	...	...	...	...	4	...	...	...	152	...	...	...	...	152
...	...	...	...	176	672	2,575	...	...	37,822	3,299	1,001	2,964	7,264	45,086
...	...	...	...	...	126	1,189	...	...	5,640	303	99	276	678	6,318
...	...	...	...	34	32	343	...	...	2,321	68	36	104	208	3,029
...	...	...	...	...	45	51	...	...	2,071	37	...	...	37	2,108
...	...	...	...	...	120	2,205	...	...	10,021	274	112	324	710	10,731
...	...	...	...	...	123	272	...	...	2,821	279	53	217	549	3,370
...	...	...	...	...	36	12	...	...	1,463	71	20	60	151	1,614
...	...	...	...	...	448	61	...	...	1,469	312	20	53	385	1,854
2,479,141	7,900	486,500	2,000	1,288	1,234	299	...	...	14,516	2,616	378	1,244	4,238	18,754
2,044,721	8,452	5,070,679	21,250	...	1,150	105	...	...	32,931	5,183	480	1,512	7,175	40,106

APPENDIX

Names of Canals,	CLEARANCE PROPER IN CANALS.		Jungle cuttings.	Re- moving Toda.	IMPROVING CANAL HEADS.		SIDE SLOPING AND REPAIRING CURVES.		Build- ings and Gardens.	Regu- lators, Bridges and Sluices.	REPAIRING CANAL BANKS.		Remov- ing Spoil banks and Inspection Paths.
	Cubic feet.	Cost.			Cubic feet.	Cost.	Cubic feet.	Cost.			Cubic feet.	Cost.	
	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.	Coals and Stores for the Steam Launch "Maud."	...	...	...	...	...	...	...	...	...	...	...	...
	Repairing and renewing Survey Pillars, &c.	...	...	...	...	...	...	...	...	...	...	...	...
	Repairing and renewing beacons along the coasts of the Indus.	...	...	...	...	...	...	...	...	...	...	...	...
Eastern Nara.	Nara Supply Channel	...	...	30	89	...	...	...	448	1,604	...	...	48
	Eastern Nara	...	...	1,922	...	...	...	...	...	43	...	...	...
	Mithrao Canal	3,075,103	11,980	1,327	1,845	149,508	615	391,237	1,516	834	3,623	462,006	1,705
	Thar Canal	...	...	...	326	...	...	...	...	38	1,142	266,917	968
	Dimwah	133,100	532	181	664	...	...	...	...	...	56	...	...
	Khipra Canal	446,485	1,562	...	...	...	...	...	...	...	11	...	...
	Heranwah	...	...	...	...	...	...	...	...	...	...	...	...
Northern Hyderabad Canals.	Mehrabwah	2,665,586	9,314	...	15	...	...	...	...	...	4,87	19	806
	Nasrat	1,054,044	3,424	...	46	...	...	...	966	...	4,000	15	...
	Naolaki	2,382,563	9,201	30	1,145	...	...	...	...	100	72,481	699	1,047
	Dambro	283,388	1,011	...	69	...	...	...	...	15	145,520	617	125
	Dadwah	4,360,800	13,860	13	144	...	...	...	1,408	13	65,376	253	838
	Renwah	274,229	1,102	...	218	...	...	...	...	48	11,269	53	89
	Other Canals	1,668,616	5,798	112	10	...	...	...	...	9	230,473	940	207
	Repairs to Right Bank	...	...	...	...	...	...	...	...	...	...	...	...
