

2

• PUBLIC WORKS (BENGAL, &c.)

FURTHER RETURN to an Order of the Honourable The House of Commons,
dated 24 February 1853;—for,

COPIES “ of the REPORTS of the several COMMISSIONERS on PUBLIC WORKS
at *Bengal, Madras, and Bombay*, in the Year 1851-2; of the MINUTES
of the Members of the Government thereon; and of any Orders or
Despatches of the COURT of DIRECTORS relating thereto.”

East India House, }
26 May 1853. }

JAMES C. MELVILL.

Note.—The Report of the Bengal Commission* has been presented to the Honourable the House of Commons; that of the Commission appointed at Bombay has not yet been received in this country.

(Mr. Hume.)

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27 May 1853.

L I S T.

	Page
Report of the Commissioners of Public Works in the Madras Presidency, 1852 -	1
Letter from Chief Secretary to Government, Fort St. George, to Secretary at the East India House, dated 13 April 1853 - - - - -	407
Letter from Chief Secretary to Government, Fort St. George, to Secretary to the Government of India, dated 13 April 1853 - - - - -	407
Minute by the Honourable Mr. Thomas, dated 12 April 1853 - - - - -	409
Minute by the Right Hon. the President, dated 13 April 1853 - - - - -	409
Minute by the Honourable Mr. Elliott, dated 13 April 1853 - - - - -	410
Extract from the Minutes of Consultation, dated 13 April 1853 - - - - -	410

East India House, }
26 May 1853. }

T. L. Peacock,
Examiner of India Correspondence.

FIRST REPORT of the COMMISSIONERS appointed to inquire into and report upon the System of Superintending and Executing PUBLIC WORKS in the Madras Presidency. Submitted to the Right honourable the Governor in Council of Fort St. George, on the 23d December 1852.

CONTENTS.

REPORT.

	Page
Section I.—Introduction	1
Section II.—History and present state of the Maramut Department of Public Works under the Board of Revenue	2
Section III.—Review of the Condition and the Treatment of the Roads in former times, and of the Working of the Road Department	37
Section IV.—An Account of the Engineer Department under the Military Board; with Suggestion of some Changes in the Structure of that Department	63
Section V.—Proposal of a New Board of Public Works	79
Section VI.—The Value of Irrigation to the Revenue and to the General Wealth; and the importance of maintaining and extending it	92
Section VII.—General View of the present Condition of the Roads of this Presidency; with Remarks on the urgent Necessity for their Real and Effective Improvement; and with some Observations on the Harbours, and their need of Attention	134
Section VIII.—Proposed Scheme of Expenditure on Works of Irrigation and Communication	191
Section IX.—The Necessity of enlarging the Public Works Establishment in all its Grades, with a Statement of the New Establishment proposed; and with some Preliminary Remarks on "Superintendence"	206
Section X.—On the proper Means of providing and training a Succession of Officers for the Public Works Department; of all Grades, Commissioned and Subordinate, European and Native	235
Section XI.—Recapitulation, and concluding General Remarks	263

APPENDIX.

Appendix (A).—Order of Government, dated 17th February 1851, appointing the Commission for inquiring into, and reporting upon, the System of Public Works at this Presidency	293
Memo. from the Chief Secretary, dated 22d March 1851, specifying the points for the Inquiry of the Commission	293
Order of Government, dated 21st March 1851, No. 109, P. W. D., giving further Instructions in connexion with the Inquiry into the System of Public Works	294
Appendix (B).—Report on the Irrigation Department by Captain A. T. Cotton, dated 13th December 1837	295
Appendix (C).—Letter from Lieutenant-Colonel A. T. Cotton, Civil Engineer, 1st Division, to the Public Works Commissioners, dated 1st June 1851, on the Results of the Improvements on the Godavery	314
Appendix (D).—Extract from a Letter from the same Officer to the Secretary to the Board of Revenue in the Department of Public Works, on the same subject, dated 2d December 1851	316
Appendix (E).—Reply of the same Officer to a Query from the Public Works Commissioners on the subject of the Roads of his Division; showing how cheaply an extensive Canal Navigation could be effected	321
Appendix (F).—Reply of the same Officer to a Query from the Public Works Commissioners respecting the wants of his Division in Officers and Subordinates	322
Appendix (G).—Extract from a Letter from the Board of Revenue in the Department of Public Works to the Chief Secretary to Government on the subject of Improvement required in the Department, dated 15th February 1847	325
Appendix (H).—Letter from the Board of Revenue in the P. W. D. to the Secretary to Government Fort Saint George, respecting the Defects in the Department, and the best means of removing them, dated 30th July 1849	327
Appendix (I).—Letter from Major H. C. Cotton, Civil Engineer of the 5th Division, to the Secretary to the Board of Revenue in the P. W. D., on the subject of the defective Qualifications of the Maistries, and the Measures necessary for improving that Class, dated 26th February 1842	334
407— I.	Appendix

	Page
Appendix (J).—Extract from a Letter from F. N. Maltby, Esq., Collector of Canara, to the Secretary to Board of Revenue P. W. D., being the Annual Report on the Roads of the District, dated 1st December 1850	337
Appendix (K).—Extract from a Letter from the same Gentleman to the Public Works Commissioners, respecting the Results of the Improvements of the Roads in his District, dated 5th June 1851	342
Appendix (L).—Minute recorded by the Honourable John Sullivan, Esq., Member of the Council of Madras, on the importance of extending Irrigation, dated 5th September 1840	345
Appendix (M).—Letter from the Madras Military Board to Government, recommending some Changes in the Official Practice, with the view of expediting Business, dated 29th September 1840	353
Appendix (N).—A Letter from Mr. John Norfor, Manager of the Porto Novo Iron Works, respecting the Condition of the Canal from the Lower Coleroon Anicut to Porto Novo	355
Appendix (O).—Letter from the Military Board, Calcutta, to the Military Board, Madras, dated 22d June 1852, as to the mode of sanctioning Estimates for Repairs and Bills for Work done	356
Appendix (P).—Letter, dated 10th April 1852, from Mr. G. W. Boothby, Superintendent of the Aska Sugar Works in the Ganjam District, respecting the very bad State of the Roads of the District, and the positive Injury thence accruing to Trade, addressed to Messrs. Binny & Co., of Madras, and communicated by them to the Public Works Commissioners	357
Appendix (Q).—Statement, showing the Expenditure on Irrigation Works and the Revenue from Irrigated Land, in Tinnevely District, for a Series of Years	360
Appendix (R).—Statement, showing the Cost and Results of the Lower Coleroon Anicut	361
Appendix (S).—Statement of the Outlay on Irrigation Works and the Revenue from Irrigated Land, in the Tanjore District, for certain Years	362
Appendix (T).—Statement, showing the Number and Amount of Estimates respectively above and below 1,000 Rupees each, in the Public Works Department of the Board of Revenue in 1850	362
Appendix (U).—Statement, showing the Collections of Revenue from all Sources in the Guntoor Collectorate for a Series of Years	363
Appendix (V).—Statement, showing the Expenditure on Works of Irrigation in the Madras Presidency, from 1816-17 to 1850-51	364
Appendix (W).—Statement of Charges incurred in the Repair and Construction of Roads, Bridges and Ghauts, in the Territories under the Presidency of Fort Saint George, from 1826 to 1850	366
Appendix (X).—Statement of Expenditure on Buildings and Repairs under the Government of Fort Saint George, from 1831 to 1850	368
Appendix (Y).—Statement of Expenditure of all kinds, in connexion with Public Works, for a series of Years	370
Appendix (Z).—Statement of the Results obtained from Expenditure for extending Irrigation in the Districts under the Madras Presidency, from 1836 to 1849	371
Appendix (AA).—Statement, showing the Charges incurred in the Repair and Construction of Public Works, under the Board of Revenue, in the Ten Years 1841 to 1850, with the Cost of Superintendence	373
Appendix (BB).—Statement, showing the Revenue from the Works in the District of Trichinopoly connected with the Coleroon Anicut, for the Twenty Fuslies, from 1240 to 1250, as well as the Annual Average Price of Paddy in the Town of Trichinopoly, for the Forty-two Fuslies, from 1219 to 1260	373
Appendix (CC).—Statement, showing the Quantity and Value of Salt sold for Home and Inland Consumption, in the several Maritime Districts of the Madras Presidency, from Fusly 1241 to 1260	374
Appendix (DD).—Detailed Statement, showing the Distribution of the proposed Establishment of all Grades in the Public Works Department	376
Appendix (EE).—Memo. showing the Numbers and Grades of Subordinates and Office Establishments allotted to each Officer, &c., being the Scale by which the Number and Distribution of the various inferior Grades, as shown in the foregoing Table, have been determined	373
Appendix (FF).—Synopsis of the proposed Establishment of all Grades in the Public Works Department	379
Appendix (GG).—Statement of the Population of the Territories of the Madras Presidency, according to the Census taken in the Revenue Year 1850-51	381
Appendix (HH).—Abstract of the present Establishment of the Maramut Department in all its Branches	384
Appendix (II).—Memorandum on the Cochrane Canal	385
Appendix (JJ).—Memoir on Coringa Harbour, by Lieutenant-Colonel A. T. Cotton	393
Appendix (KK).—Letter from the Chairman of the Madras Chamber of Commerce, to the Secretary to the Board of Revenue, on the subject of the projected Survey of the Godavary River, dated 4th March 1852	393
Appendix (LL).—List of the Works executed out of the four Lacs a year granted for the Trunk Roads	401
Glossary of Indian Terms	403

INDEX TO THE PARAGRAPHS.

SECTION I.		SECTION II.— <i>History and present state of the Maramut Department, &c.—continued.</i>	
INTRODUCTION.		The European Overseers— <i>continued.</i>	Paras.
Recital of appointment and instructions	1	The habits of the Overseers as to temperance	51
Assembling of the Commission	2	Their health	52
Subjects of Inquiry	3	They have not been fairly treated	52
Sources of information	4	Hence discontent and despondency among them	53
Plan of this Report	5	It is most desirable to remove the cause of these feelings	54
SECTION II.		The Mode of executing Work in the Revenue Department	55
<i>History and present State of the Maramut Department of the Public Works under the Board of Revenue.</i>		The Tahsildar is the Executive Officer	55
Irrigation very ancient and important	6	His jurisdiction and general duties	55
In the early periods of British rule, the Department was unorganized and imperfect	7	The several steps towards the execution of work	56
Improvement of its organization	8	The Maistry's duties in connexion with it	57
Further improvement	9	The accounts	58
Sketch of the System of Irrigation	10	Inspection by the Civil Engineer	58
Territorial Division of this Presidency	10	Some remarks and suggestions	59
Its distribution for Maramut purposes	11	Dilatoriness of execution	59
Reasons for the existing distribution	11	The Accounts are irregularly kept	60
The Districts having Government works of Irrigation	12	The Daily Accounts, how kept	61
The several modes of Irrigation	12	Not generally very trustworthy	62
By the low freshes of the Rivers	13	The final accounts also frequently garbled	63
By the high freshes	14	The means of correcting these evils	64
Irrigation Tanks described	15	The Data Tables	65
Calinculahs	15	They require revision; their legitimate use	65
Statistics of Irrigation works	16	Compulsory labour	65
The custody of the works of Irrigation	17	The causes of it	65
Of the Roads and other Communications	18	The means of preventing it	67
And of the Government Buildings	19	Full and prompt payment	68
Duties of the Board of Revenue in connexion with those works	20	The extended employment of European Overseers	70
The working of the Board	21	Retrenchment of the workpeople by the Civil Engineer	71
Its defects	22	It is often unfair	72
The cause of those defects	23	Proposed rules for limiting such retrenchments, and fixing responsibility	73
Vast and progressive increase in the business of the Department	24	Their operation would not increase the cost of works	74
And it must and will increase still more	25	The District and Talook Maistries	75
The Civil Engineer's Department	26	The Superintendents of Maramut	75
Evils of its former weakness	27	Their duties	75
The present system	28	The Talook Maistries	77
The "ordinary" Estimates	29	Their defective qualifications	77
Their execution	30	Reasons of their general inefficiency	79
The "occasional" Estimates	31	The means of improving them	80
Estimates for Roads, Bridges and Buildings	32	The system of entertaining youths as Apprentices, for instruction	81
Inspection by the Civil Engineer	33	More regular and systematic instruction is necessary	82
The Engineer Officers are too few	34	But meanwhile the Apprentice system should be continued as a temporary measure	82
Consequent evils	35	The Maistries are too much in subjection to the Tahsildars	83
The Roads	36	They should have separate duties and responsibilities	84
The Public Buildings	36	They should correspond directly with the Collector	85
The Department must be strengthened	38	Their emoluments must be increased	85
The Subordinates of the Civil Engineer Department	37	Scale of pay for Maistries	87
The Revenue Surveyors	37	They should be District and not Talook Maistries	87
Their qualifications on first appointment	38	Their numbers must be increased	88
Their instruction and improvement afterwards	39	Temporary Maistries	89
Their defects: conceit	40	The Civil Engineer's Maistries	90
Indolence; and carelessness to improve themselves	41	Some new Rules proposed by Government	91
Want of energy and resource	41	Purport of the Rules	92
Proposed remedy	42	The first Rule: inapplicable and inexpedient	93
The European Overseers	43	Its probable practical operation	94
Their number and employments	44	The Rule not at all necessary	95
Results of their employment	45	Past experience does not show it to be so	96
Testimony of Engineer Officers in their favour	46	The second proposed Rule	97
Direct money saving on work superintended by them	47	The third Rule impracticable; it would take the Engineers from their most important duties	98
The causes of this result	48	The fourth Rule: it would deprive by far the greater part of works of all effective check	99
The workpeople like them	48	It would thus revive former wholesale frauds	100
The least beneficial results are in the 2d and the 8th Divisions	49	It would greatly stop improvement	100
Remedy suggested in both instances	50	The supposed check by the Collector would be physically impossible	101
		The fifth Rule: fortnightly inspection of works by Assistant Collectors is impossible	102

INDEX TO THE PARAGRAPHS.

SECTION I.		SECTION II.— <i>History and present state of the Maramut Department, &c.—continued.</i>	
INTRODUCTION.		The European Overseers— <i>continued.</i>	Paras.
Recital of appointment and instructions	1	The habits of the Overseers as to temperance	51
Assembling of the Commission	2	Their health	51
Subjects of Inquiry	3	They have not been fairly treated	52
Sources of information	4	Hence discontent and despondency among them	53
Plan of this Report	5	It is most desirable to remove the cause of these feelings	54
SECTION II.		The Mode of executing Work in the Revenue Department	55
<i>History and present State of the Maramut Department of the Public Works under the Board of Revenue.</i>		The Tahsildar is the Executive Officer	55
Irrigation very ancient and important	6	His jurisdiction and general duties	55
In the early periods of British rule, the Department was unorganized and imperfect	7	The several steps towards the execution of work	56
Improvement of its organization	8	The Maistry's duties in connexion with it	57
Further improvement	9	The accounts	56
Sketch of the System of Irrigation	10	Inspection by the Civil Engineer	56
Territorial Division of this Presidency	10	Some remarks and suggestions	56
Its distribution for Maramut purposes	11	Dilatoriness of execution	59
Reasons for the existing distribution	11	The Accounts are irregularly kept	60
The Districts having Government works of Irrigation	12	The Daily Accounts, how kept	61
The several modes of Irrigation	12	Not generally very trustworthy	62
By the low freshes of the Rivers	13	The final accounts also frequently garbled	63
By the high freshes	14	The means of correcting these evils	64
Irrigation Tanks described	15	The Data Tables	65
Calingulabs	15	They require revision; their legitimate use	65
Statistics of Irrigation works	16	Compulsory labour	65
The custody of the works of Irrigation	17	The causes of it	65
Of the Roads and other Communications	18	The means of preventing it	67
And of the Government Buildings	19	Full and prompt payment	68
Duties of the Board of Revenue in connexion with those works	20	The extended employment of European Overseers	70
The working of the Board	21	Retrenchment of the workpeople by the Civil Engineer	71
Its defects	22	It is often unfair	72
The cause of those defects	23	Proposed rules for limiting such retrenchments, and fixing responsibility	72
Vast and progressive increase in the business of the Department	24	Their operation would not increase the cost of works	74
And it must and will increase still more	25	The District and Talook Maistries	75
The Civil Engineer's Department	26	The Superintendents of Maramut	75
Evils of its former weakness	27	Their duties	76
The present system	28	The Talook Maistries	77
The "ordinary" Estimates	29	Their defective qualifications	77
Their execution	30	Reasons of their general inefficiency	79
The "occasional" Estimates	31	The means of improving them	80
Estimates for Roads, Bridges and Buildings	32	The system of entertaining youths as Apprentices, for instruction	81
Inspection by the Civil Engineer	33	More regular and systematic instruction is necessary	82
The Engineer Officers are too few	34	But meanwhile the Apprentice system should be continued as a temporary measure	82
Consequent evils	35	The Maistries are too much in subjection to the Tahsildars	83
The Roads	36	They should have separate duties and responsibilities	84
The Public Buildings	36	They should correspond directly with the Collector	85
The Department must be strengthened	36	Their emoluments must be increased	85
The Subordinates of the Civil Engineer Department	37	Scale of pay for Maistries	87
The Revenue Surveyors	37	They should be District and not Talook Maistries	87
Their qualifications on first appointment	38	Their numbers must be increased	88
Their instruction and improvement afterwards	39	Temporary Maistries	89
Their defects: conceit	40	The Civil Engineer's Maistries	89
Indolence; and carelessness to improve themselves	41	Some new Rules proposed by Government	91
Want of energy and resource	41	Purport of the Rules	92
Proposed remedy	42	The first Rule: inapplicable and inexpedient	93
The European Overseers	43	Its probable practical operation	94
Their number and employments	44	The Rule not at all necessary	95
Results of their employment	45	Past experience does not show it to be so	95
Testimony of Engineer Officers in their favour	46	The second proposed Rule	97
Direct money saving on work superintended by them	47	The third Rule impracticable; it would take the Engineers from their most important duties	98
The causes of this result	48	The fourth Rule: it would deprive by far the greater part of works of all effective check	99
The workpeople like them	48	It would thus revive former wholesale frauds	100
The least beneficial results are in the 2d and the 8th Divisions	49	It would greatly stop improvement	101
Remedy suggested in both instances	50	The supposed check by the Collector would be physically impossible	102
		The fifth Rule: fortnightly inspection of works by Assistant Collectors is impossible	103

SECTION II.—*History and present state of the Maramut Department, &c.—continued.*

Some new Rules proposed by Government— <i>continued.</i>	
	Paras.
The great want of the Department is not "responsibility," but increase of strength	104
The proposed Rules would diminish responsibility	104
Not true that ill-considered plans are commonly sent up; and in whatever degree it is true, it is owing to want of Officers	105
The whole tendency of the Rules is to stop improvement	106

SECTION III.

Review of the Condition and the Treatment of the Roads in former times, and of the working of the Road Department.

The condition of the Roads, and means of transit, when the country first came under the English rule	107
The communication by water at the same period	108
Trade was also oppressed by vexatious taxation	109
Improvement since that time, as shown by the more general use of Carts	110
The river navigation has not been improved	111
In the early times of the British Government the roads were wholly neglected	112
The bad state of the roads in 1813, as described by the Board of Revenue	113
The trifling measures recommended by the Board for their improvement	114
Reply of the Court of Directors	115
Subsequent systematic neglect of the roads	115
The Pioneers	116
The road from Masulipatam to Hyderabad	117
The erroneous and wasteful course adopted by Government	118
Government resolve, in 1831, to abandon the idea of improving the roads of the country	119
The Pioneers converted into Sappers and Miners	120
The roads of the Salem District	121
The want of a general plan	121
Cattle railroads proposed by Captain A. Cotton, in 1836	122
A small experimental line laid down near Madras	123
Its results	123
And the causes of its failure	123
Two important lines of road opened	124
The Road Department constituted in 1845	125
Its formation approved by the Court of Directors	126
The order of Government respecting the trunk roads and the branch roads	127
The Assistants to the Superintendent	128
The instructions to the Superintendent	129
He was to be executive as well as superintending	129
His duties as then prescribed	130
The Department has failed	131
Causes of the failure	132
The state of the North Road	133
This alone would have occupied the Department several years	133
Captain Best's scheme of an establishment refused by Government	134
This refusal destroyed all hope of an efficient department	135
It was soon found necessary to give the Superintendent the aid of the Civil Engineers	136
Captain Best's first General Report	137
Loss of time, and the causes of it	137
Dissatisfaction of the Government with the Department	138
The order based on that dissatisfaction	139
Effects of this order	140
An objection by Government to one part of Captain Best's management	141
His reply	142
Some Points to be especially considered	143
The first point: the small amount expended by the department	144
The cause assigned by Captain Best not sufficient to account for it	145
Though they no doubt operated to a considerable extent	146
The second point: the results of the actual expenditure	147
Extent of Roads made and of Bridges built	148

SECTION III.—*Review of the Condition and the Treatment of the Roads, &c.—continued.*

Some Points to be especially considered— <i>continued.</i>	
	Paras.
The Western Road	149
Its condition when the Road Department first took charge of it	150
Its gradual improvement for many years past	151
Comparison of this road with the principal road under each of the other Presidencies	152
This road has much more traffic than either of those	152
And therefore requires more repair	152
Comparison of it with the Colombo and Kandy Road	153
Captain Best's early opinions as to the cost of maintaining a road were too narrow	154
Concluding remarks on the Western Road	155
The third point: what portion of the expenditure was superintended by the Road Department	156
Works to a very large amount were executed or superintended exclusively by the Civil Engineer's Department	156
And were projected by them also	157
Thus the Road Department has totally failed to relieve the Civil Engineers	158
The fourth point: has the actual outlay been applied where most required?	159
The most necessary works were not undertaken	160
But those which the Civil Engineers had projected, and were prepared to execute	160
The fifth point: the large amount of unadjusted Bills	161
The present state of the Road Department	162
The employment of the Civil Engineers in executive duties on the trunk roads is an evil	163
The Road Department has failed to attain the Objects aimed at	164
And ought to be abolished	164
It is wasteful to have two separate departments, managing works similar in character, over the same area	165
The main cause of failure was the dread of expenditure on "Superintendence"	166
The first thing should have been to ascertain the lines on which roads were most wanted	167
Next, to determine the species of road to be made	168
And then to survey and lay out the lines	168

SECTION IV.

An Account of the Engineer Department under the Military Board, with Suggestion of some Changes in the Structure of that Department.

The Military Board	169
Its present construction	170
The duties of the Board	171
Their detail and distribution	172
Particularly in the Engineering Department	173
Annual amount of works under the control of the Board	174
The local agency under the Board	175
Mode of obtaining sanction for repairs	176
And for new works	177
Mode of executing work	178
At stations in the interior	179
The course of proceeding at the Presidency	180
The Superintending Engineer is wholly an executive officer	181
The department in the Saugor Division	182
There are now no Engineer Officers under the Military Board within the Provinces	183
The existing system described	183
The change has been a gain on the whole	184
But it has much hampered the Military Department	184
Practical evils of the present system	185
An example of their operation	186
Table of Advances and of Officers responsible for them	187
The subordinates in the Military Department	188
Their qualifications	189
The European Overseers	189
Roads and Bridges in military cantonments	190
Their maintenance, how to be provided for	191
Where Government servants are employed on the cantonment roads, their services should be paid for	192
Tools and assistance obtained from the Government Arsenals and Workshops should also be paid for	192

INDEX TO THE PARAGRAPHS.

vii

SECTION IV.—An Account of the Engineer Department under the Military Board, &c.—continued.

	Paras.
Some Changes proposed in the Military Branch of the Department	193
A detail of the merely local duties now imposed on the Military Board	194
The controlling Board ought to be relieved from all such	195
A summary of the Duties of the Chief Engineer in connexion with the Public Works Department	196
He ought to be relieved from mere local duties	197
The general duties which he will retain	198
Some other duties to be assigned to him	199
The Presidency Superintending Engineer to be made an Inspecting Engineer	200
With an executive Officer and distinct Establishment	200
But the number of Officers in the division will need no increase	201
Arrangement proposed for Mysore Division and Country	202
Arrangement for the Sangor Division and Territories	203
Arrangement proposed for the Hyderabad and Nagapore Divisions	204
The stations within the frontier	205

SECTION V.

Proposal of a new Board of Public Works.

Order of treating the various subjects of Report	206
Existing defects briefly recapitulated	207
Plan of uniting all Public Works under one Board	208
The total annual expenditure very large	209
The essentials of an efficient controlling authority	209
Reasons for preferring a Board to an individual officer	210
We have discussed the question with special reference to the circumstances of this Presidency	211
Proposed composition of the Board of Public Works	212
One member to be from the Civil Service	213
The Chief Engineer	214
Two salaried professional members	214
And a Secretary	214
One of the members might travel	215
Personal communication with Government	215
Proposed salaries of the members	216
And of the Secretary	217
Appointments to be abolished	218
The Board's duties should be those of control, and it should not be burdened with detail	219
Proper mode of exercising control	220
Present absence of power in the local officers, Civil and Military, as to authorising repairs	221
All bills require the special sanction of Government	222
More latitude should be allowed on both points	223
General principles recommended	224
Already for the most part in operation in Bengal	224
Some power should be given to the local Officers and to the Board of Works in authorising improvements also	225
Annual reports to be made to the Board of Works	226
And by the Board to Government	226
An annual account current of the cost and profit of Irrigation Works	227
How it should be kept	228
The balance, how to be struck	229
A similar account for Roads	230
Procedure within the Board	231
Course of business with other Offices	232

SECTION VI.

The Value of Irrigation to the Revenue and to the general Wealth, and the Importance of maintaining and extending it.

Division of the subject	233
The present expenditure on the maintenance of irrigation works is not sufficient	234
This is proved by the diminished extent of cultivation under the works	235
The works generally are out of repair	236
The Northern Division	237
The works of the subdivision	238
The other divisions	239
General view	240

SECTION VI.—The Value of Irrigation to the Revenue and to the general Wealth, &c.—continued.

	Paras.
Results of increased Expenditure in Tinnevely	241
Maramut expenditure in the district	242
The revenue from irrigation	243
Highly favourable result	243
One important and cheap species of improvement	244
Results of Expenditure in South Arcot	245
The lower Coleroon Anicut	245
Consequent increase of revenue	246
Net results	247
But the revenue has fluctuated more than the supply of water	248
High assessment	249
Extreme want of roads	249
The navigable channels have been neglected	250
Remedies for these evils	251
Results of Expenditure in Tanjore	252
Increase of revenue	253
Gain to the people	254
Total gain	254
The effects of the attention always paid to the irrigation of Tanjore	255
Further details of those effects	256
The new Works on the Godavery River	257
Origin of the project	258
Nature of the undertaking	259
The cost of the works	260
The results hitherto in increase of revenue	261
The cause of the immediate large increase of revenue	262
Probable future results of the works	263
Probable eventual results when the works shall be in full operation	264
Vast gain to the people	265
The Samulcootah Channel	266
The Woondy Talook	267
Results obtained	268
The importance of this case as an example	269
The roads of the district must be improved	270
And the Port of Coringa	270
Remarks on the Statement of the Results of Improvements in Irrigation	271
A very few works in it have not been profitable; the reason of this	272
A large part of the outlay has been enormously profitable	273
And the result of the whole is a very large profit	274
The whole expenditure on such works has been very scanty	275
Losses through the neglect of the works of irrigation	276
Loss to the Ryot	277
A recent case of hesitation as to repairing certain tanks	278
Large profit to be obtained to Government	279
The rights and interests of the Ryot affected	280
Opinion of Mr. C. R. Cotton as to the value of irrigation	281
Opinion of Mr. John Sullivan	282
Minute in Council by the same gentleman	283
Beneficial effects of irrigation	284
Comparison of districts	284
Such undertakings benefit both the Government and the people	285
Largely add to the revenue	286
And multiply the produce and the value of the land	287
Irrigation tends to prevent famines	288
The late Famine in Guntoor	289
Vast destruction of life	290
Of revenue in all branches	291
And of private property	292
The Kistnah Anicut to prevent such another famine	293
It has been unfortunately postponed for want of officers	294
Opinions adverse to the Extension of Irrigation	295
The objection is unsound in reasoning	296
And is directly opposed to experience	297
The fear of a want of a sufficiency of labour is contradicted by facts	298
The real want of the country is not labour, but employment for labour	299
Under an active demand, a very large increase would take place in the amount of labour performed by the existing population	300
There is no want of agricultural stock	301
The Ryots are forward to cultivate where irrigation is provided, unless prevented by a too high assessment on the land	302

SECTION VI.—*The Value of Irrigation to the Revenue and to the general Wealth, &c.—continued.*

	Paras.
Exceptional Case in Trichinopoly	303
The Upper Coleroon Anicut	304
It was built solely for the benefit of Tanjore	304
But did incidentally benefit Trichinopoly	305
Causes why an increase of revenue has not appeared there	306
The accounts obtained do not go far enough back	307
Effects of withdrawal of troops from Trichinopoly	308
Grain supplies from Tanjore	309
Summary of the facts	310
Grounds for expecting improvement	311
Concluding suggestions	312
Real nature of the objection as to the present sufficiency of food	312
The land-tax is unequal in the several districts	313
And requires to be equalized	314
And the best lands are waste, because too highly taxed	315
Some indirect means of lightening the land-tax	316
The scarcity of coin is an evil to the ryot	316
And large sums are annually transmitted to the Presidency, only to be carried back again	317
Bills on the Up-country Treasuries should be more liberally issued at Madras	318
Some improvement suggested in the mode of granting such bills	319
The introduction of some other crop than rice	320
Cotton and sugar	321
Means of aiding this object	322
The Moturfa tax	323

SECTION VII.

General View of the present Condition of the Roads of this Presidency, with Remarks on the urgent Necessity for their real and effective Improvement; and with some Observations on the Harbours, and their need of Attention.

A detailed review is necessary	324
Sources of information as to the state of the roads	325
The surplus Pagoda funds	326
Extent of made road in 1846	327
The real condition of the so-called "Made Roads"	328
State of the roads in Ganjam district	329
The importance of roads to save Military operations	330
And to civilise barbarous tribes	331
Mr. G. E. Russell's opinion	331
The want of a road to the port of Calingapatam	332
Road from Russelcondah and Aska to the coast	333
The roads of Vizagapatam district	334
The roads of Rajahmundry	335
Sanction for an improvement refused	336
The roads of Masulipatam	337
Testimony of the Civil Engineer	338
The roads of Guntoor	339
The roads of Nellore	340
The Northern Trunk road	341
The Nellore and Cuddapah road	341
The roads of Cuddapah	342
Mr. Forbes's report	343
The Engineer's report	344
Size and importance of the district	344
The roads of Bellary	345
Mr. Pelly's reports	346
Size and importance of the district	347
The roads of Kurnool	348
Mr. Lushington's report	349
The roads of North Arcot	350
More detail of their condition and wants	351
The Madras and Cuddapah road	352
General condition of the roads of the district	353
The roads of Chingleput	354
The roads of South Arcot	355
General view of their state	356
The roads of Tanjore; comparatively very good	357
The necessity of an allowance for repairs	358
Further improvement still required	359
Reasons of the difference between the roads of this and other districts	359
The large surplus Pagoda funds	360
The prosperity of the people	360
The roads of Trichinopoly	361
The roads of Salem	362
Mr. Maltby's report	363

SECTION VII.—*General View of the present Condition of the Roads of this Presidency, &c.—continued.*

	Paras.
The real Condition of the so-called "Main Roads"—continued.	
The roads of Coimbatore	364
Mr. Thomas's report	365
The roads of Canara	366
Mr. Maltby's reports	367
The communications are still far from complete	368
The roads of Malabar	369
Water communications in Malabar	370
The surplus Ferry funds in Malabar	371
The roads of Madura	372
The roads of Tinnevely	373
Subsequent reports	374
The maintenance of the roads by the Ryots	375
The road from the cotton district to the port	376
The Civil Engineer's opinion	376
General View of the condition of the Roads	377
Many of the most important commercial lines have been utterly neglected	378
And many of the great military lines are little better	379
The roads of the country generally	380
The roads of Bellary	381
The roads of Cuddapah	381
The tone of the Collectors' reports is not satisfactory	382
And that of the orders of Government upon them is still less encouraging	383
The Government overrate what they have done for the roads	384
And they overrate the improvement effected	385
The main roads cannot be made or maintained by the people	386
The results of such a system	387
In Tanjore	387
In Madura	388
In Salem	389
The real character of the system	390
The result would be still worse in other districts	391
Conclusion on the question	391
The surplus ferry receipts have been withheld by the Government	392
This has been an injury to the districts concerned	393
The income from the Cochrane Canal also should be given up for local improvements	394
The social value of roads exemplified	395
The direct and powerful tendency of improvement of the Roads to augment the Revenue	396
The actual state of the roads directly impedes social advancement	397
Actual gain to Government by the road improvements	398
in Canara	398
In the land revenue	399
The salt revenue	400
Increase in the salt revenue in Canara	401
Total results in that district	402
Comparison of Canara with Ganjam and Vizagapatam	403
The Western Trunk road and the salt revenue of the Madras Collectorate	404
Table of the sales before and after the road was opened	405
The increase has much more than paid the cost of the road	406
Outline of a General System of Roads	407
The great commercial lines will be East and West	407
And there must be coast lines and connecting lines	408
North and South in the interior	408
Number of east and west lines required	409
Their length	410
The other lines	410
The Godavery River navigation	410
The number of passes proposed is not larger than necessary	411
The present classification of roads must be abandoned	412
The Question how far it is worth while to make good Roads in this Country	413
The order of Government quoted	414
Amount of the improvement that would be effected under that order	415
The effect of such limited operations	416
The Western Trunk Road	417
The low cost of carriage on that road	418
Cost of construction and maintenance of a really first-rate road	419
Value of a first-rate road and of an "improved tract" compared	420
A still greater gain would be found in a rainy or mountainous district	421

SECTION VII.—*General View of the present Condition of the Roads of this Presidency, &c.—continued.*

How far it is worth while to make Good Roads, &c.—*contd.*

	Paras.
A more careful consideration of this question is necessary	422
Estimate of the cost and the effect of perfecting the Western Trunk Road	423
Conclusion on the question	424
Under the existing rules the greater length of inferior road aimed at by Captain Captain Best could not be attained	425
The Harbours of this Presidency:	
The harbours have been much neglected	426
Coringa; its Value and Importance	427
Notice of it by Colonel A. Cotton	428
Some trifling measures to arrest deterioration, undertaken by the local authorities	429
But disallowed by the Government	430
A trifling improvement has recently been undertaken by the local authorities on their own responsibility	431
The present inaccessible state of the port	431
Measures now proposed by Colonel A. Cotton	432
The Importance of opening the Godavery Navigation	433
Present cost of the conveyance of the Berar cotton to the port of shipment	434
The cost to Coringa by the Godavery	435
Immediate saving on the carriage of cotton by opening that navigation	436
Gain in other ways	436
Enormous increase of revenue to Government	437
The Salt Revenue	437
The Land Revenue	437
Military and political advantages	438
The cost of the necessary operations on the river would be trifling	439
The port of Masulipatam	440
Its great deterioration	440
Means of restoring it	440
Negapatam Harbour	441
Its deterioration; some remedies successfully applied	441
Further inexpensive measures proposed, but refused by Government	442
The reasons of that refusal	443
Cuddalore and Porto Novo harbours, both much shallowed of late years	444
Easy means of improving them	445
Cochin harbour; its great natural advantages	446
The water on the bar ought to be deepened	447
Madras Roads; a Breakwater and a Pier required	448
The improvement of the Ports is very important	449
A special fund for that purpose exists	449
Its origin, and present amount	450
This fund ought to be used instead of lying idle in the Treasury	450
The native Commercial classes would pay higher port charges to obtain such improvements	451
But they are unable to act without assistance	451
There ought to be some established system for the conservation and improvement of the ports	452
The Marine Board should make an annual Report to Government	452
The emoluments of the Master Attendants are too small	453
Legal power for the regulation of the ports is required	454
The attempts of the Madras Government to obtain such power	454
The Act then applied for was defective	455
Measures should be taken for preventing encroachments and unlawful appropriations of land at the various ports	456
The ports are inadequately provided with boats, &c.	456
The Paumbam Channel	457
Improvements effected in it	458
The results	459
The report of the Marine Board	459
Estimate of the value of the increased traffic in figures	460

SECTION VIII.

Proposed Scheme of Expenditure on Works of Irrigation and Communication.

