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2681
1882

India Office,
London 21st Dec^r 1882

To the Secretary to Government in the Public Works
Department, Madras.

SIR,

I am directed to inform you that the Letters
of the numbers and dates noted in the margin,*
from the Government of Madras to the address of
the Secretary of State for India, have been
received.

I have the honour to be,

Sir,

Your most obedient, humble Servant,

Juland Danvers

Secretary,
Public Works Department.

A	* No. 15	dated 31 March 1882	✓
F	16	18 April	✓
F	17	20 "	✓
A	18	22 "	✓
A	20	12 May	✓
F	21	5 June	✓
M	22	5 "	✓
	23	5 "	✓
	24	5 "	✓
	27	16 "	✓
F	28	22 "	✓
	30	6 July	✓
	31	17 "	✓
	32	28 "	✓
	33	2 August	✓
	34	15 "	✓
1-36	30	"	✓
1-38	15 Sept ^r	"	✓

A Transferred to Accounts Branch
F " " Financial Department
M " " Military

GOVT. OF MADRAS.

PUBLIC WORKS DEPARTMENT.

LETTER to the Most Honorable
the Secretary of State for
India.

No. ³⁷₇₁₄ L. dated 8th Sept. 1882.

FORWARDING copy of Proceedings embodying
a brief narrative of the Cauvery Delta System.

299
C.A.P.

The list has been
checked. It will be seen
from H.O. 1028. W. 26-4-82
that Despatches that have
been replied to are not
entered in these lists.

The only Despatch that
has not been replied to
and ~~that~~ should there-
fore have been entered
is, No. $\frac{37}{714.3}$ d/8.9.82.

L.P.W.
17/11.

Since Acknowledged

Cy
17/11

Branch
Department

P. W.

2681

1882

India Office,
London 21st Dec^r 1882

Government in the Public Works
Department, Madras.

I am directed to inform you that the Letters
numbers and dates noted in the margin,*
the Government of Madras to the address of
Secretary of State for India, have been
ed.

I have the honour to be,

Sir,

Your most obedient, humble Servant,

J. M. D. D. D.

Secretary,
Public Works Department.

IRRIGATION.

Gobt. of (1882) Madras.
PUBLIC WORKS.

Dated September, 8th.

To d.

Encl.

G.O., 8th Sep. 1882. No. 712I.

SEPTEMBER.

Nos. 34-35.

Cauvery Delta System.

*A brief Narrative of the — ordered to be
forwarded to the Government of India.*

8TH SEPTEMBER 1882, No. $\frac{37}{714}$ I., PUBLIC WORKS.

PUBLIC WORKS DEPARTMENT.

LETTER—to

THE MOST HONORABLE THE SECRETARY OF STATE FOR INDIA.

MY LORD MARQUIS,

We have the honor to forward for your Lordship's information copy of our Proceedings No. 712 I., dated 8th September 1882, embodying a brief narrative of the Cauvery Delta System.

We have the honor to be,

My Lord Marquis,

Your Lordship's most obedient, humble servants,

(Signed)	M. E. GRANT DUFF.
(")	~~FRED. ROBERTS.~~
(")	DAVID F. CARMICHAEL.
(")	H. E. SULLIVAN.

OOTACAMUND,
8th September 1882.

Exd. S. T. Austin.

8TH SEPTEMBER 1882, No. 712 I., PUBLIC WORKS.

GOVERNMENT OF MADRAS.

PUBLIC WORKS DEPARTMENT.

Irrigation.

No. 34.

READ—the following paper :—

No. 86 I.

Brief Narrative of the Cauvery Delta System.

Endorsement on the above.

Submitted to Government with reference to G.O., No. 295 I., dated 13th May 1879.

(Signed) C. VINCENT,
for Chief Engineer for Irrigation.

To the Joint Secretary to Government, Public Works Department, Irrigation Branch.

No. 35.

ORDER—dated 8th September 1882, No. 712 I., Public Works.

Ordered that the Narrative of the Cauvery Delta System be forwarded to the Government of India with reference to their letter No. 22 A.—I., dated 22nd January 1879.

2. Ordered also that a copy of these Proceedings be forwarded for the information of the Secretary of State.

(Here enter No. 713 I., dated 8th September 1882.)

(True Extract.)

(Signed) J. O. HASTED, Colonel, R.E.,
Ag. Joint Secy. to Govt., P.W.D.,
Irrigation Branch.

To the Superintending Engineer, Sixth Circle.
" Chief Engineer for Irrigation.
" Revenue Department.
" Board of Revenue.
To W. Wilson, Esq.
To the Examiner, Public Works Accounts.

Exd. S. T. Austin.
Spare Copies

CAUVERY DELTA SYSTEM
APPENDIX B

General Abstract of Working Expenses Yearly from the Commencement to End of 1881-82

Period of Month	Income		Expenses		Total	Profit and Loss	Realisation of Roads including Cash	Grand Total
	During Year	To end of Year	Gross Receipts	Net Receipts				
Total of 1800-01	£ 3,565	£ 392,000	£ 91,564	£ 74,960	£ 2,0012	£ 9,157	£	£
for 1805-06	615	4,108	1,197	5,234	393	118	...	561,948
" 1806-07	683	3,834	1,180	5,405	389	118	...	11,665
" 1807-08	218	3,747	1,026	5,642	376	113	...	11,604
" 1808-09	...	3,650	1,052	5,764	367	99	...	11,688
" 1809-10	...	2,296	393	5,756	273	99	...	11,332
" 1810-11	...	2,701	718	5,976	299	57	...	8,945
" 1811-12	...	2,175	589	5,912	260	65	...	9,661
" 1812-13	...	6,740	1,878	6,509	305	55	...	9,037
" 1813-14	...	5,792	1,840	6,500	305	177	...	16,289
" 1814-15	...	7,332	4,350	5,808	688	88	...	17,662
" 1815-16	...	7,507	2,225	6,409	707	158	...	17,424
" 1816-17	...	6,340	1,911	6,241	701	217	...	17,809
" 1817-18	...	4,285	1,879	7,316	779	179	...	16,731
" 1818-19	...	6,615	3,951	6,195	1,015	358	...	14,882
" 1819-20	...	6,796	3,447	6,847	942	264	...	21,858
" 1820-21	...	...	...	...	...	247	...	19,904
Total	15,728	156,750	117,453	167,524	28,121	11,423	...	775,999

MADRAS,
30th August 1882

For the purpose of the Cauvery Delta System, the following is a statement of the Working Expenses for the year 1881-82.

Signed D. C. GORDON,
Examiner, Public Works Accounts.

CAUVERY DELTA SYSTEM.
APPENDIX C.

Summary of Capital and Revenue Accounts from the Commencement to End of 1881-82.

Years.	CAPITAL OUTLAY EXCLUSIVE OF INTEREST CHARGES.		REVENUE ACCOUNT.				Simple Interest at 4 per cent. on Capital included while Work was under Construction.	BALANCE OF INTEREST CHARGES REMAINING UNPAID.	
	During Year.	To end of Year.	Gross Direct Receipts.	Working Expenses.	Net Direct Revenue.	Add Indirect receipts (Share of enhanced land Revenue.)		Exclusive of Indirect Revenue.	Inclusive of Indirect Revenue.
£	£	£	£	£	£	£	£	£	£
Estimate of Capital and Interest Charges ...	...	(a) 170,517	...	...	...	...	Not estimated.	...	...
Estimate of Annual Revenue ...	...	...	...	...	...	...	...	...	...
Actuals to end of 1866-67	...	60,871	127	561,948	561,821	1,439,795	877,974	52,989	825,035
" 1867-68	3,846	64,717	244	11,665	11,421	77,701	66,280	2,702	63,578
" 1868-69	7,658	72,375	173	11,604	11,431	80,057	68,626	2,875	65,751
" 1869-70	336	72,731	157	11,088	10,931	83,359	72,428	3,221	69,207
" 1870-71	5,282	78,013	112	11,232	11,120	84,734	73,614	3,237	70,377
" 1871-72	12,930	90,943	42	8,945	11,220	84,375	75,472	3,431	72,041
" 1872-73	6,017	96,960	10	9,761	8,903	87,465	77,714	3,850	73,864
" 1873-74	5,994	102,954	67	9,037	9,751	86,752	77,782	4,076	73,706
" 1874-75	3,081	106,035	392	16,289	15,897	92,463	76,566	4,272	72,294
" 1875-76	3,165	109,200	41	15,762	15,721	89,077	73,356	4,394	68,962
" 1876-77	82	109,118	437	17,424	16,987	82,366	65,379	4,471	60,908
" 1877-78	1,192	110,310	303	17,869	17,566	87,740	70,174	4,491	65,683
" 1878-79	1,132	111,442	486	16,731	16,245	98,802	82,557	4,563	77,994
" 1879-80	3,984	115,426	348	14,882	14,534	104,449	89,915	4,648	85,267
" 1880-81	3,499	111,927	513	21,858	21,345	88,370	67,525	4,653	62,872
" 1881-82	...	111,927	1,097	19,904	18,807	97,374	78,567	4,069	74,498
Liability of work at end of 1881-82 for net loss and interest ...	...	...	4,549	775,999	Loss. + 771,450	2,765,379	Profit. 1,993,929	Loss. + 883,342	Profit. 1,882,037

(a) Excludes Indirect Charges, see Statement No. 1. (b) See Statement No. 8.
Note.—The minus entries in this Statement denote a loss in the operations of the year.

MADRAS,
30th August 1882.

(Signed) D. C. GORDON,
Examiner, Public Works Accounts.