	bhorti	...	...	...	...	...	...	...	...	...	...	...	...
	Naolaki Bhorti Bund	...	...	...	...	...	...	...	...	...	...	...	...
	Surveying Left Bank	...	...	...	...	...	...	...	...	...	...	...	...
	Indus	...	...	...	...	...	...	...	...	...	...	...	...
	Special repairs to Canals	...	...	...	...	...	...	...	...	...	...	...	...
	Chauki at Dowlatpur	...	...	...	...	...	...	...	48	...	...	...	...
Central Hyderabad Canals.	Ghoro Mahmuda	8,127,214	28,938	81	885	1,746,512	6,169	...	...	2	81,072	353	...
	Kari Saumali	2,652,155	9,853	52	494	...	...	...	24	...	9,014	36	...
	Nasir	3,023,086	10,544	18	144	...	...	...	...	...	23,711	42	19
	Other Canals	187,611	573	32	57	...	...	...	...	...	288,059	1,044	...
	Alibhar Kacheri	623,838	2,278	1	221	126,700	345	...	...	2	55,902	208	5
	Great Marak	4,521,674	18,417	1,011	2,616	...	...	...	...	43	1,06,556	4,859	783
	Sarfaraz	2,535,643	9,868	181	100	...	...	...	...	...	172,195	335	68
	Bund to check spill in Hala Sub-division	...	...	...	...	...	...	...	...	...	...	...	...
	Repairs to Indus Survey marks in Deh Amilpur, Taluka Hala	...	...	...	...	...	...	...	...	...	...	...	...
	Repairs to Indus Survey marks in Hala Sub-division	...	...	...	...	...	...	...	...	...	...	...	...
Fuleli Canals.	Fuleli Canal	33,311,012	1,01,442	2,315	1,200	...	...	...	623	4,418	3,572,815	15,480	530
	Other Canals	6,441,105	22,273	412	350	...	...	...	...	5,765	286,712	952	42
Begari Canals District	...	18,735,776	90,342	4,230	246	...	...	167,006	689	6,749	14,195	5,967,974	20,452
Dowlatpur Canals District	...	7,420,335	25,333	2,244	1,382	4,334,077	15,438	11,898	151	3,064	28,721	2,466,564	8,237
Ghara Canals District	...	27,377,498	1,14,091	...	1,433	1,336,800	6,025	...	...	2,590	708	746,453	2,996
Western Nara District	...	12,487,527	42,073	1,450	3,721	848,301	1,116	71,147	225	8,482	4,170	3,407,420	13,259
Karschi Canals District	...	17,479,948	65,595	1,552	2,154	860,562	3,246	678,126	2,504	3,859	2,577	6,478,118	24,470
Indus River District	...	...	...	...	...	...	...	...	...	...	...	...	...
Eastern Nara District	...	3,654,688	14,074	3,460	2,924	149,508	615	391,237	1,516	1,820	6,479	728,923	2,668
Northern Hyderabad Canals	...	12,689,226	48,710	155	1,647	...	...	...	...	2,485	185	534,111	2,596
Central do.	...	21,971,221	80,471	1,337	4,517	1,873,212	6,514	...	...	24	47	1,738,609	6,875
Fuleli Canals District	...	89,752,117	1,23,715	2,727	1,580	...	...	...	...	623	10,133	3,859,527	16,412
Total	...	161,578,336	6,07,404	17,195	19,611	9,402,280	32,954	1,319,408	5,085	29,194	67,265	25,917,699	97,965

B—concluded.