The expenditure on Public Works has been increased of late years	461
But is still far too small	462

SECTION VIII.—*Proposed Scheme of Expenditure on Works of Irrigation and Communication—continued.*

	Paras.
Proposed expenditure in maintaining the works of irrigation	463
The Tank fees	464
Those fees are paid to the Government on the express condition that the works shall be kept in good repair	465
Proposed expenditure in extending irrigation by new works	466
Classification and extent of the roads required	467
Comparison with the extent of roads and canals in England	468
Extent of village or cross roads required	469
Cost of the first and second class roads	470
Comparison of their performances with those of the common roads	470
Proposed expenditure on roads	471
The cost of maintaining the roads	472
A good road will very well bear a toll	473
Objections made to tolls in this country	474
They appear, nevertheless, to be expedient and beneficial	474
The Cart tax in Salem	475
It is willingly paid	476
But it is insignificant in amount, inferior to a toll, and partial, and ought to be abolished	477
Railways and Canals	478
The village or cross roads must be made and maintained by the people	479
The duty will be willingly performed	480
But it will need to be regulated, and to be enforced on the indolent	480
Total proposed Expenditure on Public Works	481
From what sources that expenditure should be supplied	482
The real surplus revenue of Madras is larger than the accounts show	483
Because the debits include the charges of territories, of which the revenues are credited to other Presidencies	484
But the expenditure on Public Works ought not to be measured by the yearly surplus revenue	485
A reference to the example of England	486
To borrow capital for such objects would be truly economical	487
The sum fixed for Public Works should be provided, if necessary, by loans	488
Irrigation works and common roads must generally be undertaken by the Government	489
Railways and canals by private enterprise	490
Navigable canals might be constructed very cheaply on some lines	491
The amount devoted to Public Works should be at the disposal of the local Government	492
A prospective estimate to be prepared every year for the information of the Government of India	493

SECTION IX.

The necessity of Enlarging the Public Works Establishment in all its Grades, with a Statement of the new Establishment proposed; and with some preliminary Remarks on "Superintendence."

Introduction	494
The nature of "Superintendence"	495
The various things included in the term	496
It cannot be judged of by comparison of cost	496
The projection of works	497
Inspection	498
Directing rude labour and enforcing honest work	499
More such superintendence is necessary in India than in England	500
Something must be allowed for experiments and for failures	501
The custody of works	502
We cannot specify the proper amount of superintendence	503
Much has been gained by the increase of superintendence hitherto	504
But the amount even now is extremely small	505
The necessary proportion of superintendence will be less hereafter	506

SECTION IX.—*The necessity of Enlarging the Public Works Establishment, &c.*—continued.

The nature of "Superintendence"—continued.	Paras.
The control of the distribution of water - - -	507
The present system a bad one - - -	508
All important works should be under special management - - -	509
The increase of superintendence proposed is not larger than necessary - - -	510
The want of Officers - - -	511
No science in the construction of the old native works - - -	511
And hence many of them were built at ruinous cost - - -	512
The want of officers has long been admitted - - -	513
The duties required of a Civil Engineer - - -	514
Extent of his office work - - -	515
All tanks constantly require more or less of his attention - - -	516
Danger from works being insecure - - -	516
Extensive losses from that cause occur almost every year - - -	517
The Channels - - -	518
Instance of the Calingaroyen Channel - - -	518
Other instances - - -	519
The Tadapully Channel - - -	519
The Ponnair Tank - - -	520
The Chembrumbankum Tank - - -	520
The Northern Districts even more neglected than the Carnatic - - -	521
The Roads - - -	522
And the Government buildings - - -	522
Great want of statistical information as to the works in the country - - -	523
All an Engineer's projects are necessarily prepared in a hurry - - -	524
The proposed Establishment - - -	525
What duties require Engineer Officers - - -	526
An Engineer Officer and assistant to each district - - -	526
Four district Engineers for Mysore - - -	527
The Inspecting Engineers - - -	528
Total of Commissioned Officers - - -	529
Opinion of the Marquis of Tweeddale - - -	529
And of the Board of Revenue - - -	529
We propose no more than we are persuaded true economy requires - - -	530
All the foregoing appointments should always be kept full - - -	531
Reasons for dividing the 1st Division - - -	532
How to be divided - - -	533
The wants of Ganjam and Vizagapatam - - -	534
The Mysore and Saugor divisions - - -	535
Executive Officers at Military Stations - - -	536
Officers for special Projects - - -	537
Occasional executive Officers - - -	538
All of them need not be Engineers - - -	539
Salaries proposed: the Inspecting Engineers - - -	540
The District Engineers - - -	541
It is necessary that their salary should be graduated - - -	542
Three classes are therefore proposed - - -	543
The Executive Officers to be in four classes - - -	544
Promotion: The Board to distribute and transfer officers - - -	545
To recommend for promotion - - -	546
And to be permitted to recommend for selection from the line - - -	546
European Subordinate Department - - -	547
To be divided into two primary grades, Sub-engineer and Overseer - - -	548
A certain number of both grades will be necessary for the ordinary duties of each division - - -	549
And others must be provided for special works - - -	550
Any not required at any time on such undertakings may be very profitably employed in attending to the great channels and tanks - - -	551
A certain number of Overseers are required for Military works - - -	552
Certain Native Subordinates are to be attached to each European - - -	552
No Subordinate Establishment is proposed for the Mysore and Saugor Territories - - -	552
The organization of the European Subordinate grades - - -	553
Proposed course of promotion in those grades - - -	554
It must be long before the Establishment can be completed - - -	554
What authorities to promote and recommend for promotion - - -	555

SECTION IX.—*The necessity of Enlarging the Public Works Establishment, &c.*—continued.

European Subordinate Department—continued.	Paras.
Natives and East Indians admissible to these grades on certain indispensable conditions - - -	556
The existing East Indian Revenue Surveyors, how to be dealt with - - -	557
The Native Subordinates - - -	558
Major H. C. Cotton's description of the Maistries - - -	559
His scheme for organizing an efficient Executive Establishment - - -	560
The Board's proposal for the same object - - -	560
There are now still stronger reasons for improving the Maistries - - -	561
Proposed number of Superintendents and Deputy Superintendents of Maramut - - -	562
Proposed number of Maistries for the districts - - -	562
The name of Maistry to be changed - - -	563
Others must be attached to the European Officers and Subordinates - - -	564
Proposed rates of salary - - -	565
The Native Subordinates to be entitled to pensions - - -	565
In what authorities the promotion and appointment of these classes to be vested - - -	566
The Surveyors - - -	567
The Office Establishments - - -	568

SECTION X.

On the proper Means of providing and training a succession of Officers for the Public Works Department, of all Grades, Commissioned and Subordinate, European and Native.

Whether the present Military Corps to be enlarged or a Civil Corps formed - - -	569
Their relative cost - - -	570
Their relative efficiency - - -	571
Best to augment the present Corps - - -	571
Another alternative; selections from the line - - -	572
Such Officers would have all their business to learn, and at the expense of the State - - -	572
And the requisite number could not be so procured - - -	572
Such a plan would act prejudicially on the line - - -	572
It is best to employ scientific men on scientific duties - - -	573
The foregoing remarks not intended to apply to executive duties - - -	573
The Sappers and Miners - - -	574
Number of Officers necessary for that corps - - -	575
List of Appointments requiring to be permanently filled by Engineer Officers - - -	576
One-fourth of the Officers of Engineers are absent on sick certificate and furlough - - -	577
The proportion would be larger, except for the presence of many supernumerary 2d Lieutenants - - -	578
A Table, showing the numbers absent in the several branches of the Army - - -	579
Facts exhibited by the Table - - -	580
Number of Engineer Officers required - - -	581
Proposed organization for the Corps - - -	581
The number of officers specified only provides for absolutely necessary duties - - -	582
To the exclusion of many others for which Engineers will certainly be taken - - -	582
And of mere executive duties - - -	583
The number in Bengal and Bombay - - -	584
Augmentations in Bengal - - -	585
Changes at Madras - - -	586
Proportion of the Engineers to the rest of the Army, under all the Presidencies - - -	587
The irrigation works of this Presidency require a large number of Engineer Officers - - -	588
Comparison with the other Presidencies - - -	589
Even with the proposed augmentation the number of Engineers will be very small - - -	590
And it would be more reasonable to condemn that number as insufficient than as extravagant - - -	591
Proposed order of raising the additional strength - - -	592
Supernumerary 2d Lieutenants of Engineers - - -	593
The prospects held out at Addiscombe are falsified - - -	594
The Addiscombe system of Instruction good - - -	595
But the selections for the Engineers defective in one particular - - -	596
A longer course of Civil Engineering is necessary - - -	597

SECTION X.—On the proper Means of providing and training a succession of Officers, &c.—continued.

The Addiscombe system of Instruction good—continued.	Paras.
The course of instruction in India - - -	598
Its defects - - -	598
The means of correcting them - - -	599
Parties of Sappers employed on public works, to be under the Board of Public Works - - -	600
Acquisition of a native language important - - -	601
European Subordinate Department - - -	602
Duties of a Sub-engineer - - -	602
The qualifications he requires - - -	603
Duties and qualifications of an Overseer - - -	604
Recruits for this department how to be obtained - - -	605
Engineers writers - - -	606
Estimate makers - - -	606
Draftsmen - - -	607
Surveyors - - -	608
The advantage of employing Natives on the Mechanical parts of Surveying - - -	608
The present survey school - - -	609
The teaching which it gives is very defective - - -	610
And it is utterly unable to supply the numbers required - - -	611
A College for Civil Engineering is required - - -	612
The Roorkee College - - -	613
Its early beginnings - - -	614
The constitution of the College, and the subjects of study - - -	615
The first department - - -	615
The second department - - -	616
The third department - - -	617
An institution of a similar kind is necessary here - - -	618
Some variations from the Roorkee system will be needed - - -	619
First; a native "first department" would be out of place - - -	619
Second; our "first department" should consist of candidates for sub-engineerships - - -	620
Third; the studies of the third department will need some modification - - -	620
Proposed classification of the students at the College - - -	621
Terms of admission and studies for the second department - - -	622
Terms of admission and subsistence for the first department - - -	623
The selection of the sub-engineers must be by merit, and not by seniority - - -	624
The third department; the lower division of it - - -	625
The upper division - - -	626
The English language should be the only medium of instruction - - -	627
Some general suggestions - - -	628
The necessity that the College should give real practical skill as well as theoretical knowledge - - -	629
Some suggestions as to the means of communicating it - - -	630
General management of the College - - -	631
A Library and model room to be formed - - -	631
The Presidency will be the best position for the school - - -	632
Great number and variety of Government works always going on at Madras, a means of practical teaching - - -	633
The services of lecturers may be obtained at Madras, to aid in giving instruction - - -	634
The number of students necessary in each of the departments - - -	635
Probable cost of the Institution - - -	636
Its cost will be insignificant compared with its value - - -	637
This plan of a College is only offered as an outline - - -	637

SECTION XI.

Recapitulation, and concluding General Remarks.

The scope of this Section - - -	638
The second Section; sketch of the system of irrigation - - -	639
The Public Works Department of the Board of Revenue - - -	640
The Agency under the Board - - -	641
Defects and remedies - - -	642
The Muistries - - -	643
The new rules proposed by Government - - -	643
Suggestions for immediate adoption - - -	644
The third Section - - -	645
The early state of the roads - - -	645
Their treatment by the British Government - - -	646

SECTION XI.—Recapitulation and concluding General Remarks—continued.

	Paras.
The Salem Roads - - -	647
The Red-hill Railroad - - -	647
The Road Department - - -	648
The duties required of it - - -	648
Its treatment by the Government - - -	649
Result of our inquiries as to its working - - -	650
Its abolition recommended - - -	651
The fourth Section - - -	652
The Military Board - - -	652
Its duties, and the Agency at its command, in the Engineering Department - - -	652
Routine of making estimates, &c. - - -	653
And of executing work - - -	653
The roads in Military Cantonments - - -	653
Changes proposed in the Military Department - - -	654
The fifth Section; a single new Board proposed for all Public Works - - -	655
Proposed constitution and duties of the Board - - -	656
The sixth Section - - -	657
The works of irrigation - - -	657
Their neglected condition - - -	658
Examples of the benefit of attending to the irrigation - - -	659
In Tinnevely District - - -	659
In South Arcot - - -	660
In Tanjore - - -	661
In Rajahmundry - - -	662
Results of all the improvements undertaken - - -	663
The ill effects of neglecting the irrigation - - -	664
Notices of the famine in Guntur - - -	665
Objections answered - - -	666
An exceptional case - - -	667
General suggestions - - -	667
The seventh Section - - -	668
The Collector's reports on the roads - - -	668
Condition of the roads of the country - - -	669
The Collector's reports and the orders of Government - - -	670
The people cannot make the main roads - - -	671
The Ferry funds - - -	671
Beneficial effects of road improvements on the Government Revenue - - -	672
Example in Canara - - -	672
Contrast in Ganjam and Vizagapatam - - -	673
The Western Trunk Road - - -	673
Sketch of a system of main roads - - -	674
Really good roads are required - - -	674
The Sea-ports of this Presidency need attention - - -	675
Coringa and the Godavery Navigation - - -	675
Cochin and other Ports - - -	675
A special fund for improving the harbours exists - - -	676
The Paumbam Channel - - -	676
The eighth Section - - -	677
Proper amount of expenditure on irrigation - - -	677
A special fund, not a part of the Government Revenue, set apart long ago for maintaining the irrigation works - - -	678
Extent of roads required - - -	679
Their cost - - -	680
Their effect in saving the cost of carriage - - -	681
The Cart tax in Salem - - -	682
The cross roads - - -	682
Total expenditure proposed; how to be provided for Railways and Canals to be formed by private enterprise - - -	683
The whole amount of the expenditure to be at the disposal of the local Government - - -	684
The ninth Section - - -	685
Remarks on "Superintendence" - - -	685
The want of Officers - - -	686
The proposed Establishment - - -	686
The Commissioned Officers - - -	686
The subordinate grades to be much increased - - -	687
Salaries and promotion - - -	687
The tenth Section - - -	688
Number of Engineer Officers required - - -	688
Comparison with the other Presidencies - - -	689
The training of Engineer Officers - - -	690
The subordinate grades of the department - - -	691
A training institution for them is necessary - - -	691
Further suggestions respecting the College - - -	692
It should be at the Presidency - - -	692
Number of pupils, and cost - - -	692

INDEX TO THE PARAGRAPHS.

<i>Concluding Remarks.</i>		Paras.	<i>Concluding Remarks—continued.</i>		Paras.
Our recommendations are directed to three principal points - - - - -		693	Proportion of the cost of the proposed establishments to the value of the property to be cared for - - - - -		709
Irrigation works - - - - -		694	The Government buildings - - - - -		710
Roads - - - - -		694	The irrigation works - - - - -		711
Establishments - - - - -		695	Their value - - - - -		711
The Madras Revenue System holds out peculiar inducements to the Government to promote Irrigation - - - - -		696	Per-centage of the cost of establishment - - - - -		712
And the climate makes it eminently remunerative to do so - - - - -		697	The road establishments compared with the gain from good roads - - - - -		713
A very wide field is open for such improvements - - - - -		698	Cost of superintendence in England - - - - -		714
It is to be hoped that the liberal policy followed in North India will be imitated here - - - - -		699	Comparison with Bengal - - - - -		715
And the formation of roads is not less important - - - - -		700	The Canals in North India - - - - -		715
They are necessary not merely to enable this country to advance, but to retain its present position - - - - -		701	Cost of the establishments upon them - - - - -		716
The Sugar Trade especially needs such relief at the present time - - - - -		702	Efficient establishments are needed here also - - - - -		717
Particular instance of the loss from want of roads, in this regard - - - - -		703	Details of the establishments on the North Indian Canals - - - - -		718
Present state of the roads - - - - -		704	Comparison with the very deficient establishments under this Presidency - - - - -		719
It is to be hoped that a period of improvement is now at hand - - - - -		704	The income from the Madras works, per mile, is very much greater than from those of North India - - - - -		720
The want of Engineer Officers - - - - -		705	And therefore an efficient establishment would be a much lighter charge in their case - - - - -		720
This is partly the reason of the absence of improvements - - - - -		706	The income from the North India Canals, as compared with their original cost - - - - -		721
Remarks on the scale of establishment proposed - - - - -		707	That from similar undertakings here is very much greater - - - - -		722
Extent of territory, and amount of population - - - - -		707	Conclusion - - - - -		723
The work to be done by means of the establishment - - - - -		708	The employment of convicts on public works - - - - -		724
			The amount of such labour available is too small to be of importance - - - - -		724
			Suggestions as to the management of convicts when employed on Public Works - - - - -		25

NOTIFICATION.

For convenience sake, the concluding Section of the Report contains a Recapitulation of the contents of the preceding Sections.

A Glossary of Indian Terms will be found after the Appendix.

FIRST REPORT
OF THE
MADRAS PUBLIC WORKS COMMISSIONERS.

SECTION I.

INTRODUCTION.

1. In pursuance of instructions from the Honourable the Court of Directors, conveyed in their despatch to the Government of India, dated 30th January 1850, the Right honourable the Governor in Council was pleased, in the Extract from Minutes of Consultation, Public Works Department, 17th February 1851, No. 57, to constitute us a Commission to inquire into and report upon the system of Public Works in this Presidency. By the same order we were empowered to call on all departments and individual officers for information connected with the subject of our inquiries; and by a subsequent order (21st March, No. 109), we were authorized to call before us, and examine *vidâ voce*, any persons in the service of Government whom we might think it necessary so to examine. In this latter order, and in a memorandum, dated 22d March, the particular objects for the inquiries of the Commission were pointed out with more detail. We give those orders in full in the Appendix (A.), and it does not seem necessary to refer to them more particularly in this place. * Recital of appointment and instructions.

2. Agreeably to our appointment, we met in Fort St. George, on the 21st March 1851, and commenced our proceedings. Assembling of the Commission.

3. According to the terms of the Honourable Court's despatch, para. 65, our inquiries were to embrace "the whole subject of the superintendence and execution of Public Works" under this Presidency. Those works are carried on under three distinct and independent departments; viz. 1st. The Public Works Department of the Board of Revenue. 2d. The Superintendent of Roads. 3d. The Military Board. Subjects of inquiry.

The Board of Revenue has the control of all irrigation works, all civil buildings in the provinces, and all roads and bridges, not included in the "Trunk Roads," or in military cantonments, and all canals, &c.

The Superintendent of Roads has the sole superintendence of the great lines of communication which have been classed under the term Trunk Roads: he proposes all new roads on these lines, as well as all repairs and improvements, and he and his subordinates execute the greater part of the work.

The Military Board have the superintendence of the construction and repair of fortifications; of all public buildings, both military and civil, at the Presidency; the Government roads, and all bridges at the Presidency; all military buildings and forts in the provinces; and roads and bridges, &c., in military cantonments, as well as the roads, bridges and civil buildings and works in the Saugor Division. Besides these, the work at the Paumbum Channel is under the sole superintendence of the Chief Engineer.

4. Our inquiries naturally followed the same threefold division; and the means which we adopted of obtaining information were the following:— Sources of information.

We examined *vidâ voce* the late Chief Engineer, the Secretary to the Board of Revenue in the Public Works Department, and the Master of the Survey School; the Superintendent of Roads, his assistant in charge of the high western road, the Superintendent of Government Roads at the Presidency, the Secretary to the Military Board, the Superintending Engineer of the Presidency division and his assistant, as well as some members of his native establishment, and some contractors, the head book-keeper of the Accountant-general's Office, and some other persons. And we examined at great length several Maramut gomastahs from the districts nearest to the Presidency, with the view of obtaining an insight into the actual operation of the existing practice in that branch of the Public Works Department.

Department which is under the Collectors. We also addressed papers of questions to the Collectors the Civil Engineers, the Superintendent of Roads, the Superintending Engineers, and the Commanding Officer of Sappers, and entered into correspondence with individual officers, on particular subjects relating to their districts or divisions. We likewise procured from the Records of the Government Office, the Revenue Board, and other departments, a vast body of papers bearing on the past and present state of the Public Works Department, and its operations in any of its parts.

Plan of this Report.

5. We now proceed to lay before Government the result of our inquiries and deliberations; and as it will be necessary to view the Public Works Department as a whole, we shall, in the first place, detail the present system in all the three branches above specified, pointing out in each those defects which appear to us to exist either in its structure or in its minor arrangements; and we shall then proceed to propose the remedies which we deem suitable to correct those defects and improve the system, giving special attention to the improvement of the establishments, both as to numbers and efficiency.

Although but a very small part of the roads of the country are under the Road Department, yet, for the sake of the more convenient division of the subject, we shall, for the most part, treat of all the roads under the second of the heads above specified.

And we may here add, that agreeably to the arrangement declared in our letter to Government of the 12th May 1852, and approved in Extract Minutes of Consultation, 18th idem, we shall reserve the accounts of the Public Works Department, including estimates, bills, advances and adjustments, and the details of the executive systems, for a Second Report, to be submitted as early as practicable.

SECTION II.

History and present State of the Maramut Department of the Public Works under the Board of Revenue.

Irrigation very ancient and important.

6. WE proceed then to consider the extensive Department of Public Works under the Board of Revenue; and for convenience, we shall designate it by the term "Maramut Department," by which in common speech it is very generally known. With the exception of the districts of Canara and Malabar on the Western Coast, the whole of the territories of the Madras Presidency carry on their cultivation in great part by means of artificial irrigation, the water for this purpose being obtained either by channels taken off from the rivers, or by tanks or reservoirs in which the water of the rains is stored and drawn off for use. Works of both descriptions have existed from very remote times, for the value of irrigation in increasing the fertility of the soil was very early recognized, and princes and rulers of every grade devoted large sums to the formation of such works, which thus, in the course of ages, became extremely numerous. The revenue being so intimately dependent on the efficiency of these works, they received a large share of the attention of the Government, and especially of the Revenue Officers, in whom their immediate custody was vested. Even in the tumultuous and disturbed times which immediately preceded the introduction of British rule in the Carnatic, this duty was not wholly omitted, though many fine works were then allowed to go to ruin, and all were much neglected.

In the early periods of British rule, the department was unorganized and imperfect.

7. The early English Collectors necessarily assumed the charge of the works of irrigation with that of collecting the revenue. It was essential to the security of the revenue that the works should be kept in repair, and large sums were in fact expended on that account; but being without any professional assistance whatever, the Collectors were compelled to entrust the expenditure to native revenue officers utterly without science, and with very little empirical knowledge or practical experience or aptitude for the work, and with other duties to attend to: the consequence was ignorant waste, and fraudulent embezzlement of the public money. In the course of time this state of things attracted attention, and Engineer Officers were appointed under the title of Superintendents of Tank Repairs, to aid the Collectors in this branch of their duty; but for many years they were too few to produce much effect. There was at first only one Superintendent, when our possessions in this part of India were much less extensive than they afterwards became,

became, and a second was added* in 1809, the principal irrigated districts being divided between the two; but the subject having attracted the special notice of the Honourable Court,† the department was re-organized in 1819, the territories, exclusive of Canara‡ and Malabar being then formed into three divisions, each with a "Civil Engineer;" and the whole being placed under the control of an engineer officer at the Presidency, styled the "Inspector-General§ of Civil Estimates," who was to be the channel of communication in this department between the revenue and engineer officers in the provinces and the Board of Revenue. In 1825 the whole Maramut Department, including the Inspector-general himself, was placed under the Board of Revenue; the Inspector-general having the power, however, to record his sentiments for the information of Government, when they differed from the opinion of the Board.

8. The department continued on this footing for a number of years: in 1836 a change|| was made, by giving the Chief Engineer a seat at the Board of Revenue in the Public Works Department, abolishing the office of Inspector-general of Civil Estimates, and creating that of Secretary to the Board of Revenue in the Department of Public Works, upon whom were to devolve all the administrative duties previously performed by the Inspector-general. The object of this change was to give the Chief Engineer a more entire control than he before could exercise over the officers of the corps, and to give the Maramut Department the advantage of his experience. Improvement of its organization.

9. But in 1838 a still more material alteration was made. The importance of this department to the revenue, and the improvement of the country, had been increasingly felt; and as the necessity of strengthening it as much as possible gradually forced itself on the authorities, the number of officers in the provinces had been increased as opportunity allowed, by withdrawing assistants from the superintending engineers and giving them to the Civil Engineers. Still the want of officers, and the vast extent of the divisions were such, that the superintendence, by the Civil Engineers' Department, was no more than nominal in the great majority of cases; and to remedy this evil as far as practicable, the appointment of Superintending or Military Engineer was abolished in 1838 in four¶ out of the five divisions of the army within the frontier, and the whole Presidency was re-arranged to form eight Maramut divisions, each under a civil engineer. At the same time the duty of constructing and repairing civil buildings in the provinces, which had hitherto been under the Superintending Engineer and Military Board, was transferred to the Civil Engineers and Collectors under the Revenue Board, while the custody of the military buildings (previously vested in the Superintending Engineer) was transferred to the station-staff officers, with very small executive establishments; and it was provided, that when repairs or other works to military buildings in their divisions was required, the civil engineers should give their assistance, as far as the other calls upon them would admit. On this footing the department has remained to the present time, with a few minor changes; the arrangement of the divisions has been altered, and the number of officers has been somewhat increased. Further improvement.

10. The foregoing is an outline of the origin and growth of the Public Works Department of the Board of Revenue, and of the Civil Engineer's Department in the Provinces; we will now briefly detail the duties of both, and this will involve a short account of the system of irrigation. Sketch of the system of irrigation.

Excluding the small district of Madras, the British territories under this Presidency are divided into 20 districts or collectorates, reckoning as one the newly-acquired principality of Kurnool; and the aggregate extent of the whole is 138,249 square miles. Three districts to the north, viz. Ganjam, Vizagapatam, and Masulipatam, are in great part under zemindary settlement; and the officers of Government Territorial division of this Presidency.

* Colonel D'Havilland to Board of Revenue, 10th September 1818.

† Despatch Revenue Department, 3d Sept. 1817, paras. 13 and 14.

‡ In Malabar and Canara the Superintending or Military Engineer was to perform the civil duties also.

§ Board of Revenue to Government, 4th November 1819. Government to Board, 29th November 1819. The office of Inspector-general was not then first constituted; but its duties became more extensive, because the local Superintendents were increased in number.

|| Extract Minutes of Consultation, Revenue Department, 31st August 1836, No. 1,158.

¶ In the other division (Malabar and Canara) the appointment of Superintending Engineer had been already abolished, and his duties given to a civil engineer.

ment have but little to do with the internal economy of the zemindaries.* The other districts, which are for the most part under Ryotwar settlement, are each distributed into a number of sub-divisions called Talooks; and each talook is under a Tahsildar, who is its chief revenue officer, and the head of its police, and is also charged, under the general direction and control of the Collector, with the custody of public works, other than judicial and military buildings, within his talook, and with the execution of repairs to such public works. The number of talooks in a district ranges from eight in Trichinopoly to 18 in Malabar; the average number is 13, there being 256 talooks to 20 districts.

Its distribution for Maramut purposes.

Collectorates.		Civil Engineer Divisions.	
Names.	Extent in Square Miles.	Names.	Extent in Square Miles.
Ganjam -	6,400	Sub-division -	14,050
Vizagapatam -	7,650		
Rajahmundry -	6,050	1st Division -	16,010
Masulipatam -	5,000		
Guntoor -	4,960	2d Division -	20,900
Nellore -	7,930		
Cuddapah -	12,970	3d Division -	24,019
Bellary -	13,056		
Canara -	7,720	4th Division -	9,820
Kurnool -	3,243		
Chingleput -	3,020	5th Division -	15,810
North Arcot -	6,800		
Salem -	8,200	6th Division -	6,900
South Arcot -	7,610		
Tanjore -	3,900	7th Division -	14,340
Trichinopoly -	3,000		
Malabar -	6,060	8th Division -	16,400
Coimbatore -	8,280		
Madura -	10,700		
Tinnevely -	6,700		

Reasons for the existing distribution.

11. These 20 Collectorates are divided nominally into eight Maramut divisions, but really into nine, as will be explained below. The area of each division, and the names of the Collectorates included in it, are shown in the margin. The arrangement of the divisions was re-cast in 1847; and under the present distribution, each division, except the 1st and 3d, contains two districts, one on the coast and one inland. The 1st division comprises five districts, of which all are on the coast except one (Guntoor), and even that touches it at one point; the third division, besides Canara and Bellary, includes Kurnool, where however there is at present but little work going on.

The objects intended and effected by this re-distribution were as follows: to make all the divisions more compact; to avoid the inconvenience of having one division in which

all operations must be at a stand for four or five months, as was the case when Canara and Malabar formed a division; to place the whole course of every river, as far as practicable, under one control; to equalize, as far as can be done, the amount of work in all the divisions; and to secure a due portion of attention to the two northern districts, Ganjam and Vizagapatam. This last object was effected by constituting those districts a sub-division of the new 1st division, and appointing to them a First Assistant Civil Engineer, who is independent of his nominal superior, corresponds directly with the Board, and is in fact a civil engineer in every thing except the name and the salary. The arrangement has been in all respects an improvement.

The districts having Government works of irrigation.

12. Of the 20 districts, Malabar and Canara have no irrigation, for they receive the whole brunt of the south-west monsoon, which fully supplies them with water. The irrigation works of the three zemindary districts are numerous, but only a small proportion of them, viz. those in the Government talooks, are under the charge of the officers of Government. The greater part of the works in Guntoor and Rajahmundry were likewise under the zemindars till lately, but the whole of those in Guntoor, and a great part of those in Rajahmundry, are now under the Collector, and a good deal has been done in the last few years to improve them. The remaining 12 districts are almost wholly Ryotwar, and the irrigation works in them are the property of Government. The following are the principal modes of irrigation in use.

The several modes of irrigation.

The drainage of the whole peninsula of India, except the narrow strip at the foot of the western ghauts, is towards the east; and the larger rivers having a considerable part of their course within the countries of the south-west monsoon, and partaking also of the north-east monsoon, are never quite dry, or only for one or two months in the year. Irrigation is obtained from these rivers either from the high floods, which occur during the height of each monsoon, or from the low freshes, which run for eight or ten months in the year.

By the low freshes of the rivers.

13. The latter are thus turned to account; channels are taken off from the rivers at

* Till recently Rajahmundry and Guntoor were also under zemindars, but many of the zemindars having fallen irrecoverably into arrears and embarrassments, the whole of Guntoor, and a considerable portion of Rajahmundry, have reverted or been surrendered to Government.

at so low a level as to give a command of the stream ; sometimes there is an anicut or dam of rough stone or masonry across the river at the head of the channel, which raises the stream at once, and so saves the cost of a proportionate length of channel in bringing the water to the surface of the ground ; generally, when there is no permanent anicut, a temporary dam has to be made annually. These channels require a regulating sluice at the head, to prevent the influx of the water of the high floods ; some however are without such necessary work, and are frequently breached or filled with sand by the high floods. The channels being led off at a less incline than the bed of the river, are so brought to the surface of the country, and then flow along between embankments, the water being let out to the lands by means of small sluices in the banks. Most of the irrigation from the Cauvery, the Umrauvutty, the Noel, the Tambrapoorny, the Vigay, the Pennar, and the Toombuddra, is of this description ; and of this kind also will be the irrigation from the new anicuts across the Godavery and the Kistnah. Some of the most valuable works in the country are channels of this kind ; there are single channels from the Cauvery flowing a course of 30 miles, irrigating the lands of above a hundred villages, and producing an annual revenue of above a lack and a half of rupees.

14. Flood-water channels are taken off from the rivers by similar means to those just spoken of, though sometimes at a somewhat greater height above the bed of the river ; they are led on a high level like the others till they come to the surface of the country, and their contents are there received into extensive tanks or reservoirs, where the water is stored for use, and drawn off to the fields as required, by means of sluices in the bund or retaining bank of the tank. These channels also are not secure unless they have regulating head sluices, but many are without them. These, too, are sometimes supplied by means of an anicut, and sometimes not ; the same anicut sometimes supplies channels of both kinds, and the same channels sometimes irrigates in both methods, conveying the water of the high floods to a tank, and distributing that of low freshes to the lands situated along its course. It will be obvious, from this brief description, that the operation of a flood-water channel need not interfere with the rights of existing low fresh channels. It is only necessary that the floor of the former shall be raised sufficiently above the bed of the river ; and the flood-water channel will then only take that portion of the stream which is not required by the other. There are some fine tanks supplied by means of such channels ; such are the Vecraunum tank in South Arcot, the Cauveripauk and Maumundoor tanks in North Arcot, the Cumbum tank in Cuddapah, and many others ; but in general it may be affirmed, that the greater part of the flood waters of our rivers are turned to no account, and vast bodies of water flow annually to the sea, which might be made use of to fertilize hundreds of thousands of acres now jungle or waste, to feed and maintain a vast population, and to add enormously both to the wealth of the people and to the revenue of the Government.*

By the high freshes.

15. Some account must be given also of the "Tanks" just spoken of. A tank is not an excavation, as might be inferred from the term ; it is a receptacle for water, formed by constructing an embankment or bund across a valley, and so damming up the drainage of the valley. The bund is of earth, but it is often protected in front with a facing or revetment of rough loose stone, as a defence against the action of the waves raised by the wind on the surface of the water ; it is also pierced by sluices or tunnels of masonry, by which the water is drawn off as required to the fields below, and which are furnished with a simple contrivance for opening and closing them. Some of these bunds are of great size. We subjoin a memorandum, showing some particulars of four of the largest, though not absolutely the largest :

Irrigation tanks described.

District.	Name of the Tank.	Height of the Bund.	Length of the Bund.	Number of Villages watered.	Average Annual Revenue to Government.
		<i>Fect.</i>	<i>Miles.</i>		<i>Rupres.</i>
Nellore - -	Cunnigherry Tank - -	20	2	23	78,000
North Arcot -	Cauveripaukum Tank -	45	4	23	43,000
Chingleput -	Chumbrumbaukum Tank	25	3½	58	49,000
South Arcot -	Veeranum Tank - -	21	9	149	1,14,500

But

* As canals for irrigation have been found to be prejudicial to the public health in Northern India, we may here state that such result has never been met with in this Presidency.
407—1.

But there are few tanks of this large size; the greater number yield under *Rs.* 5,000 annually each, and from many the revenue is under *Rs.* 1,000, or even *Rs.* 500. Many tanks, and all those of magnitude, besides collecting the drainage of the country in their front, receive water also from rivers, by means of channels, as already described. And this is by no means confined to tanks of the largest size; hundreds of tanks yielding no more than *Rs.* 3,000 annually have river channels. This is indeed by far the most valuable source of supply, as being more secure both from deficiency and from excess than a dependence on the rains of the locality.

Calingalahs.

Tanks possessed of only this latter source of supply form, however, a very numerous class, from small tanks having bunds 500 yards long, and yielding *Rs.* 300 or *Rs.* 400 revenue (many indeed are smaller than this), to such as have a bund of a mile in length, and yield *Rs.* 3,000 or *Rs.* 4,000 in a good year. Many of these works might be supplied from rivers, and their value would be much increased by such improvement. It is only necessary to add, that to obviate the danger of an excessive influx of water, most tanks are provided with an outlet called a Calingalah. This is work generally of masonry in large tanks, in others often of rough stone; it is built in the bund, near one end of it; it is so much lower than the bund itself that any superabundant water can escape over it, and of such width or gorge as to be sufficient to carry off all such surplus water. This opening is closed towards the end of the rainy season, so as to keep the tank quite full; and this is done by means of straw and turf. To aid this operation, the crown of the calingalah is generally provided with a row of rough granite posts, about three or four feet high, as an assistance and support to the wall of straw, turf, &c. which is built up in front of them.

Statistics of irrigation works.

16. In concluding this cursory view of the system of irrigation in use in this Presidency, we would give a statement of the number of works of each description, and of the various sizes, but no such classified list exist, and could only be prepared with much time and labour in the districts. In 1845 the Board of Revenue called upon the Collectors and civil engineers to prepare and submit lists of the tanks and channels, &c., yielding above *Rs.* 500 of annual revenue, with certain particulars. When completed the statements will form a useful record; as yet they are extremely imperfect, the civil engineer having had no time to revise them on the spot, as is properly required by the Board. The mere mention of the number of the works would give no just idea respecting them, as they vary so greatly in size and value; but we may notice that, according to the Jummabundy returns received by the Board of Revenue, which however cannot be relied on for accuracy, the number of tanks and channels in 14 of the chief ryotwar irrigated districts (omitting Tanjore, from which accounts are not received, but including Kurnool), considerably exceeds 43,000 in repair, besides above 10,000 out of repair. To these belong innumerable sluices, calingalahs, anicuts, head sluices, and a variety of other works, large and small. The revenue immediately dependent on the Government works of irrigation is about 135 lacs of rupees, besides fully 15 lacs more, alienated as enam; and assuming that they now yield no more than 10 per cent. on their original cost, the amount of the capital invested in their construction may be taken at 1,500 lacs, or 15,000,000*l.* sterling. The amount actually expended was probably much more, for many of the old works were constructed on very unfavourable sites, and many others were formed less with a view to profit than as perpetual memorials in honour of the founder, and at a cost very disproportionate to the probable return.

The custody of the works of irrigation.

17. The custody of this vast amount of property, on which so large a part of the revenue depends, and which from its very nature is peculiarly exposed to much ordinary wear and tear, besides many occasional risks, devolves primarily on the Collector and his tahsildars; then on the Civil Engineer Department, whose more special province it is to give advice and assistance to the Collector, in preventing danger and repairing damage; and, lastly, on the Board of Revenue, as supreme controlling authority over both the lower departments.

Of the roads and other communications.