CAUVERY DELTA SYSTEM

No. 9

Abstract A
Extensions and Improvements

Abstract B
Maintenance and Repair

Abstract C
Statement of Estimated Charges

1. Head Works-- Works 98 Buildings 28	2. Main Canals and Branches-- Regulations 1,084 Miscellaneous 50	3. Distribution Works-- Works 30	4. Drainage and Protection Works-- Works 197	1. Head Works-- Works 1,291 Buildings 10	2. Main Canals and Branches-- Works 19 Regulations 1 Miscellaneous 1	3. Distribution Works-- Works 24 Regulations 1 Miscellaneous 1	4. Drainage and Protection Works-- Works 100 Buildings 1 Miscellaneous 1	1. Head Works-- Works 2,457 Buildings 1	2. Main Canals and Branches-- Works 6,847 Regulations 1 Miscellaneous 1	3. Distribution Works-- Works 97 Regulations 1 Miscellaneous 1	4. Drainage and Protection Works-- Works 114 Regulations 1 Miscellaneous 1
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Madras, 30th August 1882

Signed D. C. GORDON,
Examiner, Public Works Accounts

CAUVERY DELTA SYSTEM

No. 10.—Capital Balance Sheet.

To Government for funds provided for the construction of Canal, viz:— For Productive Public Works 101,517	By Capital Outlay as per Statement No. 4 101,517
--	--

Madras,
30th August 1882

Signed D. C. GORDON,
Examiner, Public Works Accounts

CAUVERY DELTA SYSTEM

No. 11.—Revenue Balance Sheet

To Net Earnings as per Statement No. 8 1,993,529	By Government for net earnings actually realized and brought to account 1,993,529
--	---

NOTE.—These accounts are without any deduction for the collection of the same, the same being deducted as a percentage to Provincial Buildings and Roads Branch.

Madras,
30th August 1882

Signed D. C. GORDON,
Examiner, Public Works Accounts

CAUVERY DELTA SYSTEM.

APPENDIX A.

General Comparative Abstract of Receipts from the Work Year by Year from the Commencement to End of 1881-82.

Year.	Direct Receipts.													Indirect Revenue.	Share of Land Revenue due to or dependent on the Work.	Grand Total, Revenue.	Length of Canal Open.	Area of Land Irrigated.
	Assessments during Year.																	
	Balance of Assessment outstanding to end of previous Year.	Water-rates from Navigation.	Miscellaneous Receipts by Sale of Water.	Water-supply of Towns.	Receipts from Plantations.	Receipts from other Canal Produce.	Water-power.	Navigation Receipts.	Rents of Buildings.	Fines.	Miscellaneous.	Total.	Total Assessments together with the Balance of Previous Years.					
To end of 1866-67	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	
For 1867-68	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	
" 1868-69	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	
" 1869-70	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	
" 1870-71	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	
" 1871-72	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	
" 1872-73	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	
" 1873-74	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	
" 1874-75	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	
" 1875-76	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	
" 1876-77	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	
" 1877-78	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	
" 1878-79	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	
" 1879-80	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	
" 1880-81	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	
" 1881-82	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	
Total ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	

(a) In Madras there is no assessed revenue realized by the Public Works Department, these columns have therefore been left blank.
(b) Based on the approximate figures of Revenue furnished by the Board of Revenue.

MADRAS,
30th August 1882.

(Signed) D. C. GORDON,
Examiner, Public Works Accounts.

CAUVERY DELTA SYSTEM.

No. 5.—Details of Capital Expenditure for end to end of 1881-82.

Particulars.	During the Year 1881-82.		Total to end of the Year 1881-82.	
	During the Year 1881-82.	Total to end of the Year 1881-82.	During the Year 1881-82.	Total to end of the Year 1881-82.
I.—Works—				
Outlay on completed works ...	£ 77,821	£ 77,821	£ 77,821	£ 77,821
II.—Establishment ...	19,455	19,455	19,455	19,455
III.—Tools and Plant ...	1,945	1,945	1,945	1,945
Surplus ...	2,496	2,496	2,496	2,496
Total Outlay on Construction ...	101,717	101,717	101,717	101,717
Indirect Charges—				
Capitalization of depreciation of Land Revenue	6,076	6,076	6,076	6,076
Leave and Pension Allowances ...	4,134	4,134	4,134	4,134
Total Indirect Charges ...	10,210	10,210	10,210	10,210
Simple Interest ...	167,823	167,823	167,823	167,823
Grand Total ...	219,750	219,750	219,750	219,750

(a) All the details of the accounts of the year 1881-82 have been audited by the Auditor General, Madras.

Madras,
30th August 1882.

Signed, D. C. GORDON,
Examiner, Public Works Accounts.

37

CAUVERY DELTA SYSTEM.

No. 6.—Estimate of further Expenditure on Capital Account.

Particulars.	FURTHER EXPENDITURE.		
	During the Year ending 31st March 1883.	In subsequent Years.	Total.
I.—Works—	£	£	£
(1) Head Works ...	...	...	...
(2) Main Canals and Branches ...	...	...	...
(3) Distributaries ...	...	...	...
Total Works ...	...	52,875	(a) 52,875
II.—Establishment ...	...	13,219	13,219
III.—Tools and Plant ...	...	2,706	2,706
Total ...	...	68,800	68,800
Deduct value of Stock on hand to end of 1881-82.	...	..	...
Grand Total ...	..	(b) 68,800	68,800

(a) The distribution of this sum has not as yet been made.

(b) See statement No. 1.

MADRAS,
30th August 1882.

(Signed) D. C. GORDON,
Examiner, Public Works Accounts.

CAUVERY DELTA SYSTEM.

No. 7.—Revenue Account for the year ending 31st March 1882.

Expenditure.	£	Receipts.	£
Extensions and Improvements (Abstract A, Statement No. 9) ...	1,885	Direct—	
Maintenance and Repairs (Abstract B, Statement No. 9) ...	6,596	Receipts from Plantations ...	568
Charges for Establishment (Abstract C, Statement No. 9) ...	10,294	Rent of Buildings ...	7
Share of Charges for Tools and Plant ...	217	Other Canal produce ...	447
Indirect Charges ...	912	Miscellaneous and other Receipts ...	75
Refunds of Revenue ...	...	Water rates (realised in the Civil Department) ...	...
Net Profit as per Statement No. 8 ...	78,567	Total ...	1,097
Total ...	98,471	Enhanced Land Revenue (realised in the Civil Department) ...	(a) 83,344
		Old Maintenance Charges saved to Government ...	14,030
		Total ...	98,471

(a) In the absence of information from the Board of Revenue, the average of the three previous years has been taken.

MADRAS,
30th August 1882.

(Signed) D. C. GORDON,
Examiner, Public Works Accounts.

CAUVERY DELTA SYSTEM.

No. 8.—Net Revenue for the year ending 31st March 1882.

	£		£
To Interest on Capital Outlay as per Column 8, Appendix C. ...	111,892	By Net Earnings to end of the previous year ...	1,915,362
Surplus Profit after paying off the accumulated Interest ...	(a) 1,832,037	By Net Earnings during the year as per Revenue Accounts, Statement No. 7 ...	78,567
Total ...	1,993,929	Total ...	(b) 1,993,929

(a) Vide Column 10 of Appendix C.

(b) Vide Column 7 of Appendix C.

MADRAS,
30th August 1882.

(Signed) D. C. GORDON,
Examiner, Public Works Accounts.

CAUVERY DELTA SYSTEM

No. 2.—Statement of Ordinary Capital provided and utilized.

Year.	Grant of the Year.	Amount drawn in the Year.	Amount remaining undrawn.	Remarks.
<i>Ordinary Capital Grant</i>				
To end of 1866-67	£ 54,031	£ 54,031		At present the unutilized portion of the annual grant lapses at the close of each year. The sums therefore that are entered as the grants for the several years are also the amounts drawn in those years.
" 1867-68	— 8	— 8		
" 1868-69	— 10	— 10		
" 1869-70	— 10	— 10		
" 1870-71	1,067	1,067		
" 1871-72	199	199		
" 1872-73	— 71	— 71		
" 1873-74	1,686	1,686		
" 1874-75	3,371	3,371		
" 1875-76	2,932	2,932		
" 1876-77	— 81	— 81		
" 1877-78	148	148		
" 1878-79	21	21		
" 1879-80				
" 1880-81				
" 1881-82	— 62,999	— 62,999		
Total, Outlay to end of 1881-82				
Grant for 1882-83				
Total				

(a) The large recovery is due to adjustments to the debit of Productive Public Works, Capital Account, under instructions from the Accountant-General.

Note.—The *plus* entries in this statement indicate adjustments between ordinary and Productive Public Works according to the revised accounts.

MADRAS,
30th August 1882.

(Signed) D. C. GORDON,
Examiner, Public Works Accounts.

CAUVERY DELTA SYSTEM.

No. 3.—Statement of Capital for Productive Public Works provided and utilized.

GRANT OF THE YEAR.		Rate of Interest.		Amount drawn in the Year.	Amount remaining undrawn.	Remarks.
Year	14 Per Cent.	—	—	Total		
Ordinary Capital Grant.						
For 1867-68	£ 3,172	£	£	3,172	3,172	At present the unutilized portion of the annual grant lapses at the close of each year. The sums therefore that are entered as the grants for the several years are also the amounts drawn in those years.
" 1868-69	6,916	..	..	6,916	6,916	
" 1869-70	391	..	..	391	391	
" 1870-71	3,952	..	..	3,952	3,952	
" 1871-72	11,936	..	..	11,936	11,936	
" 1872-73	5,712	..	..	5,712	5,712	
" 1873-74	3,173	..	..	3,173	3,173	
" 1874-75	585	..	..	585	585	
" 1875-76	53	..	..	53	53	
" 1876-77	..	..	..	..	..	
" 1877-78	1,263	..	..	1,263	1,263	
" 1878-79	1,063	..	..	1,063	1,063	
" 1879-80	3,371	..	..	3,371	3,371	
" 1880-81	59,617	..	..	59,617	59,617	
" 1881-82	..	..	..	..	..	
Total to end of 1881-82.	1,01,717	..	..	1,01,717	1,01,717	
Grant for 1882-83 ..	..	..	..	..	..	
Total ..	1,01,717	..	..	1,01,717	1,01,717	See Statement No. 4.