REPAIRS TO RIVER EMBANKMENTS.		SPECIAL WORKS IN CONNECTION WITH RIVER EMBANKMENTS.		Protecting Slopes of Embankments and Canals.	Miscellaneous.	Arrears.	Contingencies.	Extraordinary Abkalan Expenditure, Clothing Breaches, &c.	Total Works.	ESTABLISHMENT.				Total Works and Establishment.
Cubic feet.	Cost.	Cubic feet.	Cost.							Abkalan	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.
...	...	...	...	...	1,293	...	...	...	1,293	...	...	...	...	1,293
...	...	...	...	...	193	...	...	...	193	...	...	...	...	193
...	...	...	...	...	627	...	...	...	627	...	...	...	...	627
...	...	...	...	1,027	231	...	94	...	3,571	...	2,007	...	2,007	5,578
446,448	1,826	...	...	...	1,148	...	...	712	5,661	6,435	1,796	2,367	10,688	16,239
151,400	696	...	...	...	2,284	...	124	866	27,415	2,758	2,182	2,129	7,069	34,484
41,600	145	...	...	...	518	...	...	116	3,248	1,226	1,840	800	3,866	7,114
...	...	...	...	...	...	...	...	542	1,975	272	119	319	696	2,671
...	...	...	...	...	33	...	...	23	1,639	240	188	120	548	2,177
...	...	...	...	...	48	...	...	...	48	...	...	...	...	48
...	...	...	...	...	179	...	...	...	9,497	899	139	432	970	10,467
...	...	...	...	...	152	...	...	22	4,006	463	226	441	1,130	5,136
...	...	...	...	...	455	...	...	518	13,255	900	352	764	2,016	15,271
...	...	...	...	...	119	...	...	...	1,956	404	143	466	1,013	2,969
...	...	...	...	12	9,504	...	...	5	30,550	2,172	532	1,305	4,009	34,559
...	...	...	...	...	170	...	...	54	1,684	718	315	863	1,896	3,580
...	...	...	...	...	1,926	...	...	...	8,402	683	176	517	1,376	9,773
...	...	...	...	...	7	...	...	...	7	...	...	...	...	7
...	...	...	...	...	24	...	...	...	24	1,112	64	...	1,176	1,200
...	...	...	...	...	63	...	...	...	68	...	...	...	...	68
...	...	...	...	...	...	...	...	...	48	...	...	...	...	48
...	...	...	...	...	1,963	...	...	1	37,793	1,395	682	1,728	3,805	41,598
...	...	...	...	...	289	...	...	...	10,748	767	411	1,129	2,807	13,055
...	...	...	...	...	661	...	...	42	11,470	609	304	821	1,734	13,204
...	...	...	...	...	57	...	...	...	1,763	145	18	54	217	1,980
...	...	...	...	...	162	...	...	...	3,220	321	181	438	940	4,160
...	...	...	...	...	369	...	...	26	28,124	1,402	344	1,418	3,364	31,488
...	...	...	...	...	410	...	...	...	10,912	467	353	618	1,338	12,250
...	...	...	...	...	8	...	...	...	8	...	...	...	...	8
...	...	...	...	...	2	...	...	...	2	...	...	...	...	2
...	...	...	...	...	18	...	...	...	18	...	...	...	...	18
...	...	...	75	2,698	631	...	641	1,243	1,31,326	5,356	4,021	7,121	16,498	1,47,824
70,000	300	...	...	1,653	...	...	244	724	32,745	1,255	646	1,327	3,228	35,973
3,128,662	24,001	6,241,161	40,303	...	10,171	...	3,168	15,065	2,29,561	17,258	5,320	6,642	29,270	2,53,631
1,533,531	14,733	8,475,009	37,673	2,459	2,124	...	1,125	548	1,42,838	11,771	1,769	5,349	18,889	1,61,727
377,779	1,733	...	...	...	4,541	...	273	...	1,34,390	11,833	2,736	8,188	22,807	1,57,197
360,133	1,427	...	...	1,639	8,245	...	...	319	67,808	12,224	5,403	9,130	26,757	1,14,565
4,528,862	16,352	5,637,179	23,250	1,498	4,669	6,709	...	...	1,45,662	15,532	3,308	9,997	28,837	1,74,499
...	...	...	...	...	2,113	...	...	...	2,113	...	...	...	...	2,113
639,448	2,667	...	...	1,027	4,262	...	218	2,250	43,537	10,931	8,125	5,718	24,774	68,311
...	...	...	...	12	11,046	...	...	599	69,497	6,851	1,947	4,768	13,586	83,083
...	...	...	...	...	3,339	...	...	69	1,04,058	5,106	2,393	6,206	13,705	1,17,763
700,000	300	...	75	4,351	631	...	885	1,967	1,64,171	6,611	4,867	8,443	19,726	1,83,797
10,633,415	61,212	20,273,349	1,01,201	11,006	46,893	6,709	5,669	20,826	11,36,535	98,167	35,668	64,516	1,98,351	13,21,686
As per Booked Accounts ...									11,31,161	98,167	35,668	64,516	1,98,351	13,20,512†

* The Executive Engineer, Northern Hyderabad Canals District, has shown Rs. 968 as arrears; these have not been shown in the detailed columns.