18. The roads and communications of the country are also generally under the Board of Revenue; and, subject to its control, are under charge of the Collectors and Civil Engineers. Up to a recent period, all roads throughout the Presidency were under the Board, except those at Madras and those within military cantonments; but in the early part of 1845, a new department was constituted, under a Superintendent of Roads, to whose charge are entrusted certain of the principal lines, extending in the aggregate to about 2,300 miles. All other roads in the provinces,

provinces, as well as the few navigable canals that exist, are still under the Board of Revenue. The extent of these roads cannot be stated, for they have never been classified or measured; but some idea of it may be gathered from the consideration that they form the internal communication of a country considerably larger than the whole of the United Kingdom. We shall have to speak of the condition of the roads below; and will here only observe, that they have almost invariably been wholly neglected. This circumstance is to be attributed in part to the fact that the Civil Engineers have never had more than a very little time to give to the roads, while without their aid the Collectors could do very little; but chiefly to the fact, that the importance of improving the communications has never been duly recognised. Hence the Board of Revenue have failed to do more than adopt some of the improvements brought before them by the local officers, and have never attempted to form any general system of roads; and hence, expenditure on the roads has almost always been an unwelcome subject with Government, and they have discouraged the submission of projects of improvement by the Board of Revenue, and have rejected some that have been submitted.

19. All revenue, judicial and general buildings in the provinces are likewise under the same authorities, except that the custody of judicial buildings rests in the Judicial Department and not in the Collectors, and estimates for their repair or improvement, though made by the Civil Engineer or the Revenue Officers, and executed by the latter, are submitted for the sanction of Government through the Sudder Adawlut, and not through the Board of Revenue. And of the Government buildings.

The revenue and police buildings comprise the Collectors' Cutcheries, the Treasuries, the Talook Cutcheries, Sea Custom-houses, Salt, Godowns, Cutcheries of Police Ameens and the Cutwals' Choultries. The judicial buildings comprise the Court-houses of the Civil and Subordinate Judges, and of the Principal Sudder Ameens, Sudder Ameens, and the District Moonsiffs, and the Gaols. The general buildings are chiefly Dispensaries, Travellers' Bungalows and Lighthouses.

20. In all the foregoing classes of works; judicial buildings excepted, all repairs and alterations are made under the orders of the Board of Revenue; and it is the same authority that receives and discusses all projects for constructing new works, or for improving or enlarging old ones. All estimates for such works are submitted to the Board by the local officers, except in the few cases to be noticed below, in which such submission is dispensed with; and if approved by the Board, are laid by them before Government. The Board likewise exercises control over the execution of works; receives, examines and submits to Government the bills for work done; distributes and transfers the assistants and other subordinate officers of the Civil Engineer; is the referee and appellent authority in all matters connected with the Maramut Department; and, in short, exercises a general control over every part of the department, whether under the Civil Engineers or under the Collectors. It is obvious that these duties must involve a vast deal of business. The number of estimates received and disposed of by the Board, in 1850, was 5,872, to the amount of Rs. 17,28,324; and the number of Bills passed and submitted to Government in the same year, was 8,530, to an aggregate amount of Rs. 11,86,284; the number of letters received and despatched from and to Government, was 945, and from and to other offices, was 6,743; the number of foolscap pages of current business, was 22,332. And even with this amount of work the Board's office is not kept clear, and in one important particular there are heavy arrears. We find, that from the heavy pressure of business in the office, bills for works done can rarely be examined in less than a year after receipt, and, probably, in consequence of this inability to deal with them when they come, the Board fail to hasten their submission by the district authorities; so that a still longer time sometimes elapses between the completion of a work and the transmission of the bill for it to the Board. To this subject we shall have to recur in more detail in our report on the accounts of the department.

Duties of the Board of Revenue in connexion with those works.

Such delays, however, can hardly be imputed as a fault of the Board, they proceed almost wholly from the inadequacy of their office establishment; and for that the Board are not responsible, as they have repeatedly, though with very scanty success, urged on Government the necessity of giving them more assistance in their office.

21. The Board, in common with the provincial part of the department, have also been charged with other misfeasances; viz. over-expenditure beyond estimates, The working of the Board.

the failure of works, and the recommendation of projects without sufficient examination. But it appears that an appeal to actual facts fails to substantiate these charges. With respect to insufficient estimates, we obtained from the office of the Board a statement showing the amounts of all the estimates for occasional works in the six years, 1843 to 1848, being 150 in number, and the sums actually expended in the execution of each. Out of the whole number of estimates, to the total amount of Rs. 11,60,184, we find that only 16, to the aggregate amount of Rs. 2,31,249, were exceeded in execution by more than 10 per cent. And of this small number, the excess was caused, in five instances, by natural accidents, such as certainly no estimate ought to provide for; in three, by the enlargement of the design after the estimate was sanctioned; in two, by unforeseen rise in the price of timber; and in others by various causes, of which want of good superintendence, and defective arrangements on the part of the revenue officers, seem the principal. In four, the sole or the partial cause seems to have been an inadequate estimate; but in two out of the four, a nearer approach to the fact could not have been obtained beforehand, except by a careful examination of the soil over long distances, and at very considerable depths; an operation involving both loss of time and expense. The statement here alluded to is a long one, and as this is the only occasion on which we have to advert to it, it seems needless to print it in the Appendix.

As to the alleged adoption and recommendation of projects by the Board on insufficient grounds, and the unsuccessful issue of such projects, we beg to refer to the statement in Appendix (Z.) That statement shows the results of all the expenditure for improving irrigation during 14 years. The number of works is 39, and their cost Rs. 5,41,116; and the annual return in revenue, after deducting the cost of repairs and minor improvements, amounts to 69½ per cent. on the outlay, a result which must be admitted to be a full justification of the recommendation of the projects by the local officers and by the Board of Revenue. Three of the works, from peculiar causes, have yielded no profit, and that afforded by others has been at a low rate; but it is not in the nature of things that all should be equally successful; and excessive caution to avoid all possibility of failure might have refused some of the projects which have proved the most remunerative. We shall have to advert to this statement again.

Its defects.

22. But though we are of opinion that the Board have to this extent acquitted themselves of the duties committed to them, we are of opinion that they have much come short of what ought to have been done in more important parts of their duty, viz. in the higher functions of a general controlling authority. We find an absence of anything like a general view of the resources and of the wants of the different parts of the country. With one imperfect exception, there has been no attempt to ascertain the number, size or condition of the works of irrigation throughout the country; there seems to have been no comparison of one district with another, either as to the quantity of work done, the cost of doing it, or its results; no inquiries as to the capabilities of districts for improvement, or as to the backwardness of some officers to bring forward improvements, compared with the multiplicity of such recommendations received from others. And as to the roads, there has been no comprehensive view of the wants of each district, no general scheme of roads proposed, no consideration of the sort of road or other means of communication most proper in each locality. In short, the Board have done their best, with the aid, in general, of a highly efficient Secretary, but with a very inadequate office establishment, to deal with the business brought before them; but they have attempted very little beyond that, and have rarely taken the initiative in suggesting improvements.

The cause of those defects.

23. And the cause of these deficiencies is not difficult to discover, it lies undoubtedly in the fact, that the Board is physically utterly unequal to the various duties required of it. It is primarily a Board of Revenue, and its duties, in connexion with the public works of the country, highly important as they are, have always and unavoidably been regarded as supplementary and subordinate. The revenue duties are fully sufficient to occupy the whole time of the members, and they are unable to give more than a very limited amount of attention to the Public Works Department. It is true that the Chief Engineer has a seat in the Board in that branch of its business, and nominally he is the professional head of the department; but he has, besides that, two other offices to attend to, his own and the Military Board, in which also he has a seat. Hence he also, though he gives his written opinion on new projects, agreeably to the orders of the Honourable Court,

Court, has but little time to give to the general business of the Board or to devote to the improvement of the department. Again, except on the one day of the week that the Revenue Board meet, he does not come to that office, but sits in his own office, in a distant part of the Fort. Hence, when the authority of a member of the Board is required for any order, the Secretary is naturally led to apply to one of the civil members instead of the Chief Engineer; and thus, though all papers go in circulation to the latter officer, yet many minor matters, which require immediate reply, are disposed of before he sees them; and from these causes it comes to pass, that he certainly exercises less influence in the department than might be expected from his ostensible position. In point of fact, the Secretary alone has long been its real head; and this is more emphatically the case in consequence of a late despatch from the Court of Directors.

Up to a recent period the Secretary regarded himself, and was regarded by the Board, simply as their ministerial officer, bound to afford them the aid of his knowledge and experience, but not sharing the responsibility of their decisions. But in their despatch of the 29th May 1845, para. 11, noticing the insufficiency of the estimate for the Godavery anicut, the Honourable Court passed censure jointly on the Chief Engineer and the Board's Secretary in the Public Works Department, for not having pointed out the inadequacy of that estimate. Captain Bell now felt that if he was to be liable to censure for acts of the Board, it was just that he should have the right to record his dissent from their opinions; and this right the Board conceded to him, and he has exercised it more than once. This state of matters appears to us very objectionable; it is obviously contrary to good policy that a Board should be so weak or so encumbered as to be obliged to leave the disposal of business wholly to the Secretary, but we think it still worse that a Secretary, whose duty it is to carry into effect the orders of the Board, should be placed in the mixed and anomalous position of also sharing their responsibility, and therefore of discussing and disputing their orders.

24. The defects now noticeable in the present constitution of this department must have existed in some degree from the very first, viz., when a department for Public Works was constituted in the Board's office in 1836, and we cannot suppose that that arrangement was adopted as anything better than the least of two evils. And not only has the business of the Revenue Department of the Board very much increased since that time, but the Maramut, or Public Works Department, has become enlarged in a much greater degree. At the time of the change that department was still infantine in its proportions, and utterly crude and unformed in its structure, but during the whole succeeding period it has been gradually and progressively growing, till at the present time, though still much below the requirements of this extensive country, it has far outgrown the power of the present controlling body to deal with it. To prove this we need only appeal to a table which we have obtained from the Board, and which we give in a note at the foot of this page.* It will be seen from that Table, that since the department was annexed to the Board

Vast and progressive increase in the business of the department.

* TABLE of the Increase of Business in the Office of the Board of Revenue in the Public Works Department.

Years.	Correspondence.				Foolscap Sides of Collections for Honourable Court.	Foolscap Sides of Current Business.	Expenditure.			Number of European Officers, and Revenue Surveyors in the Department.
	With Government.		With other Officers.				Works of Irrigation.	Buildings and Roads.	Total.	
	Received.	Sent.	Received.	Sent.						
1836	229	208	672	707	649	4,174	6,97,951	45,723	7,43,674	26
1837	350	247	920	958	765	6,270	5,30,832	1,18,525	6,49,357	24
1838	429	386	1,371	1,281	1,094	7,695	5,96,668	1,87,762	7,84,430	29
1839	327	245	1,053	1,090	1,674	6,562	5,14,818	5,02,951	10,17,769	25
1840	319	281	1,410	1,111	1,839	6,758	6,25,013	3,90,446	10,15,459	31
1841	249	225	1,317	958	1,966	6,977	5,69,937	3,65,684	9,35,621	33
1842	298	224	1,228	950	2,518	6,895	5,30,845	4,11,217	9,42,062	36
1843	241	224	1,534	932	2,490	7,193	3,99,016	4,47,621	8,46,637	34
1844	337	324	1,655	917	2,718	11,152	6,09,687	3,74,577	9,84,264	34
1845	376	353	1,904	950	4,874	10,345	5,89,631	2,31,907	8,21,538	36
1846	436	393	2,580	1,279	6,537	10,246	5,65,186	2,13,802	7,78,988	40
1847	442	409	3,112	1,476	5,715	10,143	7,53,630	2,75,039	10,28,669	58
1848	479	514	3,422	1,369	5,850	13,976	9,03,098	4,14,104	13,17,192	73
1849	452	444	3,677	1,501	4,094	19,860	6,29,842	4,00,622	10,30,464	78
1850	449	496	4,156	1,642	2,890	22,332	9,54,441	2,56,419	12,10,860	87

of Revenue, the correspondence with Government has increased nearly sixfold, and the whole correspondence nearly ninefold; that the expenditure under the control of the Board has very nearly doubled, and that the number of commissioned and non-commissioned officers and revenue surveyors has increased from 26 to 87, or nearly fourfold.

And it must and will increase still more.

25. And it is important to observe how singularly equable and continuous the increase has been in every particular; showing conclusively that it has not been owing to any extraneous or accidental circumstances, but has been the natural process of the growth and development of a new department, and it is certain that this department is still very far from having reached its full dimensions. We shall have to detail, in a subsequent part of our Report, how unequal the existing establishments are, even to the present scale of operations, and how urgently the interests of the Government, and of the country, require that those operations should be much enlarged. We are led, therefore, to the inevitable conclusion, that the Board of Revenue is of necessity, and from the very nature of the case, unequal to the control of the Maramut Department; we consider it absolutely necessary that this duty should be transferred to a different body, and in the proper place we shall set forth what we consider the fittest and best plan to adopt.

The Civil Engineers' Department.

26. We have next to detail the system of carrying on work in the Provinces. We have already (paras. 7 to 10) alluded to the gradual development of the Civil Engineer Department; it consisted at first of a single officer, but as our possessions extended, and its importance became better understood, it was enlarged from time to time, till it now numbers 24 commissioned officers of Engineers, besides 11 officers of the Line temporarily employed; there are also 25 Revenue Surveyors, who are, in fact, assistants to the Civil Engineers in their general duties, and 23 European Overseers from the Sappers and Miners, who are employed generally in the superintendence of large works in execution. The department, however, is one of supervision chiefly; the execution of works rests, for the most part, with the Revenue Department. The tahsildars are charged with this duty in their respective talooks; there are also a number of maistries and maramut accountants in each district, and most of the revenue servants take part in the duty in their respective ranges.

Evils of its former weakness.

27. Formerly, when the Civil Engineer Department was in its infancy, the estimates for all repairs of an ordinary character were made by the tahsildars and maistries, but this practice was found productive of very bad effects. The tahsildars were quite ignorant of the principles of the work thus imposed on them, and the maistries were no less so, and hence their estimates were generally injudicious and wasteful. Again, repairs were often allowed by a tahsildar, when they were not at all wanted, for the purpose of throwing Government money into the hands of his own friends or connexions among the village meerasdars; or if a heavy balance was outstanding in a village, a considerable sum was allotted for the repair of its tank, but was immediately credited in liquidation of the arrears; and in addition to these abuses, gross fraud was practised, in the absence of any sufficient supervising department, by charging for work which in fact had never been done. As the Civil Engineer Department became stronger, it became more and more the custom for estimates of all kinds to be made by that department, and the inspection exercised by it over work done has also become very much more extensive than it could be formerly.

Present system.

28. The system, according to the present practice, is as follows: the work is divided into three classes, Emergent, Ordinary, and Occasional. Emergent work is that which cannot be postponed, as when a tank or channel is breached, and must be repaired immediately, to save the crops, and the revenue of the year. Such work is done immediately by the Collector, without applying for sanction; it is for the most part of a very small amount.

The "Ordinary" estimates.

29. All irrigation works are necessarily exposed to the action of water, and of water running or raised into waves. It is obvious, therefore, that they must stand in need of continual attention and repair, especially that large portion of them which are composed of earth. The "Ordinary" estimates meet this necessity; they include, as their name implies, those repairs to tanks and watercourses, and other irrigation works, which are of a merely common and matter-of-course description, and such as are necessary to keep the works in efficient condition. Estimates of this class are now for the most part made by the Civil Engineer or his subordinates, who,

as

as they pass through the districts in their tours, receive lists of works requiring repair from the Collector or tahsildar, or visit them without their being so expressly pointed out. The estimates so made are sent to the Collector, who after examining them with reference to the revenue, of the village and other particulars, enters them (or such of them as seem proper to be executed), in an annual list. A similar list is made of those ordinary estimates framed by the tahsildars, which have been approved by the Collector, and both these lists are sent to the Civil Engineer. It was the practice, till very recently, to send these lists to the Board of Revenue, by whom they were submitted to Government; but this practice has lately been discontinued as quite useless, since the works were, for the most part, executed before the pleasure of the Government or the Board, as to the estimates, could be known to the Collector.

30. As soon as the lists are made out by the Collector, or as soon after the commencement of the year as possible, the Collector issues his orders to the tahsildars to commence the work, placing at their disposal for the purpose a sum equal to about a half or one-third of the amount of the estimates for their talooks respectively. The tahsildars then take steps for the execution of the work, making engagements with workmen, and making advances to them; and this is done in all ordinary works of moderate amount by means of the village officers of the villages where the work is to be done. When the first advance is worked out a second is made, and so on till the work is completed. The work is marked out and explained by the talook maistry, who also visits it from time to time while in progress, and reports on it. It is also, in many cases, visited while in progress by some officer of the Civil Engineer Department; and monthly or bi-weekly progress reports of the work are also sent to the Collector by the tahsildar. When completed, the work is measured, first by the Tahsildar's Department and by the maistry, and afterwards, in many cases, by the Civil Engineer Department, and the accounts are then made up.

Their execution.

31. The estimates called "Occasional" are in general terms, such as are designed either for the improvement or extension of existing works, or for the construction of new works. Of late years, indeed, some sorts of work have been required to be included in the occasional list which are merely "Ordinary" in their character. The intention of this change appears to have been to limit the discretion of the local authorities, and we think the effect has not been beneficial. Occasional estimates are made almost wholly by the Civil Engineer Department, though often on suggestion or recommendation from the Collector. They require the previous sanction of Government before execution, and are submitted through the Board of Revenue. When the estimates are sanctioned, they are executed by the tahsildars in the same manner as "Ordinary" estimates, except that the larger or more important works are now often executed under the superintendence of European overseers: in that case also the materials are frequently provided by the tahsildars. It may be here observed, that the Assistant Civil Engineers and also the Surveyors are generally authorized to make estimates or suggest projects. The Surveyors, however, generally refrain from making estimates for large works, except when they have been specially deputed on that duty, contenting themselves with bringing the subject to the notice of the Civil Engineer for his orders. In all cases the Civil Engineer adopts only such projects or estimates of his subordinates as he approves, disallowing the rest, or detaining them till he can obtain further information on the subject, by personal inspection or otherwise.

The "Occasional" estimates.

32. Estimates for repairing or making roads and bridges (other than the trunk roads), and for the repair or extension or construction of revenue and judicial buildings are under similar rules to those for occasional works of irrigation, except that in the case of judicial buildings, the estimates, after having been framed by the Civil Engineer Department (or if small by a maistry of the Collector's establishment), is submitted to Government for sanction through the Civil Judge and Sudder Adawlut, instead of through the Collector and the Board of Revenue. The estimates for all these works are almost invariably made by the Civil Engineer Department, except in the case of very trifling repairs. The previous sanction of Government is, in all cases, necessary before execution (except in the trifling cases of emergent repairs under Rs. 20 to buildings generally, and under Rs. 50 to travellers' bungalows), and when sanctioned, the work is done, in most cases, by the Tahsildar's Department, aided, when necessary, by the instructions of the Civil Engineer; and in the case of larger works, it is often done under the superintendence of a European overseer.

Estimates for roads, bridges and buildings.

Inspection by the
Civil Engineer.

33. It will be seen from the above brief detail of the present system, that the executive is almost entirely in the hands of the tahsildars, under the control of the Collectors, while the duties of the Civil Engineer Department are first, projecting and estimating; and, secondly, directing and inspecting. The works indeed are so numerous and so scattered, that with the utmost activity a Civil Engineer is unable to provide for the inspection of all by himself or his department; but all are liable to inspection, and it cannot be said beforehand which works will actually receive it, and which will not. The inspection too is a real effectual inspection, the work done is measured, and its quality tested, the accounts are examined, and the charges compared with the rates paid at other places, and with the common rates of the spot, and the complaints of the workpeople, if any, are received. A report of the whole goes to the Collector, who calls the parties concerned to account, as may be required by the circumstances; and a copy of the Civil Engineer's diary, with a memorandum of the Collector's orders upon it, goes to the Board of Revenue. Again, as to works in progress, not only are a considerable number visited by the Civil Engineer Department, but the Collector, the tahsildars, and the maistries correspond with him when at a loss on any point connected with the works, and receive his instructions.

The engineer
officers are too few.

34. With respect to the Civil Engineers' branch of the department, we have no hesitation in saying that its first and chief want is an increase of Engineer Officers. On this point, however, we will not enlarge here, as we shall have occasion to discuss it at length hereafter, we will only remark that a very little consideration is sufficient to show that the present strength of the department must be inadequate to its duties. The average extent of a division (*see* para. 11) is little less than 16,000 square miles. Over this large extent are scattered, probably, 10,000 works of irrigation, all of which require, in a greater or less degree, the attention of the Civil Engineer. The number of works actually receiving repair or improvement in a division may be about 800 annually, almost all of which ought to be estimated for and examined by the Civil Engineer's Department.

Consequent evils.

35. But besides this ordinary and routine work, many openings for improvement call for the attention of the Civil Engineer, which would be valuable in increasing the revenue and developing the resources of the country, but for which he has little time; these are both the restoration of many ancient works which were destroyed many years ago, and have never been restored, because no officer has had leisure to attend to them; the improving and enlarging of existing works, and the formation of new works. It is indubitable that much remains to be done in every district in this direction, in particular in turning to more advantage the waters of the numerous rivers which traverse the Carnatic. But to this end it is absolutely necessary that there should be officers in each division possessed of sufficient time to attend to such projects. The neglect of extending irrigation from the great rivers is noticed by the Board of Revenue in their letter of the 15th February 1847. Para. 28 to 31, Appendix (G.), the Board recommend that four officers should be specially employed for investigating projects of that description.

The roads.

36. Again, there are the roads, the improvement of which is of the utmost importance as respects both the Government revenue and the prosperity of the people. The district roads (*i. e.* all roads except the trunk roads), have always been nominally under the Civil Engineers; but as we have already said, very little has been done to them. If the country is to make any advance, this neglect must no longer be suffered; and we also propose, as will hereafter be more fully detailed, to place the local charge of the trunk roads also under the Civil Engineer. This subject, however, will be treated of more at large below, we now only refer to it as affording one reason why the Civil Engineer's department must be strengthened.

The public build-
ings.

And in addition to all the foregoing, the Civil Engineer has to provide for the repair, improvement and construction of the numerous civil buildings in two Collectorates, which, in 1850, averaged 40 distinct works, at an outlay of Rs. 16,000 in each division; and it is also necessary, as remarked by the Board, that the Civil Engineer should be enabled to give more attention to the military works in his division than has yet been practicable. This also will be more fully noticed in another place.

The department
must be strength-
ened.

Looking to all these calls on a Civil Engineer's time and thoughts, and even allowing for the additional strength which we shall propose to the subordinate departments, we are decidedly of opinion that, in order to secure efficiency, a considerable

siderable addition must be made to the permanent establishment of Engineer Officers in the Maramut Department, independently of those which will be at all times required for special works. We shall state below the details of what we think necessary, with particular reference to the order of Government,* calling for our opinion as to the number of Assistant Civil Engineers to be appointed to the department.

37. We will now briefly notice the Subordinates of the Civil Engineer's Department, and the particulars in which their efficiency needs to be increased. These subordinates are of two classes, the Revenue Surveyors and the Overseers. The former class appear always to have existed in the department; they have invariably been East Indians with one exception, that of a Serjeant of Sappers, who was made an assistant Revenue Surveyor some years ago. The term Revenue Surveyor may lead to the impression that these officers have some connexion with a Revenue survey; but this is not the case, there is no establishment whatever for such surveys; nor has a correct survey been made of any portion of the Madras territories. This class appear to have been called Surveyors, because surveying is a principal part of the instruction they receive; and Revenue Surveyors, because they are chiefly employed on irrigation works on which the revenue so much depends. Even in the latter sense, however, the term surveyor is improper, as their duties are by no means limited to surveying; they are in fact employed by the Civil Engineer as far as their respective individual qualifications enable him to do so, in all the various duties appertaining to the department; besides surveying and taking levels, they project small works, make estimates, and inspect work performed by the Collector's Department, and they are also occasionally employed in the superintendence of important works in execution. A Survey School, previously attached to the Observatory, was transferred in 1819, to the office of the Inspector-general, for the instruction of lads designed for Revenue Surveyors, and is still in existence; it is on a very meagre scale and a very defective plan, and in a subsequent part of this Report we shall have to recommend its abolition. On leaving the school, which they do after a course of about a year or a year and a half, and after an easy examination on the subjects which they have there studied, the lads are placed under the Civil Engineers as Sub-assistant Surveyors; their pay is Rs. 79. 0. 8., and as soon as they are reported by the Civil Engineer to be qualified for detached duty, they receive Rs. 24. 8., tent-allowance in addition. After being seven years in the department, from the time of entering the school, their allowances are raised to Rs. 141. 4., on their being recommended for it by the Civil Engineer; and two further advances of salary are open to them after certain terms of service, on the same recommendation. There are now in the department 25 Revenue Surveyors of the several grades.

The Subordinates of the Civil Engineer Department. The Revenue Surveyors.

38. We were particularly anxious to ascertain the actual qualifications of both the Surveyors and the European Overseers, and the results of their employment, and we addressed a number of questions to the Civil Engineers on the subject. The information we have obtained, as respects the Surveyors, is as follows: when a lad first joins a Civil Engineer's office, being then about 19 years of age, he is generally acquainted with such parts of his duty as can be learnt in an office; he can draw plans pretty well; can survey and take levels, though not with accuracy or certainty; and can prepare estimates, if the dimensions and other details are furnished to him. He is totally wanting in practical knowledge; he does not know a good brick from a bad one; is quite ignorant of the mode of preparing bricks or chunam; knows nothing, except by hearsay, of the various works employed in irrigation; and though he can generally speak one or perhaps two native languages, he cannot read or write any.

Their qualifications on first appointment.

39. A Sub-assistant Surveyor is generally kept by the Civil Engineer in his own office for about a year, during which period he is employed in drawing plans, and perhaps calculating estimates; he also accompanies the Civil Engineer in his visits to all works, and has the advantage of hearing his remarks upon them, and his instructions to maistries or others superintending works, and of reading his diaries. In this manner, by intercourse with the Surveyors and Overseers in charge of works visited, or who may come to the Civil Engineer's office, and by being employed

Their instruction and improvement afterwards.

* Extract Minutes of Consultation, Revenue Department, 24th April 1851, No. 308.
407—I.

employed occasionally to take a set of levels or make a survey, the young man gradually acquires some insight into his duties; and after a year or two, the Civil Engineer is compelled by his need of such aid, to detach him to make estimates for small repairs, and to inspect work done; as he improves, his services become more valuable, and he is gradually employed on more important duties; and those of the number who turn out well, become extremely useful to the Civil Engineer after they have been seven or eight years in the department.

Their defects; conceit.

40. As regards the moral qualities of this class, they are stated to be in general intelligent; they are also represented as having been for the most part both honest and sober; though some exceptions have occurred in both points. Their great defects appear to be, indolence; a want of activity and energy; an over estimate of their own importance; and a false estimation of what constitutes respectability, which makes them regard it as a degradation to put their own hands to any work. When first detached on duty by the Civil Engineer, a Sub-assistant Surveyor is only about 20 years of age; yet he goes about a district, inspects and reports upon work done by men of much greater practical knowledge than himself; his diaries go to the Civil Engineer and to the Collector, and orders are issued upon them, fining a maistry or reprimanding a tahsildar. Of course he feels himself to be a person of importance; he is liable to give himself airs; and though the testimony as to the general integrity of the class is very uniform, yet it must be taken rather with reference to gross acts, and there is no doubt that the temptations have been too strong for not a few young heads to bear.

Indolence and carelessness to improve themselves.

41. Almost all the officers whom we applied to, concur as to the indolence of the Surveyors, and their want of desire to improve themselves; and most of them, and we think with justice, condemn the rules with respect to promotion and salary, as in great part the cause of this apathy. The Sub-assistants appear to display much activity for a short time previous to the period at which they become entitled, in point of service, to promotion; and the same with the Assistant Surveyors, as they approach the periods for the increase in their allowances; but when the desired object is gained, this temporary zeal disappears. We think the principle of the present system a bad one, and we shall recommend a change: where length of service is the rule for pay or promotion, the necessary recommendation will rarely be withheld for mere negative inefficiency; we should have expected the practical operation of the rule to be just what it is stated to be; more especially as the very frequent changes among the commissioned officers of the department encourage a Surveyor to hope that the officer who witnesses his inactivity after gaining a step in allowances, will have left the division long before it becomes necessary that he should obtain a recommendation for another step.

Want of energy and resource.

But it is in the actual superintendence of work that the want of energy and resource in the East Indian Surveyor contrasts so strongly with the qualities displayed by the European Overseer; even in enduring exposure to the climate, that is to heat and wet, the latter is stated by some officers to be superior, his greater physical stamina more than counterbalancing the advantage which the East Indian possesses in being in his native climate.

Proposed remedy.

42. There is one remedy for these defects in the character of this class, which we think will work a reform, and we think it is the only one: it is to throw the appointments open to the Overseers from the Sappers, a most valuable class, and form the whole into one body, every individual to enter in the lowest grade, and to rise less by length of service than by merit. Under such a system as we shall hereafter propose, the East Indian as well as the European will in the first place go through a course of theoretical and practical instruction; they will then be employed in common in executing large works, taking levels and making surveys; and meanwhile they will every day be gaining an addition to their store of knowledge and experience; and when they arrive at such a rank as to be employed independently on the more responsible duty of estimating for repairs or new works, or reporting on works executed, they will not be mere lads, but men of knowledge, experience and steadiness of character.

We think this open competition essential to the efficiency of the department, and we anticipate much benefit from it to the East Indian aspirants themselves. For want of models of other ranks, they have grown up under the idea that they must aim at being gentlemen; but they will now learn that it is no degradation to them to handle a tool, or to show a workman how to lay a brick or use a masonry.

momaty. The indolent and idle will leave the department, or will not seek to enter it; but the active and energetic will be roused to exertion, and many we believe, under this joint stimulus of example and emulation, will compete successfully with their European comrades.

43. The employment of European Overseers from the Sappers is only of recent origin. The first suggestion on the subject came from Colonel Cotton, who in 1844 applied for the assistance of some of the most intelligent non-commissioned officers of the Sappers and Miners to aid him in the work of improving the irrigation of the Rajahmundry district, on which he was then engaged. This application, though supported by the Board of Revenue, elicited only a general reply from Government; but in January 1845, the Chief Engineer, Colonel Sim, brought urgently before Government the utter absence in this Presidency of intelligent subordinates, competent to execute large or difficult works; a want which had often come under the notice of the Government before, and which was quite notorious; and he recommended that a European Subordinate Department should be formed here, similar to what already existed in Bengal and Bombay. This recommendation was approved by the Government; and the concurrence of the Honourable Court and the Government of India having been obtained, 22 men (including some for the Superintendent of Roads), were ordered on the 21st December 1846 to be transferred to the department, though several of the number did not actually join the stations assigned to them till some time later.*

The European Overseers.

44. The number now belonging to the Maramut Department is 25: viz. seven in the first division, and one or two, and in some cases three in each of the other divisions; there are also 11 under the Superintendent of Roads.† They have been employed almost exclusively in superintending work; viz. the construction of buildings, bridges and large works of irrigation, and the making of roads and passes; occasionally they have been employed in making surveys and taking levels, and, in a few instances, in inspecting work done by the Collector's Department. Their services would have been made use of more extensively in the last three modes (in which they were often much wanted, and for which many of the men are well qualified), were it not that being unprovided with either horse or tent, the Overseer cannot be often required to march. When the men first joined the department, their qualifications varied in great measure according to their employment prior to enlistment. Some were very fair surveyors, others were good clerks and accountants, and others were practical artificers; all could read and write, at least fairly, but none were well acquainted with any native language, and few had more than a very meagre knowledge of any.

Their number and employments.

45. The results of the employment of this class have been most satisfactory, both in the Maramut Department and under the Superintendent of Roads. Although much cast down and disheartened by the withholding of promotion, they have displayed a very high degree of activity and energy, as well as zeal and self-devotedness; indeed it is in these qualities, as we have already observed, that they are found so eminently superior to the East Indians. They fearlessly encounter exposure both to the sun and to malaria, in their anxiety to see their work well done. Their intelligence, also, is spoken of in very high terms, and they have established a high character for integrity; no instance of dishonesty has occurred in any of the number, and several, when directly tempted with the offer of a present, have immediately reported it to their superior, or brought the money to him. A few of the number have been remanded to the Sappers for intemperance, but in general they have been quite steady and sober.

Results of their employment.

46. The following are a few of the general testimonies in their favour, extracted from the replies of the Civil Engineers to our circular;—

Testimony of Engineer Officers in their favour.

Colonel A. Cotton says(°)—“I consider this class, as Superintendents of Work, perfectly invaluable in this country;” and again, “Their willingness, steadiness, activity, endurance of fatigue and exposure, obedience, and complete effectiveness, have been remarkable; and it is evident that there are men among them fit for

* A few men were already employed in the Road Department before the date of the above order.

† In the Road Department there are also several East Indian Overseers, of whom one or two are extremely useful men.

(°) Replies to queries, dated 23d April 1851, Para. 10.

for far superior appointments, and not one that is not 'worth more than he now gets : ' and again, " I am certain that there is not one whose salary has not been saved over and over again in the work he has been employed upon."

Captain Lawford says^(b)—" I have no hesitation in stating, that to the ability, assiduity and honesty of my Overseers, I am indebted for the successful completion of the various important works executed in this division since 1847. * * *

* * * I have never found a duty committed to these men neglected or slurred over, nor have they ever shown the least inclination to disreputable conduct. The natives of all classes evidently respect them."

Major Henderson says^(c)—" I have found their services valuable; and I beg to instance the thorough repair of the Tenny Tank, in which economy and efficiency were both secured through the services of Corporal Cabill. I may also instance the conduct of the late Surveyor Meighan (from the Sappers), who, though repeatedly struck down with fever while superintending the construction of the ghaut at Hussanoor in Coimbatore, would not leave his post, knowing that if he did the work would be deserted by all the people, but continued at the place, taking Warburg's drops, when attacked, till the season ended." And again^(d)—" Their intelligence and skill are generally above that required for their present duties, and if properly directed might be made more valuable to Government. * * * Their activity and zeal are generally very great."

Captain Best, Superintendent of Roads, says^(e)—" I consider that the employment of the European Overseers has greatly tended to good execution and economy, although the reduction of cost may not have been very great. The bridges on the Southern Trunk Road I believe to be much better built than any that have been constructed under native maistries. The work at the Vellaur Bridge has been inspected by Captains Lawford, Bell, Smyth and Ludlow, and I do not believe that superior work of the sort could be done in England."

Again^(f)—" The European Overseer generally possesses an energy which is unknown among the natives, who, placed under him, seem to learn for the first time in their lives what it is to work with a will."

Captain Smyth writes^(g)—" I am happy to give a most favourable report of the intelligence, skill, activity, zeal, sobriety and honesty of all those under, or who have been under my orders."

Direct money saving on work superintended by them.

47. The foregoing testimonies refer principally to the general conduct of the Overseers; it is obvious that circumstances may often prevent a direct and tangible money-saving appearing on the estimate; the Overseer's work may be only a portion of a very large work, and not susceptible of being shown separately, as at the Godavery Anicut and the Cauvery Bridge; the estimate may have been framed with special reference to the economy to be effected by European superintendence; accidents or unforeseen contingencies may prevent the saving from being apparent; or, lastly, the gain may appear in improved and more substantial work only. Some very marked instances of direct saving have, however, been brought to our notice, and we will mention a few.

The first instance we will cite is^(h) that of the Trivady Anicut, which was "most excellently built," and in which a saving of Rs. 4,130, or above 23 per cent. was effected out of an estimate of Rs. 17,859, though in the opinion of the Civil Engineer the whole amount of the estimate would have been required, if the work had been executed under the ordinary superintendence.

A second instance is⁽ⁱ⁾ the Dispensary at Salem, built in 1849, where Overseer Reid effected a saving of Rs. 1,071 out of a sanction of Rs. 2,976, or 36 per cent. It should be added that convict labour was partially employed in this work; and though a deduction of Rs. 381 was made from the estimate on that account, it is possible that more work was done by the convicts than was at first intended.

A third instance is^(j) furnished by the same officer; it is that of the Bowany Bridge, over the Cauvery. The work is not yet quite completed, but Captain Smyth and the Board of Revenue anticipate a saving of about Rs. 14,000 out of an estimate of Rs. 48,790; and this very favourable result is attributed, by the
Civil

(^b) Replies to queries, dated 22d April 1851, Para. 8.—(^c) Replies to queries, dated 20th May 1851, Para. 10.—(^d) Ditto, Para. 12.—(^e) Replies, 15th May 1851, Para. 7.—(^f) Ditto, Para. 8.—(^g) Replica, 6th June 1851, Para. 12.—(^h) Captain Smyth's replies as above, Para. 10.—(ⁱ) Diary of Assistant Civil Engineer 5th Division, for March 1850.—(^j) Replies as above.

Civil Engineer, in a great measure to the exertions of Lieut. Wilkieson, his first assistant, and the subordinate executive servants, particularly Overseer Reid.