(a) See explanation in foot-note (a) to Statement No. 2.

MADRAS,
30th August 1882.

(Signed) D. C. GORDON,
Examiner, Public Works Accounts.

CAUVERY DELTA SYSTEM.

No. 4.—Receipts and Expenditure on Capital Account.

Dr.		Cr.	
Amount Expended to end of 1880-81.	During 1881-82.	Amount to end of 1880-81.	During 1881-82.
£	£	£	£
77,821	...	101,718	...
19,455	...	101,718	...
1,945	...	1	...
2,496	...	1	...
101,717	...	101,717	...
6,076	...	6,076	...
4,134	...	4,134	...
111,927	...	107,823	...
107,823	...	219,750	...
223,819	...	223,819	...
Total		Total	
To Expenditure—		By Receipts—	
Outlay on works completed—		Funds supplied by Government—	
Works		For Productive Public Works	
Establishment		Total	
Tools and Plant		Less refunds to Government for receipts on Capital Account—	
Suspense		Productive Public Works	
Total, Outlay on Construction		Total	
Add Indirect Administrative charges—		Balance Net Receipts—	
Capitalization of abatement of Land Revenue		Productive Public Works as per Statement No. 3	
Leave and Pension Allowances		Total	
Total, Capital excluding Interest Simple Interest		Indirect Administrative Charges—	
		Capitalization of Abatement of Land Revenue	
		Leave and Pension Allowances	
		Government of India for Interest	
		Total	

(c) For details see Statement No. 5.

MADRAS,
30th August 1882.

(Signed) D. C. GORDON,
Examiner, Public Works Accounts.

section of it is divided into five sub-sections of six arches each, by means of small arches of 17 feet span, under each of which two sluices 6 feet broad are placed. The main arches of the south section are of 34 feet span each, and those of the north section of 33 feet 4 inches, thus affording a waterway of 1,020 feet in the former and of 1,000 feet in the latter, independently of the sluice arches which add 48 feet of waterway to each section.

The dam of the north section is $8\frac{1}{4}$ feet high and is divided into two steps each 4 feet broad, the upper being $3\frac{1}{4}$ feet and the lower 5 feet high. There are 3 feet of solid foundation above wells sunk 6 feet. There are two masonry aprons, the total breadth being 24 feet, the lower end being supported by a retaining wall on foundations similar to those of the dam. Below the retaining wall is a rough stone apron 24 feet broad. The piers of the bridge are 5 feet thick and $16\frac{1}{4}$ feet high to the springing line. The rise of the arches is 6 feet, and the breadth of the roadway $20\frac{1}{2}$ feet.

The dam of the south section does not differ from the above description in any essential particulars, except that it is only $7\frac{1}{2}$ feet high, broken into two steps $2\frac{3}{4}$ and $4\frac{3}{4}$ feet.

41. The area dependent on the Vadavár Channel and North Rajah Voikal was, in 1870-71, 74,617 acres. According to subsequent returns the total area irrigated on the north and south banks by the Lower Anicut, and the increase of revenue during the same years, due to the work, have been as follows:—

Year.	Area Irrigated.	Increase due to Work.
	ACRES.	RS.
1874-75	109,443	3,25,048
1875-76	109,521	2,68,404
1876-77	109,517	2,65,999
1877-78	108,649	3,17,032
1878-79	120,357	2,60,450
1879-80	123,412	3,39,767

CAUVERY DELTA SYSTEM.

[A Project partly old and partly constructed by the British Government.]

Statement of Capital sanctioned and provided by the Government to end of 1882-83.

DESPATCH OF THE SECRETARY OF STATE CONVEYING SANCTIONS.	No.	Date.	Particulars of Sanction.	ESTIMATE COST SANCTIONED.				CAPITAL OUTLAY PROVIDED, BEING OUTLAY TO END OF 1881-82 PLUS GRANT FOR 1882-83.				BALANCE OF SANCTIONED CONSTRUCTION COST FOR WHICH GRANTS HAVE NOT YET BEEN AUTHORIZED BY THE GOVERNMENT OF INDIA.			
				Construction Cost involving Actual and Direct Outlay.		Indirect or Estimated Items not involving Actual and Direct Cost Outlay.	Total.	Ordinary Outlay.	Productive Public Works.	Total.	Ordinary Outlay.	Productive Public Works.	Total.	Ordinary Outlay.	Productive Public Works.
				1	2										
				£.	£.	£.	£.	£.	£.	£.	£.	£.	£.	£.	£.
			A Project for restoring and extending Irrigation in the Delta of Cauvery (Tanjore District).	..	101,717	..	101,717	..	101,717	101,717	..	..	..	..	..
			Old outlay	..	..	..	..	..	..	..	..	..	..	..	..
			Sanctions by the Government of India (Register No. 20 I. of 1881-82) and the Public Works Department, No. 62 I., dated 17th February 1882.	..	..	..	..	..	..	..	..	..	..	..	..
			Constructing works for the regulation of the Cauvery and its branches in the Tanjore District	..	68,800	..	68,800	..	68,800	..	..	68,800	68,800	..	68,800
			Total	..	170,517	..	170,517	..	(a) 101,717	101,717	..	68,800	68,800	..	(b) 68,800

(a) See column 1 of Statement No. 3.

(b) For details see Column 2 of Statement No. 6.

MADRAS,
30th August 1882.

(Signed) D. C. GORDON,
Examiner, Public Works Accounts.

36. The cost of the River Conservancy and Water Regulation Establishment employed in the delta is as follows:—

	RS.
17 Superintendents at Rs. 7 to 17½ ...	181½
127 Lascars at Rs. 4 to 6 ...	564
Total per month ...	745½

It will be readily understood that where channels carrying very large volumes of water and which run above the level of the surrounding country, such as the Cauvery and Vennár with their branches, have to be dealt with, the proper conservancy of their banks, and a prompt dealing with any encroachments, is of the very highest importance. Wooden groynes combined with the planting of nana

grass* and wild cane are principally employed in Tanjore for the training of the rivers, to protect the margins, &c., and a portion of the duties of the conservancy establishment consists in superintending and carrying out these works.

37. This brief account of the Cauvery Delta System may here be concluded. To render the narrative complete a few words are added in an appendix, describing the Lower Coleroon Anicut.

The narrative is also followed by the usual financial statements prepared in the authorised forms by the Examiner, Public Works Accounts, and is accompanied by a sketch-map illustrative of the delta and of its principal rivers, channels, and component works.

(Signed) C. VINCENT,
For Chief Engr. for Irrigation

CHEPAUK,
13th July 1882.

APPENDIX

THE LOWER COLEROON ANICUT.*

38. The reasons that rendered necessary the construction of this anicut at the same time as that of the Upper Anicut have been given in paragraph 12. On the north side of the river the Vadavar Channel feeding the large Veeranum Tank, (of which the bank is 12 miles long and the contents are about 5,400 million cubic feet), and four minor channels, had to be ensured against a failure of supply. A new channel, called the North Rajah Voikal, was excavated for the supply of the area dependent on the last mentioned four channels; and another new channel, called the South Rajah Voikal, was excavated for the supply of a small area situated in the extreme north-east corner of the Cauvery Delta, and which was not commanded by any of the Delta Channels.

39. The first estimate for the Lower Anicut was sanctioned on July 31st, 1835, and amounted to Rs. 1,35,236. The dam was built to a height of 6 feet during the first year of construction, and two feet were added in 1837, but in the same year a formidable breach was made in the work by a high flood, and Rs. 30,926 had to be sanctioned on May 2nd, 1838, for the necessary repairs. The work was again damaged in 1862, and in 1864 a large portion of the southern section of the dam gave way, the cost of the repairs amounting to Rs. 1,10,858. The principal items of the capital expenditure on the work are shown in the following table:—

Year.	Work done.	Cost
		RS.
1836 ...	Construction of dam ...	73,740
1856-57 ...	Extension of dam and construction of bridge ...	1,51,450
1863-69 ...	Putting in retaining walls and lower apron.	69,676

40. The work is situated about 67 miles below the Upper Anicut. It is built in two sections, with an island 1,285 feet broad between them. A bridge has been built immediately above the dam. Each

* The irrigation under this work was excluded from the Cauvery Delta System in Proceedings of Madras Government, No. 2141 of August 16th, 1876.

33. The average cost of *repairs* during the five years ending with 1880-81 has been Rs. 62,146 for *works* outlay.

The total expenditure on Revenue Account to the end of 1880-81 is shown below:—

	RS.
Extensions and Improvements	1,02,783
Maintenance and Repairs.	6,64,641
	<u>7,67,427</u>
Unclassified Works	36,62,547
	<u>44,29,974</u>
Total Works	11,29,974
Establishment	12,80,129
Tools and Plant	1,12,064
	<u>25,22,167</u>
Total	58,22,167
Share of Collection Charges in Civil Department	14,71,975
	<u>72,94,142</u>

34. The total receipts due to the system to the end of 1880-81 are—

	RS.
In Public Works Department	34,533
Share of Land Revenue	2,04,41,996
Old Maintenance Charges saved	60,60,735
	<u>2,65,39,364</u>

The total *net* receipts due to the system are thus Rs. 1,92,44,922, excluding interest and indirect charges. These, to the end of 1880-81, amount respectively to Rs. 10,78,233 for interest, and Rs. 2,72,091 for leave and pension allowances, or a total of Rs. 13,50,324, so that the total *net* receipts including these charges are Rs. 1,78,94,598.