† Exclusive of outlay on contribution. Difference due chiefly to omission of certain works in Fuleil Division and adjustments in supplementary accounts for March 1900.

APPENDIX C.

Statement showing the Expenditure incurred on Work Establishment employed in the Deccan Districts during the year 1899-1900, and the percentage it bears to the Outlay on Works and Repairs proper.

No.	Name of Sub-division or District.	OUTLAY ON										COST OF WORK ESTABLISHMENT SANCTIONED BY			REMARKS.
		By Contract.			By Departmental Agency.				Total Contract and Departmental, Columns 5 and 8.	Chief or Super- Intending Engineer.	Executive Engineer.	Total.	Percentage (Column 12 bears to Column 9).		
		Original Works, including additions and alterations and improve- ments and extensions.	Repairs.	Total.	Original Works, including additions and alterations and improve- ments and extensions.	Repairs.	Total.								
								3						4		5	6	7	8	9	10	11	12	13	14
1	2	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.		
1	Mutha Canals ...	...	...	...	14,172	15,165	29,337	29,337	2,217	3,168	5,385	18-36	The result seems to be satisfac- tory as compared with last year. Increased percentage due to less Capital outlay.
2	Poona Water-supply...	...	...	...	6,528	7,647	14,175	14,175	1,222	5,321	6,543	46-16	
3	Nira Canal ...	...	...	...	3,107	17,042	20,149	20,149	2,472	5,103	7,575	37-59	
4	Other Poona Irrigation Works*	...	...	...	78,581	3,310	81,891	81,891	995	2,532	3,527	4-30	Decrease due to large outlay on the Shetphal Tank.
5	Sholapur Irrigation Work†	...	...	...	5,54,319	10,192	5,64,511	5,64,511	2,508	15,227	17,735	3-14	
6	Ahmednagar Irrigation Works ...	...	...	...	2,42,826	59,028	3,01,854	3,01,854	12,533	...	12,533	4-15	Decrease due to large outlay on famine relief works.
7	Khândesh Irrigation Works ...	3,444	...	3,444	1,25,311	26,168	1,51,479	1,54,923	2,370	3,941	6,311	4-07			
8	Dhârwar Irrigation Works ...	...	3,946	3,946	280	35,731	36,011	39,957	1,530	2,254	3,784	9-47	Do. do.	
	Total ...	3,444	3,946	7,390	10,25,124	1,74,283	11,99,407	12,06,797	25,847	37,546	63,393	5-25	The percentage compares favourably with that of the last year.		

* Includes Shetphal Tank.

† Includes Pathri, Mangi, Hotei, Wadshwe, Budhbal and Phamburdi Tanks.