Another instance (*) of saving by the employment of European superintendence is that of the Military Hospital at Palamcottah. The estimate for that work amounted to Rs. 8,809, and the actual cost was only Rs. 7,061, leaving a clear saving of Rs. 1,748, or nearly 20 per cent.; after deducting Rs. 35 a month for six months and a half to the European Superintendent, who in this instance was not in the department, but was the conductor of stores stationed at Palamcottah.

A fifth instance is (†) that of the road from Vizianaggrum to Bimlipatam, superintended by Overseers Robertson and Olive. The estimate for this road amounted to Rs. 10,105, and it was made of a greater width than the estimate contemplated, and yet cost only Rs. 6,550.

48. In all the foregoing cases the estimates appear to have been made at the usual rates,* and it is unlikely that there would have been much to spare from them under the common superintendence. It may be asked, then, to what cause is the saving to be ascribed; is there really this amount of cheating under ordinary circumstances? We believe not: cheating and peculation to a certain extent are no doubt practised in Maramut works; but a large part of the saving effected by means of European superintendence is ascribable to other causes, besides the mere prevention of direct fraud. The skill of all classes of workpeople in this country is at a low point, and their tools are bad: again, all of them are much disposed to loiter over their work, and especially when they are working in large bodies. Now an active intelligent Overseer will correct all this; and to this cause we believe a great part of the result of their employment is due. Thus Captain Best, (‡) speaking of bridges built by one of his Overseers (Brown), states, that by good workmanship and good management every cubic yard of masonry built by him consumed much less chunam, and employed considerably less labour, than the work even of other Overseers; so that there was a saving of 15 per cent. in the cost of the work (even compared with that of other Overseers), while the work was much better, because the joints were closer. In like manner the Assistant Civil Engineer of the fifth division states, (††) in speaking of the Salem Dispensary, that each bricklayer on an average laid from 800 to 1,000 bricks a day, while, under ordinary circumstances, it is thought very good to lay 500. And in the case of the Bimlipatam road, above mentioned, the saving is ascribed by Lieutenant Rundall (‡) to the cheaper cost of materials, by a proper distribution, and strict supervision of the labour employed.

The causes of this result.

Nor is this economy of labour produced by harsh or severe treatment of the people; on the contrary, employment under the Overseers appears to be peculiarly popular. Thus Lieutenant Rundall states, in the case of the Bimlipatam road, that though at first no more than 100 or 200 people daily could be obtained, and that under compulsion, yet as soon as it became known that the hire was regularly paid every evening, the people came in crowds, and within 10 days there were 2,000 voluntary labourers every day.

The workpeople like them.

49. The instances in which the service of the European Overseers appear to be least appreciated, and in which little or no money-saving appears to have resulted from their employment, are the second and eight divisions. The cause of this however is apparent, viz. that the Overseers have not been judiciously employed, or their services made the most of. In the second division (‡), (or more properly speaking in the Nellore district, for the Civil Engineer confines himself to that), the Overseers take no part in the preparation of materials, and are even stated by the Civil Engineer to be incapable of judging of the proper prices. (‡) It further appears that they exercise little power to scrutinise materials, and reject such as are bad; and the Civil Engineer also states, that they are so little acquainted with their business as to be dependent on the Maistries, (†) and to be consequently afraid to interfere with them or oppose their wishes. Of these Maistries the same officer says:

The least beneficial results are in the 2d and the 8th divisions.

(*) Replies of Captain Horseley, dated 9th April 1851, Para. 10.—(†) Letter from Lieutenant F. H. Rundall, 16th May 1851.

* We should except the roofing of the Palamcottah Hospital, the estimate rate for which is stated by Captain Horseley to have been slightly above the ordinary rates of the district, having been entered by the chief engineer at the Presidency.

(‡) Letter to Government, 1st May 1851, No. 91, Para. 52.—(§) Diary for March 1850.—(¶) Letter as above Para.—(‡) Captain De Butta's Replies, 22d April 1851, Para. 10.—(†) Letter from the same officer, 15th May 1851, Para. 8.—(r) Replies as above, Paras. 11 and 13.

says: (*) "They seldom use any exertions to reduce the prices of materials, nor do I know any instance in which they have reported that the materials were of an inferior description." Captain De Butts bears testimony to the honesty and sobriety of the Overseers, and to the interest they take in their work; and we cannot but think that if they were more trusted, and better supported by their superior officer, they would be found able to do as much as their comrades in other districts, and would show themselves capable of acting independently of Maistries, and above the necessity of tacitly allowing their dishonesty.

In the 8th division the mode of employing the Overseers appears to us to be still worse. (†) The Civil Engineer informs us that works are there generally given to some native bricklayer or contractor; and this not by competition, but at the estimate rates, almost as a matter of course, because the rates being known no one will offer for less. (‡) The Civil Engineer further states his opinion, that under an honest and active European Overseer, having charge of the payment for materials and workmen, as well as of the work itself, a proportionate saving might be effected in the execution of considerable buildings, to that noticed above in para. 47, in the building of the hospital at Palamcottah.

Remedy suggested
in both instances.

50. In these two divisions we are of opinion, that the existing mode of employing the services of Overseers should be amended. We think that in every large work on which an Overseer is employed, he should be charged with the payment of the workpeople and the keeping of the accounts; that he should be empowered to reject inferior materials, and determine the price of all, with a right of appeal to the Civil Engineer by any dissatisfied party, and that whenever practicable the materials should be provided by him. Independently of the direct saving to Government, which we believe would result from such a practice, we think that it would have a very beneficial effect on the execution of all works; on the one hand, a standard would thus in time be obtained in each Talook, for the proper cost of all descriptions of materials and labour, and, on the other, artizans and other workpeople would both learn to work in better modes and with more industry, and being here accustomed to full and prompt payment, would not quietly submit to delays or exactions on other smaller works.

The habits of the
Overseers as to
temperance.

51. There are two very important points for inquiry with respect to this class of Europeans; their sobriety and the effect of the employment on their health, and to both these we directed our inquiries. As regards their sobriety, the testimony we have received has been on the whole very gratifying; some men have been intemperate, and have been remanded to the Sappers; but the men more recently brought into the department appear to be superior in this particular as well as in others, to those first appointed to it.

Their health.

With respect to the health of the Overseers the general opinion of the Civil Engineers appears to be that it does suffer; but all point out how unfavourably they are situated, in not being allowed even the shelter of a tent. On the whole there seems reason to believe, that though the men do seem to be affected to some extent by the exposure to climate which their employment involves, yet that with the simple and ordinary precaution of allowing them tents, and some other trifling indulgences which we shall speak of below, and with a little more caution on the part of the men themselves, in restraining their zeal and avoiding unnecessary exposure, a temperate man will retain his health as well in the department as in cantonment life.

They have not been
fairly treated.

52. We have mentioned above (para. 45), that the Overseers are disheartened by the withholding of promotion; and we will state the circumstances which have occasioned that feeling. When their employment was first authorised, it was ordered that they should be in four classes: the civil pay of the first and of the fourth class were provisionally settled, the former at Rs. 43, 15 annas, 1 pie. and the latter at Rs. 90 a month; that of the two intermediate grades was left for after consideration. (¶) All men transferred to the Maramut Department were properly placed in the lowest grade, with the prospect and promise of promotion; but up to this time nothing has been done towards completing the arrangements, or fulfilling the expectations then held out. Some men have been in the department

(*) Replica as above, Para. 15.—(†) Replies 9th April 1851. Letter 28th April.—(‡) Letter as above, Para. 6. (¶) Letter from the Board of Revenue to Government, 20th August 1846, No. 544. Extract Minutes of Consultation of Government, 16th September 1846.

ment nearly five years, have given uniform satisfaction to their superiors, and have been again and again strongly recommended for promotion, both by their immediate superiors and by the Board of Revenue; but not one man has yet been advanced from the lowest step of rank and pay.

53. This treatment has produced its natural effect, of despondency, discontent, and disgust with the service. And it has affected not only those men who ought to have been promoted already; but even the juniors of the body, who see in their case what they have themselves to expect. The life of an Overseer is not such as to tempt men to the employment for itself; it involves much personal inconvenience and hardship, great isolation from companionship, and, to some extent, even the severance of domestic ties. And it is stated that many Overseers, seeing no chance of advancement in the department, would gladly leave it for the worse paid, but more quiet and stationary appointment of Serjeant-Major; and that some even would willingly return to the Sappers. One instance is mentioned by Colonel Cotton, of a man, "In every way most effective, and with health and strength for anything," who gave Rs. 500 for his discharge, and went home to begin life again, because he found himself cut off from all hope of advancement in this country. The men naturally compare their own circumstances with those of their more fortunate contemporaries, who went to Bengal or Bombay, many of whom are already promoted a grade, or even two above them, while all are in the line of promotion; and they cannot but look with discontent at their own condition, receiving as they do actually less pay than an East Indian boy just out of the survey school, and this without any prospect of improvement.*

Hence discontent and despondency among them.

54. Under these very discouraging circumstances we think it a matter of surprise, and highly creditable to the men themselves; that they have behaved so well; but it is important in every point of view that this state of things should not continue. Not only must it affect the activity and zeal of the men, but there is reason to fear that it would operate on their integrity also; that some, at least, of the number, made sore by the feeling of being unfairly treated by Government, would be induced to give way to the temptations coming in their way to pay themselves. We need not point out how much such a consummation is to be deprecated, or how prejudicial to the interests of Government would be the demoralization of a European branch of the service, in which so much confidence must be reposed.

It is most desirable to remove the causes of these feelings.

We trust, however, that the Government will now be induced to take up the subject, and to relieve this very deserving class from the causes of discontent under which they suffer. In a subsequent part of this report we shall have to return to this subject, and to detail our views both as to the organization of the body, and the scale of pay and allowances proper to be granted to it. We shall at the same time consider the very important subject of the instruction of the men in the theory and the practical parts of their duty, and in the native languages, as well as the qualifications which ought to be mainly looked to in selecting men for the corps in England. We shall also discuss more fully the best manner of dealing with the Surveyor class.

55. We come next to speak of the execution of work. In our notice of the Civil Engineer's Department, we have already (para. 30 to 33) given a general view of the duties of Tahsildar and his subordinates in connexion with public works. We will not repeat what is there said, but will add some further particulars, with the view of fully explaining the existing system. In reviewing the accounts of the department, we shall hereafter examine in more detail the machinery for executing works and its actual operation, and we shall then suggest various material changes from the present system.

The mode of executing works in the Revenue Department.

The Tahsildar must be regarded as the Executive Officer, and the Collector as the controlling authority over him. The Collector empowers the Tahsildar to undertake a given work, and places funds at his disposal for the purpose; but it is the Tahsildar who makes contracts and engagements for materials and labour; it is he who is responsible that the work is done, and done properly and in time; and he in the first instance receives and checks the accounts of expenditure.

The Tahsildar is the Executive Officer.

A Tahsildar's

* Since this was penned nine of the Overseers have received an addition to their pay, but still no rules for promotion and increase of pay for this useful class have been drawn up.

His jurisdiction
and general duties.

A Tahsildar's division or Talook ranges generally from 350 to 600 square miles, contains from 100 to 300 villages, with from 200 to 300 works of irrigation, and yields a revenue of from one lack to two and a half lacks of rupees. He has a treasury and an establishment of servants, some for accounts and correspondence, others stationed out in the Talook in charge of subdivisions of it; the latter are called by the various terms, Peishcar, Zillahdar, Turrufdar, Carcoon, and others. And all the village officers are likewise under his orders. Almost all the powers which a Collector exercises, fiscal, police, judicial and miscellaneous, are confided in a minor degree, and within the range of his more limited jurisdiction, to the Tahsildar, who may be described as the Collector's Deputy within his Talook.

The several steps
towards the execu-
tion of work.

56. When the Collector gives orders to the Tahsildar to execute a certain work or number of works, he sends him at the same time a copy of the estimate (unless it is one that came from the Tahsildar), and in the case of a new work, of the plan likewise; he also directs his cash-keeper to pay the Tahsildar on application a certain sum, usually half the amount of the estimate. The Tahsildar then sends his receipt to the Collector's treasury and receives the money, and proceeds to make arrangements for the work. In the case of all works of moderate amount, *i. e.* under Rs. 300 or 400 (and these are the most numerous), the village officers have charge of the execution. In the case of earth or rough stone-work they produce workmen before the Tahsildar, who execute agreements and receive advance; in the case of masonry the village officers generally undertake themselves to provide materials, and receive advance for the purpose. A copy of the estimate is also given them, as well as the list of the materials required, the latter drawn up from the estimate by the Talook Maistry. In larger works the Tahsildar himself makes agreements with brickmakers, lime-burners and other tradespeople for the supply of materials, and advances them money on bond and security. He also engages workmen, aided by the village officers.

The Maistry's du-
ties in connexion
with it.

57. The Talook Maistry shows how the work is to be done; in the case of earthwork, marks out with pegs the line of the channel or bank, and gives sections;* pointing out also where the earth is to be dug in the latter case, and to be deposited in the former. In the case of masonry works, he also inspects and reports on the materials prepared before the work begins. During the progress of the work he visits it from time to time, noticing mistakes or backwardness, or giving further instructions as required; indeed, during the working season he is continually on the move. He records all his proceedings in a diary, which is sent to the Collector once or twice a month (the practice varies in different districts), and on which such orders as seem necessary are sent to the Tahsildar. Progress reports monthly or half monthly are also sent by the Tahsildar to the Collector, showing for each work what advances have been made, what materials collected, and what work done, with explanation of delay.

The Accounts.

58. With regard to the Accounts; in all earthen embankments, and in revetments, anicuts, calingalahs, &c. of rough stone, the work is done by people of a particular class, who contract for it by the cubic yard, and no detailed daily accounts are required. As to masonry work of small amount, such as is executed by the village officers, the accounts are kept by the curnum or village accountant; in larger works there is generally an officer specially appointed by the Tahsildar to the work, who keeps the daily account. In such large works it is required to be sent to the Talook Cutcherry every day, every five days, or every 10 days, according to the district practice; but the time does not appear to be very strictly adhered to. It is from these accounts of expenditure that the accounts of the cost of the work are ultimately made up; the latter are prepared by the Tahsildar and forwarded by the Collector, with a measurement and survey report by the Tahsildar, or some of his department, and the Maistry. In the case of earth and rough stone work, the measurement and survey report alone is sent. In the Collector's office the accounts are examined, compared with the district data, and with any remarks that may have been made on the work or the materials by the Civil Engineer; they are sent back to the Tahsildar for correction if found erroneous;

* In making or repairing banks, it is of importance that firm soil should be used; and in the case of channels, the earth dug out must be carried a certain distance from the edge and laid in a regular line. Hence the necessity for the Maistry's services in this part of the work.

neous; explanation is required of any excess above the estimate; and finally, the bill is sent through the Civil Engineer to the Board of Revenue, to be submitted to Government for sanction. It should be observed that most works of any importance, and not a few small works, are visited by the Civil Engineer or some of his subordinates while in progress; and most works of considerable amount are inspected by the Civil Engineer or his assistant after completion. The officer examines the quality of the work and takes its measurement; he also investigates the rates charged for materials and labour, and the quantity of both.* His report goes to the Collector; and the accounts are audited agreeably to his remarks, unless in any particular he shall appear to be mistaken, in which case a reference is made to him, and ultimately, if necessary, to the Board of Revenue.

Inspection by the Civil Engineer.

59. The foregoing is the general course followed. The details vary slightly in the several districts, according to local practice or local circumstances. We now proceed to make some observations and suggestions on the various parts of this course; and in so doing we shall notice such local peculiarities of practice as may seem to need remark.

Some remarks and suggestions.

One of the chief inconveniences in the existing system of executing public Maramut work is dilatoriness; and this is more particularly the case with those smaller works which are executed by the village officers. It is difficult to obtain the attendance of these officers at the Talook Cutcherry with workpeople to receive advances; and when that is done, the work sometimes is not commenced or materials provided for months; hence, work which ought to be completed in May or June is not begun till June or July, and is hardly completed before the monsoon. In former times there is no doubt that the money received as advance was misapplied, either in payment of Government revenue, or in small loans, or in the purchase of grain for sale, to the personal profit of the recipient; cases of such malversation appear to be now rare, and we think the delay is to be chiefly ascribed to the procrastinating bent of the native character. Other causes sometimes exist, accidents or difficulty of agreeing with workpeople, &c. The delay occurs less in those districts where a good system has been established, and where the village and other officers have more experience in such work: in other districts the attention of the Collector is required, and if that is given, and due notice is taken of delay the practice will in no long time improve there likewise. So also of the delay on the part of the Talook officers, it does not appear to be the opinion of any of the Collectors that Maramut money in the Talook treasury is now misapplied to private purposes. And it appears to us that if the periodical returns of the Talook treasuries are duly scrutinized at the Collector's office, and if the treasuries themselves are examined occasionally as opportunity occurs, such mis-use will be too hazardous to be attempted.

The dilatoriness of execution.

60. In order to get a real *boni fide* knowledge of the actual cost of a work, correct and trustworthy accounts of the detailed expenditure are essential, and these can only be framed from faithful daily accounts. The accounts of work done in the Maramut Department appear to be very irregularly kept. As regards the daily accounts, the practice varies; no Collector believes that they are accurately kept for the smaller class of irrigation works which are executed by the village officers; in some districts the semblance of writing them is maintained, but they are not thought worthy of much trust; in other districts such works are undertaken by the village authorities at the rates of the estimate, being measured and paid for by the cubic foot, and no detailed accounts are asked for. In point of fact, we believe works of this class are thus done in a manner on contract by the village officers or meerasdars in all districts, and that where daily accounts are prepared they are not to be relied on. We are far from thinking, however, that where good work is ensured by strict after inspection, these works are a source of gain to those who thus undertake them; on the contrary, there seems reason to believe that they frequently cost more than the estimates, especially in remote villages, where bricklayers, &c. have to be brought from a distance; but as the work is beneficial to the village community, they willingly bear the additional cost. We do not recommend any change in the present mode of executing these works; but it is obviously desirable that the estimates should be carefully made on correct data.

The accounts are irregularly kept.

61. In

* The Surveyors also are employed to inspect work done; but their examination and report are not in general very minute or critical.

The daily accounts,
how kept.

61. In the larger works it is of great importance that the daily accounts should be correctly kept, as it is clear that, without them, trustworthy accounts of the total cost cannot be obtained. Yet great laxity prevails with respect to the daily accounts even of these works. The practice varies in different districts: generally it may be stated that the Talook officer in charge of the work writes the daily accounts and sends them to the Talook Cutcherry every day, or every week or 10 days, according to the importance of the work and the practice of the district; but the proper time of sending them does not seem to be very strictly observed. In some districts some pains have been taken to ensure these accounts being genuine; thus in Canara, the officer in charge of a work is furnished with a blank book, of which each page is numbered and signed by the Tahsildar, and in this the daily account is entered, and it is sent to the Tahsildar with the accounts of the work. In Trichinopoly, at large works, a list of all the people at work is sent off to the Talook Cutcherry in the morning, and a list of the hire paid them is dispatched in the evening. In Guntoor, the officer in charge has a book, each page being numbered and having the seal of the Collector, in which the daily account is written; every evening two copies of the day's entries are made and dispatched, one to the Tahsildar, the other to the Collector.

Of these precautionary measures, as well as of the daily transmission required in some other districts in large works, it is to be observed that, if strictly and honestly worked, they provide against tampering with the accounts after they are once written, and with the exception of the Canara plan, they ensure that the accounts shall be written on the very day that they refer to; and these two points are very important.

With the above exceptions, very little attention is paid to the daily accounts. They are sent to the Talook Cutcherry by the officer on the work very irregularly; in some districts they come to the Collector's Cutcherry, in some they do not; but even where they do, very little use appears to be made of them except in Guntoor, where, it is stated, the abstract accounts finally sent in from the Talook are carefully compared with them.

Not generally very
trustworthy.

62. The opinions of the Collectors vary as to the degree of credit due to these daily accounts: some think that they are generally authentic; but the majority express the opinion that they are not very faithful or exactly kept, and the Civil Engineers express the same conviction still more strongly. It is obvious that, if each day's account were written at the time, as it ought to be, the whole could be produced at a moment's notice on the requisition of an officer visiting the work, either during its progress or after its completion; but, in point of fact, they are not so produced. Almost all the Engineer officers say that it is their practice to ask for the daily accounts, but that they are seldom forthcoming at once, and often are not to be obtained at all; showing that either the accounts are not written, or that it is not convenient to expose them to inspection. The Civil Engineer of the Eighth Division states that a frequent excuse for the failure to produce the accounts is that the prices of the materials cannot be accurately determined till the work is finished, as some have been used and some remain on hand. This excuse is obviously bad; the fact alleged would not prevent the preparation or exhibition of accounts of the workpeople employed and their hire, or of the quantities of materials received and expended. Even their value also could be shown if the prices have been settled beforehand; and no reason is apparent why they should not be so settled, except that they are to be cut down, if necessary, at last, to bring the total expenditure within the estimate, or within the amount allowed by the Civil Engineer on his inspection or measurement.

The final accounts
also frequently
garbled.

63. In reply to the question how far the final accounts of works are genuine, opinions also differ. Some Collectors think that the final accounts are fairly made up from the daily accounts; while others, and all the Civil Engineers, declare their belief that they also are garbled. We should observe that this opinion is expressed most strongly by the officers of the Northern Division, where we believe the native public servants are much inferior in character to those of the South. Colonel Cotton mentions one instance, in which, "when an account of some work showed a palpable disproportion of some class of workman, the Gomastah said very simply that he would correct the accounts by altering the proportions." On the whole, we believe that this "cooking" of accounts does take place very generally, to balance the several items and bring them into conformity with the estimate; and we believe also that the total is sometimes altered, though less commonly, to bring it

it within the estimate when the actual cost has exceeded it, or to raise it nearly up to the estimate when it is materially less.

64. This is a state of unsoundness which calls for a remedy; and we think much may be done to effect improvement, if the attention of Collectors and Civil Engineers is steadily directed to this point. In the first place, it is necessary that estimates should be carefully made with reference to the peculiar circumstances of every work or locality, and not upon the same data for an extensive district; and strict agreement between estimate and bill ought not to be insisted on, as that directly encourages tampering with accounts. The daily accounts may likewise be much improved in form, and those for works of the same class may be made everywhere uniform. The tabular form should be adopted, and we think that the use of English should be introduced, for the figures certainly, and probably at no distant period for the headings and remarks also. The knowledge of English necessary for this would be very small. We attach much importance also to the inspection of the daily accounts of a work by officers of the Civil Engineer's Department. An officer visiting a work, whether in progress or completed, ought invariably to call for the daily accounts, and should record in his diary the particulars and amount of the expenditure up to that date, and whether they agree with what he sees and learns upon the spot; and he should affix his signature to each leaf of the accounts. If they are not produced, he should state in his diary the fact and the reason assigned for it, and the Collector should not fail to take due notice of the circumstance. It should also be made generally known that any instance of fabrication or falsification of accounts, at any stage and by any officer, would be signally punished. We believe, however, that the most effectual means of checking this and other mal-practices will be the extended execution of works by European agency; but to this we shall have to refer more at length below.

The means of correcting these evils.

65. We will next advert to the data tables; these are lists showing the quantities of materials and labour, and the value of each, required to produce a given quantity of work of each kind, as, for example, a cubic yard of brickwork or a square of roofing. All estimates are framed from these tables, and they are much used also in valuing work done; it is obvious, therefore, that their accuracy is of importance; yet they have not received sufficient attention. In some districts there are complete data lists, in others, the tables so called are mere lists of the prices of materials and labour; in some districts there is a table for every Talook, while in others there is only one for the whole district. Some of them are of very old date, and few have been revised more recently than 1843.

The data tables.

Without going into detail, we think that the information we have obtained respecting these data tables fully justifies us in stating that they ought to be thoroughly examined and revised. Not only the prices of labour and materials should be carefully ascertained, but the quantities also; and the revision should be made by the Civil Engineer, in communication with the Collector. When thus corrected, the data tables will be very useful as a standard; but even then they must not be too closely adhered to. They never can pretend to be anything but an average; and in making an estimate, an officer should always consider what are the local or peculiar circumstances of the work, and how they will affect each particular that enters into the calculation; and the rates allowed in the estimates should be modified accordingly from the data rates. But however carefully this is done, perfect accuracy cannot be obtained; for at best, an estimate can only represent probabilities, while the actual result will be affected by contingencies of season and weather, which can never be foreseen. Again, we have already pointed out how much more work is done, and how much material is economized, by good superintendence; but that good work can be obtained only in rare instances, while the estimate must be framed to suit ordinary circumstances. Further, in inspecting a work, the same attention must be paid to actual facts, and too rigid agreement of cost, either with the estimate or with the established data, must not be insisted on.

They require revision; their legitimate use.

66. This brings us to the question how far the existing rates of remuneration for labour are sufficient; how far the labour employed on public works is voluntary, and how far otherwise. On these points we called for the opinions of Collectors and Civil Engineers, and on these as on other points those opinions are various. The circumstances of different districts vary; thus in Malabar and Canara the people in general are stated to be too independent to work for insufficient wages. In Madura, it is stated that though the rate is lower than is given by private

Compulsory labour.

employers, the people work willingly for it on the irrigation works, because the improvement of those works benefits themselves. On the whole, however, there appears to be no district in which the labour is not more or less obtained by compulsion: little actual coercion is used, but it is known that it will be used if required; and indeed the workpeople themselves, from long custom, consider themselves under a sort of obligation to work for the Government on the established terms; but where the remuneration is inadequate, they work unwillingly and slowly.

The causes of it.

67. For this practical insufficiency of the hire there are several causes. In the first place, the rate allowed is too low in some districts, as in Madura, where it is stated to be one-third under the rate paid by private persons. Secondly, short measurement is taken in measuring work, so as in fact to make the rate still lower. Thirdly, artificers, bricklayers in particular, are often required to leave their own town, where they could get constant work, to go to a distant part of the Talook, to be separated from their friends, and to submit to privations; and after all get perhaps less wages than they would have earned at home. Fourthly, There is great delay in paying workmen. Colonel Cotton mentions a case in which, when an officer took charge of a work from the Tahsildar's people, he found the Coolies Rs. 2,000 in arrear, and no intelligible accounts forthcoming. After a work is completed, it is often months before the accounts are closed; and even then the workpeople are often not paid their full hire, for the Civil Engineer has still to examine the work; and a part of the amount due for materials and labour is kept back till after his visit, to meet any retrenchments that he may make. This is one of the most effectual reasons why employment on public works is unpopular. Lastly, There is no doubt that the full hire, as set down in the accounts, does not reach the workpeople; but that they submit to a deduction from it, which in all districts has become customary, for the benefit of the various officers employed on or about the work and in the disbursement of the money. The proportion thus deducted varies in different districts and in the same district according to the vigilance, activity and accessibility of the Collector, and the ability, honesty and boldness of the Tahsildar; but we believe it has, in no case, been wholly stopped, even temporarily.

The means of preventing it.

68. The remedies for most of these defects are at hand. First. Where the rate paid for Government work is lower than that common in the locality for private works, it should clearly be raised. Mr. F. N. Maltby, of Canara, justly observes, that in fairness Government ought to pay more than private individuals, because they require better work, and because there must often be some delay in paying wages, and the price of materials, except for the commonest labour. We believe, however, under the circumstances stated below, in the next paragraph, the cases will be few in which an increase of rate will be necessary. Again, fair measure ought undoubtedly to be taken. The practice of under-measuring by the Talook officers is caused by their fear that the Civil Engineer will allow less than they, and that they will be blamed, while they expect approbation if they keep down the cost. Where a Civil Engineer or his assistant himself inspects work, and sees it measured, not leaving too much to his Maistry, the measurement will be correctly taken; but where the Civil Engineer's measurement exceeds that of the Tahsildar, the latter appears nevertheless to be generally adopted in the bill. This practice is wrong, and should be corrected. Thirdly. Where workpeople are required to leave their homes, and go to Government work at a distance, it is obviously no more than fair that the hire paid them should be increased in proportion. This will never be the case, to any great extent, except in the instance of works of great magnitude.

Full and prompt payment.

69. Fourthly and Fifthly. These are the real abuses which require to be guarded against, and the cure is not difficult. We have abundant testimony, that in general where the existing rates are paid promptly and in full, they are sufficient to secure plenty of voluntary labour. Thus, in some unhealthy parts of the Coimbatore District, some large works had been delayed or stopped from the impossibility of getting labourers; but when an active European officer (Lieutenant Chauncey) was placed in charge, he obtained as many men as he wished for.

Again,

Again, Lieutenant Rundall, in the subdivision, states that, in several instances, the Tahsildars have declared that no labourers could be procured to execute work, but that abundance of men flock to be employed in road work under European Overseers. The testimony of Colonel Cotton is to the same effect, and the fact is fully established, that in general where the ordinary rate of hire is paid daily in the case of day-work, or where the work is measured, and paid for at short intervals, in the case of piece-work, and this under European superintendence, there is no want of willing and active workmen. It is true that what is wanted is only the punctual and full payment, and if that is secured, the nature of the agency is immaterial. But, independently of any fraud, even punctuality has never been obtained under native superintendence, or if at all, only in very rare instances, and hence European superintendence is necessary, in order to inspire confidence in the working class. It has hitherto proved impracticable to induce native functionaries to pay for work punctually; they always appear to think that, at all events, it is safest to delay paying money, and they wholly fail to comprehend the evils of delay, its impolicy and its injustice.

70. The first remedy then which we propose, is the extended employment of Europeans in overseeing work. We have already more than once adverted to the expediency of this measure, and from whatever point we approach the subject of the execution of works, we arrive at the conviction of its importance. We cannot but state our firm belief that it will be found the most effectual means of meeting the several defects of the system on which we have now been commenting. It will introduce fair dealing, confidence and order into the system, instead of the mutual suspicion of both parties now prevailing; it will tend to ascertain and establish proper rates of wages and prices, and fair measurement; it will afford in every district numerous and increasing examples of full and punctual payment for work, and it will furnish the very best materials for correcting the data tables, and judging of the proper cost of work. Its effects will be equally valuable in stimulating the energies of the Maistry class, and in affording encouragement to those among them who wish to do their duty, but are overawed by numbers.

The extended employment of European Overseers.

71. It also appears to us important in this connexion, that some rules should be laid down as to retrenchments consequent on inspection of work by the Civil Engineer. The practice at present is as follows: some time after the completion of a work—it may be a month, or it may be six—the Civil Engineer, or one of his department, comes to inspect it. He examines the work, compares it with the plan and estimate, takes measurements of all its parts, scrutinizes the quality of the materials and workmanship as well as he can, and looks over the accounts, if they are forthcoming; after this detailed examination, he enters the results in his diary, with a valuation of the work, perhaps made with more or less careful reference to the peculiar circumstances of the locality, perhaps with none at all.* This report goes to the Collector, who thereupon, except in rare cases, adopts the Civil Engineer's valuation of the work; and where that is below the cost as shown in the accounts or the measurements of the Tahsildar, directs the latter officer to recover the difference, and remit it to the Treasury. The Tahsildar accordingly recovers the amount from the village officers, or the workpeople, as the case may be; unless, as frequently happens, the precaution had been taken of retaining unpaid a part of the amount due to them, so as to save the trouble of recovering the money.

Retrenchment of the workpeople by the Civil Engineer.

72. We think the course thus detailed unfair and objectionable. The Civil Engineer's valuation, at the best, is wholly arbitrary; yet he does not hesitate to reduce the rates allowed in the estimate, and on the faith of which the work was done; although, with a little care, the proper rate might generally have been accurately determined, in the case of earth and rough stone-work† at least, quite as well at the time of making the estimate, as he can do it at the inspection, except with the aid of the accounts which he disallows. Careful inquiry at the time of making the estimate would also reduce to a minimum the variation between the estimate

It is often unfair.

* In some cases the officer, especially if a Surveyor, merely compares the charge with the estimate. This is wrong; the actual cost ought to be scrutinized, but in a fair spirit.

† The rate of earthwork is determined by the nature of the soil, and the distance and height to which it has to be conveyed; that for rough stone by the last two conditions, and the size of the stones. As the estimate is always made on the spot, these particulars could then be definitively ascertained. They should be noted in detail at the foot of the estimate, especially if that is made by the Tahsildar's department. This is sometimes done now, though not with sufficient care.

and the actual cost in the case of masonry work. And even where the charge for such work is too high, it by no means follows that the workpeople have not been on the work the full number of days set down; it is quite as likely that they were detained idle, because a dawdling Maistry or other officer did not set them to work or provide the necessary materials. Yet, unless the blame can be shown to attach really to the workpeople, they cannot fairly be mulcted of their hire; and it is necessary to justice, therefore, that the inspecting officer should perform this part of his duty with care and discrimination.

Again, the delay of inspection may affect the apparent quality of work done; in the case of a channel or bank, heavy rain may wash down some of the new earth in the one case, or lessen the apparent depth of cutting in the other. But the great evil of delay is that to which we have already alluded, viz., that it keeps the workpeople so long from their due, and then they have to be called away, perhaps a considerable distance, from other work on which they are engaged, and so a further loss, that of time, is entailed on them.

Proposed rules for limiting such retrenchments, and fixing responsibility.

73. In looking for a cure of these evils, it must be borne in mind that even in the case of a real overcharge, the recovery of the amount is by no means the only remedy. The punishment of the Government servant, through whose carelessness or fraud it occurred, though it will not replace the amount in the Treasury, will much more surely tend to discourage a repetition of the wrong. And we think it one ill consequence of the practice of recovering the supposed overcharge from the frequently innocent workpeople, that the conduct of the Government officer, who is often the real offender, too generally escapes notice.

The following, then, are the rules which we would recommend, to do away with the evils above noticed :

First. The measurement and valuation of a work by the Civil Engineer shall be adopted in the bill, where it exceeds that of the Tahsildar by 5 per cent.

Second. No deduction shall be made in the charges for a work on the inspection report of a Civil Engineer, unless his valuation is less than that of the Tahsildar by 10 per cent.

Third. If the examination by the Civil Engineer takes place more than three months after the completion of the work, no reduction of charge shall be made, however much his valuation may differ from that of the Tahsildar, unless fraud be apparent.

Fourth. In every case of a difference of more than 5 per cent. between the accounts of the Tahsildar and the valuation by the Civil Engineer, and specially in cases wherein, under the foregoing rules, the difference is recoverable, the Civil Engineer shall record his opinion as to the parties to whose fault the difference, whether of overcharge or deficiency, is due.

Fifth. In such cases the Collector shall institute inquiry, and shall visit the party appearing to be in fault, if a Government servant, with such reprimand or punishment as the nature of the case may seem to require: if fault appear really to rest on workmen or supply of materials, they shall be liable to be mulcted in accordance with the second and third rules, to make good the amount of the overcharge.

The Civil Engineers should also be instructed, when inspecting works in progress or completed, always to inquire particularly from the workpeople and the suppliers of materials whether they have been duly paid or are in arrear; and shall state the particulars in his diary.

Their operation would not increase the cost of works.

74. We think that these rules, if fairly acted on, would correct the evils we have noticed in the present system, and would tend to make employment on Government works more popular than it now is. We should add, that we fully believe that the cost of works would not be increased in any perceptible degree by the second and third rules. The vigilance of the Tahsildars and other Talook officers would be increased by their augmented responsibility under the fourth and fifth rules; and overcharges would probably never occur, except in those cases of gross fraud, wherein all the parties concerned would be as fully liable as at present both to refund and to punishment. It may be added that even now the aggregate amount of recoveries consequent on a Civil Engineer's report is by no means large; the great practical evil of the system is the plea which it affords for withholding payment from the workpeople.

75. The

75. The Maistries constitute a very important branch of the Executive Department, and we must notice them at some length. Like every other part of it, their position and duties have undergone material change during the last 30 years. In the early periods of the department, they were simply head-bricklayers, who superintended the execution of the few masonry works, and probably often accompanied the Tahsildar when he went to measure earthwork. As the department grew, and became more effective and better organized, the duties required to be performed by the Maistries became more extensive and more important; but no commensurate improvement, and little improvement at all, took place in their qualifications. Hence the want of proper men to execute their projects has long been a grievous complaint with the Civil Engineers; and these complaints have been noticed by Government, and have even attracted the attention of the Honourable Court of Directors. The necessity of giving the Maistries some preparatory training has repeatedly been urged on Government, but nothing has been done. The recent order of the Board of Revenue, requiring that before nomination a Maistry shall obtain a certificate of qualification from the Civil Engineer, was a step in the right direction; but as it was not accompanied by the provision of any means whereby the men could obtain preparatory instruction, its good effect has been very limited.

The District and Talook Maistries.