35. The net results due to the system in individual years are shown for various years in its history and for the last four years in a concise form in the following table:—

Year.	Capital Outlay to end of Year.	Area Irrigated.	RECEIPTS DURING YEAR DUE TO THE WORKS.					Working Expenses.	NET RESULTS EXCLUDING INTEREST.		Interest Charges.	NET RESULTS INCLUDING INTEREST.		Total Land Revenue of Tanjore District.
			Water rates, &c.	Collected with Land Revenue.	Old Maintenance Charges saved.	Total.	Surplus Revenue.		Rate per cent. on Capital Outlay.	Surplus Revenue.		Rate per cent. on Capital Outlay.		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	
1801	..	..	RS.	RS.	RS.	RS.	RS.	RS.	RS.	RS.	RS.	RS.	RS.	
1830	..	Not stated.	..	..	..	..	..	..	..	..	..	..	31,27,714	
1837-38	..	646,820	..	1,79,491	..	..	..	..	..	..	..	..	33,87,506	
1846-47	..	668,386	..	6,09,427	..	..	..	..	..	..	..	..	36,89,861	
1856-57	..	704,591	..	3,72,598	..	..	..	..	..	..	..	..	42,23,812	
1866-67	..	709,305	..	5,57,563	..	..	..	..	..	..	..	..	42,03,782	
1867-68	..	741,454	..	6,36,720	1,34,683	7,73,840	1,16,651	6,57,189	101.65	27,017	6,30,172	97.37	41,00,297	
1872-73	..	773,217	2,437	7,34,352	1,34,683	8,69,134	97,612	7,71,522	79.68	38,502	7,33,020	76.70	43,04,432	
1877-78	..	794,722	3,031	7,34,107	1,34,683	8,71,821	1,78,470	6,93,351	62.85	44,913	6,48,438	68.78	41,72,816	
1878-79	..	805,033	4,867	8,47,722	1,34,683	9,87,262	1,67,288	8,19,964	73.68	46,632	7,74,332	69.48	42,63,909	
1879-80	..	814,366	3,437	9,04,202	1,34,683	10,42,372	1,48,881	8,93,541	77.41	46,477	8,47,064	73.39	43,16,850	
1880-81	..	8,12,078	5,127	8,38,677	1,34,683	9,68,487	2,24,365	7,44,122	66.48	46,527	6,97,595	62.33	44,57,000	

* A recovery of Rs. 34,989 was effected during the year.

mortar. Its crest is about 7 feet above the bed of the Cauvery, and its breadth averages about 50 feet. A portion is built in the Ogee form, and a portion in a series of steps, the foot of the dam being protected by rough stone. Ten sluices, 3 feet broad, with their sills 10 feet below the crest, were built in 1830. A bridge of 30 arches of 32 feet span following the wavy line of the dam was built over it in 1838, the estimate, amounting to Rs. 7,021, being sanctioned on October 11th. A supplemental estimate of Rs. 1,491 was sanctioned on September 3rd, 1839. The waterway of the anicut is 960 feet, which is reduced to 735 feet by dam-stones. These, however, will be removed, and proper screw-shutters substituted under the estimate detailed in paragraph 19. Other improvements to the anicut to be effected from the Rs. 55,590 are the strengthening of the foundations and aprons and the raising of the arches 5 feet. With a maximum flood, it is calculated that the Grand Anicut will then discharge 85,000 cubic feet per second.

25. The third surplus work is the Coviladi Calingulah. It is situated nearly $2\frac{1}{2}$ miles east of the Grand Anicut, and was built in 1839. It consists of a dam 7 feet high, broken into two steps $4\frac{1}{2}$ and 4 feet high, and 3 and 4 feet high respectively, with dam-stones 2' 2" high and an apron 10 feet broad with retaining wall. The length of the dam is 300 feet, but the available waterway is reduced by the dam-stones to 254 feet. Above the dam is a bridge of 9 arches of 30 feet span. The maximum discharging capacity of the calingulah is about 7,236 cubic feet per second.

26. The fourth and last surplus work is the Vadavagudi surplus sluices, situated about 6 miles below the Cauvery-Kodamurti Regulators. The work consists of a massive weir pierced by twelve vents of $4 \times 3'$ each, the floors of which are 8 feet below its crest. The width of the crest is $37\frac{1}{2}$ feet. The weir is protected below by one apron 30 feet broad, and by a second one 8 feet broad resting on a retaining wall. In front there was originally an apron $15\frac{1}{2}$ feet broad; but on account of percolation a retaining wall $3\frac{1}{2}$ feet broad and 9 feet high was added in 1861 at a cost of Rs. 2,081. The length of the crest of the weir is 109 $\frac{1}{2}$ feet, reduced by means of dam-stones to an effective length of 81 feet. The maximum

discharging capacity of the work is 3,566 cubic feet per second.

There are no surplus works on any of the other rivers of sufficient importance to be referred to separately.

(3.) Sundry Works.

27. It will be sufficient to enter in a list such sundry works as have from time to time been sanctioned and charged against Capital Funds, adding a few remarks on the more important.

List of sundry works in the Cauvery Delta sanctioned from time to time and charged to Capital Account.

Item No.	Name of Work.	ESTIMATE.		Expenditure.
		When sanctioned.	Amount.	
			RS.	RS.
1	Improving the Valavanar River	Budget of 1850.	7,244	7,244
2	Drainage Channels	Do.	4,741	4,741
3	Calingulah and bridge across Govinden Kalagam	Do.	3,647	3,315
4	Embanking the Verasholen and Nandalur	Budget of 1851.	3,011	2,790
5	Reconstructing Perambur head	Do.	2,816	2,764
6	Improving Shobavanar	Do.	2,432	2,197
7	Altering course of Vellayar	Do.	3,771	3,771
8	Sitar head-works	Do.	4,740	1,320
9	Improving Adapar	Budget of 1852.	7,762	6,086
10	Do. Vadavár	Do.	9,364	8,713
11	Do. Pillay Voikal	Do.	7,870	5,830
12	Do. Terumani	Do.	2,833	2,812
13	South bank of Coleroon	Do.	5,159	4,707
14	Embanking Oopnar	Do.	4,027	3,799
15	Improving Sandana Channel from Verasholen	Budget of 1856-57.	5,000	3,526
16	Tulnoyer Cottagam	Do.	26,757	26,515
17	Altering the course of Umbanar, improving Verasholen and Port of Tranquebar (Rs. 15,000 more contributed from Pagoda Funds)	Do.	8,091	8,344
18	Channel from the Adapar Anicut	Do.	8,579	8,354
19	Improving the Muniyár for navigation	Do.	35,000	33,540
20	Reconstructing Adapar Anicut	Do.	3,649	3,365
21	Dam at the head of Athaveeramananar and across Vennár	Do.	2,713	2,627
22	Improving the head of Vadavár	G.O., No. 1790, of June 6, 1866.	5,184	5,184
23	Surplus dam on Anunda Cauvery	G.O., No. 785, of Mar. 14, 1870.	7,400	7,452
24	Ponavassel Channel	G.O., No. 2881, of Dec. 6, 1872; and G.O., No. 620 I., of Sept. 27, 1880.	25,430	22,312
	Total ..		1,97,220	1,81,038

Only Nos. 13, 16, 19, and 24 of the above works need be specially referred to.

28. *Item No. 13.*—From what has been said before as to the value of the Coleroon as the natural drainage channel of the Cauvery Delta, and in view of the present intention to turn all the water into it that is not actually required for purposes of irrigation, it is evident that the proper conservancy of the Coleroon, which includes, of course, the formation and maintenance of embankments on, at any rate, one side of it, is of the very highest importance. It is recognised that until the inequalities in the discharging capacity of the Coleroon are remedied by steadily-

Cauvery. It was, however, considered by the Chief Engineer for Irrigation after a minute inspection of the Cauvery works, that owing to the broad and shallow nature of the beds of the rivers, which naturally led to a constant shifting of the deep channels, these works did not fulfil so perfectly as was to be desired the purpose for which they were designed, and that therefore in designing works for the branches of the Vennár it would be better to resort to the system of division sluices, by which means the supply could be kept absolutely under control under all circumstances. The estimates were accordingly revised, were forwarded to the Government of India with letter No. 1616, of July 6th, 1870, and

were sanctioned in P.M.G., No. 2072, of letter No. 325 I., of August 29th, 1870 August* 9th, 1870

They amounted to Rs. 2,11,195, of which amount Rs. 13,955 were debitable to Local Funds on account of bridges, leaving Rs. 1,97,210 chargeable to Productive Public Works. The total of the estimates was divided as follows:

	Rs.
Vetár Regulator	87,810
Pamaniár and Corayár do. ...	65,775
Pandaviár do.	31,561
Vellayár do.	26,046

The works executed were—

	River.	Proportion to be carried	Number of Vents.	Description of Shutters.
1	Vennár	63 per cent.	17 of 10 feet	20 of 4 feet (centre). 10 of 5 feet (sides). 9 of 4 feet (centre). 8 of 5 feet (sides). 11 of 4½ feet.
2	Vetár	37 "	27 of 10 feet	4 do. 9 do. 8 of 2½ feet.
3	Pamaniár	16 "	16 of 10 feet	8 of 4 feet.
4	Corayár	34 "	11 of 10 feet	4 of 4 feet. 4 of 3 feet. 3 of 4 feet. 3 of 3 feet.
5	Pandaviár	41 "		
6	Vellayár	56 "		
7	Vennár	63 "		
8	Vellayár	37 "		

Subsequent sanctions raised the estimates to Rs. 2,15,174, and the actual cost chargeable to Productive Public Works has been Rs. 2,07,733.

22. The last regulating work that need be specially referred to is the regulator built at the point where the Tirumalrajen

branches off from the Kodamurti. The irrigation affected is—

	ACRES.
Under the Kodamurti ...	46,320
Do. Moodicondanar...	36,477
Do. Tirumalrajen ...	14,662

It was recognised in 1876 that the latter obtained far more than its fair share of water, and that therefore some means of regulating the supply were essential. The first estimates, amounting to Rs. 31,380, were sanctioned by the Government of India from Ordinary

* P.M.G., No. 374 I., of Funds in letter No. October 4th, 1877. 266 I.,* of September 11th, 1877.