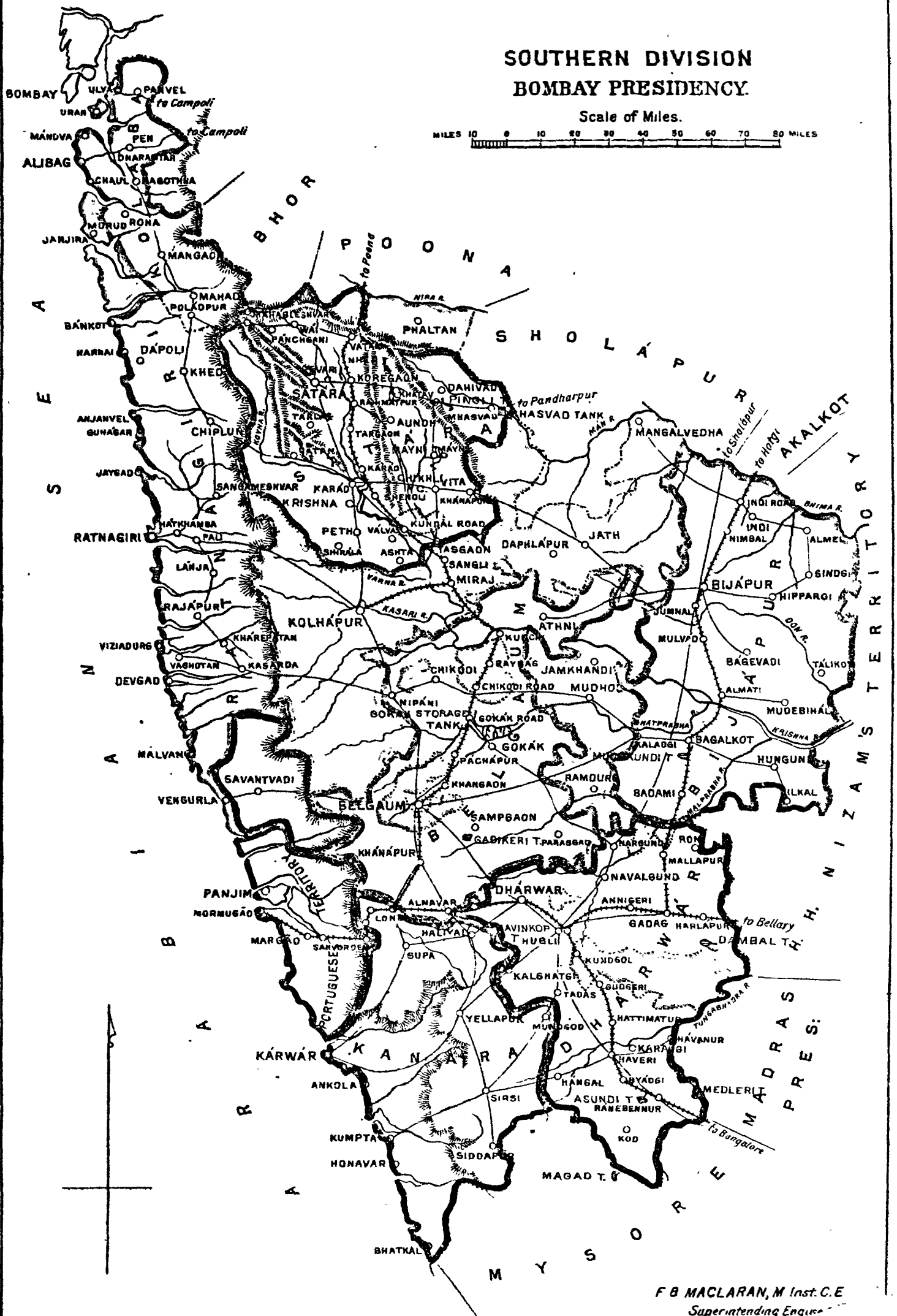
Note.—The figures of expenditure for works in the Nasik District are given in Appendix C to the Administration Report of Civil Works of this Department for 1899-1900 (General Branch).

Statement showing the results of Run-off from catchment area of Tanks in the Deccan for the year 1899.