76. The number of Maistries at present in the 14 irrigation districts is 79; besides 12 Superintendents of Maramut, viz., one to each district, except Nellore and Guntoor. The appointment of Superintendents of Maramut is of comparatively recent creation, but they are a very valuable class of officers. They have almost invariably been brought up in the Civil Engineer's Department, and served some time as Maistry to a Civil Engineer, being thus in immediate and constant communication with him. As Superintendents of Maramut, they are under the immediate orders of the Collector, and are usually employed as follows: at the proper seasons they go round the district to make estimates, or to examine work done; they make surveys, and take levels, when ordered to do so, for the use of the Civil Engineer; they are called on occasionally to report to the Collector on any improvement or new project proposed: they prepare plans of works; and, lastly, they are occasionally placed to execute large and important works. Thus they are the native head of the department under the Collector. They keep diaries of their daily employment, with remarks on all the works which they look at, and these diaries are submitted periodically to the Collector.

The Superintendents of Maramut.

Their duties.

77. The Maistries are stationed out in different parts of the district; each one on the average has charge of the work in $2\frac{1}{2}$ Talooks, being, together, about 1,280 square miles in extent, and containing about 1,000 works of all kinds, besides hundreds of miles of road. His duties in connexion with this charge are as follows. He ought to be acquainted with the position and state of all the tanks, channels, and other works; he has to visit all from time to time, especially such as are reported to be in need of repair: if the Civil Engineer does not visit the Talook at the proper season for making estimates, they must be made by the Maistry; when work is ordered to be executed, the Maistry is required, as already said, to point out precisely how it is to be done; and he has also to visit and report upon it frequently while in progress: and, finally, he takes the measurement in most districts, either in company with the Tahsildar, or independently. In the case of considerable works, the Maistry is also frequently stationed to superintend the execution. He is required likewise to make surveys and estimates, and to take levels for the repair of roads, to be subjected to the revision of the Civil Engineer.

The Talook Maistries.

78. The foregoing detail gives the work that the Maistries have to do, but it is only repetition to say that very few of them possess the qualifications necessary for the efficient discharge of such duties. Except two or three Collectors, who make no complaints, the unvarying testimony from every district is, that the Maistries are "incompetent," "untrustworthy," "little better than common bricklayers," "totally wanting in zeal and energy," "unequal to anything but routine duty." The opinions of the Civil Engineers, who have ample opportunity of knowing the Maistries, are still more strongly expressed to the same effect; and there is no doubt that, as a body, they are very inefficient; yet, bad as they are, there is such a total want of any qualified class from which to obtain men to fill vacancies in the list, that bad and useless men are retained, simply because, if they were discharged, no men, even so good, could be got in their place. Almost, if not absolutely, the

Their defective qualifications.

few Maistries who have been efficient are such as have had some training under a Civil Engineer; and even they have generally been wanting in one important qualification, viz., that as the civil Engineer's Department is not executive, they have had no opportunity of acquiring practical acquaintance with bricklaying or building.

Reasons of their general inefficiency.

79. A Maistry properly qualified and properly supported by his superiors is a very valuable officer; not only on account of his own work, but also from the check which he enables the Collector to exercise over the Maramut proceedings of the Talook Revenue officers. But this advantage has been, in fact, attained very rarely; partly because, in many districts, the Maistries have been placed almost entirely under the Tahsildars, and systematically restrained from acting independently; and, partly, because from their ignorance and utter inefficiency they have been incompetent to assume any other position, even where it was the wish of the Collector so to elevate them. The lowness of their pay, and the small inducement to activity, honesty and self-improvement held out to them, have also tended to keep them down.

The means of improving them.

80. In order to raise the Maistries, and place them in that position of usefulness which they ought to take, it is necessary both to improve their personal qualifications, and to give them a more independent and respectable position; it will also be necessary to increase their salary and their number. In the first place they must be suitably educated and trained for the duties they will have to perform. The necessity of this preparation seems so obvious, that it is matter of astonishment that it has been so long and so greatly neglected. The utter ignorance and inefficiency of the present class of Maistries has long been notorious to every officer brought into contact with them; and it has repeatedly been brought to the notice of the higher authorities. But yet scarcely anything has yet been done to improve them: and the very little that has been effected, has been the result almost exclusively of the unaided efforts of individual officers. Of late years several of the Civil Engineers (especially Captain Horsley, in the 8th Division) have made it a practice to take volunteers in their offices as they could get them, for the purpose of forming Talook Maistries. These youths, who are generally the sons or nephews of old Maistries, see all the works inspected by the Civil Engineer, as well as his office work, and get a little instruction from himself, or his Overseers, or Maistries in engineering, estimate making, surveying, drawing, &c. Having no salary, they are seldom disposed or able to remain more than six months or a year at the utmost; and it shows forcibly both the utter inefficiency of the existing class, and the absence of fit candidates, that with the small amount of knowledge so picked up these youths are gladly entertained by Collectors as Talook Maistries; and if of an active turn, are found to be extremely useful.

The system of entertaining youths as apprentices, for instruction.

81. But the most important trial of this sort of training was made by Captain Best, the late Superintendent of Roads, and with very good results. In February 1848, Captain Best obtained permission from Government to entertain six lads as apprentices; and in March 1849 he was allowed to increase the number to 12. The lads were bound to the department for four years, and received Rs. 7 a month. And this is the whole amount of the assistance obtained from the Government towards the very important object of giving an efficient training to the Maistries. The apprentices were instructed in surveying and levelling, in plan drawing, in making estimates, and calculating, and in all the practical work of the department. Captain Best wrote to us as follows respecting them: * "The expectations I formed from the employment of apprentices have not been disappointed;" and, again, "They have from the first been worth a considerable portion of their pay." He went on to say that the system was defective at present, in not giving the lads time to apply continuously to practical geometry, drawing, and other branches of education; and the cause of this was the same as exists in the Maramut Department, viz., that he was obliged to employ them very soon as Maistries, in preference to any such Maistries as he could get. At the date of his letter Captain Best had had, in all, 18 apprentices; of these one died, one was allowed to leave the department, and three were dismissed after short periods, six were still under instruction, but two of them had already been employed on some sorts of duty. The remaining seven were in permanent employ in the department as Maistries, or in surveying, and their qualifications were very favourably reported on by Captain Best.

82. This

82. This plan of apprenticeships is certainly the best that has yet been adopted for the preparation of Maistries, and its results are particularly encouraging, as proving that apt pupils are not wanting; but still it would be utterly inadequate to meet the evil. Carried out on a scale sufficient to supply the department with Maistries, it would convert the Civil Engineers into schoolmasters; and so would engross a great part of their time, which is already far too short for their own proper duties. But this is not by any means all that is to be said; not one officer in 20 would be found capable of bringing to the irksome task of teaching, the patience and good temper which distinguished Captain Best; and without those qualities the result would be a failure.

More regular and systematic instruction is necessary.

It is said that the work of actual instruction need not engage the head of the office, but might be devolved on the subordinates: it is replied, first, that the consequence must be an inferior sort of instruction, because given by men only half instructed themselves; and, second, that the evils above stated would still remain; the time of the subordinates could not be given up to this work any more than that of the head, without abridging the portion of it available for their proper duty; and aptness to teach is not more common in the lower than in the higher ranks of society.

In short, the interests of Government require that the Maistries, as well as the other subordinate classes, should be well instructed in their duty; and we are convinced that this can be well done only by a systematic course, under regular teachers. In a subsequent part of this Report we shall detail the mode in which we propose to carry out this principle.

We would here only add one remark. It must of necessity be some considerable time before any large system of instruction can be in actual operation; and meanwhile all the evils of the present state of things continue to be a source of heavy loss to Government. As a temporary expedient, therefore, we consider it very desirable that the apprenticing system should be extended. We beg to propose that every Civil Engineer and First Assistant Civil Engineer should immediately be empowered (but not required, for we would leave it to his own option) to entertain not more than four apprentices, on the terms adopted by Captain Best. This would be a great improvement on the present state of matters under which a youth can scarcely get instruction as a Maistry, however anxious to do so. A number of Maistries of a better class would be trained for the department before the establishment of the proposed school; and, on that event occurring, the apprentices still under instruction should be transferred to that institution to complete their course. We think that every officer taking apprentices should be required to report to the Board of Revenue, yearly or half-yearly, on their qualifications and conduct.

But meanwhile the Apprentice system should be continued as a temporary measure.

83. The next thing to training is to improve the position and standing of the Maistries. Hitherto they have almost everywhere, and for the cause above detailed, been regarded as a mere appendage to the Tahsildars, who commonly wish to allow them no independent action whatever. In the Northern division things are still worse: Colonel Cotton states that the whole department, including the Maistries, are treated with the utmost contempt by the Revenue Officers; and the Collector of Rajahmundry states, that he is not aware that he has a single honest man among all his Maramut servants, except the Superintendent. But it is in Bellary that the Maistries appear to be made less use of than elsewhere. Their scale of pay there is liberal compared with what it is in most districts: but, nevertheless, the Civil Engineer states, that they are not employed to make estimates, or to examine or report on works, both being done by Gomastahs of the Tahsildar's establishment on $3\frac{1}{2}$ to Rs. 14 a month; they are not even employed to execute the more important works, which are entrusted to Peons or Gomastahs; while the Maistries are looking after one or two small works, and are not allowed to notice anything beyond these. No doubt this state of things is owing in part to the low standard of qualification of the Maistries, of whom the Civil Engineer says, that they can only write their own language indifferently; and that, with one exception, none of them can multiply two units together mentally; but we believe it is also owing, in great part, to the wish of the Tahsildar's department, who are mostly Brahmmins, to keep down the Maistries. We are happy to add, that the present Collector appears to be aware of the evil of the present state of things, and we have no doubt that it will be improved.

The Maistries are too much in subjection to the Tahsildars.

84. In order to raise the standing of the Maistries, efficient training and instruction are essential, so as to render them equal to their duties, and enable them both

They should have separate duties and responsibilities.

to entertain self-respect, and to command the respect of others. But, besides this, the Maistry should be made, in a great degree, independent of the Tahsildar, and should have separate duties and a separate responsibility of his own. The custody of the public works in his Talook should still remain with the Tahsildar, and he should still receive information of every accident, or occasion for repair; but the duty of making estimates should belong to the Maistry, who would be prepared for it by previous training, and not at all to the Tahsildar, who could only do it empirically. Again, as to the execution of works, it should still be the Tahsildar's duty to provide materials and workpeople, and to make other necessary arrangements; but the Maistry should be responsible that the materials were good, and that the work was done in accordance with the plan and estimate; or rather, he should be responsible for rejecting bad materials, and bringing to the notice of the Tahsildar and of the Collector every instance of the use of such, and every departure from the plan, or other fault in execution.

They should correspond directly with the Collector.

85. In most districts it is even now the practice to require from the Maistry a diary of his daily proceedings, which he sends in every week, or 10 or 15 days. In some districts these diaries go direct to the Collector, in others they reach that officer through the Tahsildar or the Superintendent of Maramut. In one district the Tahsildar is required to countersign them, in testimony of their accuracy; in another the diaries go weekly to the Superintendent, and are detained by him and sent monthly, with his own, to the Collector; in a third, where the Maistries' diaries now come to the Collector through the Tahsildar every five days, the Collector states his intention of letting them remain altogether in the Talook in future, and requiring instead a 10 days' inspection report. We think this indirect transmission of the diaries objectionable: one object of requiring them at all, is, to acquaint the Collector with neglect or misconduct on the part of the Tahsildar's department; and this seems quite sufficient reason why they should not come through the Tahsildar. And we can see no sufficient advantage in their going to the Superintendent; he may occasionally add a useful remark for the Collector's information, but he can issue no order to a Tahsildar; and the receipt of the diary by the Collector is thereby much delayed, especially when the Superintendent is on detached duty. On the other hand, we deem it very important that the Maistries should be in direct communication with the Collector; and we think that diaries, twice a month, that they might not be too frequent, should be sent in to him direct; and that the Maistries should also be allowed to address him, by arzee, on sufficient occasion. This would place them in an independent position, and would secure them a fair hearing. After having been seen by the Collector, and orders passed on them, the diaries might be sent to the Superintendent of Maramut, if considered expedient: and we also think it of consequence that an abstract of them in English, showing the daily occupation of the Maistries, should be sent by the Collector to the Civil Engineer.

Their emoluments must be increased.

86. It will be necessary also to increase the emoluments both of the Superintendents and of the Maistry class; and so to graduate those of the latter, that there shall be a reasonable hope of promotion by good conduct; while, on the other hand, degradation to a lower class may be a punishment for neglect or misconduct. The pay of the Superintendent in Tanjore is Rs. 100, and in Bellary it is Rs. 60; the other Superintendents receive only Rs. 50. These salaries are decidedly inadequate to the duties of the office: a Superintendent is required to be very much on the march and away from home, which is peculiarly disagreeable to a native; though he does not himself disburse public money, he overlooks those who do so to a large amount; and much valuable property depends on his activity and integrity. Considering the importance of the duties, the constant absence from home which they involve, and the position that a Superintendent ought to hold in a district, we think his salary should be rather more than that of a Tahsildar of a Talook, that is, that it should range from Rs. 90 to Rs. 120. We shall also propose below, that the higher appointment of Sub-engineer shall be open to men of this class. Deputy Superintendents will also be required in the larger collectorates.

Scale of pay for Maistries.

87. As to the Maistries, we are of opinion that the lowest grade should not receive less than Rs. 15 a month, and that there should be gradations up to Rs. 40 monthly; efficiency and qualification being the chief claim to promotion, and length of service secondary to that. We do not propose, indeed, that these salaries should be given immediately, at least not generally, either to Superintendents or Maistries, because

because men worth so much are now rarely to be found. But we recommend that the salaries should be now fixed, and that men should be encouraged to improve themselves up to them; the salaries actually paid being increased from time to time, with the qualifications of the incumbents. We think, also, that the Maistries should not be permanently attached to particular Talooks, but should be borne on the establishment of the Collector's own office, and allotted from time to time to particular Talooks or works, as may be expedient. And we would also recommend, that the duties should be divided in a manner somewhat similar to that which we have already spoken of for the European subordinates; viz., that the Maistries of the lower classes should not be employed in estimating or overlooking work, but should be chiefly confined to executing work, and to making surveys and taking levels on given lines, and in working under the immediate direction of superior officers.

They should be District, and not Talook Maistries.

88. Lastly, it is necessary that the number of the Maistries should be increased. At present the total number in the 20 districts is only 97; the number of works undertaken in 1850 was 5,655; so that on an average each Maistry had to attend to 58 works, or, deducting those for which other superintendence was provided from other quarters, each man had probably 50 works, on an average, and those spread over an area of about 800 square miles. It is obvious that no man living could duly attend to all these works, and the fact consequently is that a great proportion of them are neglected, and that the other duties of the Maistries, which we have described, are almost wholly omitted. At a subsequent part of this Report we shall propose a Schedule of Maistries for the whole Presidency: In doing this, we shall bear in mind the greater amount of efficient work which will be done by men trained as we propose; but even allowing for both these considerations a very material increase of number will be required.

Their numbers must be increased.

89. In the case of particular works, where constant supervision is necessary, but to which the permanent Maistries are too few to attend, it is the practice to appoint hungaamy or temporary Maistries. Some officers express a dislike to this system, on the ground that temporary Maistries are without those guarantees for good conduct, which a permanent tenure of office entails. We are of opinion, however, that the practice must be continued for the present at least, and until the permanent establishment is rendered more equal to its duties; even then, perhaps, it will be impracticable to dispense with temporary Maistries altogether. We believe, also, that where these Maistries are selected from candidates for permanent employment, they will commonly be found careful and correct. Pupils who have made some considerable progress in instruction, or who have qualified, but are waiting for permanent vacancies, may be detached for a time as hungaamy Maistries, as was done by Captain Best; and they will, we are sure, prove very efficient in that capacity.

Temporary Maistries.

90. It may be proper to add, that our remarks on Maistries are not intended to apply to the Civil Engineer Maistries, but to those of the Collector's Department only. Each Civil Engineer, and each First Assistant Civil Engineer, has a Maistry on Rs. 35 a month. These men have always been brought up in the Civil Engineer's office, and they are almost invariably very intelligent and efficient, and very far superior to the Talook Maistries. And this difference must be ascribed to the different treatment they have received; for they are almost exclusively from the same class as the Talook Maistries, but have had the advantage of that species of training which we are so anxious to obtain, with some improvement both in quality and degree, for the whole body. They are also in a position of trust and responsibility, and on more liberal salaries than the other class; and they have the prospect of promotion to the post of Superintendent of Maramut, if they conduct themselves well.

The Civil Engineers' Maistries.

91. With an order of Government, in the Public Works Department, No. 183, dated 30th May 1851, we had the honour to receive for consideration, in connexion with the general subject of our inquiries, the papers noted below,* having reference to some proposed changes in the Maramut Department. We have given careful consideration to the proposed regulations, and the present seems a fit place for stating

Some new rules proposed by Government.

* Extract from Minutes of Consultation of Government, P. W. D., January 31st, 1851, No. 48; and Letter from the Secretary to the Board of Revenue in the P. W. D., to the Chief Secretary, dated 10th April 1851, No. 227.

stating our opinion upon them. The Board of Revenue indeed have remarked upon them at some length; and as we concur generally in the views so set forth by the Board, we will avoid repeating what they have urged, and confine ourselves to such further observations as have occurred to us.

Purport of the rules.

92. The purport of the five rules proposed is as follows:

The first directs that no new work or renewal of an old work, exceeding an outlay of Rs. 2,000 shall be submitted to Government till the Collector or Sub-collector has made inquiry on the spot, in person, and satisfied himself of the correctness of the data on which the expected return has been calculated. And that it shall be reported whether the Ryots have means to extend their cultivation, if water is provided; and whether such extension will be effected by withdrawing labour and stock from other lands already cultivated.

The second rule directs, that before estimates for new works of irrigation are laid before Government, it shall be ascertained "that the increase of revenue from the works is sure to be such as fully to repay the outlay under all circumstances;" "that the supply of water is certain, and to be depended on;" and, "that the Ryots are able to take advantage of the improvements."

The third rule directs that a Civil Engineer shall confine himself chiefly in alternate years to each one of the two districts of his division; and that the execution of important works in each district shall be mainly limited to those years when the Civil Engineer is within it.

The fourth rule is, that neither the Civil Engineer, nor any of his department, shall attend to or interfere in any work, new or old, of which the cost is less than Rs. 1,000; the whole responsibility for such works, as respects both recommendation and execution, being left to the Collector.

The fifth rule directs that periodical reports of the progress of all important works shall be made to the Board; and that all such works, while in progress, shall be visited once a fortnight or oftener, if necessary, by an Assistant Collector.

The first rule inapplicable and inexpedient.

93. With respect to the first rule, we may observe, that the points there indicated for special inquiry and report, are for the most part very necessary to be ascertained before a proposed work is recommended for sanction; the existing rules prescribe such particular inquiry, and the Board seldom fail to enforce it. We think, however, that a rule requiring that this inquiry shall be made on the spot, in person, by the Collector or Sub-collector, is founded on a mistake as to the necessities of the case, as well as a forgetfulness of the territorial extent of a Collector's charge, and the heavy pressure of his duties. The average size of a collectorate is nearly 7,000 square miles; the largest being above 13,000, while two or three are little more than 3,000; the distance in a direct line from one extremity of a district to the other, is in many instances 130 miles; and in not a few, it exceeds 150; in all but the five smallest districts there is a Sub-collector, who has separate and immediate charge of about a fourth part of the district. The Collector, and, in a minor degree, the Sub-collector, cannot, without much inconvenience and delay of business, separate himself even for two or three days from his catchery; and his movements must necessarily, therefore, except in extraordinary cases, be limited by their powers of locomotion; *i. e.*, he cannot travel at a greater rate than 10 miles a day, and not even so much for any continuance without very much hindrance to business.

Its probable practical operation.

94. If the rule should ever be put in force, the operation of it in general would be that in the case of works within a moderate distance of his usual place of residence (*viz.*, within 15 or 20 miles), a Collector would go to the spot on horseback, or in a palankeen, as his tastes and habits might incline him, take a hurried look at it, ask a few questions of village people, and then go home again, having the people brought to his catchery for more detailed inquiry. As to projects affecting places more distant, they would be postponed till the annual Jammabundy tour; and, as even then, the Collector can only visit the chief place in each Talook, that place would be the centre from which he would pay similar hurried visits to works projected. It is obvious that in this way the operation of the rule would be to postpone distant works in favour of those nearer to the Collector's own residence, which already, perhaps, receive too large a part of his attention. But this is supposing a Collector anxious to improve his district even at the cost of personal inconvenience and accumulated labour to himself. All Collectors, however, are not men of such a character, and with the less active and zealous, the result undoubtedly would be that the reports on projects

projects would be postponed indefinitely, or evaded altogether, and so improvement would be totally stopped.

95. Again, any such alteration of the present practice appears to us to be quite uncalled for. In all the various departments of a Collector's duty, he depends for local information, in the first instance, on his Tahsildars; and so in such inquiries as those now under consideration, it has hitherto been considered the duty of that class of functionary to make inquiries as to the extent of land capable of being brought under cultivation by a given improvement, the willingness and ability of the Ryots to cultivate it, and the increase of revenue thence derivable. The Collector scrutinizes the Tahsildar's report; and in any case in which he deems it necessary, requires further information on particular points, calls up the village officers before himself, with their accounts, or perhaps in rare instances, for it is rarely necessary, waits till he can make inquiries himself on the spot. We say such personal inquiry is rarely necessary, for the points of inquiry are simple, and the Tahsildar, acting as he does, under responsibility, is fully competent to make them; and a little prudent caution on the part of the Collector is generally sufficient to prevent disappointment. And this being so, we think the proposed alteration as unnecessary, as we have already shown it to be impracticable.

The rule not at all necessary.

96. The present proposed rule, indeed, implies that Government have, in former instances, found or supposed information based on such inquiries to be deceptive: and in para. 12, of the same paper, it is directly alleged that the subordinate authorities "generally fail to place before Government" sufficient information to justify sanction. No instances of the fallaciousness of such information are given, however; and on referring to the records of past experience, we do not find the statement supported by the general result. We will not deny, indeed, that individual cases of failure have occurred, in which a fair return for the money expended has not been realized; but the question must be looked at in a broader aspect; and we would point confidently to the statement, Appendix (Z.), already once alluded to, for proof that generally a just discrimination has been displayed by Civil Engineers and Collectors in projecting improvements and recommending them for sanction. It is seen in that statement that the whole outlay in a series of years in extending irrigation, has produced an average net annual return, at the rate of 69½ per cent. on the first cost, after deducting from the gross receipts the amount of the repairs.

Past experience does not show it to be so.

Now in these cases of which the results are so remunerative, the Civil Engineer, the Collectors and the Board of Revenue were satisfied with the evidence of expected profit. And if the Government were not satisfied with it, or if, as it appears, they are not satisfied with similar evidence now, then the inference follows, that the Government are less capable of judging of such cases than the subordinate authorities just mentioned: and this affords an additional and practical reason why the Government should entrust to those authorities a larger share in the determination of such questions, as we shall have to recommend in a subsequent part of this Report.

97. The second rule applies to the same subject as the first, viz., the information to be furnished before a work is sanctioned; it differs from that in requiring absolute certainty both for the supply of water and the increase of revenue. Now, it appears to us that it is only necessary to point attention to this particular, in order to show the impracticability of the rule. Both the supply of water and the consequent increase of revenue obviously depend mainly on season and weather, of which the incidents are inevitably uncertain beforehand to human knowledge. It is like forbidding the commander of a ship to leave port without the certainty of a fair wind all the voyage. But if it be said that the certainty intended is not mathematical certainty, but only a high degree of probability, then we would say, first, that the language of the rule should be qualified; and, second, that even of probability, only so much must be required as the nature of the case permits and warrants. That high degree, which we call a "moral certainty," is not generally applicable to cases such as the present, but only that lower degree which is indicated by the expression "a reasonable expectation."

The second proposed rule.

With respect to the detailed information required by this and the preceding rule, as to the Ryots' agricultural stock and the supply of labour, we will say little here, as we shall have occasion to advert hereafter to the actual facts of the case. We will only remark that, in general Ryots are very ready to take advantage of improved means of irrigation, unless there are special, disabling, or indisposing causes; the chief of which is, not want of means to cultivate, but an exorbitant assessment.

The third rule impracticable; it would take the Engineers from their most important duties.

98. The remarks of the Board of Revenue on the third rule appears to us to show convincingly that it is impracticable; and that, if put in operation, it would produce more harm than good. It seems to have been altogether forgotten, when the rule was penned, that the Civil Engineer is not and cannot be an executive officer, except to a very trifling extent. His chief duties are to project work, to aid the executive officers with professional advice while it is in progress, and to inspect and test it afterwards. If he is to become executive, not only must these very important duties be omitted, but the cost of superintendence on the work so executed, a charge which is already considered by Government to be objectionably large, will be vastly increased.

And we cannot but remark with reference to this and the following rule, that a more emphatic acknowledgment of the inadequacy of the Professional Department could hardly be given by the Government. For it is here declared that such is the insufficiency of that department, as to make it necessary, both to deprive entirely of the benefit of their science and skill five-sevenths of the whole expenditure on Public Works, and also to stop the progress of all such works as are still left under their control, in 10 out of the 20 districts, every year.

The fourth rule; it would deprive by far the greater part of works of all effective check.

99. The fourth rule proposes to relieve the Civil Engineer by entirely withdrawing from his control or interference the estimating for and inspection of all works, new or old, involving a cost exceeding Rs.1,000. And this is enlarged (in paras. 14 and 15) to signify that the ordinary repairs, to whatever amount apparently, shall be entirely out of the jurisdiction of the Civil Engineer, neither to be estimated for, inspected, nor the accounts examined by him. The Board have stated substantial practical reasons against this measure, to which we will add a few considerations.

As it appears likely that, in proposing the rule, the Government were not fully aware what would be the extent of its operation, we have obtained from the Revenue Board a statement, showing, for the year 1850, the number and the aggregate amount of estimates respectively under and above Rs.1,000, and this statement we give in Appendix (T.) It will be seen that of 4,339 estimates for works of irrigation, to the aggregate amount of Rs.6,68,368, only 90 estimates, to the total amount on Rs.1,71,251, were above Rs.1,000 each, while no fewer than 4,249 estimates, amounting to Rs.4,97,117, were under Rs.1,000 each. Thus under the operation of the proposed rule, no less than five lacs of rupees annual expenditure on tanks and water-courses, out of a total of 6½ lacs, would be entirely withdrawn from the interference of the Cheeking Department.

The operation of the rule, in the case of buildings, would be to a similar extent as to roads; the estimates for that class of works are generally larger, and a smaller proportion, therefore, would be withdrawn from the cognizance and control of the professional department.

It would thus revive former wholesale frauds.

100. In detailing, in a former part of this Report, the past history of the Civil Engineer's Department, we briefly referred to the frauds formerly practised in tank repairs; work was performed that was not wanted, to favour those who obtained the good will of the Tahsildar; and work was charged for that was never performed at all, the money being appropriated to the public servants and their colleagues in the fraud: even where an honest discharge of duty was intended, though there was no wholesale fraud, there was large waste and misapplication of public money, through the unskillfulness of those who planned the work. That these evils have been so very greatly reduced, and the grosser frauds wholly eradicated, is due almost entirely to the active check exercised by the Civil Engineer's Department, and to the aid received from it by the Collector; and should the large class of works above specified be now withdrawn from the cognizance of that department, we can anticipate nothing less than the revival of a large part of the old abuses. And this is an evil much to be deprecated, not only in itself, but in its demoralizing effect on a large body of public servants.

It would greatly stop improvement.

101. Further, we have no hesitation in declaring our belief that the effect of this rule would be to put an almost total stop to a very useful class of works: viz. the very numerous improvements or extensions, varying in amount from Rs.200 or 300 to Rs.1,000, being for new sluices or calingalabs, cutting through heads of channels, forming new and more advantageous heads to river channels, &c. We have already said that, in former times, when tank repairs were chiefly in the hands of the Tahsildar, all such improvements were neglected, and the work done was for

for the most part confined to heaping earth on tank banks, or digging it out of channels, without much regard to its disposal in the former case, or to the judicious excavation in the latter, and attention being very rarely given, by the best-intentioned Tahsildar, to any improvement. The Tahsildars are little different in character now from what they were formerly; the revenue and police work required of them is much more than it was then, and they have no more assistance; and such being the case, we can anticipate nothing from the operation of the proposed rule but a return to the old system.

102. The Government anticipate that the change in view would lead to the maintenance of a more efficient control by the Collector over the Talook servants; but we are quite at a loss to see how it could have this effect, as it would deprive the Collector of the very important information and co-operation of the Civil Engineer, while it would give him nothing in their room.

The supposed check by the Collector would be physically impossible.

As to any personal and direct supervision that could be exercised by a Collector over the execution of work, it is evident that this must be extremely limited. While on a tour through his district, he would visit the works near his route, as he does at present; but the numerous and pressing duties, which oblige him to have a large establishment along with him, effectually prevent, and must prevent frequent and rapid tours. Again as to the Assistant Collectors, we fully recognise the importance of their being much employed in visiting Maramut works, but this too can only be within narrow limits. A Collector requires the services of his assistant, as the Board have pointed out, for revenue, police, and general duties, and cannot spare more than a portion of their time for Maramut. If Assistant Collectors are really to take any effectual part in inspecting Maramut works, there must be two more given to each district; and we cannot see anything but an evil in employing them to do work for which they have not been prepared by any previous training, and which could be done both much better and much more cheaply by Assistant Civil Engineers and Surveyors.

For the foregoing reasons, we strongly object to the proposed rule. We would deprecate it in the strongest terms, as a decidedly retrograde step, as inflicting a very heavy blow on the efficiency of the Maramut Department, and as tending to undo very much of the improvement that has been effected in it in the course of the last 30 years.

103. As respects the fifth rule, we think it advantageous to require periodical reports on the progress of important works; but the Board's remark seems sound, that such reports should not be in detail, except for works of the greatest magnitude.

The fifth rule; fortnightly inspection of works by Asst. Collectors is impossible.

With respect to the second part of this rule, which requires that all important works should be visited once a fortnight by an Assistant Collector, we must refer to our observations on the first and fourth rules. The extent of the districts, the distance of works from each other, and the other duties which a Collector must require of his assistant (for he has rarely more than one second assistant), make it impossible that this rule can be carried into effect at present; and as to increasing the number of Assistant Collectors in order to make it practicable, it would so obviously be much better to lay out the money in strengthening the Civil Engineer's Department, that we shall say nothing further on that point. It is undoubtedly very desirable to induce the junior civil servants in the Revenue Department to take an active interest in Maramut operations, and more especially in those connected with the works of irrigation, and to make themselves acquainted with the incidents and circumstances of such works. To that end, Collectors should require their assistants, even from their first joining their districts, to visit works in progress, and should encourage them to observe the uses of such works, and of their various parts. In every case also where an Assistant has a separate revenue charge, we think he ought also to have the immediate control of the Maramut within it, except in particular cases, and the Sub-collector ought always to have charge of the Maramut Department within his Talooks. We dwell on these particulars, both because we deem it highly important that officers of the Revenue Department should be awake to the vast importance of works of irrigation and communication to the prosperity of the country, and competent to form a general judgment as to the effect of a proposed improvement, and even to originate improvements; and also because they ought to be able, by a familiarity with details which no officer has time to acquire, except in the earlier periods of his career, to exercise a real and effective check over the proceedings of the subordinates

dinates of the Public Work Department, as well his own as those of the Civil Engineer's Establishment; but though the object of the rule under notice is approvable, so far as it might conduce to this end, we must strongly object to the enactment of the rule in its present terms, for the reasons already given.

The great want of the Department is not "responsibility," but increase of strength.

The proposed rules would diminish responsibility.

104. Having thus stated our opinion on each of the rules severally, we will conclude with a few general observations. We fully admit that the present "system is defective," (Minutes of Consultation, para. 3,) but we believe the main defect of the department to be, not the impossibility of fixing responsibility (para. 10), but the want of sufficient officers. We think the Board of Revenue fully warranted in their statement, that officers of all grades are already under a strict and efficient responsibility for the due performance of their respective duties; but undoubtedly that responsibility is qualified by the fact, that officers of all grades have so many things to attend to, that the attention they can give to any one, and consequently their responsibility for any one, must be small. It is our firm conviction, however, that this is the best arrangement under present circumstances; far better than to concentrate professional care and responsibility on a few works, by withdrawing it entirely from the many, in the manner now proposed. The present division of duties is correct as far as it goes; the projection and inspection of works are vested in one department, and the execution of them in another. Under the rules now proposed by the Government, the projection, execution and inspection of works would be in the same department; viz. of works below Rs. 1,000 in that of the Tahsildar, and of those above that amount in that of the Civil Engineer. Effective and independent inspection would be wholly absent in both instances, but most emphatically in the former; and without such inspection, as the Board truly observe, responsibility would be but a name.

Not true that ill-considered plans are commonly sent up; and in whatever degree it is true, it is owing to want of officers.

105. Again it is objected, that under the present system, ill-considered plans are sent up by the Civil Engineer, and hastily adopted by the Board of Revenue, (Minutes of Consultation, para. 11), and that estimates are very frequently insufficient, (para. 8). Our examinations of the records of the Board as explained above (para. 21), have led us to the conviction that this is not the case by any means to the extent indicated by the general terms used; but it may be confidently asserted, that in whatever degree it is so, it arises almost solely from the same cause, viz. the paucity of officers; this insufficiency in the number of officers has long been acknowledged; but up to the present time it has always been thought better that works should be done in a manner short of perfection, than not done at all; and assuredly this is the correct view; for even limiting our regards to the narrow subject of revenue, we find that the direct profit to Government from the outlay incurred, has been on the whole very great. We fully admit, and we are anxious to bring home the conviction to others, that works have sometimes been expensively and injudiciously constructed from want of a sufficient quantity of scientific and skilled superintendence; and that some few works have been executed which have not been successful, and which probably would not have been undertaken if the projects could have been fully considered; but even with these admitted defects, and including these failures, the total result has been largely profitable; and such being the case, it is obviously the wiser course, until adequate additional strength is granted, to continue the present system, imperfect as it is, rather than to paralyze under the idea of improving it. It would plainly be most unwise and senseless to reject the 40 or 50 per cent. of direct annual profit, obtainable by outlay, even with existing means, because it is possible that by improved means, not now available, the first cost of the works might be reduced 5 or 10 per cent.

The whole tendency of the rules is to stop improvement.

106. For we would observe, lastly, that the whole tendency of the proposed rules is to stop improvement, as we have already remarked in noticing them in detail, and for this reason, if for no other, we would earnestly deprecate their adoption. The country is destitute of the means of transport, and vast sources of wealth flow to waste in our rivers; hence commerce languishes, and industry is depressed. This, then, is not a time to contract still more the too limited scale of our expenditure on such works; to restrict the utility even of the means of control already existing, by requiring increased minuteness of previous detail. The proper course, recommended by policy and fully justified by past experience, is to employ those means over the widest possible field, and to increase them as rapidly as possible.

SECTION III.

*Review of the Condition and the Treatment of the Roads in former Times ;
and of the working of the Road Department.*

107. IN speaking of the works of irrigation, we observed that in the Provinces which now form the Madras Presidency, the East India Company acquired a vast property in tanks and channels, which only required to be kept in efficient repair. With regard to the communications of the country, the case was far otherwise. It cannot be said that there was any capital invested in the ancient roads ; and canals, for the purpose of navigation, had no existence in the South of India. Throughout the whole Peninsula there was not one complete road of any length on which it would have answered to employ wheel-carriages ; their use therefore was very limited, and the distant traffic of the country had no where the advantage of them. Trucks were used by those who collected stone for the dams and tank embankments ; and in some localities the harvest was brought in by carts upon wheels either formed of solid pieces of timber, or cut from a single block of stone ; these carts were drawn by several pairs of bullocks, and carried nearly a ton, but they were never used for distant journeys ; even the main streets of many of the largest towns were not practicable for wheels ; and where the most wealthy used light carriages, they rarely left the precincts of their village. The only "made roads" (if they deserve the name) were the mountain passes, which in the later wars were opened for the passage of artillery ; but they had generally been destroyed by the monsoon rains, before the country came into the possession of the Company. The only proof of attention to the great roads was to be seen in the fine avenues of trees, which in some districts measured several hundred miles in length ; but as the road-ways beneath them never had been properly formed or drained, and bridges had not been built, or care taken to keep the pathway practicable, they were roads no longer ; but in most cases, from being worn down by former traffic, and washed by the rains of the monsoon, they had become the drain of all the country that they passed through, and were so much more rugged than the land on either side, that their only use was as a guide to travellers, who took a course as nearly parallel as the ground permitted.

The condition of the roads and means of transit when the country first came under the English rule.