These provided for sixteen vents of 10 feet each on the Kodamurti, and for ten vents of the same dimension on the Tirumalrajen, with shutters. 4½ feet high. The sanctioned amount proved insufficient, and after a first revised estimate for Rs. 43,024 had been sanctioned in G.O., No. 438 I., of July 9th, 1880, a final estimate for Rs. 46,960 was approved in G.O., No. 204 I., of March 4th, 1882.

(2.) Surplus Works.

23. Reference has been made in paragraph 9 to the under-sluices built in 1829 and subsequent years, that constituted the first successful endeavours to cope with the difficulties under which the Cauvery then laboured. The surplus works at present existing will now be referred to in rather more detail. The first is known as the 150 yards calingulah, and is situated about 3 miles below the Upper Anicut. It consists of a wall 4 feet high and 5½ feet broad, resting on a basement of 3 feet of masonry above 6 feet wells, with a rough-stone flooring 6 feet broad in front and 22 feet in rear. There is a bridge over the work of 19 arches, 17 being of 20½ feet and 2 of 18½ feet span. The width of the bridge between parapets is 3 feet, and the parapets are 1½ feet high. The clear waterway is 388½ feet, and the maximum discharging capacity of the work is about 5,200 cubic feet per second, the rise of the backwater in high floods preventing any larger volume from going over. The dam was built in 1834 and the bridge carried over it in 1838. The cost of the former was Rs. 17,002.

24. The second surplus work is the Grand Anicut. This is 1,080 feet long, and consists of rough blocks of granite on a mud core, the outside being covered with a facing of roughly dressed granite in

receives the drainage from 300 square miles below its head, which it has no means of passing off, so that if a storm occurs when it is receiving a full supply breaches must inevitably take place. The power of shutting off the supply at the head will evidently meet the difficulty. A revision of the estimates for the head-works was accordingly undertaken, and they were finally forwarded to the Government of India with docket No. 645 I., of September 27th, 1881, and provisionally sanctioned in letter No. 62 I., of February 17th, 1882, printed in P.M.G., No. 208 I., of March 6th, 1882.

The revised estimates are divided as follows:—

	RS.
Grand Anicut alterations ...	55,956
Dam at Vennár head ...	12,295
Head-sluice to Cauvery ...	1,62,000
Lock and basin ...	42,000
Head-sluice to Vennár ...	1,24,000
New channel to do. ...	71,550
New head to Pillay Voikal... ..	3,015
Compensation for land ...	35,550
Buildings ...	7,880
Sundry works ...	14,480
Total Works ...	5,28,750
Establishment 25 per cent... ..	1,32,187
Tools and Plant ...	27,063
Total, Direct Charges ...	6,88,000
Indirect Charges, assuming five years for the com- pletion of the works ...	1,53,347
Grand Total ...	8,41,347

20. The idea of impounding a portion of the flood waters, as mentioned in the last paragraph, had occurred to Captain Cotton in 1834 with a view to its subsequent utilisation for irrigation. Subsequently also the question had often been discussed, without any practical action being taken, but in 1865-66 some surveys and levels were prepared.

Some further work was carried out in 1869, but it was not till 1880 that really definite proposals as to the formation of a reservoir were submitted. The chief point of these proposals, which still await final investigation, was the formation of a large reservoir to hold 27,000 million cubic feet on the Bhaváni, which is one of the principal tributaries of the Cauvery. Its drainage area is 2,480 square miles, which is about one-eleventh of the whole drainage basin above the Upper Anicut, but the supply furnished by the Bhaváni is one-sixth of the total supply. The area

submerged by the proposed reservoir would be 30 square miles, and the maximum depth of water against the dam, which would be of masonry, is 100 feet. The approximate cost of the dam is 18 lakhs, and that of a canal 100 miles long, with subsidiary works, to supply land now un-irrigated is 22 lakhs. It is calculated that on an average 50,000 million cubic feet of water would be available each year for the Tanjore Delta irrigation, or a two months' supply for the whole irrigated area; also that 25,000 million cubic feet would be available for the new irrigation, of which there would be from 75,000 to 100,000 acres. The anticipated return on the expenditure is $4\frac{1}{2}$ lakhs from the Tanjore Delta and Rs. 5,62,500 from the new irrigation. The total is Rs. 11,02,500, or 27 per cent. on the anticipated expenditure of 40 lakhs. It must, however, be added that the whole of the above figures are liable to revision whenever the scheme is completely worked out.

21. The regulating works on the principal branch rivers will now be briefly referred to. The first to be considered are those on Vennár. This river, as will be seen from the figures given in paragraph 15, is scarcely inferior to the Cauvery, considered with regard to the irrigation dependent on it. It has five principal branches, viz.:—

	Irrigating.
The Vetár ...	94,541 Acres.
" Pamaniar ...	33,546 "
" Corayár ...	113,216 "
" Pandaviár ...	21,365 "
" Vellayár ...	35,713 "

The Vetár had first been improved on an estimate, amounting to Rs. 23,063, sanctioned on March 21st, 1834. The river was then a mere drainage channel, and its bed had been so deepened that the irrigation under it had failed, the average annual loss being Rs. 36,000. The estimate provided for an anicut across the Vetár, and for the excavation of two channels from it, with head-sluices, &c. All the branches from the Vennár were, however, as much in need of regulating works at their head as those from the Cauvery, and for similar reasons. The first estimates prepared in 1869,* and amounting to Rs. 93,150, provided for regulators to the above-mentioned channels similar in design to those then under execution on the

* P.M.G., No. 3293, of October 12th.

was sanctioned in G.O., No. 270, of January 24th, 1868.

The actual cost of construction was Rs. 11,731.

19. It will have been evident from what has been said in the last few paragraphs, regarding the proportion of the supply taken off by each succeeding branch from the Cauvery before the construction of the regulating works, that the latter river in no case secured its proper supply of water. This evil being cumulative, it is not surprising that the lowest reach of the river but very seldom secured a supply sufficient for the cultivation under it. Not unnaturally too, this condition of affairs led non-professional observers to the erroneous conclusion, that the only remedy required was the removal of silt from the lower portion of the Cauvery. This of course would have done little or no good, but the undeniable lack of water in the eastern portion of the delta, which resulted in average remissions of about Rs. 70,000 a year, led to an extended investigation into the circumstances of the delta, and to the preparation of the estimates for some of the regulating works which have been described. Another result of the investigation was, however, to show very clearly the enormous damage to which the delta was subject in consequence of the frequent recurrence of high freshes, which, owing to the enormous length of embankment to be maintained, to deficiencies in the powers of legal control by Public Works Officers over such works, and to deficiencies in the actual staff of officers, almost invariably found a weak point in some of the embankments, burst through, spread over the surrounding country, caused much loss of produce, and necessitated very heavy expenditure for repairs. Such expenditure was estimated in 1870 at not less than Rs. 60,000 annually, and subsequent experience, *e.g.*, the floods of 1880, does not tend to modify this estimate.

Accordingly, the * Captain, now Lieut.-Col. Mead, R.E., officer who undertook the investigations very strongly urged the construction of a complete system of head-works, with sluices, &c., so as to have the whole supply of the delta absolutely under control. Three sites were proposed: the first, at the Upper Cauvery dam; the second, just below the 150 yards cullingah; the third, just below the Grand Anicut. The

consideration of the proposal was postponed at first for some little time, partly in deference to a suggestion from the Secretary of State that

Despatch No. 27 of September 14th, 1867, in P.M.G., No. 3248, of October 19th, 1867. reservoirs in the upper basin of the river might possibly prevent the recurrence of floods,* or

that the extension of the Upper Coleroon Anicut across the island dividing it might render it possible to pass them off; and partly in consequence of an assumption originated by Colonel Strachey, R.E., Inspector-General of Irrigation Works, during a flying visit to the delta in March 1867, that the bed of the Cauvery was gradually rising, and that a serious catastrophe must sooner or later occur. Careful investigation, however, showed clearly that neither the reservoirs nor the extension of the Upper Coleroon Anicut would have the full effect required, and that the rising of the bed of the Cauvery was not actually occurring, though even if there were any danger of its so doing, the best preventive measure would be the construction of the head-works previously alluded to. Estimates for these were accordingly prepared, the site selected being that immediately below the Grand Anicut. They amounted to Rs. 5,20,260, and were forwarded to the Government of India for sanction on September 3rd, 1870, with letter No. 2117. In reply, the Government of India requested in letter No. 81 I., of March †

† P.M.G., No. 916, of March 28th, 1871. complete investigations

might be made as to the capacity of the Coleroon to carry off all the flood water proposed to be turned into it at the Grand Anicut. These investigations were at once commenced, but various circumstances prevented their being completed till February 1881, when a full report on the subject was submitted. In a review of this report in P.M.G., No. 363 I., of June 9th, 1881, it is shown (1) that the maximum volume the Coleroon is likely to be called upon to dispose of is 285,000 cubic feet per second, which it is capable of doing, and (2) that till the head-works are constructed, the occurrence of floods in the Cauvery and Vennár is inevitable. Although a full supply is obtained by the Cauvery alone when there is a depth of 5 feet on the Upper Anicut, the Vennár requires a depth of 6·4 feet; and then the Cauvery is over-supplied. Moreover, the Vennár

last described, the level of the floors being—

Cauvery Section.

		Feet above Datum
7 arches	...	211
2 flanking arches	...	211 $\frac{1}{2}$
2 do. do. ...	...	212
2 do. do. ...	...	213

Kodamurti Section.