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
Khândesh ...	Mukti Tank ...	1899 ...	34.20	4.27	339.27	10.76	0.32	The tank was at its highest level on the 13th June at R. L. 917.20, being 31.70 feet above sill of sluice and at its lowest on the 31st October, being 12.25 feet above sill of the sluice. The rainfall taken is an average of two gauges at Dahiana and Sargao from 1st June to 31st October. The tank was at its lowest level on the 8th June, being 11.15 feet above sill of sluice, and at its highest on the 19th June, being 19.95 feet above sill of sluice. The rainfall is taken between the above dates.
	Mhaswa Tank ...	Do. ...	13.40	9.98	310.69	96.47	.31	
	Hartala Tank ...	Do. ...	6.80	6.66	105.21	Nil.	Nil.	
Nasik ...	Parodi Tank ...	Do. ...	17.75	6.90	284.53	13.84	.049	The tank was at its highest level on the 18th June, being 11.85 feet above sill and at its lowest on 31st October, being 2.35 feet above sill of the sluice. Rainfall is taken from 1st June to 31st October. The first rainfall was on the 13th June. On the 12th June the R. L. of water in the tank was at 97.94. The waste weir with crest at R. L. 114 began to flow on the morning of 12th July. Average rainfall at Peint and Chachadgaon between these dates has been taken for calculation. The run-off is made up as under:— (1) Tank replenishment, 194.44 Mil. C. ft. (2) Outlet discharge ... .875 do.
	Waghad Tank ...	Do. ...	29	18.365	1,237.801	195.319	0.157	
Ahmednagar ...	Bhatodi Tank ...	Do. ...	44	9.33	952.70	183.81	0.193	Rainfall from 3rd June to 16th September. The tank did not fill to waste weir level during the year.
Poona ...	Bhadalwadi Tank ...	Do. ...	23	10.21	545.56	58.79	.108	Rainfall from 10th June to 19th September 1899. Do. 5th June to 13th September 1899.
	Shirsapbal Tank ...	Do. ...	23.50	7.83	427.48	50.256	.118	
	Mhaswad Tank ...	Do. ...	480	8.77	9,779.74	1,854.26	.189	
Sholapur ...	Ekrak Tank ...	Do. ...	159	12.50	4,617.36	207.62	0.044	The tank received its first replenishment on 5th June and the water in the tank flowed over waste weir on 13th September. The tank received its first replenishment on 6th June and the water rose to the highest level on 19th September. The waste weir did not overflow. The tank received its first replenishment on 5th June. The waste weir overflowed on 17th September. The tank received first replenishment on the 6th of June and the water rose to the highest level at 87.80 on the 18th September. The waste weir did not overflow.
	Aashti Tank ...	Do. ...	92	12.05	2,575.60	546.70	0.213	
	Koregaon Tank ...	Do. ...	4.40	11.30	115.51	26.67	.222	
Bijapur ...	Muchkundi ...	Do. ...	26	3.17	191.478	17.793	.093	From first rainfall—13th May to 21st May. The tank did not fill during the season.
	Do. ...	Do. ...	26	15.65	945.310	241.901	.256	
	Do. ...	Do. ...	26	19.25	1,162.762	281.958	.242	
Dhárwar ...	Asundi ...	Do. ...	23	3.40	181.674	28.668	.158	From first rainfall—17th April to 22nd April. The tank did not fill during the season.
	Do. ...	Do. ...	23	8.07	431.209	23.768	.055	
	Dambal ...	Do. ...	43	6.19	618.366	50.102	.081	
Sátara ...	Do. ...	Do. ...	43	5.89	588.397	54.993	.093	From 4th September to 25th September. From 1st June to end of 31st October. The tank overflowed from 5th June to 8th June. From 1st June to end of 31st October. The tank did not fill during the season.
	Do. ...	Do. ...	43	11.07	1,105.866	169.636	.153	
	Medleri ...	Do. ...	11	13.47	344.229	43.765	.127	
Sátara ...	Maini ...	Do. ...	54	4.23	530.665	125.399	.236	From 6th September to 9th September. From 12th June to 9th September, on which date the tank filled to overflowing. From 7th September to 29th September, on which date water rose to R. L. 2,659.14, the R. L. of temporary weir being 2,661.02.
	Do. ...	Do. ...	54	5.56	697.517	183.573	.270	
	Nehr ...	Do. ...	59.50	6.46	892.968	327.788	.367	
	Do. ...	Do. ...	59.50	14.03	1,946.284	343.536	.176	From 1st June to end of 31st October. The tank did not fill during the season.

SOUTHERN DIVISION BOMBAY PRESIDENCY.

Scale of Miles.



F B MACLARAN, M Inst. C.E.
Superintending Engineer

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