108. With such a want of roads, it might have been expected that water-carriage, wherever it was available, would have been turned to the best account ; but such was not the case ; little use was made of the rivers, and nothing seems ever to have been done to improve their navigation. In the heavy freshes, rafts of timber, and circular boats of wicker-work, covered with leather, were floated down some of the larger streams ; but on very few of the rivers was any attempt ever made to take laden vessels up the stream. Still less use was made of the canals of irrigation, though many of them were well adapted for water-carriage during six or eight months of the year. The back-waters both of the eastern and western coast were turned to somewhat more account ; but the boats in use upon them were canoes made from single trees, which from their narrowness and consequent deep draught of water, were very ill-suited to the shallow lakes they navigated. A considerable traffic was carried on by means of coasting craft, but that was expensive, slow and dangerous. On the Coromandel coast the dhonies were badly shaped for sailing, even when the wind was fair, and from their want of keel could never work to windward. In some respects the pattimar on the other side of the Peninsula had advantages, being well-built for speed, and having a better form of sail ; but in both cases they were quite unfit to trust in such storms as the coasts are subject to. That the carriage was expensive to what it might have been, is to be accounted for by the indolent manner in which the vessels were worked : by the number of men necessary to manage their unwieldy sails, and the time lost by the necessity for waiting till the wind was fair. The cost was also greatly increased by the difficulty of shipping and landing goods ; to facilitate which no attempt seems ever to have been made by any of the native rulers of the country.

The communication by water at the same period.

109. Such were the only means of carriage in the South of India under the Native Governments, and, as if traffic was not sufficiently impeded by existing difficulties, heavy transit duties, the pernicious moturpha tax, and port charges of a hundred kinds, all collected in the most vexatious way, were imposed on every article excepting grain ; and that was only exempt probably because the Govern-

Trade was also oppressed by vexatious taxation.

ment were the great dealers, as they received the revenue from the irrigated lands in kind. Under these circumstances, it is not to be wondered at that the trade of the Peninsula was at the lowest ebb, and there cannot be a doubt that in the cost of carriage from these various causes, is to be found the reason why so little attention was ever paid in the inland districts of Southern India, to the production of anything beyond the food and simple clothing required by its inhabitants.

Improvement since that time, as shown by the more general use of carts.

110. That a great change for the better has taken place in the communications of the country between that time and this cannot be denied, for bad as the roads are at present, wheel carriages can be profitably worked in a great portion of the Presidency; and the comfort of the people has been greatly increased by their use, even in places which have not got the advantage of extended lines of road leading to distant markets. The introduction of the European form of wheel has, it is true, led to the employment of cattle in draught, where little or nothing has been done for the roads; but the extensive use now made of the common cart (or "bullock bandy") for the traffic between the inland districts and the coasts, is only to be accounted for by the improved condition of many hundred miles of road. From the returns sent in by the Collectors of districts in 1848, it appears that there were at that time about 90,000 bullocks in use in the Presidency; and as this census, like all others, was supposed by the inhabitants to have been taken with a view to some additional tax being imposed, it is probably much too low. Still, however, much of the produce of the country can only be transported to the coast, or even to the markets of the district in which it is grown, upon bullocks; and in many places the roads are yet impassable for laden cattle, and men carry the goods from place to place.

The river navigation has not been improved.

111. The river navigation of the country has not been improved, and canals for traffic have only been attempted on the very smallest scale. It can hardly be said that anything has yet been done to facilitate the landing and shipping of goods; and even in the Port of Madras the trade is still dependent on the Masula boat, without which a communication could not be kept up between the anchorage and the shore. One or two slight efforts have been made to improve the entrance of the smaller rivers, and with satisfactory results; but nothing has yet been attempted to turn the larger rivers to account to shelter shipping. A very great boon has, however, been conferred on the coasting trade, by the number of good lights kept on both sides of the Peninsula; and the clearing of the Paumbum passage has had a most beneficial effect on the traffic of the eastern and southern ports; leading, as is stated by the Marine Board, to the use of a better class of vessel for the navigation of the Gulf of Manaur, and increasing greatly the trade between Ceylon and the Continent. Many fine vessels built in Calcutta, Bombay, Moulmein, Cochin and Coringa, are now engaged in the trade upon the eastern coast; but the native dhony is still much used, and the pattimar is yet almost exclusively in use upon the western side of the Peninsula.

In the early times of the British Government the roads were wholly neglected.

112. We now proceed to trace briefly the operations on the roads under the British Government, as well as the records which we have searched enable us to do it. We have said that some few mountain passes were open in the later times of the native governments for the passage of artillery and troops; but after the military movements ended they were no longer kept in order, and soon became so rugged that cattle could hardly climb them. Nor does it appear that our Government in those times showed much more wisdom than former Governments, as to the treatment of the roads and passes of the country. Those which were opened by our armies were neglected from the day that they were made; and the lines which were essential to the security of conquered territories, were only kept open by constant re-construction; no effort seems to have been made to prevent their ruin, or by timely repair to lessen the cost of keeping them fit for use. The traffic of the country profited in some degree by these military lines, and we can even now trace in most of our great trunk roads, as they are called, the lines used for connecting the military arsenals and cantonments. New roads for this purpose were opened in the time of peace, and on some of the mountain passes a great amount of labour was expended; still nothing was done to keep up the roads when opened, and little inquiry was made, how far the lines selected for improvement would beneficially affect the traffic of the country.

The bad state of the roads in 1813, as

113. The necessity for commercial roads was not, however, altogether overlooked either by the local Government or the Honourable Court; for we find a despatch

despatch upon the subject, dated 3d September 1817, and written in answer to a letter from the Board of Revenue to Government, bearing date 9th November 1813, from which it appears that the subject of internal communications had then been for some time under investigation. As the general tenor of this despatch seems in a great measure to have regulated the conduct of the local Government for many years, we give it here, together with several extracts from the letter to which it forms an answer. To begin with the latter, the Board of Revenue had been desired by the Government to call on all Collectors of districts for information regarding their roads, and from the reports received they wrote as follows: "Except a few of the principal roads in the Zillah of Chingleput, and the military road that leads through the Ceded Districts, it does not appear that any of the roads in these territories have ever been repaired at the expense of Government: even the military roads in the Ceded Districts are described to be now in some places very bad indeed, and the Ghants at Balpullee, and between Wintemullah and Cuddapah, though not impassable for artillery carriages, to be yet so very stony and difficult, as almost to destroy every conveyance of that sort which is brought through them. The Board have every reason to believe that the other roads which have been made or repaired at the expense of Government are also fast approaching to decay: indeed, those which have been framed merely by digging ditches, and raising the earth in the centre, are not perhaps so good as the old beaten track; for a raised road, not jellied (gravelled), is little better than a swamp after the rains. There scarcely exist any bridges in the interior of the country, and though ferries are established at the most frequented passages over the principal rivers, they are not under any systematic management; at some places they are rented out, at others they are kept up at the expense of Government; and, in some cases, a considerable surplus revenue is derived from them. In Bellary the net revenue from this source is about 1,500 pagodas; in Canara, about 500 pagodas, and in Malabar about 1,000 pagodas per annum; and at many stations the ferries are kept up by boatmen on their own account."

"The importance of an easy and secure communication by land, in a political point of view, as well as to the commerce, the revenue, and the general prosperity of the country, is sufficiently obvious; but to create and maintain good roads throughout these territories, would involve the disbursement of a large portion of the revenue of Government, and, considering the existing state of inland commerce, would perhaps be as unnecessary as it would prove expensive."

114. The Board go on to point out that the roads of the Northern Circars are particularly bad; that it would be well to widen them where they pass through jungle, and to establish ferries; and they observe that the "jungle being entire," the expenditure on that account would be very heavy. In the 12th para. it is said, that with reference to the finances of Government it is not practicable to make roads through the country; so that, before anything is done, it would be well to determine the nature of the repairs that ought to be made. It is suggested, therefore, that where the jungle is too close the roads should be widened by its removal; that the banks of rivers should be sloped; that "passes should be cleared so as to admit of the safe passage of wheel carriages;" that better ferries should be established, and that they should be kept up by tolls; that the surplus money so raised should be spent on bridges, roads and causeways; and that the convicts should not confine their labour to the Zillah stations after their improvements were completed.

The trifling measures recommended by the Board for their improvement.

In thus summing up their recommendations for the management of the roads, the only tangible means applied for by the Board were the surplus ferry funds, amounting to less (in fact considerably less) than Rs. 35,000 a year, and the convict labour after the improvement of the Zillah stations was completed; the latter amounted to nothing, since the convicts could not do more than put the Zillah stations in order, and keep up the roads in the vicinity. Indeed, they have never yet effected this, for it cannot be said that any of them (except perhaps Madura, which has had a liberal sum of money spent upon it) are, to this day, either sufficiently drained, or have had their "improvements completed," in any sense of the words.

115. The Honourable Court's reply to this letter contained all that could have been expected, indeed, all that was asked for; sanction was given for the expenditure of the surplus ferry funds on road-making, and the convicts were to be

Reply of the Court of Directors.

employed on the roads when they could be spared. In answer to the general suggestions of the Board general instructions were returned; and the Court, misled by the exaggerated account given of the impediments met with in making roads, concurred in the opinion that the "finances are obviously inadequate, did not the nature of the soil and seasons oppose insurmountable obstacles," to the formation and maintenance of artificial roads. When this correspondence ended, the country generally had no provision whatever, either for the improvement or the maintenance of its roads; and no other means of communication were suggested.

Subsequent systematic neglect of the roads.

For a long time after this, nothing was done by Government for the roads of the country. A few Collectors, who happened to take an interest in their roads, did something by the aid of the inhabitants to improve the communications of their districts, but it rarely happened that they met with co-operation from their neighbour Collectors; so that there does not appear to have been one line of road completed either from the centre of the continent to the coast, or between any two distant markets. And so completely did the local Government neglect this important subject, that even the surplus ferry funds were not applied to the purpose for which they had been granted by the Court of Directors, and they never have been so up to the present day.

The Pioneers.

116. With all this unwise economy, there was a continual waste of money, and a vast loss of labour, by the employment of the corps of Pioneers, without any aid from engineering skill, to make roads on the great military lines. When not on active military service, this corps had to be maintained like the rest of the army, and any work done by it was so much saved out of an unavoidable expenditure. The Pioneers mustered at that time about 2,000 strong, and were notoriously a hard-working, useful body of men, worth double the number of any other native troops, but little hampered by customs of caste, and ready for any employment that was given to them. Had this corps been worked under the instruction of professional officers, they would have earned for the country far more than they cost; but it was the false economy of that time, as it is indeed to the present day, to work with inefficient means. The Pioneers were officered from the regiments of the Line; by men who had not only no knowledge of engineering, but who did not affect to understand surveying or levelling, or even the use of a plan or section if they had it. And, as if in mockery of all reason, they were referred, in cases of unusual difficulty, to the Department of the Quartermaster-general, which, from its organization, has no more scientific knowledge than the Pioneers themselves, and which, being entirely wanting in all practical experience in road-making, was a shade more blind than those it had to lead.

The road from Masulipatam to Hyderabad.

117. To show how this system worked, we give an extract from Minutes of Consultation, dated 2d February 1831, passing final orders on the results of an attempt to open a military road from Masulipatam to Hyderabad: "In December 1822, the Commander-in-Chief, in a letter from the Quartermaster-general, suggested the employment of the head-quarters and three companies of Pioneers on this work (the road from Hyderabad to Masulipatam), and stated that he was not aware that the Pioneers would require more assistance than a few carts, for the purpose of making the road in those places where the natural soil might require to be amended. The Government, on the 24th of the same month, approved the arrangement proposed by his Excellency for repairing the road from Secunderabad to Masulipatam, and granted authority for indenting on the Commissariat for the number of carts required." On the 16th of May 1823, the Commander-in-Chief submitted that it would take the three companies of Pioneers six years to complete the road, and stated the number of tank-diggers, artificers, carts, &c., which would be required in aid of the Pioneers, to effect the same object in three years. The Government then called for an estimate, and one was furnished by the Deputy Quartermaster-general of the Hyderabad force, amounting to Rs. 1,70,568 for the whole distance, viz. 222 miles; the portion through the Company's territories, 126 miles, requiring "little less than a lac." The Resident was ordered to apply to the Nizam for what was required through his territories, and the Revenue Board was directed to supply means for the remainder. The Minute goes on to say, "Instead, however, of the road having been completed in 1826, at a cost of 1,53,664 Madras rupees, the Right honourable the Governor in Council regrets to find that only 176 miles of road have as yet been made, and that the enormous sum of Rs. 8,43,347. 9. 9. had been expended on this work prior to the 30th June last."

"It is accordingly resolved that all the carts, coolies and extra artificers attached to

to the party of Pioneers employed on the Hyderabad road be immediately discharged; and that the duty of the Pioneers be hereafter confined to the repair of such parts of the road as may be now impassable for wheel carriages."

118. In this case, the Government had begun in the hope that the Pioneer corps, with some little pecuniary aid, would open the road, and found itself betrayed into a heavy expenditure with most inadequate results. But that the error in policy was still overlooked, is clear from the 3d para. of the same Minute, in which the Government consoles itself by the reflection that the rest of the Pioneers (eight companies) were very judiciously employed in opening the passes of Neilgherries and the Western Ghats, "where the work can only be done by scientific men, inured to hardships; and, moreover, as they have no hired carts or extra establishments attached to them, the expense of the work performed by these companies is confined to their pay and allowances." The Pioneers, who were totally without any pretensions to science, and who had utterly failed in the open plains, were thus, by some strange process of reasoning, supposed, as "scientific men," to be well qualified to open the intricate communications on the western side of the Peninsula, where it was confidently hoped that they could have no aid of any kind. While on the continent of Europe the ablest Engineers were sought for to open the mountain passes, and every available means was placed at their disposal, it was considered politic to do the work in India at any loss of labour, so that no money-payment appeared in the accounts. The result, of course, was, that wrong lines for the trade were chosen, and the passes were made just too steep for wheels; a vast amount of toil, as well as time, was spent on rocks which would have been avoided had the use of the levelling instrument been understood; mouths were thrown away working with cheap and inefficient tools; and there is not one of the passes so made which has not either been already superseded, or which should not be abandoned for a better line. We may instance amongst their most laborious undertakings the Bizly, the Higgelah and the Periah Ghauts, all abandoned, except as local passes, for the Munjerabad, Sumpagee and Periambaddy respectively. There are also the Kotagherry, Conoor and Koondah passes, still impracticable for wheels; and others, both in Canara and Malabar, which might, if they were not buried in the jungle out of sight, be of more service now as monuments of Madras economy, than they ever were, or could be in any other way.

The erroneous and wasteful course adopted by Government.

119. In the Minutes of Consultation above quoted, there is a clear exposition of the views then entertained by our local Government on the subject of roads. The Hyderabad and Masulipatam road had cost a large sum of money, and there was more required; so without any good means of knowing what the road was worth to the country, what it would cost to complete it, what ought to be done to preserve the portion finished, or by what other means more satisfactory results on all points might be attained, it is determined to cut off all further supplies, and leave the Pioneers to keep the communication open as they best could.

Government resolve in 1831 to abandon the idea of improving the roads of the country.

The Minute further states, that "a full consideration of the difficulties opposed to the maintenance of good roads in other places than the immediate vicinity of large towns, has satisfied the Government that the attempt should not be persisted in. At Madras, a very considerable portion of the expense incurred in the formation and repair of roads is defrayed from the Assessment Fund, and at large stations in the provinces the work is mostly performed by convicts; and repairs being undertaken directly the slightest failure is observed, large disbursements on that account are avoided. In large military roads" (all great roads are here intended), "through long tracts of thinly-inhabited districts, the case is evidently different; the whole cost of the work falls on the Government; and from there being no means at hand to repair damages so soon as sustained, large portions of the raised roads through the low countries, in which the Carnatic and other provinces subject to the Government abound, must be carried away by every monsoon, or be so injured as to make their repair almost as expensive as their original formation.

"These and other reasons have satisfied the Governor in Council that the attention of the Government in this respect may now be safely and beneficially limited to the maintenance of communication between different stations for the common wheeled carriages of the country, and that this object can be best and most economically effected, as it now is, by the Collectors of Districts, except in special cases, which will be open to the particular consideration of Government."

Thus, then, it was again resolved in 1831, that no further attempt was to be made to keep up great lines of road through the country; the Collectors were to

do what they could each in their own district, and the Pioneers were to work without any pecuniary aid from Government.

The Pioneers converted into Sappers and Miners.

120. In the course of the same year, 1831, it was determined that the corps of Pioneers should be re-organized under the name of "Sappers and Miners," and officered by Engineers. This was a move in the right direction; but as nothing at that time was done without retrenchment, the corps was reduced to one battalion of six companies. There seemed no good reason for reducing this regiment, instead of one or even two regiments of the line, which in the time of peace, at all events, were of far less value to the country. For some years the head-quarters of the Sappers were fixed at Bangalore, and they had parties on some roads chiefly in the Mysore country, but their work in that way was limited. About 1843 they were transferred to Mercara, and since that time they have not been employed on the roads at all. Though nominally officered by Engineers, yet from the extreme paucity of the officers of that corps, and the urgent call for them for other duties, there have rarely been more than two with the Sappers, a Commandant and an Adjutant, the other officers being from the line.

The roads of the Salem district.

121. About this time, viz. between 1829 and 1837, several of the roads of the Salem district were put into good order under the management of the Collector (Mr. Orr), at a cost of only Rs. 41,000 of Government money, by far the greater part of the work having been done by unpaid labour, called voluntary. That country was peculiarly favourable for road-making; there were no great rivers to be bridged, or plains of alluvium to be crossed, the soil in general was well adapted for the surface of a road, and there was nothing to prevent a choice of lines. Mr. Orr probably obtained more aid from the people than they could well afford to give, or than was quite justifiable after the receipt of the Court's despatch above quoted, where, in their 65th para., they wisely express their "serious doubts of the expediency of adopting any measure which would augment the pressure of the landed assessment on the agricultural resources of the country." The effect on the district, however, was very good; and as a light contribution was raised from the carts to form a fund towards keeping the roads in order, and the system of unpaid labour has been continued for the same object, the communications of that part of the country have been since then in somewhat better condition than those of any other collectorate. As a proof, however, of the ill effect of road-making without a general plan of operation, we may state that, up to the present time, the main line through the centre of the Salem district has not been completed, either to the eastern or western coast. Through Coimbatore, some of the greatest impediments have very recently been removed by the clearing of the Walliar jungle; but from the frontier of Salem, through South Arcot to Cuddalore (the natural seaport of the former district), the road is still one of the very worst in the Carnatic. With all that has been done, both by the Government and the people, the principal part of Salem has no tolerable direct outlet for its produce; and there being no considerable military station within it, or any very great trading town, much of the advantage that ought to have been derived from its own good roads has been lost.

The want of a general plan.

Cattle railroad proposed by Captain A. Cotton in 1830.

122. In the period under review, the improvement of the main communications of the country was once more discussed, and Captain (now Lieut.-Colonel) A. T. Cotton was called upon for his opinion on the subject; his report was written in May 1830, and was ordered to be lithographed, in the hope that it would be the groundwork of something more detailed. Captain Cotton suggested a system of cheap railroads, worked by cattle, on those lines where water-carriage could not be had. He pointed out the great advantage to be derived from one general scheme, drawn up and acted upon by the Government, as a security against the waste that results from contending interests, when individuals or companies are each working to benefit themselves without a fixed plan of action.

Captain Cotton, after going very fully into the grounds on which he formed his opinion, wrote as follows: "Upon the whole, I am myself so satisfied with the prospect which the construction of railroads holds out, that, in my opinion, it would be most advisable, before another rupee is expended on the common roads in India, to sketch out a general plan for 5,000 miles of railroad, open a loan for from one to two crore of rupees, and form a regular department for carrying out all the details of the work, commencing, of course, with one or two lines, and proceeding as the results afforded encouragement; and it appears to me that, to do this,

this, nothing is necessary but the determination of the Government, as no money would be required from the Treasury, and the Government are in a situation now to carry communications wherever they please. Were this sum of money required for carrying on a war, it would no doubt be instantly procured, though it would leave a permanent burthen upon the Treasury."

His recommendation regarding the communications parallel to both coasts was, that the back-waters should be united by canals; by which he calculated that goods could be moved at the rate of 3 or 4 pice per ton per mile, and that at a cost of Rs. 7,80,000 about 600 miles of inland navigation could be completed, of vast importance in all respects, especially in its effect of equalizing the price of grain in times of scarcity.

Captain Cotton suggested that the first line laid down should be from Madras to the westward as far as Wallajahnuggur, 70 miles; and that no time should be lost in investigating the whole proposal in more detail.

123. His suggestions contained in that report were too comprehensive to suit the times; and as there appeared little chance of anything on a large scale being done, he proposed to show the effect of a cattle railroad in bringing to Madras the material used for the roads and streets of the town and its suburbs. This project was sanctioned, and the work executed, but Captain Cotton had reduced his estimate of the cost of the work too low, and had calculated too little loss from loading and unloading; and much of the profit anticipated from the rail was consumed by the use of a canal for some portion of the distance. After this work had been in operation a short time, it was found that the rails would not bear the traffic, and that altogether the work was not answering the expectations of the projector; a committee was therefore appointed to inquire into the state of affairs, in order that the work might be rendered more efficient, or abandoned. The result of this inquiry was a recommendation that the work should be given up; and the rails removed; the committee's opinion to this effect being expressed in an extract from their report, given below.*

A small experimental line laid down near Madras.

The effect of the railroad had been to reduce considerably the cost of carriage by its results.

* EXTRACT from the 2d Report of the Committee upon the Red Hill Railroad, dated 2d February 1839.

92. "The Committee have before stated (in para. 56 of their Report) that the project of the railway was one which at its first commencement had every reasonable prospect of success. Nor at the time that it was undertaken, was there the least cause to believe that any circumstances could arise whereby the Government could be deprived of the profits which might fairly have been expected from it.

93. "At that time Government, who were to be the sole proprietors of the undertaking, were also to be the sole parties benefited by it, they being almost the sole consumers of the article whose cost was to be reduced. As long as this position of things continued, the injurious effects of a competition would, it is plain, offer no just argument against the soundness of the speculation, or the reality of the profits effected by it. It would be quite satisfactory, for instance, were the Government assured, that whereas before the establishment of a railroad they had been compelled to purchase annually 1,00,000 loads of jelly at a cost of 8 ½ annas per load, they now procured the same at a diminished cost of only 6 annas; although other parties benefiting by the competition established at their expense, should actually succeed in purchasing the same at 5 annas.

94. "But long since the commencement, indeed before the completion of the railroad, the Government have unfortunately ceased to be the sole consumers of the material which it is the object of the railroad to supply, and the transfer of the charge of the public roads into municipal management has changed the character of this establishment, which, instead of continuing what it was originally contemplated to be, a means of certainly diminishing a large unavoidable outlay, has now been compelled to take its chance as a speculation for supplying others, into whose pockets now passes the saving effected by the competition, and the reduction of prices, brought about most probably at the expense of Government.

95. "That the railway, after reducing the prices of transport to the lowest possible charge, should be able to compete with these reduced charges, and show the same profits as the original scheme contemplated, is of course not to be expected; yet at the same time it cannot be denied, that without this it will be vain to look for any remunerative profit in the new position in which it now stands; the great advantages which the railway fairly promised to the consumers of material being now lost to Government, except in a very partial proportion.

96. "It is, indeed, not unreasonable to say that a considerable saving is now being effected by the existence of this undertaking, which, in the reduced prices effected by it, must certainly in some degree have contributed to the lessening the annual outlay upon repairs of public roads, though its share in this reduction cannot perhaps be exactly estimated, or its value ascertained. It is important, however, to recollect that this by no means insignificant saving has been and still continues to be felt; though, unless some means can be devised for directing it into its proper channel, the benefit, as a return for the capital expended, must be for ever lost; and the Government, by the further prosecution of the project, might be altogether disappointed of the profits realised, by not being sensible that they were being reaped by others."

by the common bandy (by the owners entering into competition); and had the Government kept under its own management the whole of the roads and streets as they had hitherto done, the saving by this alone would probably, in spite of its extra cost, have paid a fair interest for the money sacrificed: but as arrangements were made just at that time for placing a greater part of the roads under municipal management, the Government, which was to bear the whole expense of the railroad, and all the works connected with it, had comparatively little interest in lowering the cost of road material.

And the causes of its failure.

The failure of this project put an end for the time to all hopes of further inquiry into the value of cattle railroads, for though nothing was proved, except that a line working in connexion with a canal, on so small a scale, and for a very limited purpose, had not, from various causes, yielded the profit expected, it afforded sufficient grounds for abandoning a scheme, at the time considered visionary, probably because it exceeded in extent the ordinary projects of improvement submitted for the consideration of the Madras Government.

Two important lines of road opened.

124. In the course of the years 1837 to 1843 some important lines of road were opened or improved; but there was a want of system in the management of the several undertakings which led to a considerable unnecessary expenditure. Two of the most important works were the making a road on the line from Madras to the northern limits of the Salem District, in the direction of Bangalore (since called the Western Trunk Road), and opening a line of road from the western boundary of Mysore, through Coorg to Mangalore. The object of the former was to facilitate traffic, and the movements of troops and stores, between Madras and Bangalore, and the stations on the western coast: the latter was to enable troops and artillery to move with ease through some Talooks of Canara, which had lately been in revolt against the Government.

On the Madras and Bangalore road a large body of convicts were employed, and no expense was spared to facilitate the work, which, when the establishment was broken up in October 1844, had cost 10½ lacks of rupees. There were some essential faults in the line chosen, and the result of the expenditure was not considered satisfactory; but still the formation of the road was a vast benefit, as we shall presently have to state more in detail; and it must be remembered, that the large sum which we have named covered not only the original cost of the road, but its maintenance for four years against a very heavy traffic.

The Sumpajee line to Mangalore, which was traced by a young officer of Engineers, and carried on under many different executive officers, was completed with perfect success, though the sum spent upon it was greater than had been anticipated; and probably greater than would have been expended if more accurate previous inquiries had been made, and if the work had been completed under the management of one experienced officer. There was, however, no great cause for complaint, seeing that a magnificent carriage-road was opened for a distance of 70 miles through a most difficult country, including a pass of 2,500 feet in height, at a cost of less than Rs. 4,000 a mile. The Sumpajee Ghaut was the first of the Great Western passes opened on an easy slope for wheel-carriages; and it is a noble monument of the genius of the late Lieutenant Fast, who died two years after his work on the Sumpajee ended, while carrying out a similar undertaking in the Coimbatore District, even then only 25 years of age.

The Road Department constituted in 1845.

125. In the 20 years from 1826 to 1845, the average yearly outlay on the communications of the whole Presidency of Madras, 1,38,249 square miles in extent, had been Rs. 1,16,926, or £. 11,693 sterling (*see* Appendix (W)). The expenditure had been more liberal in the later half of the term than in the earlier: the yearly average of the first 10 years being Rs. 84,503, and that of the second Rs. 1,79,348. A very large part of this increased outlay was absorbed by the high Western Road, and the Sumpajee Ghaut and road also contributed to swell the average. With the year 1846 a new era commenced in the history of the roads of the country, and the operations and the expenditure became somewhat larger.

Up to the year 1845 the whole of the expenditure on roads was under the control of the Board of Revenue; but the Marquis of Tweeddale, being dissatisfied with the working of the system as we have been describing it, and feeling the necessity of a more efficient agency for improving the means of transit, resolved in that year to constitute a separate department for the purpose, to be under a "Superintendent of Roads," and with a fixed annual sum set apart for it. Pending a reference

a reference to the Honourable Court of Directors, Captain Best of the Engineers was provisionally appointed Superintendent on the 21st April 1845; the object of the appointment was declared (extract Minutes of Consultation, 12 April 1845) to be exclusively the repair and preservation of existing roads; and it was expressly prescribed that the Superintendent should not be engaged in laying out new roads. In pursuance of instructions, not very precise, Captain Best took charge of the two newly formed lines specified in the last paragraph, and adopted measures for their maintenance; and he also examined the country between Madras and Trichinopoly, with the view of determining the best line for a new road.

126. The Court of Directors approved of the nomination of an officer for the special charge of the main or trunk roads; and they also acceded to the proposal of the Government, that four lacs of rupees should be annually devoted to their formation, maintenance and repair. And on the 27th January 1846, the Government gave effect to this sanction of the Honourable Court in an order, of which the chief points are embodied in the following abstract:—

Its formation approved by the Court of Directors.

It relieved the Board of Revenue from the supervision of the great lines and trunk roads, and placed, permanently, under Captain Best, the four lines noted at foot,* being a total length of nearly 1,300 miles, together with the comprehensive but somewhat indefinite addition of "all extensive lines of road;" the branch roads and minor district roads being still left under the Collectors and Civil Engineers. It gave Captain Best an assistant, and directed him to state the office establishment that would be required; he was also (para. 21) to give his particular attention to the subject of the employment of European Overseers, and to report the arrangements that he would propose for that object.

The order of Government, respecting the trunk roads.

It provided that the outlay on the trunk roads should never exceed four lacs annually, including all charges of every description connected with them, and all estimates already sanctioned for works upon them; but it added that expenditure on the minor roads should not be provided out of this four lacs.

It stated, that as the four lacs had been placed at the exclusive disposal of the Madras Government, estimates for works under it would be passed without reference to the Government of India; but that those for opening new lines, if greatly exceeding Rs. 10,000, would be submitted for the sanction of the Court of Directors.

The Superintendent was to correspond directly with Government; he was to report on each five miles of road finished; and a general report of the transactions in the department in each year was to be submitted after its close.

127. The same order also contained some directions intended for the better management of the district or cross roads, of which we will also give the purport here.

And the branch roads.

It was ordered that both the Collectors and the Civil Engineers should report to the Board of Revenue in the Department of Public Works on the state of the roads of that class within their respective districts and divisions; the former officers stating the actual advantages gained by past improvements, and suggesting new; the latter reporting the condition of the roads, with a view to their timely repair.

The Collectors were also authorised to disburse money for the repair of made roads of this class, on the responsibility of the Civil Engineer for the necessity of the outlay, to an amount not exceeding Rs. 50 a mile annually; but this permission never reached the local officers, for the Board of Revenue wholly omitted to communicate it to them, and it has, therefore, never been put in operation.

In order to ensure uniformity of system in the management of the trunk roads and of the branch roads, it was directed that the Superintendent of Roads should be "consulted in the formation, the keeping in repair, and the improvement of the branch roads, and whenever the public money is expended on roads;" and in order that "Government might have before it in one statement a clear view of the total annual outlay on roads," it was directed that the Superintendent should, in communication

* 1. The Western Road to the Mysore frontier, about	- - - - -	200 miles.
2. The Southern Road to Trichonopoly, about	- - - - -	205 "
3. The Northern Road, with the branch to Cuddapah	- - - - -	785 "
4. The Sumpjee Ghaut Road, from the Mysore country through Coorg to Mangalore	105	"
TOTAL - - -		1,295 miles.

munication with the Board of Revenue, forward to Government statements to be submitted by the local officers; and the Board, as well as the Collectors and Civil Engineers, were ordered to furnish the Superintendent with "whatever information, Reports, &c. connected with roads," he might require. So also the Superintendent was to furnish the Board with whatever statements and information might be necessary to enable them to complete their annual reports of expenditure in the Maramut and Civil Buildings Department.

The Assistants to the Superintendent.

128. The office of Assistant to the Superintendent was conferred on Lieutenant James Johnstone of the Engineers, but ill-health obliged that officer to leave India six months afterwards, and no Engineer has since been appointed. Thus the engineering labours of the Superintendent were at once doubled. Two Assistants were subsequently nominated from the Line, in place of the single Professional Assistant; but though very valuable in the active and efficient execution of work, they were and are unable to relieve the Superintendent of any part of his engineering work; and the Government have recently pronounced it unfit that they should be left any considerable time without his personal direction, even in the management of works in progress.

The instructions to the Superintendent.

129. Captain Best was placed in direct communication with Government, under the supposition that he would thus be able to act with more freedom, and consequently with more vigour, than if placed under the intermediate authority of the Revenue Board. The instructions by which he was to be guided are conveyed in the order of Government of which we have given the purport. But referring as they do to four previous and somewhat conflicting orders, they fail to convey to us a clear idea of the intentions of Government on some material points.

He was to be executive as well as superintending.

One of the papers to which Captain Best is there referred, is an extract from the Minutes of Consultation, dated 12th April 1845, which expressly declared the object of his appointment to be "exclusively the repair and preservation of existing roads, constructed at a heavy outlay." It gave him authority to make such minor improvements as might be necessary, but clearly declared that he was "not to be engaged in laying out new roads, or in examining new lines." And it was added, "The object of his appointment is limited to the keeping the roads already made in perfect order, and to superintending, therefore, in person, the execution of those timely repairs which all formed roads in this country so especially need." The order last quoted implies that the Superintendent was to consider himself as charged with the execution in the most minute detail. And we find that Captain Best, who was at that time in constant personal communication with the Governor on the subject of his new office, and who, as it appears from the minutes of the President above quoted, made many suggestions himself as to the mode of organizing the Road Department, considered himself in executive charge of the works in progress.

His duties as then proscribed.

130. The duties, therefore, as he considered them, were apparently as follows: He had personal and executive charge of four lines of road diverging from Madras; viz. southward, to Trichinopoly; westward, to Bangalore and Mangalore; and northward, to the frontier of the Bengal territory, with a branch inland to Cuddapah, in all 1,300 miles in length; and as the lines radiated from a point on the coast, they were most unfavourably situated for frequent inspection. With the aid of one Engineer Assistant he was required partly to create a new, and partly to restore from a state of total ruin this great extent of road, and to report upon each five miles that were completed, after personal superintendence of the work; and having drawn all the money required in his own name, and laid it out in works under his own immediate direction and control, he was to check his own accounts, and forward the bills direct to the Government for sanction. He was also to give instructions to the Public Works Department of the Board of Revenue as to the management of all the cross or minor roads of the country; and to be consulting Engineer to the Board in all cases regarding the repair or improvement of those roads. At the end of each year, his expenditure was to be made known to the Board, who were in like manner to keep him informed of all sums spent upon the cross-roads and works connected with them. And in addition to the report upon each completed space of five miles, he was to send in annually a general report upon the trunk roads.

The Department has failed.

131. It is hardly necessary to say that the incongruities here described led to the total failure of the Road Department for the purpose for which it was organized. The report upon small spaces of roadway completed was never attempted, because

because practically impossible; and a monthly report of the proceedings of the department was substituted, in which inspections of work executed were recorded, but in many cases not till years after the accounts had been closed. The position in which the Superintendent was placed in his communications with the Board of Revenue having been objected to by the latter, and the Court of Directors agreeing with them, that it was not a suitable arrangement, no inter-communication ever took place between the two offices. Captain Best indeed forwarded to the Board a set of rules for the classification and management of the roads of the country left under the Board's control; but though those rules were circulated to the Collectors and Civil Engineers, it was without any expression of the Board's opinion, or any order whatever, and consequently they have been entirely inoperative. There was no interchange of information between the two departments as to the annual expenditure in each, and the Board have never, in any instance, applied to the Superintendent for information or advice as to any roads.

And as to the work of the Road Department itself, the expenditure in the six years has only been 13 lacs instead of 24, and no small portion of that has been on works not contemplated when the grant was made. Only one line of road can yet be called complete, and that was almost equally complete before the department was formed. The greater part of the work on these roads is once more under the management of the Civil Engineer and Revenue Departments; with this change only from the system of former times, that the accounts are sent in direct to Government by the officer in whose name the money is drawn, without any examination by a controlling department, or any certain inspection of work or check on expenditure. With 12 lines of road now nominally under the Superintendent, measuring 2,288 miles, his movements have been restricted, by a late order of Government, to three lines near the Presidency, to the extent of only 300 miles, the remaining portion of what have been considered the most important roads of the country being only here and there under management of any sort. The general reports, which should have been sent in annually, have only been prepared twice in the six years. On the 1st of May last, the date to which the second report reaches, there were accounts unadjusted to the amount of Rs. 8,34,427. 7. 3; and the strength of the Road Department, which was to have extended its operations over the whole country, is not at all more than sufficient for the very small portion of road still under the personal control of the Superintendent himself.

132. It must be admitted, that as a department for the management of the trunk roads of the Presidency, its failure has been complete; but we feel confident that we can show that the result may fully be accounted for by the impracticability of the original instructions, the restrictions since imposed, and the withholding of the necessary means and assistance from the late most zealous Superintendent, who can only be held responsible to the extent of having taken upon himself duties which, even if well supported, no one individual could have performed.

Causes of the failure.

Captain Best took the charge upon himself without remonstrance. Indeed from the President's minute, it is evident that he was himself, in a great degree, the originator of the scheme. He did this with the hope that his own energy would carry him through all that was expected of him, and in the expectation that within the limits sanctioned by the Court, he would have the full support and confidence of the Government in disposing of the "Four Lac Fund." And had he been invested with such powers as to enable him to modify and improve his system as his experience suggested, it is possible that so great a change in it would gradually have taken place as would have made the department of real value to the country.

133. To show that the original instructions were impracticable, it is hardly necessary to do more than point to the length and condition of one of the four lines to be restored, or rather to be made. The northern road extended from Madras to the frontiers of Bengal, a distance of 676 miles, and the whole of it, with the exception of 102 miles, between Goomadapoondy and Ulloor, and 54 miles between Itchapoor and the boundaries of the Presidency was in utter ruin, and even the two excepted portions were in a very bad state. This line was to be entirely re-formed and bridged, and much of it even to be retraced. The country through which it passes is one in which there are the greatest impediments to road-making; the line lying across the whole drainage of the country, and running for a considerable

The state of the North road.

siderable distance through the low lands near the coast, subject to most destructive floods.