3 centre arches	...	211
Flanking sluice arch	...	209 $\frac{1}{2}$
2 do. arches	...	212
2 do. do.	...	213
2 do. do.	...	213 $\frac{1}{2}$
2 do. do.	...	214

The dam rests on the upper retaining wall of the bridges built over it, which each consist of thirteen arches of 34 feet span; but in the Kodamurti section the fifth arch from each end is broken into two small 14 $\frac{1}{2}$ feet arches, under each of which two 5 feet sluices are provided. There is nothing peculiar in the construction of the work, so the detailed description of it may be dispensed with. The regulators are built at right angles to the course of their respective streams, the angle between them being 156 feet, and the adjoining side wings being protected by a semi-circular nose of 17 feet radius. The total cost of the work was Rs. 99,445; but the Local Fund Board of Tanjore gave a contribution for the bridges, which has reduced the amount chargeable to Productive Public Works to Rs. 65,145. Rs. 6,300 for extending the aprons were sanctioned in G.O., No. 795 of March 13th, 1873; the expenditure has been Rs. 6,193.

17. The next regulating work is that at the head of the Arasillár river. This consists as before of a dam across the two rivers, rising in steps, the following being the arrangement:—

	Feet above Datum	LENGTH	
		Arasillár	Cauvery
Crest of dam	156.5	60	156
1st step	157.5	70	60
2nd do.	158.5	37	41
1st apron	155.5	6 broad.	10 $\frac{1}{2}$ broad.
2nd do.	154.5	9	None

There is no bridge over it. The dam consists of a solid wall with a minimum depth of 10 feet, protected by an apron with retaining wall. The two sections

are connected by a circular nose of masonry. The estimated cost of this work was Rs. 16,970, sanctioned in G.O., No. 270, of January 24th, 1868. The actual expenditure has been Rs. 16,057. The Arasillár runs on a lower level than the portion of the Cauvery below their bifurcation, and before the construction of the works it carried off about 39 per cent. of the water in high floods, and from 50 to 100 per cent. in low floods. The proportion of the cultivation under it to that under the Cauvery below it is 34.5 to 65.5. The effect of the regulator has been that the proportion absorbed by the Arasillár in high floods remains as before, but that when the water is low it never now takes more than 50 per cent. of the supply. In building the regulators a supply larger than that really required by the cultivation under it was allowed to pass down the Arasillár to obviate the possibility of any complaints being made by the French authorities, who have a large area in Karikal dependent on it.

18. The next and last regulating work on the Cauvery is at the point where the Verasholen River takes off. The regulator here is precisely similar in design to that of the Arasillár, the levels and lengths being as follows:—

	Feet above Datum.	LENGTH.	
		Verasholen.	Cauvery.
Crest	126.5	83	50
First step	127.5	15	60
Second do.	128.5	30	30
First apron	125.5	9 broad.	6 broad.
Second do.	124.5	None.	9 do.

The dams are connected by a circular wall, but there is no bridge.

Before the regulator was built the Verasholen took off 56 per cent. of the total supply in high floods, 50 per cent. in ordinary floods, and 33 per cent. in low floods, the area of cultivation as compared with that of the Cauvery below the division being 44 to 56. The effect of the regulators has been that during periods of the full theoretical supply the division is now in proportion to the areas irrigated, while in high floods about 50 per cent. of the supply goes down each.

The estimate for the Cauvery-Verasholen dam amounted to Rs. 11,270, and

When the improvements in the delta were first under consideration, it was found that a ridge of rock existed half a mile below the Vennár head, which prevented its receiving anything like a full supply. A portion of this rock was removed in 1829 and 1834, and at the same time a sluice, since abandoned, was put into the south bank of the Cauvery three-quarters of a mile below the head, from which a channel entered the Vennár below the ridge.

The first effect of the Upper Coleroon Dam was, as already mentioned, to turn a large volume of water into the Cauvery, which had the natural consequence of scouring out its bed. The results of this on the rivers taking off from the Cauvery were either that their heads remained at their previous level, in which case a serious diminution of supply occurred, or else that they also were scoured out, in which case some of the head of water necessary to command the delta irrigation was lost. In either case it seemed necessary to adopt some measure for controlling the supply, and in this view an estimate was submitted to Government on November 29th, 1838, amounting to Rs. 46,016, of which the principal items were Rs. 36,397 for constructing an anicut across the Cauvery at the head of the Vennár River, and Rs. 2,319 for constructing a temporary anicut across the Cauvery at the head of the Kodamurti. It would appear, however, that no action was taken in the matter at the time, probably because the construction of the Upper Cauvery Dam was then under consideration, and it was hoped that this would render the proposed works unnecessary. Such, however, was not the case. The temporary measures that were adopted were inadequate to meet the circumstances, and accordingly, in 1848, an estimate amounting to Rs. 49,924, was submitted for the Cauvery and Vennár regulators. This was forwarded to the Government of India for sanction on August 17th, 1848, but the work does not appear to have been executed till 1851, being entered in the budget for that year.

The regulator, as existing, consists of a floor rising in steps from the centre to the sides in each river, which is spanned by a bridge $7\frac{1}{2}$ feet broad between parapets, with recesses to enable carts to pass. The bridge over the Cauvery consists of thirty 30 feet arches, and two sets of sluices amounted to Rs. 65,700, and was sanctioned in G.O. No. 775, of March 14th, 1869.

It is similar in principle to the regulator of three vents of 6 feet span each. That over the Vennár has eighteen 30 feet arches, and one set of sluice similar to those in the Cauvery. The levels on which the dam is built are as follows:—

Floor of Cauvery Dam.

		Feet above Mean Sea Level.
2	Centre arches ...	45.6
4	Arches on each side ...	46.1
1	Set of sluices on each side ...	45.1
4	Arches on each side ...	46.1
3	Do. do. ...	46.6
3	Do. do. ...	47.0

Floor of Vennár Dam.

1	Set of sluices in centre ...	44.9
8	Arches on north side ...	45.9
7	Do. south side ...	
1	Do. north side ...	46.3
2	Do. south side ...	

The dam stands on a basement of 3 feet of masonry over 6 feet wells of 3 feet interior and $4\frac{1}{2}$ feet exterior diameter, filled with concrete. An apron of roughly dressed granite over 1 foot of masonry extends for 12 feet beyond the cut-waters of the piers, and the work is further protected above and below by means of rough-stone aprons, 6 and 12 feet broad respectively. The piers are $11\frac{1}{2}$ high and 5 feet thick, the rise of the arches being 6 feet. The nose of the piece of land dividing the two works is protected by wing-walls, between which is a sluice of three vents of 6 feet for the supply of 8,136 acres under the Pillay Voikal Channel. A further supply to this channel is secured by means of the Cutchamungalum Anicut, an old native work 8 miles below the head of the Vennár. The Cauvery-Vennár Dam was much damaged by the floods of 1853, and Rs. 13,697 were sanctioned on March 21st, 1854, for the necessary repairs.

16. The regulating work next in order on the Cauvery is the Kodamurti regulator. The object of this work is to divide the water in low floods somewhat in proportion to the area dependent on the two streams, and in high floods to continue to take advantage of the capacity of the Kodamurti and its branches to carry flood water. Before the regulator was built the Kodamurti in high or ordinary floods took 46 per cent. of the water at the point of bifurcation, and in low floods from 50 to 54 per cent.; while the proportion of cultivation under it as compared with that under the Cauvery below its offtake is only 28 to 72. The estimate for the work

a rough-stone apron 12 feet broad. The portion of the dam rebuilt in 1870 is a rather stronger section than that previously constructed. There is a narrow bridge 6 feet between parapets over this anicut, consisting of 50 arches, exclusive of seven sluice arches, with spans varying from 30 to 34 feet over the southern section, and 12 arches, of spans from 53 feet 4 inches, to 35 feet 3 inches over the northern section, exclusive of two sluice arches. The total length of the dam is as follows:—

	Feet	Fathoms
North Branch. (Sluices ... 48)	333	
Island ... 315 1/2)	660	
South Branch. (Sluices ... 111)	1,736	
(Dam ... 1,625)		
	2,789 1/2	

On the north bank two channels are taken off for the irrigation of lands in the Trichinopoly District, viz:—

Channel.	Area in Acres	Area in Acres
Iyen ...	8,862	74,846
Peruvally ...	7,698	48,060

On the south side the dam runs into the island of Srirangam, the head of which was first protected in 1838, an estimate of Rs. 2,489 being sanctioned on March 7th. The protection now consists of a masonry wall 14 feet high which runs round the point of the island and is connected on the south side with the northern flank of the Cauvery regulating dam. The wall is of irregular form, being broken into two flights of steps for the convenience of natives who came to bathe in the sacred stream. The Cauvery dam consists simply of a flooring 3 feet thick, of which the upper foot is in cut-stone, on the level of the bed of the river, resting on a double row of wells of 4 1/2 feet exterior diameter and 6 feet deep filled with concrete. The upstream side is protected by a rough-stone apron 9 feet broad, and the downstream side by one of 21 feet broad. There is also a row of wells 12 feet from the flooring put in to carry the rear retaining wall of a bridge of 41 arches of 40 feet span, which was designed and the foundations for which have been built, but which has never been completed. The flooring is 1,950 feet long from wing to wing, and has two steps at 75 feet from either end. The first step is 1-4 feet and the second 2-4 feet

above the level of the flooring, these portions being two feet broad and faced with cut-stone. There is generally about 2 feet of sand above the centre of the dam when the river is dry, small portions of which are therefore visible.

The actual capital expenditure on the two works is recorded in the accounts as follows:—

Coleroon Dam.		RS.
Constructing Anicut ...		83,401
Improvements to do. ...		23,719
Sluices in north and centre branches and front apron		6,369
Raising rear aprons and constructing wings at the head of the island ...		18,542
Minor improvements ...		2,151
Lengthening anicut ...		18,736
Extending north branch and constructing wooden bridge ...		8,131
Extending apron and constructing masonry bridge		18,982
Enlarging under-sluices and completing bridge ...		3,120
Constructing wings and front aprons to sluices (1866) ...		1,135
Total Coleroon Dam ...		1,84,286

Cauvery Dam.		RS.
Constructing Anicut ...		56,714
Grand Total ...		2,41,000

14. The description of the principal works below the head of the delta will now be undertaken. It will be convenient to divide the description into—

- (1) Regulating Works.
- (2) Surplusage do.
- (3) Various do.

(1) *Regulating Works.*

15. The first river branching off from the Cauvery is the Vennár, which supplies water to the whole of the southern portion of the delta. The area of irrigation under each may be taken approximately as follows:—

	ACRES.
Under Cauvery ...	429,000
Do. Vennár ...	393,000

The proportion of water taken by the Vennár from the Cauvery is 22 per cent. in high floods and 30 per cent. in low floods, which is not a fair distribution. It is, however, the best that can at present be made, because the Vennár is unable to void water below its head, while the Cauvery can do so easily by means of its surplus works.

to have been incurred till 1843, when an important estimate of Rs. 24,939 was sanctioned on January 19th, for the following works :—

Extending the anicut across the island between the south and centre sections.	Rs. 14,437
Lowering the crest of the centre section (700 feet long) 2 feet.	7,592
Erecting a wooden foot bridge.	3,000

12. It is necessary to go back a little to point out the reasons that rendered necessary this lowering and extension of the Upper Coleroon Anicut. Its real effect had been to practically reverse the conditions of the two main branches of the Agunda Cauvery; almost the whole supply being turned by it into the Cauvery, very much in the same way as had previously been done by the temporary dam, and with similar disastrous effect, the surplusings being quite inadequate to control the great volume of water poured into the river. At the same time great erosion of the bed and banks took place near the head, and the Coleroon above the anicut fast became silted up, the under-sluiques, only 41 feet in total width, that had been originally provided, being quite inadequate to keep the channel clear. The level of the water below the anicut thus became naturally very much diminished on account of the smaller supply, to the very serious prejudice of the cultivation in the lower reaches of the river. This lowering of the water level in the Coleroon had been clearly foreseen by Captain Cotton when preparing his estimates for the Upper Anicut, and he had at the same time drawn up estimates for a Lower Anicut at the head of the Vadavār Channel to the Veerannam Tank. These, amounting to Rs. 1,35,236, were sanctioned on July 31st, 1835, at the same time as those for the Upper Anicut, and the construction of the two works was undertaken together. A brief account of the Lower Anicut is given in an appendix to this narrative, for, as has been already stated, it does not form one of the component works of the Cauvery system. The fact of the silting above the Upper Anicut and of the consequent absorption by the Cauvery of nearly the whole of the previous supply in the Coleroon had become however a very serious matter, and though the lowering of the anicut, and the simultaneous enlargement of the

under-sluiques to a total width of 129½ feet, effected all that was necessary so far as the Coleroon was concerned, it was recognised that nothing less than the construction of a dam across the Cauvery would meet the circumstances of the case there. Colonel Sim accordingly submitted an estimate for the work in 1844, amounting to Rs. 72,738, which was at once sanctioned, and the dam was built between February 5th and April 20th, 1845. Its success was immediate and complete. The inflow to the Cauvery at once became perfectly smooth and regular, and there has since been no objectionable deposit of silt at the head of the Coleroon.

13. It will be as well to complete here the financial history of these two works, which are now called "The Upper Anicut," and to give a brief description of them before entering upon an account of the delta channels.

A small extension of the Coleroon Anicut on the north side, and the construction of an additional scouring sluice, were undertaken at a cost of Rs. 1,950 on an estimate sanctioned on February 16th, 1844. Another estimate was sanctioned on February 2nd, 1846, amounting to Rs. 22,000, for extending the apron from 21 to 40 feet, enlarging the under-sluiques, and replacing the temporary bridge by a permanent structure. This estimate was increased by Rs. 971 on May 19th, 1846.

Eight arches of the bridge over the north branch with the portion of the dam between them were carried away by a flood in November 1858, and the work was restored in 1859 at a cost of Rs. 19,000, the sluices in the north branch being then placed under its two central arches. In 1871, 529 feet of the south branch were raised 1 foot, and this constitutes the last work of any importance undertaken in connection with the dam.

The following is a general description of the work as existing. The foundations consist of a double row of wells, 9 feet deep and of 4½ feet external diameter, filled with concrete. Above these are 3 feet of solid brickwork 6 feet broad to bed-level, and on this is built the body-wall, which is 7 feet high in the northern section, and from 5 feet 4 inches to 5 feet 10 inches high in the southern section. Below the dam is a masonry apron from 31 to 40 feet broad and 2 feet thick, supported by a retaining wall 3 feet high resting on wells 6 feet deep. Below this is

sets of these were accordingly constructed. The first, consisting of ten vents ($1' \times 3'$) in the body-wall of the Grand Anicut was sanctioned at a cost of Rs. 17,151 on December 4th, 1829, the sills being 10 feet below the crest. The second, at Vadavagudi, 16 miles below the Grand Anicut, consisted of 12 vents ($4' \times 3'$), the estimate, amounting to Rs. 23,832, being sanctioned on January 31st, 1831. An additional estimate of Rs. 7,396 was sanctioned for this work on February 5th, 1833, Rs. 5,667 for a shutter platform, and Rs. 1,729 for a road bridge.

The effect of these two works was so marked, (it was said that the bed of the Cauvery had been lowered by their means $2\frac{1}{2}$ feet on an average), that in 1832 it was decided to construct two more sets of under-sluices. A third set at Permacovil, 28 miles below the Grand Anicut, was therefore sanctioned on April 27th, 1832, at a cost of Rs. 11,071; and the fourth set, consisting of twenty vents ($12' \times 5'$), situated 2 miles below the head of the island of Srirangam, was sanctioned on February 5th, 1833, at a cost of Rs. 23,959. The third and fourth sets have since been abandoned, the latter in 1846. In addition to the above, a calingulah 450 feet long was erected in 1831 a short distance below the fourth set of under-sluices.

10. The construction of the works mentioned in the last paragraph materially improved the condition of the river, the silt in its bed being naturally cleared out, and the more immediate danger of breaching being removed from the embankments. But the most important question of all remained to be considered, which was the division and regulation of the supply coming from the Agunda Cauvery between the Cauvery and Coleroon. The fact that any adequate supply had for many years been secured to the Cauvery only by artificial and temporary means has already been noticed, and many suggestions for a permanent work had been offered by Engineer Officers, without producing, it would appear, any really practical proposal. The question, however, was pressing. The areas of irrigation under the two rivers

were,* approximately, 505,000 acres under the Cauvery and 165,000 acres under the Coleroon, so that supposing all the ordinary supply to be utilised, the former required roughly three-quarters and the

latter one-quarter of it. By actual measurement it was found, however, that of a discharge of 16,875 cubic feet per second, the Coleroon took 7,500 cubic feet and the Cauvery only 9,375 cubic feet; the volume in the Coleroon being thus just about as much too large for the area of irrigation under it, as that in the Cauvery was too small.

11. In 1828, Captain (now Sir Arthur) Cotton was deputed to Tanjore to inquire into the state of the rivers, and to him is due the entire credit of the initiation of the series of works that were shortly afterwards undertaken, and which have fulfilled the purpose for which they were designed with such remarkable success. Captain Cotton submitted three reports to Government in 1834, on January 29th, July 7th, and July 15th, respectively.

The first work he estimated for was sanctioned on July 31st, 1835. This was for an anicut across the head of the Coleroon, to limit the supply entering that river, and so to force an increased volume of water down the Cauvery. The estimate amounted to Rs. 98,383, divided as follows:—

	RS.
Anicut	82,953
Lock	2,049
Cutting a new head to the Iyen Voikal	7,000
Sluice of 3 vents to do.	6,381
Total	98,383

The anicut was originally divided into three sections by means of islands, one of which has since been removed. The northern section was breached for a length of 240 feet the year following its construction. The accident was attributed to the immature condition of the masonry, as well as to accumulations of sand in the centre of the river above the dam. The wall was at once rebuilt at a cost of Rs. 14,859, sanctioned on December 26th, 1836. Minor improvements were carried out during subsequent years, the following being the expenditure:—

	RS.
In 1837	10,614
„ 1838	10,476
„ 1839	18,785

On January 25th, 1840, an estimate amounting to Rs. 1,127 was sanctioned for securing the stones of the aprons with iron clamps, but no further expenditure appears

7. At that time the state of affairs in the delta had become very critical. Owing to the differences of level* between the Coleroon and the

Cauvery—the former having a more direct channel to the sea and a consequently greater bed-slope—the less favourably circumstanced river progressively deteriorated from the formation of deposits at its head, and the consequent diversion of the greater portion of its supply into the Coleroon. Captain Caldwell, of the Engineers, reported in 1801 that if measures were not adopted to remedy the natural difference between the two branches, the inevitable result would be the annihilation of the Cauvery as an irrigating stream, and the consequent utter ruin of Tanjore. Nor was this silting prejudicial only as interfering with the passage of low freshes down the river. In high floods its effects, though precisely opposite, were equally disastrous, for the bed had been so raised that the channel was quite incapable of carrying the water that then poured down. Its embankments were only from 1 to 3 feet above the ordinary flood level, and constant breaches, and the consequent silting up of large tracts of country were the results.

8. In Minutes of Proceedings, dated November 15th, 1806, 3,000 pagodas were sanctioned to raise the embankments, and at about the same time the Grand Ament was raised considerably so as to retain a larger quantity of water in the river below it. This work, before it was raised, consisted of a solid mass of rough stones of moderate size, 1,080 feet in length, from 40 to 60 feet in breadth, and from 15 to 18 feet in depth, stretching across the bed of the Cauvery in a serpentine form. Captain Caldwell's repairs consisted in raising the body of the dam, levelling the surface, supplying uprights of cut stone against which planks could be set to regulate the supply of water, and laying the stones of the upper portion in mortar.