This alone would have occupied the department several years.

We do not hesitate to say that to have laid out this road only, bridged the streams, and brought it into good order, would have occupied Captain Best and his Engineer Assistant all the years that have elapsed since the department was formed. Indeed if such attention to detail were to have been given as was implied by the report, "after personal inspection of each five miles when executed," even that period would not nearly have sufficed to complete this one undertaking. The actual progress in the formation of the southern trunk road bears out this assertion, although it is now more than four years since the estimate was sanctioned, that road, 200 miles in length, is still hardly more than half finished, though the difficulties are very trifling in comparison with those of the northern road.

The branch road to Cuddapah entailed the trace of a new Ghaut, and much engineering skill, probably two years' work; and the great western road from Madras to Bangalore, having to be brought into order, and kept in that state against such a traffic as no other road in the country had been subjected to, would have afforded ample occupation for the most active engineer.

Captain Best's scheme of an establishment refused by Government.

134. On the 4th of March 1846, Captain Best brought before Government his scheme for forming a Subordinate Department, at a cost of Rs. 1,390 monthly; it included teachers for the Maistries and others, and was such as he considered would be sufficient when the expenditure amounted to four lacs annually. This establishment was objected to; the Government considered it "inexpedient to sanction so large an establishment as that proposed by the Superintendent of Trunk Roads in the foregoing letter;" and added the following expression of their sentiments:—"Independently of the heavy charges it would create, a large establishment of this nature is open to exception, as tending to take the Superintendent from his more direct and immediate duties, the constant personal supervision of the works under his care, and to constitute him rather the head of a fixed office establishment, when he would be occupied in superintending the routine office duties of an establishment. This would not meet the views of Government, as it is the object of his Lordship in Council to keep the Road Department a practical working department, rendered efficient by undertaking no more at one period than can be readily and thoroughly superintended, and by securing for all works the constant personal supervision of the European heads of the department; and he is of opinion, therefore, that the establishment should be such as can move without difficulty with the Superintendent."

"Under this view, his Lordship in Council desires that an amended list of establishment be submitted, approximating as closely as possible to the working establishment entertained for the Civil Engineers of a division and their assistants, with one or two extra Writers and a Calculator, and that the salaries proposed be regulated with reference to those drawn by servants attached to the Divisional Engineers.

"These observations are not intended to apply to that portion of the establishment recommended by the Superintendent for the execution of works, as Maistries, and Overseers and their assistants, taken from the Sappers. These should be proposed as the works progress, and a list of those actually required at this date, with the salaries now recommended for each, should be submitted with the amended list of the Government establishment called for, and the particular duties on which they are employed should be stated."

This refusal destroyed all hope of an efficient department.

135. The rejection of this proposal put an end at once to all prospect of an efficient department; it was to be formed on the model of the Civil Engineer's establishments, which were notoriously inefficient for the duties they had to perform; but worse than that, the executive portion being only sufficient for the work required from day to day, there was no material for extending it. It may be that the Superintendent would not have been able, by means of the establishment he applied for, to supply the trunk roads with a good executive force in any moderate number of years; but had there been a system of education in progress from that time, it is more than probable that there would have been ere this a certain number of good road-makers to carry the result of the Superintendents' experience over the country, for the instruction of the Revenue executive, who to this day know no more of the art of making roads than they did before the Road Department was formed. Even that department, with its limited sphere of operation, was crippled by

by the want of instructed agents; and to correct this we find that in 1848 the Superintendent was allowed to entertain six apprentices at Rs. 7 a month each; but no instructors were provided, and the education of these lads seems to have cost much of the Superintendent's own time, which could ill be spared for such a purpose; while, from the smallness of the number, nothing important to the country in general could or did result, except the fact being established by experiment, that native youths would make useful subordinates in the Road Department, if properly instructed.

136. If the Road Department, as at first arranged, was unable to realise the anticipations of Government, it was still less likely to do so when one of the two Engineer Officers was withdrawn from it, and the original extent of road (1,300 miles) had been increased to 12 lines, measuring 2,288 miles. This extension of work, with reduced means, led, as might have been expected, to a rapid development of the errors of the system; and even so early as the 10th August 1847, the Government was obliged to give the Superintendent the occasional aid of the Civil Engineers, though one object of the formation of a separate department for the trunk roads was to relieve those officers, who were acknowledged to be overworked. Captain Best says, in his Report of May 1848, para. 19, "Some portion of the roads, in accordance with this decision, will be constructed under the immediate supervision of the Superintendent of Roads and his assistants, the remainder under that of Civil Engineers of divisions, corresponding on the subject of trunk roads with the Superintendent of Roads, as they do with the Board of Revenue in the Department of Public Works, regarding branch and minor roads and works of irrigation."

It was soon found necessary to give the Superintendent the aid of the Civil Engineers.

From that time the department changed its character; it was executive on the roads near Madras, but not elsewhere; still, however, the Superintendent drew the money on his own receipt from the Collectors, though it remained in their treasuries to be actually paid out as required by the Civil Engineer or his assistants engaged in the executive. The accounts were rendered to Captain Best as the head of the department, and it was his duty to forward them for sanction when he had inspected the work.

137. In August 1848 Captain Best sent in his First General Report, reviewing the operations of the department up to the close of the year ending the 30th April of that year. The account which accompanied it, showed that in three years only Rs. 2,65,609. 14. had been expended out of the 12 lacs sanctioned by the Court. This was a grievous loss of time, but was fully to be accounted for by the very inadequate scale on which the department was formed. (On almost every one of the lines of road under the nominal charge of the Superintendent, careful designs and traces were to be made before estimates could be prepared; and for such work the undivided attention of an Engineer was required, but could not be given. Even to effect the very limited expenditure above indicated, it was necessary to adopt projects and estimates which had been already sent up by the Civil Engineers; and several such projects having been approved by the Government, were adopted for execution by the Road Department, and the money for the purpose was supplied from the Four-lac Fund. In other cases the Superintendent considered it his duty to defer decision on projects sent up by the Civil Engineers, till he could personally inspect the locality himself. The Perumbuddy Ghaut was a case of the former kind, being entered upon without the inspection of the Superintendent; while the Walliaur and Coimbatore Road was, on the other hand, delayed three years till he could visit the spot; the fact being that Captain Best had determined to carry out to the utmost the instructions given him, to be personally engaged in all that was done, but was frequently obliged to receive extraneous assistance in spite of himself. We need not follow Captain Best in his Reports upon the several roads in 1848, as they are not in sufficient detail to afford the means of a comparison between the condition of the roads then and now.

Captain Best's first general report;

Loss of time and the causes of it.

138. During the years 1849 and 1850 the Government appear to have become increasingly dissatisfied with the working of the Road Department; and on the 31st of January 1851, they expressed an opinion to that effect in Minutes of Consultation, No. 48, in the following terms:—"In regard to the Road Department, also, some alteration of the system seems necessary. With every disposition to give full credit to Captain Best's zeal and exertions, the Governor in Council, adverting to the correspondence which took place in 1846, and particularly to that

Dissatisfaction of Government with the department.

officer's three memoranda of the 20th, 26th and 27th November 1845, which were laid before the Council Board by the late President, is forced to admit that nothing has yet been effected as to roads at all adequate to the expectations which were at that time formed, with reference to the Honourable Court's sanction for an annual outlay of four lacs of rupees.

"Whatever may have been the circumstances which have led to this result, it is useless now to discuss; but there is sufficient to show the necessity for a closer superintendence of all work, and to demonstrate that no large portion of any of the trunk roads on which workmen are engaged, should be for any period beyond a few days left without the personal supervision of the Superintendent of Roads, or one of his assistants.

"In pursuance of these views, the Government (under date 4th October 1850, No. 191,) desired Captain Best to confine his movements, and to give his best attention to the western and southern roads, and to the roads from Arcot and Vellore to Chittoor, and thence to the Mysore frontier, observing at the time that these works would amply occupy the time and attention of himself and his present assistants, and that by concentrating his labours, and those of his department, on these large and important works, and postponing the commencement of others till these were thoroughly and efficiently completed, the public interests would be best consulted, and a judicious expenditure of the large sums sanctioned for these works secured."

The order based on that dissatisfaction.

139. From these remarks it appears, that the great defect in the Road Department, and the main cause why it had not effected all that was expected from it, was considered to be the want of an effective executive; of that very aid which had been refused on Captain Best's application. We will not here stop to consider whether this cause was really the only one; but will merely observe that the course taken to remedy the want thus recognized, was not to strengthen the executive portion of the department, so as to enable it to carry out the projects of the professional and directing portion; but to sacrifice the advantage of having such a professional head to the department, by making Captain Best himself, almost exclusively an executive officer. The order proceeds as follows:

"The Governor in Council resolves therefore to lay it down as a general rule, that the Superintendent of Roads should confine himself to the execution and completion of such great lines of road only as he can personally and efficiently inspect; and he is of opinion that a system of superintendence, based upon this principle, by which the energies of the Superintendent and his department will be concentrated, will in the end be found the most economical and effective, and better calculated to yield permanently beneficial results than by the plan now pursued by that officer of passing hurriedly throughout the whole Presidency, leaving the works in progress to his assistants without his frequent supervision.

"At all events it is certain that by the stimulus of Captain Best's personal direction and superintendence, what is done will be well and effectually done under this system. Unexpected difficulties will be met and provided for at once by his professional skill, on view of the locality, which would be an occasion of delay if it were necessary to refer to him at a distance. Mistakes will be quickly corrected, which might be mischievous if not discovered and remedied in due time. The Superintendent closely observing the execution of work, may see occasion to alter his plan at particular points, so as to improve the road. The practical experience gained by him in overcoming a difficulty at one place, will teach him how best to avoid or obviate a similar difficulty at another. He will learn expedients to meet every variety of exigency arising from the variety of circumstances he meets with. The work must therefore be better, as well as more promptly executed."

Effects of this order.

140. This order reduced the Road Department, in the formation of which so much had been intended, and from which so much had been expected, to the position of a small executive agency, under the constant personal management of the Superintendent; its operations were to be confined to 390 miles of road only; while the rest of the roads which had been withdrawn from the direct management of the Collectors and Civil Engineers, in order to be placed under the Road Department, being 1,898 miles, were now left without any systematic management whatever. Though selected as the most important lines in the country, they were in this respect worse off than the cross-roads, and far worse off than they themselves were before the Road Department was formed, when from their importance they received a special share of the time of the Civil Engineer Department. They remained

remained nominally under the Superintendent, but he was forbidden to visit them, so that although he had to forward the bills for the work done on the previously sanctioned estimates, he could not inspect it, or speak with any confidence as to the manner in which the money had been expended.

But the worst result from the change was the utter impossibility of spending the four lacs of rupees so wisely granted. In the space to which the Superintendent's visits and expenditure were to be confined, experience had proved that he could not lay out one lac of rupees annually; indeed, when the Government objected to the expenditure of so small a sum as Rs. 40,000 a year, for four years, in perfecting the 125 miles of the western road, the sum he could expend on the four short lines left under his charge became exceedingly small. If this arrangement were to continue, a considerable portion of the grant would be virtually annulled, and slow as the movements of the Road Department have been already, the progress for the future would be much slower still. We find, however, that since this order was issued, estimates to a considerable amount have been sanctioned out of the Four-lac Fund, on lines not actually enumerated in the list above quoted: but still the main portion of the trunk roads are left without certain supervision, and it will be impossible to spend even one-half of the annual sum granted by the Honourable Court, while the order is in force, without drawing largely on the overworked Civil Engineer Department for this extraneous duty.

141. This seems a fitting place to advert to Captain Best's reply to one objection taken by the Government to his management, in their proceedings of the 31st January 1851, just noticed. That objection is contained in the following extract:

An objection by Government to one part of Capt. Best's management.

"Another deficiency in Captain Best's arrangements, which has been observed more particularly in the papers referring to the northern trunk road, is the absence of that provision for its due preservation and repair which the Honourable Court of Directors has insisted upon in para. 5, of their despatch of 23d September 1845, quoted below.

"We attach peculiar importance to the rule thus stated, that ample provision should be made for the due preservation and repairs of a road at the time of its formation, and we trust that it will never fail to be kept in view; we fear that it has been much lost sight of in forming the lines of road on which such large sums have recently been expended."

142. Captain Best shows, in the annexed passages from his letter of the 25th March 1851, that these observations were recorded by Government under a misapprehension of the actual facts:

His reply.

"18. The northern trunk road is no less than 676 miles in length; but of all that distance, only two parts can be said to have been formed (and they were never completed), viz. one between the 27th and 118th miles, the other between the 626th and 676th miles. Between the 27th and 118th miles, what has been done was almost entirely completed before 1845. Very soon after the Road Department was established, I prepared estimates for the improvement of it, and to make provision for its repairs; these were sanctioned in Minutes of Consultation of 20 October 1846, and the road has been kept in good order ever since. My estimate for bridges, and the still further improvement of this portion, was ordered to lie over in Minutes of Consultation, of 4 June 1850. For the remaining portion, viz., that between the 626th and 676th miles, provision for repairs was allowed in my estimate, sanctioned in Minutes of Consultation of 28 September 1847, and so far as the road is made, it has been kept in good repair ever since 1847. I also made estimates, and this department has been engaged in work on the northern line, between the 3d and 27th miles; but as sanction was granted only for earthen embankments and drainage, and has been refused for the bridges and metalling, it could not, and has not, come into use as a road, and of course no provision for repair was made in this case. That the whole road is not good arises from its wanting the further improvements, to arrange for which, I travelled northward in May last, and for which Captain Campbell has lately sent me an estimate.

"19. There has been great expenditure upon other parts of the northern trunk line; but the work done (I cannot call it the road made), for the money laid out in 1823 to 1828, has long been beyond the possibility of repairs; consisting, as it did, of marking out an ill-selected and too narrow road, by the planting of too narrow avenues, the improvement effected must have been problematical from the

first, and the bad, but costly track has only been growing worse and worse, as the trees have grown bigger and bigger.

“ 20. The Honourable Court's order directs, that ample provision should be made for the due preservation and repair of a road at the time of its formation. In no one instance have I failed to furnish, and solicit sanction for, estimates for such provision, whenever a portion of trunk road has been formed or much improved. In the Memoranda referred to in Minutes of Consultation of 31 January 1851, I proposed, so long ago as November 1845, that similar provision should be made for the trunk roads throughout their whole extent, and I have suggested the same in other papers. I append a list of the sums now annually allowed for the maintenance of different portions of trunk roads, the total of which is Rs. 72,394. 3.

“ 21. And besides these, I have submitted special Estimates for the maintenance of Nos. 1 and 5, roads in Salem; for part of No. 8, between 185th and 194th miles near Trichinopoly, as well as for No. 10 road between Raneepett and Chittoor, and Chittoor and the Mysore frontier, ‘during the time of its formation;’ for all these I solicited annual sanction, but the Government granted sanction for one year only in the two first cases, (and thus prevented my forming the establishment for the Salem Roads), and in the last case have taken no notice of my application, which was in literal and exact conformity with that order of the Honourable Court which I am found fault with for neglecting.”

Thus it appears that Captain Best had not failed to perform his part in making arrangements for the maintenance of all the roads which had been completed; and that where such arrangements had not been carried into effect, it was because the Government had not seen fit to grant an allowance for that purpose as recommended by him.

Some points to be specially considered.

143. Having thus sketched the history of the Road Department, and shown that it has failed in many of its most important objects, we will now examine the results in somewhat more detail, and state our opinion as to the causes which have led to the failure; and in so doing we shall consider the following points:

First.—From what cause has so large a portion of the “Four-lac Fund” remained unspent?

Secondly.—With what effect has the money expended been laid out?

Thirdly.—What portion of the whole expenditure has been spent by the Road Department, and what by officers of the Revenue or Civil Engineer's Department?

Fourthly.—Has the sum spent been applied to the works most required, and to such only as were intended by the terms of the grant?

Fifthly.—What has led to so great an accumulation of unadjusted bills?

The first point; the small amount expended by the department.

144. The first point is—“From what cause has so large a portion of the ‘Four-lac Fund’ remained unspent?”

In his reply of the 25th March 1851, to the remarks on the department in the Minutes of Consultation of Government, 31 January 1851, Captain Best assigns as the cause of the failure that he had not possessed that amount of assistance, or enjoyed that measure of the confidence and of the support of Government, which he had been led to expect when he undertook the expenditure of four lacs of rupees yearly. His language on these points is as follows:

“ 4. I do not pretend to have in every respect carried out to the full extent all that was mentioned in the memoranda of the 20th, 26th and 27th November 1845. In stating then what I hoped the Road Department might be able to effect, I may have proposed to my ambition objects not quite within my reach. Yet, on carefully reading over those papers, and having experience of what really has been, and has not been effected by the department under my orders, I can come to no other conclusion, than that the causes of my having fallen short of the expectations I held out were, most of them, beyond my control. Those memoranda show what I thought might be done under certain conditions of assistance and confidence, which were many of them mentioned in the papers themselves, others *videlicet* in interviews with which I was honoured by the Most Noble the late Governor; and as that help has not been granted to me, considerable part of the failure which is stated to have occurred may not rest with me.

“ 5. It may be my fault that I have not sufficiently insisted upon the want of such assistance, not often enough reiterated my requests for it. But when my applications have not been listened to, or have been negatived, I have supposed it
my

my duty to abstain from re-urging them; continuing my best endeavours to execute the works sanctioned, as well and economically as the means granted me might permit."

" 8. I observed that the expenditure could not reach the maximum limit until an establishment should be formed. I calculated upon having at least one officer under my orders, qualified by education and experience to assist me from the first. I anticipated difficulty in procuring Overseers, Maistries and others versed in the peculiar duties of the department; and in a letter (5th March 1846) I brought this circumstance particularly to the notice of Government, and proposed an arrangement for supplying the deficiency, which I still am of opinion would have answered the purpose, but which was not approved. In another letter (7th March 1846) I applied for five Overseers and eleven Assistant Overseers to begin with, and requested certain powers to enable me to control them, and stimulate them to exert and improve themselves; but these applications were not acceded to. There have never been more than 11 Assistant Overseers in the department; none has yet been promoted to the rank and pay of Overseer; and I have been obliged to instruct every one of my subordinates, and even very many workmen, in all but the elementary parts of their work. In my General Report (dated 9th August 1848), I again brought this subject forward.

" 9. In two memoranda dated 2d November 1849, I again pointed out the difficulties under which the department laboured and still labours in this respect, and submitted a scheme for the outlay of the four lacs of rupees, and a scale of superintendence. But I have never been made acquainted with the views of Government on this subject, or on many other fundamentally important points, connected with the duties which I am now declared to have performed in so unsatisfactory a manner."

" 11. Few Engineers or Architects in England employed on works of magnitude would be restricted as I have been, in the first place by the absolute absence of qualified subordinates in sufficient numbers; in the next place, by not being allowed my own choice from limited numbers; and thirdly, by want of power to control those chosen for me.

" 12. My assistants, and generally all my subordinates, have now acquired knowledge, as, under many discouraging circumstances, they have always shown the most exemplary zeal; but time was of necessity lost, and some work may have been done not so well as I wished, while they were becoming instructed. Their numbers are still as defective as when I wrote on the subject in November 1849; and I think it but fair that I should mention as one result of my work, which may easily have escaped the notice of Government, that I have thus instructed a small body of efficient subordinates."

" 15. The expenditure in 1848, 1849 and 1850, would not have been so large as it has been, had it not included the outlay in those years upon seven miles of No. 8, on 13 miles of No. 9, on the Perumbuddy Road and Ghaut, on the Trichinopoly, Cauvery and Coleroon Bridges, and on the Cauvery Bridge at Bowaney, works under the superintendence of the Civil Engineers. But I am perfectly convinced that had the establishment I required been granted to me, and had the scheme proposed in my memorandum of the 2d November 1849 been approved, and had estimates been sanctioned in time for me to make arrangements in one year for the work to be done in the next, I should have been able before now to expend four lacs of rupees, annually, and by the direct agency of my own department, with as great economy and to greater advantage than has ever yet resulted from an equal expenditure on roads in this Presidency. Nor should I have failed to introduce some improvements into the method of executing works, although it might have been necessary for me to make numerous, almost continual journeys from one end of the Presidency to the other. I am compelled in my own defence to write what may appear boastful; but I infer from experience of what has been done under many difficulties, what might have been done had they not existed."

145. It will be observed that Captain Best was still of opinion, that with the assistance at first promised him (one Engineer officer), and with such a subordinate establishment as he had proposed to raise, when his scheme was rejected in March 1846, he could have spent four lacs of rupees yearly upon the trunk roads. We cannot but think that on this point the Superintendent was too sanguine. There is nothing in the working of the small department he had organized that

Not sufficient to account for it.

gives fair grounds for such a supposition. The work done on the trunk roads by the Civil Engineer's Department had not in any one year been inspected; the Northern Road alone would have required the attention of himself and his Engineer Assistant for several years, to lay out the line anew in many parts, to design new bridges, and to superintend the executive. And had he succeeded in raising such a subordinate department as would have enabled him to spend four lacs of rupees annually, he could not have kept even so good a supervision over the more important of his undertakings, covering as they would so vastly larger an extent of territory, as is now exercised by the Civil Engineers over the important works in their divisions, and that is justly considered to be altogether inadequate.

The department under Captain Best had a very limited charge, and under his own instructions the work was well and economically done. There can be no doubt that every year his subordinates were better able to work without his guidance; but even supposing that he had extended his department, so that each distant road could have had the advantage of his share of the sum allowed, it would have been impossible for him to have given more than a very hurried visit to each line once in a year. Without his executive duties he could not have found time for a careful examination of work, and while actually engaged in the executive in any one locality, an annual tour of his roads was quite impracticable. It is true, the Civil Engineers might have acted for him as far as their other duties allowed; but if they were to do so at all it would be better that they should act on their own responsibility, and be amenable to their legitimate superior, the Board of Revenue. The object of a Road Department was lost when it had to trust to the Collectors and Civil Engineers, who had been relieved from the charge of the trunk roads, because they had not time to devote to their management.

The entertaining and holding out hopes that an establishment under the control of one officer, even if he had a professional assistant, could, in any moderate time, bring all the main roads of the Presidency in to order, and keep them so, was, as it appears to us, Captain Best's only important error.

Though they, no doubt, operated to a considerable extent.

146. But though we cannot agree with Captain Best that the causes which he assigns for the deficiency in the operations of the Road Department are by any means sufficient to account for it, yet we acknowledge, as every one must, that those causes must have had no inconsiderable effect in hampering the department. It must be admitted by all that he could not, without an Engineer Assistant, do as much work as he could have done with one; that when the efficient subordinate agency on which he had calculated was withheld, he could not be reproached for failing to fulfil the expectation which he had held out; that when his establishment was so constituted as to be incapable of extension by the education of new members, his work must necessarily proceed very slowly; and that had his estimates been sanctioned instead of being refused as too large, more work would have been done. Captain Best did not say too much when he pointed out these causes for time being lost, but we cannot admit that the whole of this irreparable loss of years is to be thus accounted for.

The second point; the results of the actual expenditure.

147. Our next point for consideration is, what has been effected by means of the money spent? While works are in an unfinished state, a correct estimate of the value of the progress made can only be obtained by a very careful comparison of the work done with the expenditure. The Government has had before it statements of money spent, but never any connected or clear report upon the improvements resulting from the outlay; nor indeed is such a paper in existence, for Captain Best's general reports are upon the estimates and bills; the actual condition of the road is specified in but very few cases. We have drawn up a statement, however, compiled from Captain Best's monthly reports and other sources of information, giving as correct and concise a view as we can arrive at, of the works executed and the sums they have cost. This statement is in the Appendix (III.), and we feel sure that it will be held to prove satisfactorily that all the money spent has been most economically used. We beg to call particular attention to its details, as without that it will be impossible to realise the whole result of this expenditure. We doubt, indeed, if any one accustomed to works of engineering in England will, even after examining the paper, fully understand the amount of work performed and difficulties overcome by the outlay of this small sum of 130,000*l*.

Extent of roads made, and of bridges built.

148. The extent of road made through a country which in England would be thought

thought a most difficult one, is 296 miles: 660 miles have been kept in repair, and one mountain pass, which in any part of Europe would be considered a magnificent work, has been nearly completed in three seasons of six months each. If the amount of labour expended on such undertakings as these cannot be clearly explained, yet the list of masonry works will at all events be well appreciated. Several great losses have to be included in summing up these charges; losses which must be considered as legitimate expenditures in the bridge-building of India, where it answers better to run the risk of an unseasonable flood than to go to the expense of such dams as would secure the work against all dangers. By the destruction of a great part of the Coleroon Bridge when nearly completed, a heavy loss was sustained; including which sum, and another severe loss on the Cauvery, the cost at these most difficult sites is about Rs. 55 (5 l. 10 s.) for each running foot of bridge. The foundations of the Cauvery and Coleroon Bridges rest on pure sand, and the rivers are subject to heavy annual freshes, causing constant changes in their beds.

149. One of the subjects specially noticed by the Honourable Court of Directors, in their Despatch of the 31st January 1850, was the Western trunk road. The Western road. And therefore, in answering this question, "What results have been produced by the money spent on the roads?" we will give a more particular account of the expenditure on that road. In reviewing a report made upon it by Mr. Forlong in September and October 1851, the Government expressed their disapprobation of its condition; and it has evidently at all times been considered the main test of the success or failure of the Road Department.

The sum spent upon the road between Madras and Vaniambaddy from April 1845 to May 1851, was Rs. 3,71,212, exclusively of the cost of superintendence. This sum Captain Best divided into "completing," "repairing," and "maintaining" the road; a correct and useful division of the charges when a road has once been completed; but in this case, the road never having been perfected, the division is too arbitrary to be of any value, since no one can say of a road with so uneven a surface, what repairs were necessary to counteract the effect of weather and other causes of injury, and what to replace the metal removed by the traffic. We shall therefore consider the whole sum as spent under the head of "repairs," and inquire what has been gained by the outlay.

150. The last report written upon this road before Captain Best took charge of it, was by Lieutenant James Johnston, of the Engineers, who was sent to inspect it in the early part of 1845. Of this report, Colonel Sim, the Chief Engineer, wrote as follows: Its condition when the Road Department first took charge of it.

"From Lieutenant Johnston's report, it will be seen that the state of the road is much worse than was apprehended. Several bridges and tunnels have been destroyed by the last heavy rains, and the surface of the road is generally very uneven, in many parts full of holes and ruts, and rapidly breaking up; and throughout the whole distance, the covering of laterite and gravel is considerably worn. The chief causes of the rapid deterioration of the road are, the very great amount of traffic (which at the same time proves its vast importance), the want of hardness and durability of the materials with which it is formed, and the insufficiency of the repairs which it has received since its construction. The total cost of repairs executed between Madras and Vellore during the last two years amounts to only Rs. 8,951. 7. 1., or Rs. 4,326 yearly; a sum manifestly inadequate for the purpose. There are also some defects in the original construction, which tend to lessen the durability of the road: these are the unnecessary height to which it has in many cases been raised, and the having raised and covered with laterite or gravel the whole distance, instead of taking advantage of the natural surface of the country, where that was hard and permanent, by merely levelling and draining it. If this had been done with care and judgment, a good road for all practical purposes might have been made at a far less original cost, and which would have required a much less annual outlay to keep it in repair. Unfortunately, these defects cannot now be remedied; but it is still a noble and most useful work, and well merits the expense of being kept in repair."

151. At that time even the bandy traffic had great difficulty in passing certain parts of the road; but from the date of that report it has been gradually improving, while the traffic has greatly increased. The following memorandum, taken from actual correspondence between a Madras merchant and his constituent at Walla- Its gradual improvement for many years past.

jahnuggur shows clearly the great reduction in the cost of carriage, in proportion as the road has been improved.

	<i>Rs. a. p.</i>
In 1823, the hire of a cart from Wallajahnuggur to Madras, carrying 37½ maunds or 900 lbs., was - - - -	7 - -
In 1835 - - - ditto - - - ditto - - - -	6 9 -
In 1837 - - - ditto - - - ditto - - - -	5 - -
In 1844 - - - ditto - - - ditto, carrying 1,000 lbs.	4 8 -
In 1845 the Road Department was formed.	
In 1847, the hire of a cart from Wallajahnuggur to Madras, carrying 1,000 lbs., was - - - -	4 - -
In 1851 - - - ditto - - - ditto, carrying 1,600 lbs.	3 10 -

Before the year 1823, there was "no road," as the merchant expressed it; but from that time large sums have been spent upon the line, and the cost of carriage has been gradually falling as the improvements progressed. It will be seen that since the Road Department commenced its operations, the cost of carriage has fallen about one-half, although the demand for it has been as regularly advancing, as is shown by the increase of exports from Madras. Indeed, if we had not this evidence, the fact that post travelling carriages can now be worked upon the road at the rate of six miles an hour, with profit to the owner, if not very agreeably or luxuriously to the traveller, is of itself sufficient proof of the great improvement which has taken place since 1845.

Comparison of this road with the principal road under each of the other Presidencies.

152. We will now consider whether greater improvement could with good reason have been anticipated, or by good management effected, in return for the money spent. Captain Best, in his second Report, dated 17 October 1851, draws a comparison between the great Western Road and roads of other countries, thus:

"22. It is not easy to apply the rules established in England from the experience of road-makers there to the circumstances of this country. Differences of climate, in the nature of the materials procurable, in the nature of the traffic and vehicles, render what are sound maxims there, bad guides here. In this Presidency, no road similar to this affords data by which to form correct estimates of its requirements. I have endeavoured to procure information from the other Presidencies, and have obtained it from Bombay. But the Superintendent of the Agra trunk road has not favoured me with the result of his experience, and I have no particulars of that work, except such as I have gathered from Part II. of Selections from Public Correspondence, published by authority, N. W. Provinces, and from some of the public prints. The former dates no later than May 1845.

"23. It appears, however, from these, that 'Kunkur' is obtainable without great difficulty along all these lines, that laterite and gravel are all but unknown, and that whatever material be procurable it is laid on without stint, there being no limit to the outlay which the Governments of those Presidencies are willing to incur. It does not appear either that there is any road in those Presidencies on which the number of carts that pass daily is nearly equal to that with which the road No. 1, between Madras and Poonamallee, is covered from morning to night.

This road has much more traffic than either of those;

"24. In the Calcutta Review, No. XXVIII., December 1850, a statement (swelled up by counting camels, bullocks, horses, sheep, goats, elephants and foot-passengers) is given of the traffic of the Agra trunk road for an entire year: in this, 48,489 laden and 14,417 unladen hackeries are enumerated; but the number of carts that pass yearly between Madras and Poonamallee is at the least six times as many, and there is no part of No. 1 road between Vellore and Madras, where it is not more than thrice as many, while on the remaining 40 miles out of 125 it is more than equal. The number of carts that passed up and down the Thul Ghaut in the Bombay Presidency, between September 1848 and the 15th June 1849, was 38,528, drawn each by two bullocks, and 113 drawn each by four; this is about two-thirds of the number that pass along our road at Wanumbaddy, one-fourth of the average number along the whole line, and one-eighth of the numbers between Poonamallee and Madras.

And therefore requires more repair.

"25. From this it is easy to understand why the trunk road, No. 1, requires a large quantity of material to replace that which is worn out by the traffic. I have been very anxious to ascertain the quantity, and had taken measures for doing so, but they were frustrated by circumstances I could not control. The quantities worn off the Presidency roads would serve as some criterion, but that they undergo the wear and tear of carriages only, not of bullock carts. European and American engineers, who rightly insist much upon the importance of keeping up a road as distinguished

distinguished from repairing it, calculate the quantity of material for alimentionation rather than reparation, sufficient to make up the annual loss and diminution of depth, at from two-thirds to one cubic yard per mile for every animal employed in draught. Considering the inferior construction of carts in this country, the narrowness of the tires, and the looseness of the wheels on the axles, and also the brittleness of the stone, and the extreme drought, it may be at once admitted that at least a cubic yard should be allowed per mile per cart on our roads."

We have not the information from which Captain Best calculated the number of bandies passing daily, but there appears to be some great oversight in stating it so low as 352 per mile, since that is less than the number given in the Report of the 1st May 1848. Lieutenant Forlong, from whom Captain Best's information on this subject was chiefly obtained, and who has lately made further inquiry, gives the number of carts at nearly double that above stated, viz. at 667 daily per mile; it is possible that Captain Best reckoned only the fully-laden carts.

153. While reviewing this subject, we have had an opportunity of obtaining from Mr. Norris, the late Civil Engineer of Ceylon, the cost of keeping in repair the Colombo and Kandy Road, which has a heavier traffic than any other in the Colony, and is kept in the very highest order: Comparison of it with the Colombo and Kandy road.

Distance from Colombo to Kandy, 72 miles.
 Cost of maintenance, &c. in 1848 - £. 15,263 } average, £. 208 a mile
 Ditto - - - in 1849 - 14,677 } annually.

As this information will be useful as a test of the value of Captain Best's work, we will endeavour to show how a fair comparison may be drawn between the charges on the Western Road and those on the Colombo and Kandy Road.

The climate of the island differs from that of the Carnatic in having a longer season of rain; but the excessive drought and heat of the country in the neighbourhood of Madras is probably not less injurious to the surface of a well-drained road than the monsoon of Ceylon, a point on which we can speak with some confidence from the effect produced on the Palghat and Ponany trunk line, which is in a climate precisely like that of Colombo. In this particular, therefore, the roads are on an equal footing, and they are also similarly circumstanced in having the main traffic carried on upon carts drawn by a pair of bullocks, but the Colombo Road, being in higher order, the average weight of the loads is greater; the difference in this respect is, however, more than counterbalanced by the use in Ceylon of well-made axles of English manufacture, the rude axles of India being most destructive to the roads, and a constant cause of complaint by those in charge of them. Metal is procured on an average within one mile and a half of the Colombo Road, while much of the supply for the Western Road has to be carried eight miles. There is, however, great difference in the value of money in the two countries, the cost of carriage being four times, and of labour twice, as high in Ceylon as under this Presidency; making due allowance for this circumstance, we will take the rupee to be worth only one-third in the former country of what it is in the latter. Even on that hypothesis, the cost of such a traffic as that of the Western Road, at the rate actually paid on the Colombo Road, would be Rs. 4,000 a mile annually; whereas we have seen that the actual expenditure has been no more than Rs. 472 a mile yearly.

These facts appear conclusive proof that the expenditure on the Western trunk road has been very economically managed; the road has improved, the traffic increased, and the cost of carriage fallen to two-thirds of what it was, and this at a cost, when compared with the traffic, equal to one-eighth of the sum, which, making allowances for the difference in the value of money, &c., would have been considered necessary in Ceylon, for the mere maintenance of a road already in the highest order.

154. Captain Best did not pursue the same system of road-making from first to last, from which some may infer that his first expenditures were not made on the most judicious principles. Such may, perhaps, have been the case; but as we find that every change was on the side of more liberal outlay, it seems evident that he had been at first too sanguine as to the cheap rate at which given results might be attained, and that he had aimed to keep down his charges to the utmost; as he Captain Best's early opinions as to the cost of maintaining a road were too narrow.

gained experience he was obliged to make larger demands: and as he did so he approached more and more nearly to the real necessities of the road.

The Great Western Road is already in better order than Captain Best considered necessary for the trade when he took charge of his appointment. At that time he argued in favour of the expenditure on roads being extended over much greater distances; but the necessity for bringing the surface of this line into a condition to admit of fast travelling obliged him to demand a much larger sum than he originally intended to spend upon it; and it may have been on that account that the necessity for his greater expenditure was questioned, and his estimates refused. In his General Report of August 1848, when speaking of the Western Road, he says (Para. 27):—

“The other estimate, submitted by me with the same letter, was intended to supply the material wanted to bring the road into good order; for, as I stated in that letter, the quantity of material on the road had been worn so thin that this appeared necessary to prevent it from breaking up; the amount was Rs. 1,68,263. 15. 0., and I anticipated that it might take four years to execute, the total work of both estimates being sufficient to employ 400 carts continually for eight months in every year, together with a proportionate number of labourers for digging, breaking and spreading material.

“But this estimate was not sanctioned. ‘The Governor in Council thought Government should pause before sanctioning so large a portion of the Four-lac Fund on such a comparatively small portion of one trunk road.’

“I was, therefore, forced to confine my endeavours to keep the road from getting worse; and even to do this with such limited means was difficult, because, in the first place, the annual allowance, averaging a thickness of only $1\frac{1}{3}$ inch, was not sufficient to make good the want of material, to provide which my other estimate was prepared; and, in the second place, the estimate for maintenance allowed for gravel and laterite only, at average rates of 2 annas, and 2 annas 7 pice for digging and breaking, on the supposition that stronger and more expensive material to form a substratum for it would have been granted.”

Concluding remarks on the Western Road.

155. Captain Best has here given his reasons why the western road has not been brought into better order, and as his expenditures generally produced such good results, it must be admitted that the sum he then demanded would have made a very material difference in the condition of the road, if it had not brought it to perfection. He effected great things with the money allowed him, and without more means no more could be expected.