9. During the succeeding years the energies of the officers in charge of the delta seem to have been principally devoted to repairing and developing the embankments of the various rivers and

7
channels, sanction for the two following works being also, however, on record:—

Work.	Estimate.	Sanction.
Connection between the Arasillár and Tirumalrajén Rivers.	RS. Not stated.	Sept. 23rd, 1813.
Straightening the course of the Vetár.	16,179	March 15th, 1822.

In order to secure the supply of water necessary for the irrigation of the delta, it was usual for the Collector to go with large gangs of coolies to the head of the island of Srirangam, and to construct a dam of grass, clay, and sand across the head of the Coleroon, by which means nearly the whole of the water in the Agunda Cauvery was sent down the Cauvery. At the same time the accumulations of sand in the beds of the minor channels were cleared by manual labor, and waterways were similarly cut in the beds of the main channels or rivers. No permanent effect could, however, be produced by such means, especially in a river having no clear outlet to the sea. The bed therefore continued to rise. Moreover, the effect of the dam above mentioned, however beneficial in small freshes, was in high floods to cause breaches in the banks, through which water carrying with it some of the sand deposit poured, and spread this over the neighbouring cultivation. The bed of the river was certainly cleared by this means, but the embankments being repaired, it only required a few years for it to resume its former condition. Constant additions to the heights of the embankments thus became inevitable, but it was soon evident that in this contest with nature, nature would certainly triumph ultimately, for the bed of the Cauvery was steadily rising, and the longer this went on and the more the banks were raised, the greater would be the final disaster. In those early days of Indian irrigation engineering it would appear that none of the many methods were known that might now be suggested for dealing with a similar difficulty, and it was not till about 1829 that Major Sim, of the Engineers, proposed under-slucices in the Cauvery with outlets to the Coleroon, as likely to prove an efficient means to prevent the accumulation of silt in the upper reaches of the former. Four

Only one river of any importance drains into the Cauvery in its course through the delta, viz., the Kodamurti, with a drainage area of 868 square miles, which joins it 8 miles below the head of the delta.

4. The arrangement of the principal channels, with the average area of irrigation under each, is shown in the following table, which the sketch map illustrates :—

River.	Area	River	Area	Area.
	ACRES.		ACRES.	ACRES.
				109,338
				5,551
				114,889
				57,867
				22,235
				80,102
				55,125
				12,524
				6,407
				19,508
				34,527
				76,082
				28,785
				1,073
				8,136
				3,865
				13,014
				94,541
				33,546
				113,216
				21,365
				35,713
				4,964
				39,912
				24,761

4

5. The above brief description of the circumstances of the delta will help to render more easily intelligible the account of the improvements that have been carried out in it since the district of Tanjore first came under British rule. It may, however, be added that what has since been done is not so much to enlarge the area of irrigation commanded to any very great extent, as to so improve the supply and general arrangements that a very much wider area than formerly can now be cultivated. All the principal rivers and channels are the creation, not of the skill of English Engineers, but of the ingenuity of past generations of Hindoo cultivators. Had the works been designed and executed within the last forty years, as have those of all the other important irrigation systems in the Madras Presidency, no doubt there is much in the alignment of the channels that might have been improved upon; and this has to be borne in mind in following the description of the various component works. What the British Government has done is to restore the works which it found falling into ruin to more than their pristine condition, so that the system stands out now, firstly, as the most remunerative irrigation system in India; secondly, as a great type of native engineering skill; and, thirdly, as an example of what may be done by a very moderate expenditure judiciously bestowed, to maintain, improve, and develop existing works.

6. The first of the Tanjore Delta Works are exceedingly ancient, so much so indeed that it is quite impossible to state even approximately when they were executed. Tradition gives the credit of them to a certain Rajah Veeranum, who came from the northern portion of what is now the Madras Presidency and conquered Tanjore towards the close of the second century of our era. There is no doubt that many of the great temples with which this part of the country is studded were commenced at about this time, and this evidence of enlightenment and constructive skill affords good grounds for assigning the commencement of the delta works to the same period. But the correctness or not of this hypothesis is of no great importance to the purpose of the present narrative, in which it is only proposed to take up the history of the works from the date of the cession of Tanjore to the British in 1800.

dam is about 100 feet, which represents a discharge of 12,000 cubic feet per second.

Allowing 1 cubic foot per second for the irrigation of 66 acres (2 cubic feet per acre per hour), this is sufficient for the irrigation of about 822,000 acres. A good deal more water than this is known to be actually used, the system of distribution being still, as will be said, extremely imperfect, so that the loss and wastage is enormous. It is worthy of special remark that, until quite recently, the most erroneous views have been held not only as regards the discharge of the river, but also as to the actual consumption of irrigation. For instance, it had been assumed that a cubic foot of water was required per acre per hour, which would imply a supply of 1 cubic foot per second. The actual consumption was maintained with a rather small amount of flood, where it is a matter of fact that it requires a flow of only 1 cubic foot per acre per hour. The error arose from applying the formula $V = 2.48 \sqrt{h}$ in use for determining the discharge of channels, to a large river.

2. The river and its tributaries being fed by the rains of both monsoons, the flow is abundant and generally sufficient for about nine months in the year. The following is the ordinary state of the supply: the first rain occurs in the middle of June, which enables cultivation to be commenced. The supply continues fairly good till the middle of July, when the heavy south-west monsoon rain begins to come down. The full supply continues through August, but in September the river is generally very low, though the rains keep the crop from withering. In October and November there are freshes from the effect of the north-east monsoon, which occasionally culminates about the middle of November in very heavy floods. After this the supply gradually diminishes till March, when the bed is dry.

3. The head of the delta is to be found east of Trichinopoly, at the upper end of the island of Srirangam, famous for its sacred shrine and magnificent temple. This island is about 17 miles long and 1 mile wide at its broadest part, and divides the Vennda Cauvery into two branches: the northern branch being termed the Coleroon and the southern the Cauvery. The two are connected again at the lower end of the delta, near the

channel here was closed many centuries ago by the work known as the Grand Anicut, which was probably constructed at the time when the first large channels were excavated, and the water utilised for purposes of irrigation.

The Coleroon branch is about 2,400 feet wide at its head, and continues a broad and well-defined river to where it falls into the Bay of Bengal, 7 miles to the south of Porto Novo. It forms the northern boundary of the Tanjore Delta, but there is no irrigation of importance from it until it reaches what is called the Lower Anicut, 67 miles from the head of the delta. Up to this point its functions are almost wholly confined to that of a great natural drainage channel, in which capacity it is difficult to over-estimate its importance. The whole of the supply entering the Cauvery, either by natural flow or by drainage, which cannot be disposed of by the irrigation channels, is passed into the Coleroon by means of several surplus works, of which the Grand Anicut is the principal.

Three important irrigation channels are taken off the Coleroon at the Lower Anicut—the Vadavar and the North Rajah Voikal supplying the large Veeranum Tank and other cultivation in the South Arcot District, and the South Rajah Voikal supplying the north-east corner of the Cauvery Delta—but under special orders neither the expenditure on the Lower Anicut or any of the dependent works, nor the irrigation under them, are included in the returns for the Cauvery Delta System. The work is indeed separately classed as one for which a continuous record of expenditure is maintained. It will be understood then that all reference to the Lower Anicut and its dependent channels made in the course of this narrative is simply to avoid the incompleteness that the omission of all mention of works rendered necessary by those undertaken on behalf of the delta proper would cause.

The Cauvery itself from the point of bifurcation is very differently circumstanced to the Coleroon. At the head of the delta it is about 2,000 feet wide, and so continues $14\frac{1}{2}$ miles to where the Venndar River takes off from it. Two and three-quarter miles lower down comes the Grand Anicut, over which a large proportion of the surplus supply passes back to the Coleroon during high floods. Nine and-a-half miles to the east of the Grand Anicut, or $26\frac{3}{4}$ miles from the head, the

BRIEF NARRATIVE OF THE CAUVERY DELTA SYSTEM OF IRRIGATION.

THE river Cauvery rises near Mercara, the chief town of the province of Coorg, in latitude $12^{\circ} 26'$ and longitude $75^{\circ} 48'$. It pursues at first a north-easterly course, passes close to the town of Seringapatam, and, after flowing 150 miles, reaches the well-known "Cauvery Falls." On leaving the Mysore plateau the river flows nearly due south, then turns to the east, and finally flows to the sea in a north-easterly direction.

During its course through the plains it receives numerous affluents. The principal of these are—

On the right or south bank—(1) the Bhaváni, which drains the greater portion of the Nilgiri range; (2) the Noyil, which also rises in those mountains; and (3) the Amarávati, which rises in the Anaimalai Hills, forming the southern boundary of the district of Coimbatore.

On the left or north bank—the Iyár, which joins the Cauvery at the head of the delta.

Up to this point the river is generally termed the Agunda*

* Agunda = broad. Cauvery to distinguish it from the deltaic portion, which is termed simply the Cauvery, or sometimes the Anunda†

† Anunda = much divided or broken up. Cauvery. At the head of the delta the

river is about 4,400 feet wide, and has a depth of flow during high floods of about 12 feet. The depth of the maximum recorded flood which occurred in November 1858 was $13' 3''$.‡

‡ Measured on the Cauvery Dam. The highest previous flood was in 1818,

when it is said the depth was about 13 feet. The drainage area of the river up to the head of the delta is about 27,705 square miles, and the discharge with a maximum flood is about 284,000 cubic feet per second. The total average annual discharge is about 490,000 million cubic feet, equivalent to 17.68 inches of discharge from the whole drainage basin. It is reckoned that the irrigation in the delta can be fully supplied theoretically when the depth of flow on the Cauvery

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