The estimate that was then rejected had been prepared after the most mature consideration; by a comparison of the effect of the actual traffic on the line, with the results obtained in other countries, and from data most carefully and cleverly collected on the road itself. Amongst other plans adopted to determine the loss of material occasioned by the wear of the bandy-wheels, we find him measuring the difference between the loss of material on the two sides of the road near Madras; as on one the bandies entered the town almost all loaded, while on the other a certain known proportion of the carts returning inland were empty. The difference in the wear of metal was sufficiently appreciable, and afforded him some means of calculating the actual quantity displaced by each ton carried on the road; Captain Best had a peculiar talent for the collection of such data, and was constantly correcting his calculation of quantities to bring them nearer to the truth; and certainly no one in the country could form a judgment as well as he could, of the necessities of the road.

On the western trunk road the Road Department cannot be said to have fallen short in any way. The executive was under the constant supervision of the Superintendent himself, whose instructions to the Assistants and Overseers are in the most elaborate detail. The books of the office contain page after page of most ingenious suggestions for the perfection of work and saving of expenditure, and hardly a day passed that some new expedient was not adopted for turning the labour of the department to greater account.

The third point; what portion of the expenditure was superintended by

156. We will now inquire what part of the Four-lac Fund has been actually spent by the Road Department, and what by others.

In the 15th para. of his letter of the 25th March 1851, above quoted, Captain Best

Best enumerated the following works, as having been executed under the superintendence of the Civil Engineers; and we have added their cost:—

	Rs.	a.	p.
7 Miles of No. 8 road - - - - -	8,239	-	-
13 ditto of No. 9 ditto - - - - -	16,017	-	-
The Parumbuddy Ghaut and Roads - - - - -	1,83,135	5	2
The Cauvery Bridge at Trichinopoly - - - - -	28,129	11	4
The Coleroon ditto near ditto - - - - -	1,10,488	11	-
The Cauvery ditto at Bowany - - - - -	35,900	-	-
TOTAL - - - - -	3,81,909	11	6

the Road Department.

But, in addition to these, the following so completely occupied the time of officers of the Civil Engineers and Revenue Departments, that they must be placed in the same list:—

	Rs.	a.	p.
Maintenance of the Perumbuddy Road and Ghaut	3,400	-	-
Repairs of the road from Waliour to Ponany	7,700	13	3
Maintenance of - - ditto - - - - -	1,703	12	3
Ditto - - - - ditto - ditto - - - - -	2,496	3	9
Ditto - - - - ditto from the 324th to 394th miles of - ditto - - - - -	6,981	14	9
Construction of Nurrungumpilly Bridge - - - - -	5,903	9	6
Improvements between Waliour and Ponany	6,688	14	11
Maintenance of road from Itchapore to Berhampore	720	-	-
Ditto - - - - ditto - - ditto - - - - -	720	-	-
Ditto - from Berhampore to Bengal Frontier	3,360	-	-
Ditto - - - - ditto - - ditto - - - - -	3,607	1	1
Repairs from Itchapore to Berhampore - - - - -	6,912	14	-
Construction of bridge over Bimlipatam river	8,000	-	-
Ditto of road from the north bank of the Cavery to the south bank of Coleroon - - - - -	8,239	13	6
Ditto of road from the south bank of the Coleroon to Samiaveram - - - - -	22,858	12	-
Maintenance of road from Samiaveram to Trichinopoly - - - - -	2,494	11	-
Construction of New Head Sluice to Northern Rajah Voykal - - - - -	4,000	-	-
Ditto of Goolcherroo Road and Ghaut - - - - -	7,359	5	11
Continuation of - - ditto - - ditto - - - - -	12,000	-	-
TOTAL - - - - -	1,15,147	13	11

Works to a very large amount were executed or superintended exclusively by the Civil Engineer's Department.

GRAND TOTAL - - - - - **4,97,057 9 5**

Thus we see that out of a total expenditure of 13 lacs, nominally under the superintendence of the Road Department, very nearly five lacs, being considerably more than one-third, was really expended by other departments; and the cause of this result unquestionably is, that the Road Department was on a scale utterly disproportioned to the work laid upon it.

157. And the works above enumerated were projected as well as executed by other departments, and occupied no slight portion of the time which was required for the proper duties of those departments. And were projected by them also.

In the first Division, the Civil Engineer having been called upon for assistance, declared that he had not the means of giving it, and so no work was done in that Division. In the second Division the Assistant Civil Engineer has been occupied for two years and a half on a part of No. 12 trunk road; viz., in the construction of the Goolcherroo Pass, on the road from Cuddapah to Chittoor. In the third, the new works were projected by the Civil Engineer's Department, while those managed by the Road Department have only been inspected once in six years. In the fourth, the Road Department has done its own work. In the fifth, the Assistant Civil Engineer has been fully occupied the whole of two working seasons, on the works of the Road Department, while the Nerunjapett Channel, and other important works of his own department, have been in abeyance. In the sixth, the Civil Engineer has managed the great bridges over the Coleroon and Cauvery,

while, as we have said elsewhere, several fine works of irrigation in ruins were waiting in vain for a share of his attention. In the seventh, one executive officer has been working on the part of the Road Department, but the Head Assistant Collector of Malabar has done the work on the Walliaur and Ponany road, while the Civil Engineer has been considered the supervisor of the Perumbuddy Ghaut and roads. In the eighth Division no work has been done.

Thus the Road Department has totally failed to relieve the Civil Engineers.

158. These facts will show how completely the Road Department has failed in relieving the Civil Engineers, or in bringing the trunk roads really under that separate management, for providing which, with vigour and efficiency, the new department was formed.

The road fund, in fact, by supplying the means, has led to a great increase of labour to the Civil Engineer's Department in this description of work; and thereby has rendered it still more inefficient than it was before for the management of works of irrigation; a result, the very opposite of what was contemplated when the new department was formed.

Yet no one who inspects the records of Captain Best's office can question for a moment his capacity or activity; his labour was incessant, his exertions untiring. Indeed, the complaint made by the Government that his movements were "hurried," was quite true as matter of fact; but they were so from the very necessities of his position, from the heavy and multifarious duties laid upon him, without any adequate assistance. The late energetic Superintendent would not admit, indeed, that he was hurried; but we find him constantly striving to be in different parts of his enormous charge at one time, and many promised visits were necessarily delayed. He shows that he had made "but one sole inspection of a great portion of the trunk roads since 1845." And although he states, in 1851, that he had "inspected every part of the northern, southern and western roads, on which his assistants had been superintending work, from 10 to 30 times," yet, in a Report sent in to the Government the year before, he says, in reference to one of the roads that he had so frequently visited, "I receive Reports and Journals in which progress is detailed, but the not being able to give personal and continual attention to a work of this kind causes me much unpleasant anxiety."

The fourth point; has the actual outlay been applied where most required?

159. To the question, has the sum spent been applied to the works most required, and to such only as were intended by the terms of the grant, we cannot say that it has.

The terms of the original grant are not very definite; but it seems evidently to have been the intention that no extensive new works were to be undertaken, till the existing lines were put into good order. Under this supposition, it can hardly be said that any of the larger works executed by the Civil Engineer's Department should have been charged to that fund. The Honourable Court, however, having given their sanction to that appropriation of the fund, no objection need be raised; but in speaking of the results of the department falling short of the anticipations formed when the annual allowance was sanctioned, it must not be overlooked that the money has been spent on those great works, while more than a thousand miles of the great trunk roads have remained untouched.

The most necessary works were not undertaken;

160. Nor were even those works selected as of first-rate importance; although each one is an essential part of a complete system of trunk roads, many of them are of less immediate importance than improvements not yet undertaken. The Cauvery bridge at Bowany, is in the very centre of the peninsula, a point from which the trade flows away to the sea on either side; it will therefore have very little traffic over it compared with any of those rivers near either coast, where the traffic having converged, has reached its maximum. The great bridges near Trichinopoly, though most useful works, were by no means so urgently required as a passage over the Palaur on the Western Road, or across the Ponany River near the port of that name in Malabar.

But those which the Civil Engineers had projected, and were prepared to execute.

The works selected have been chosen, not because they were the most urgently required, but because the Civil Engineer Department had projected them, and was prepared to carry them into execution; the Four-lac Fund supplied the means, and they could be completed without an increase of the Road Department; but not of course without a corresponding loss, or more probably a much greater one, to the general improvement. Had the Civil Engineers' labour been expended in their proper duties, work of the same extent would have been done for the better irrigation of the country, or the improvement of its cross-roads. The Honourable Court's grant was given as a clear addition to such expenditures; but the trusting
its

its management to a crippled department reduced it to a substitute for other grants, and defeated the object of the boon.

161. The answer to the next question is simple enough, "Why bills to so large amount remain unadjusted." The accounts, though kept with the most minute accuracy, could not be brought to an adjustment, because there was no inspection; we find bills to the amount of Rs. 8,34,427. 7. 3. of the whole outlay still hanging over the executive officers, though much of the work was done and paid for several years previously. It might be supposed from this, that there was some negligence in the office of the Superintendent; but no supposition could be farther from the truth. The bills might have been settled at any moment, could the works have been inspected and compared; but this the department had not the means of doing; and there can be no doubt that if the expenditure had ever increased to the whole amount sanctioned, the difficulty on this point would have increased in proportion.

The fifth point; the large amount of unadjusted Bills.

162. The present state of the Road Department then is as follows: the Superintendent is the head of a small establishment for the management of work in execution on a very limited extent of road, which is not to be carried on beyond the reach of his own personal inspection; he still, however, retains nominal charge of the whole of the trunk roads, though he is not to visit them, and has only the power to apply to the Civil Engineers for such aid as they can give when their other duties admit of it. The accounts of works still in progress on roads at a distance from Madras, are sent in to the Superintendent, and must either accumulate in his office, or be sent up by him to Government without any comparison with the work executed; while the bills for work done on those roads which are still under the Superintendent's own personal management, are sent up by him for sanction without any check but his own; though he is the very officer on whose pecuniary responsibility the work was done.

The present state of the Road Department.

Under the order of 31 January 1851, the expenditure of money ought to be limited to what the Superintendent can manage personally; but it seems to be understood that a further outlay from the fund may be made where the Civil Engineer's Department will undertake the executive management of the work.

The Superintendent, acting strictly up to the order, could not carry on more work than is in progress within the very confined range therein specified; and even within that range he could hardly adhere literally to the order; for he could not visit the working party south of Oolundoor, or those in the neighbourhood of Chittoor, without being absent from each work at least 20 days.

163. The Civil Engineers may possibly be well employed upon bridges, ghauts or other important works on the trunk roads; but as there is not one division in which other improvements are not obliged to lie over, while the time and attention of the Civil Engineer, or his Assistant, is engrossed by the executive management of such works, it is evident that an expenditure from the Four-lac Fund becomes only a substitute for some other grant, and as it advances the trunk roads, it retards other improvement of the country. Indeed it does more than that; for by occupying the Civil Engineers with executive duties, it takes them from their more important functions of projecting new works, and supervising the operations of the revenue executive.

The employment of the Civil Engineers in executive duties on the trunk roads is an evil.

This result of the inefficient state of the Road Department is most injurious, as confining the very limited amount of engineering skill the country is possessed of to the execution of a few works annually. Should this system be continued without an addition of numbers, it may be expected that the progress of the country will be still slower than it has been of late years, and speculations in the Tank Department be hardly less extensive than they were formerly.

164. Having thus reviewed the working of the Road Department, we are compelled to record our opinion that it has failed, and that the failure is to be ascribed to the anomalies and incongruities of its original constitution, aggravated as they have been by subsequent measures; viz., first, by refusing the necessary subordinate establishments; second, by withholding sanction for estimates; and third, by bringing the department down into a fettered and useless position by the order of the 31st January 1851. It has failed to spend the money assigned to the roads; it has failed to effect anything towards their improvement, commensurate with the expectations held out at the time of its formation; and it has failed to afford any material relief to the Civil Engineers, or to the Board of Revenue.

The Road Department has failed to attain the objects aimed at;

It appears needless to inquire whether the department could be so improved as to become effective; because we think it decidedly more expedient to abolish it as a separate establishment. The considerations which led to its formation were, that

And ought to be abolished.

the Board of Revenue and the Civil Engineers had not sufficient leisure to attend to the roads; and that consequently their improvement had never been systematically taken up. Both propositions were true as facts, but the inferences deduced from them were unsound. As to the neglect of the roads, the Government themselves were at least as much to blame for it as the Board, as our preceding remarks have shown; for they constantly refused to recognise the policy of improving the roads, and withheld the funds necessary for the purpose. The Board and the Civil Engineers were indeed overworked; but a review of the working of the Road Department shows, that the measure adopted for their relief was far from being the proper one.

It is wasteful to have two separate departments, managing works similar in character over the same area.

165. Where public works are thinly scattered over large tracts, it is unthrifty to have separate establishments for the management of the several classes of those works.

In a country in which official travelling, with the necessary office establishment, cannot exceed 10 miles a day, and in which even the Government mail does not exceed 100 miles a day, the Road Department had its agents at work at a distance of 500, and even 1,000 miles from its head; while the Civil Engineer of the division was passing over or near the road under repair or construction, perhaps several times in the course of the year, but was precluded from interfering, except in particular cases. The Order of the 31st January 1851, removed this anomaly indeed, to some extent; but the supposed reform was effected by leaving the greater part of the main roads of the country without any superintendence or management whatever, and by employing the scientific and highly paid Superintendent to perform in person duties which would have been done quite as well under his superintendence, by any active and intelligent officer, on one-fifth of his salary.

The Road Department has always been numerically unequal to even a small part of the work originally required of it; but even if it had an Engineer Deputy Superintendent in every district, it would still be bad economy to retain it, because it would be unwise and wasteful to have officers of two separate and unconnected departments travelling over the same ground, in the performance of similar duties. Fully as well convinced as the late Governor, of the importance and the necessity of undertaking the improvement of the means of transit on a systematic and comprehensive plan, we are yet led to the decided conclusion, that in order to effect this economically and well, the Road Department ought to be abolished, and that the charge of the roads ought to be re-united to that of the works of irrigation, both in the local offices, and in the Controlling-office at the Presidency.

The main cause of failure was the dread of expenditure on "Superintendence."

166. Before leaving the subject, we would call particular attention to the fact, that here, as in so many other cases, the main cause of failure was the dread of spending money on "Superintendence."

Captain Best's tempting offer to manage every branch of the department was too readily acceded to. One Engineer Assistant was allowed him, but only a few months after it was found that a clear saving of superintendence could be effected by allowing two unprofessional officers instead of the Engineer. The consequence of which was that the whole of the most important duties of the Superintendent were doubled. Captain Best next asked for such a subordinate department as should be capable of extension as his work increased; but it was to be paid for under the head of superintendence, so a saving was effected by rejecting his scheme, and reducing the establishment so low that it was only sufficient for the work in progress. And, latterly, when it was thought necessary that no work should be carried on, except under the eye of an Engineer officer, and it was, therefore, requisite either to give further professional assistance, or limit the operations of the department, the latter alternative was chosen, and the result was equivalent to annulling two-thirds of the grant.

The first thing should have been to ascertain the lines on which roads were most wanted:

167. Had there not been this dread, the natural course, when the Road Department was constituted, would have been, first, the employment of one or more able men of any service to ascertain the wants of the country, to examine the existing traffic, and to determine where the main communication should be opened. That this point was not sufficiently attended to is already apparent; we find on an average nine bandies a day on the Mercara and Mangalore road, which was made a trunk line; while the great cotton road from Bellary to the part of Coompta on the western coast, which is not in the list of trunk roads, is described by Mr. Malby, the Collector of Canara, as being so crowded, as to resemble "the approach to some large fair, being crowded with cattle, and lined with encamping grounds."

grounds." We might mention, as another omission, the road leading to the seaport of Tuticorin, the natural outlet for the cotton of Tinnevely; and as a third, a direct line from Salem to the sea; while the road from Madras to Trichinopoly, called a trunk road, and now constructing, at great cost, has comparatively little trade upon it.

168. This first point having been determined, after careful inquiry, there would have been work for Engineers in all parts of the country to decide what description of communication would be most suitable in each particular locality, whether railroads, canals or common roads; and having settled that important question, there was employment for a number of Engineers several years to trace the lines and plan the works required. For all this no provision was made; and hence the northern road is now in progress, closely parallel to if not actually through back-waters, which, when used for navigation, afford a means of carriage at one-eighth of the cost of transit by a road, and much more rapid.

Next to this, executive establishments were necessary, which could act without the constant attention of an officer of Engineers in each of the Collectorates; and educated artificers were required in every trade employed.

It is possible, if not more than probable, that a whole year's allowance, viz. four lacs of rupees, might have been laid out to advantage in the preliminary investigations, traces and designs. And in such a case, although the whole bill for the year would have come under the head of "Superintendence," it might not have borne too great a per-centage on the expenditure.

The result of this mistaken economy has been to retard the improvement of the roads three years at least, to check improvements by other works, to make some portion of the advance which has been made in the wrong direction, and by keeping works in an incomplete state, to lose much of the advantage of the sum expended.

Next, to determine the species of road to be made:

And then to survey and lay out the lines.

SECTION IV.

An Account of the Engineer Department under the Military Board, with Suggestion of some Changes in the Structure of that Department.

169. We have now to describe the Department of Works under the Military Board.

The Military Board.

The Military Board was formed at this Presidency, by order of the Honourable Court of Directors (*vide* Letter 21st September 1785, in Military Department), and appointed to consist of the following officers:—

- 1st. The Commander-in-Chief.
- 2d. The Senior Officer at the Presidency.
- 3d. The Senior Officer of the Artillery.
- 4th. The Chief Engineer.
- 5th. The Adjutant-General of the Army.
- 6th. The Quartermaster-General.
- 7th. The Commissary-General of Stores, with a Secretary and Assistants.

In the year 1794, the Senior Officer at the Presidency and the Commissary-General of Stores were discontinued as members of the Board; and in 1810, when the Commissariat Department was formed, the Commissary-general, as head of the Department of Supply, was constituted a member of the Board, but ceased to belong thereto in 1814, on the Honourable Court objecting (Letter dated 3d September 1813), "On the general principle that no officer should sit in judgment, or be called upon to act as a check and control over his own supplies." The Board then consisted of the following officers: the Commander-in-Chief, the Commandant of Artillery, the Chief Engineer, the Adjutant-general, and the Quartermaster-general; but this constitution was found productive of practical inconveniences, principally great delay in business, because all the members being so *ex officio*, and their time being almost wholly occupied by the duties of their own offices respectively, all the work of the Board devolved on the Secretary. With the view of getting rid of these evils, and expediting business, an alteration was made in 1839, by relieving the Adjutant-general and the Quartermaster-general from their duties in the Board, and adding two stipendiary members, in order, as stated* by the Honourable Court, "That the duties of the Board previously, to a very great extent, discharged

* Hon. Court's Letter, No. 39, of 17th June 1844.

discharged by the Secretary, might be wholly performed by the members of the Board."

Its present construction.

170. At present, therefore, the Board consists of the Commandant of Artillery, the Chief Engineer, and two stipendiary members, with a Secretary and an Assistant Secretary, and the work is arranged as follows: all subjects of importance still come before the whole Board; but minor questions and matters of routine are disposed of by the stipendiary members. The full Board sits twice a week; and, besides these meetings, there are also two "Diary Board Days," as they are called; viz., meetings formed of the stipendiary members only (though the *ex-officio* members have a right to attend if they think proper), at which the minor matters above referred to are discussed and disposed of. All routine papers, such as indents for stores, provided they are strictly in accordance with regulation, are disposed of by the Secretary endorsing on the back the usual order for the issue of the stores; and this indorsement, when initialed by the stipendiary members, is authority for the Secretary to pass the indent. The resolutions of the Diary Board, as well as of the general meetings, are recorded in proceedings, all papers of importance being recorded in full, the others abbreviated. The routine papers are briefly entered in diaries, which, with the Diary Board's proceedings, are circulated on the following day to the *ex-officio* members, in order to keep them acquainted with the whole business of the Board, and to give them an opportunity of bringing before the General Board any order of the Diary Board from which they may dissent. The stipendiary members also aid the Secretary, by writing letters, orders, and other papers on important matters; and, besides their attendance on Board days, they are usually at the office on the other two days of the week, engaged in that manner, and at hand to pass orders on emergent questions requiring immediate reply. The present system appears to have produced partially the results sought for in the change; viz. a more rapid and effective transaction of business; and the division of work between the General Board and the Diary Board is found to work well and to facilitate business.

The duties of the Board.

171. The duties of the Board, as originally laid down by the Honourable Court, were as follows:—

1st. To examine into the state of the musters of the troops, and to give their strictest attention that all the establishments are kept up to the full complement.

2d. To be regularly informed of the amount, both in quantity and quality, of provisions, ammunitions and stores of every kind, in forts, granaries and garrisons.

3d. To attend to the artillery arms, and implements of engineering, so that our settlements may be amply provided with everything requisite for the complete equipment of an army on the shortest emergency.

The Honourable Court mentioned these particulars as an illustration of the nature of the duty to be performed, meaning that every article of military expenditure should come under the revision and control of the Board; the arrangement was partially modified afterwards by the creation of the Audit and Commissariat Departments.

The Court explicitly desired it to be understood, that no part of the discipline of the army, or the distribution of the troops, or the application of that force, should fall under the Board's authority, those powers remaining exclusively with the Government and the Commander-in-Chief respectively. The Honourable Court also declared that the Board was not to exercise any power independently of the Government, or to have authority to issue money, or grant warrants for its issue; and the Court were of opinion that much benefit would be derived from the institution of the Board in the detail of such business as is immediately connected with the regularity, the economy, and effective strength of the army, and as a Board of reference and report, for the purpose of inspection, and to prevent abuses and deficiencies.

Their detail and distribution.

172. The detail duties of the Board may briefly be stated as follows:—It checks and controls the Commissariat accounts, as far as quantities, and charges to a limit of 25 per cent, above the previous year's charges; it checks also all the ordnance and military stores, the gunpowder and gun-carriage manufactories, the Stationery-office, the equipments of the army and the saddle contracts; and it also superintends and controls the whole department of buildings and repairs as connected with

with the army, as well as all such works at the Presidency for every branch of the service.

The work of the Board is divided in two departments; viz. the Ordnance Department and the Engineer Department; the latter comprises all buildings and repairs, and the former comprehends all the other branches of business above specified. But this division is for the sake of convenience and orderly arrangement only; the Board itself is not divided into sections, but subject to the above detailed arrangement of General and Diary Boards; all the members attend indifferently to all business brought before the Board.

The inquiries of this Commission are directed only to the Engineer Department of the Board, and having given the foregoing general view of the various branches of its duty, we now proceed to describe more minutely its proceedings in that department.

173. As already stated, the Board has control over all military works in the interior, and all Government buildings and works at the Presidency, whether military or civil.* This general description includes, at the Presidency, all buildings, whether military, civil, judicial, marine, ecclesiastical or general; all bridges, and all works on what are called the Government roads, as distinguished from those which are maintained by the Assessment Fund. In the interior the authority of the Military Board extends over all roads, bridges, drains, &c. within military cantonments; all military and ecclesiastical buildings and post-offices within cantonments; all forts, and Government buildings of whatever kind therein. In the Saugor and Mhow Division the Military Board has control likewise over all buildings, whether military, revenue, judicial or general, and partially so over the main roads, bridges and tanks of the country at large, comprised under the designation of the Saugor and Nerbudda territories; over the political buildings of the residencies at Indore and Sehore, and the military buildings of the contingents, as well as of Bhopal and Holkar. With respect to the work in those territories the Board act under three separate authorities; in the case of the civil and the political works they are in communication with the Governor-general of India; in the case of certain roads and bridges, and of the salary and office bills of the Engineer Department chargeable to the Civil and Political Departments, they communicate with the Lieutenant-governor of Agra; while all the military works are undertaken and carried on under the orders of the Madras Government.

Particularly in the Engineering Department.

174. The engineering works are distributed in 10 divisions, corresponding with the divisions of the army. The statement in the margin gives the names of nine of the divisions, as well as the annual expenditure in each of them; being the average of 20 years from 1831 to 1850. Of the remaining division, that of Saugor, with the Saugor and Nerbudda territories, the works have been under the control of the Madras Military Board only since the beginning of 1850; we have been unable to obtain accounts of the amount of the expenditure. It will be seen that, independently of that division, the whole expenditure controlled by the Board in this department, amounts to about two lacs and three quarters annually. The expenditure for buildings, &c. on the Tenasserim coast being under the Bengal Board, and that of the Straits Settlements under the Governor of Penang, both are excluded from the statement.

	New Buildings.	Repairs.	TOTAL.
	Rs.	Rs.	Rs.
Presidency Division -	65,422	64,919	1,30,341
Mysore - ditto -	9,254	8,729	17,983
Southern - ditto -	12,796	8,593	21,389
Centre - ditto -	3,808	4,888	8,696
Northern - ditto -	5,300	4,515	9,815
Ceded Districts -	11,101	4,827	15,928
Malabar and Canara -	13,189	4,237	17,426
Nagpore Subsidiary Force	20,308	5,580	25,888
Hyderabad Subsidiary Force—			
At Secunderabad -	17,822	2,096	19,918
At Jaulnah -	2,923	1,265	4,187
TOTAL - -	1,61,902	1,09,696	2,71,600

Annual amount of works under the control of the Board.

The Military Board has power, without reference to Government, to direct the execution of repairs on estimate not exceeding Rs. 500 each; for all repairs to a larger amount, and for all new works, as well as extensions, improvements and alterations, the previous sanction of Government is necessary. Officers commanding divisions and forces have power to sanction petty repairs to buildings not exceeding Rs. 50 to any one building in a half year, and to order repairs of an emergent nature

* The Governor of Madras, however, as Commander-in-Chief of Fort Saint George, exercises the power of ordering certain works within the Fort, without the intervention of the Board, as will be stated more particularly below.

nature to an amount not exceeding *Rs.* 500; but in the case of commissariat buildings and storehouses, there is in emergent cases no money limit to their power to order repairs.

The local agency under the Board.

175. The local agency at the command of the Board in this department is as follows:—There is a Superintending Engineer for the Presidency Division, with an assistant; and a Superintending Engineer in each of the Mysore, Hyderabad, Nagpore, and Saugor and Mhow Divisions. In the last named there are likewise four executive officers;* viz. one to each of the four circles into which that division is subdivided; and in the Hyderabad Division the executive duties at Jaulnah are entrusted to the local cantonment staff officer, who corresponds direct with the Board, and is hardly in any respect under the Superintending Engineer of the division. In the remaining five divisions there is no Superintending Engineer, or any officer permanently under the orders of the Board for the execution of work, the whole of the duties being executed by commanding and staff or other officers, as may be most convenient.

Modes of obtaining sanction for repairs.

176. We now proceed to describe the course of proceeding in the construction and repair of works, first in those divisions in which there are Superintending Engineers, and afterwards in those where there are none. The Superintending Engineers of Mysore,† Hyderabad, Nagpore and Saugor have professional charge within their divisions respectively, and under the general control of the Military Board of all military and public buildings, all fortifications, and all bridges and drains within military cantonments. The charge and custody of all buildings remain with the office, corps or department in occupation thereof, and when vacant it devolves on the staff officer, or the Quartermaster-general's Department, or the commanding officer.

Formerly, committees were assembled annually to examine all public buildings, and report what repairs they required; but this system was abolished in 1830, and the officers and departments respectively in charge or occupation of buildings are at present required to report to the proper authority when any repair is wanted. At stations in the interior, this report is made to the officer commanding the Division, who after causing a statement of the requisite repairs to be made by the Superintending Engineer's Department, may immediately, and without the previous sanction of higher authority, direct the execution of both emergent and petty repairs; the limit being that the outlay shall not exceed *Rs.* 50 for petty repairs, to any single building in the half-year, and *Rs.* 500 for each emergent work. In the case of more extensive repairs not emergent, a report is submitted by the commanding officer to the Quarter-Master General of the army, by whom it is laid before the Military Board; the Board call for plans and estimates, and if the amount of the estimate does not exceed *Rs.* 500, they have power at once to authorize the works, the circumstance being merely notified for the information of Government; but if above *Rs.* 500, the previous sanction of Government must be obtained before execution can be ordered.

And for new works.

177. When new works, extensions, improvements and alterations are required in the Military Department, the officer commanding the division represents the necessity for the work through the Quartermaster-general, to the Commander-in-Chief; and if approved by him, the application is forwarded to Government, and for similar work in other Departments under the Military Board, application must in like manner be submitted to Government through the head of the Department. Thus, for all Marine buildings at the Presidency, the channel of application is from the Marine Board to Government; for buildings connected with Her Majesty's Supreme Court or with the Police, applications are submitted by the Judges and Superintendents

* The executive duties of the Saugor circle have lately been laid upon the Superintending Engineer, an arrangement which cannot be beneficial to the public service, as it combines controlling and executive duties in one and the same officer, and also because it leaves him very little time for the important duty of controlling the young and comparatively inexperienced executive officers. In consequence of this amalgamation of duties, one of the four executive officers has been dispensed with.

† The Superintending Engineer of the Mysore Division has also the control of all the roads and bridges, and all irrigation works throughout the Mysore country, being 28,000 square miles in extent; but as respects those works, he is not subordinate to the Military Board, but to the Commissioner of Mysore and the Governor general. It is superfluous to add that the services of a single officer over so extensive a country, though valuable for the professional advice and counsel which he is able to afford, must be little more than nominal, except in very rare instances, in the way of real superintendence or inspection.

Superintendents of Police, and for Ecclesiastical buildings by the Bishop. The Government, if they concur in the necessity or expediency of the work proposed, either direct the Military Board to submit a plan and estimate for it, or merely call for their opinion; but in every case, whether their opinion be called for or not, it is the duty and practice of the Board to state any objections to the work that may occur to them. If the Board object to the work, they state their opinion without calling for estimates; if they see no objection, they call for plans and estimates from the Superintending Engineer, and submit the same to Government, with their remarks. Until lately, the custom had gradually crept in for the commanding-officer to obtain from the Superintending Engineer a plan and estimate for the proposed work, and submit them at once to the Commander-in-Chief, through the Quartermaster general, with his application; but this objectionable practice, involving the preparation of numerous plans and estimates for works which after all were never sanctioned, has been constantly discouraged by Government; and by a recent decision of the Honourable Court, the practice of calling for plans and estimates, except through the Military Board, has been prohibited.

178. The course followed in executing works is the same in all the foregoing cases; except that the more important works receive a larger amount of the attention of the Superintending Engineer than the smaller ones. The execution of works on contract is in extremely limited use in the up-country stations, because very few men of respectability, capital and skill, can be found to take contracts; and because it is found that work in course of execution by contract requires fully as much careful superintendence as that done by the direct agency of the department. It is very much the practice, however, to obtain supplies of building materials by contract, because there is there less opening for fraud.

Mode of executing work.

179. When a Superintending Engineer receives instructions for the execution of a work, the Paymaster is at the same time directed to supply him with the necessary funds, in accordance with established rules, which will be more fully noticed hereafter in speaking of the accounts of the department. The advance as drawn from the Paymaster is generally paid over without delay for materials contracted for or received, or for work done. In the case of works at the headquarters of a division or station, the workpeople are in some cases paid once a week at the office of the Superintending Engineer, while in others the payment is left entirely to the head Conicopillay; at out-stations the workpeople are paid by the subordinate Overseer or Conicopillay in charge of the work. The price of materials is for the most part paid at the head-quarter station, through the head native servant of the Superintending Engineer establishment, in presence of the European serjeant; at out-stations it is paid by the servant in charge of the work. The Superintending Engineer receives daily reports of work performed and materials expended on works at the head-quarter station; and from out-stations he receives a daily, or weekly or monthly report. While a work is in course of execution, monthly progress reports in detail are sent to the Military Board, and after the work is completed, a survey is held by a committee, when professional officers can be obtained under the order of the officer commanding the division, and they make a report in a prescribed form, certifying that the work is in accordance with the plan and estimate, and of good materials and workmanship. But when a professional committee cannot be assembled, then the officer commanding, or the head of the department for whose use the building is intended, inspects the work during its progress, granting a certificate at each of the four stages at which the work when in progress is inspected. After the accounts of the work are finally closed, the bill is prepared from the daily accounts and submitted. If it exceeds the estimate, explanation of the cause is sent with it: and if it falls below the amount drawn as advance, the difference is repaid to the Paymaster, and his receipt accompanies the bill, as also the survey report or the certificates. The bill is sent to the Chief Engineer, the despatch being at the same time notified to the Board; the Chief Engineer, after causing the bill to be examined in his office, reports upon it to the Board, and it is then disposed of, either immediately, if correct and according to rule, or after explanation by the Executive Officer if it should be in excess of the estimate, or otherwise open to objection. It is either finally sanctioned by the Board if within the power vested in them, or submitted for the sanction of Government.

At stations in the interior.

The course of proceeding at the Presidency.

180. At the Presidency, the course of proceeding is somewhat different. In the first place there is no officer commanding the Presidency Division, and no one therefore to exercise the powers in connexion with the Public Works Department, which in the interior devolve on such an officer. Again, a large portion of the buildings at the Presidency belong to Civil Departments, and in respect to them also there is no one having similar powers. From both these causes it comes to pass that much detail is thrown upon the Board in connexion with the works of the Presidency Division, which hampers their proceedings, and from which it is desirable to relieve them. Again, the fact that the Governor for the time being is Commander-in-Chief of Fort St. George modifies the operation of the system. In virtue of his holding that office, no work can be done, and no alteration made, to any building within the fort, Civil or Military, or to any military building outside the fort, in the occupation of the troops forming a part of the garrison, without the previous consent of the Governor; and all applications, either for new works or for repairs, must first be made to him. His Excellency holds the power of authorising repairs to any of the buildings above described, to the amount of 200 rupees without estimates; he also authorises new works or improvements to the same amount, on estimate; the orders both to prepare the estimate and to execute the work, are generally sent direct to the Superintending Engineer, through the Town Major, without the intervention of the Military Board. In case of works of larger magnitude, the estimate after being received from the Superintending Engineer by the Town Major, is sent by the latter officer to the Military Board, who dispose of it in the usual order.

At the Presidency, the Barrack-master has charge of all Government buildings when vacant. When they are in occupation, any occasion for repair is reported to him, and he inspects the building and certifies the facts as he finds them. His report to this effect goes, in the case of the buildings inside the fort or belonging to the garrison, to the Town Major, for the information of his Excellency the Governor; and in the case of other buildings to the Military Board. And the necessary orders are thereupon issued to the Superintending Engineer to prepare estimates for the work required.

As respects the execution of works, the course followed at the Presidency, is for the most part the same as at the stations in the interior, with the difference that contracts are more generally in use. The work of the division being so much heavier than in any of the up-country divisions, the Superintending Engineer has an assistant who is a commissioned officer, as well as several European Overseers, and a larger establishment of inferior servants.

The Superintending Engineer is wholly an executive officer.

181. It will be seen from the foregoing detail that the duties of the Superintending Engineer are wholly executive; for though at the subordinate stations of the up-country divisions, the work is not done under his Engineer's own eye, yet it is done by the establishments, on his responsibility, and under his direction and control. And this executive department is without any sufficient control by an inspecting department. At the Presidency indeed the duty of inspecting the work done by the Superintending Engineer is laid on the Chief Engineer, but the latter officer has besides, three separate offices to attend to; viz., his own, the department of Public Works of the Revenue Board and the Military Board; and it is therefore impossible that he should give much time to this additional duty. A Maistry of his establishment is probably sent to look at a work executed by the Superintending Engineer Department; but except this objectionable kind of inspection, there is practically no direct inspecting department at the Presidency; while many of those functions which would properly be discharged by an inspecting office now devolve on the Military Board, and encumber it with details not properly appertaining to an office of general control. In the interior the inspecting office is still more emphatically wanting, there is not even the pretence of it; and the result there also is, that many little details fall on the Board. We cannot but regard this absence of inspection as a material defect in the structure of the department; we have given our careful attention to the means by which it can be removed, and shall bring forward suggestions for this object.

The department in the Saugor Division.

182. When the Saugor Division was recently transferred to this Presidency an effort was made by the Military Board to organize the Engineer Department on a different principle from that which obtains at Madras, and in accordance with the Bengal and Bombay systems, viz., Superintending or Inspecting Department separate

separate from the executive. But from the first, the Superintending Engineer appears to have been intended by Government to be an executive officer, like the other Superintending Engineers. But the Saugor territories are very extensive (having an area of above 29,500 square miles), and besides the work of a number of military stations, there are also extensive works constantly in progress on the roads, and in the Holkar and Bhopal States. It was therefore found necessary to sub-divide this division into four circles, to each of which an executive Engineer was at first appointed; and upon the recommendation of the Military Board the Government were induced to consent that the Superintending Engineer should cease to be himself executive, and confine himself to the proper duties of an inspecting officer; that is, projecting works, or considering projects proposed by others, making or revising estimates, aiding the executive officers with his professional advice on works while in progress, inspecting work done, and checking and examining bills. This system commends itself to approval, both because it secures that check and oversight by an independent officer so valuable as a stimulus to activity, and as a check to malversation, and also because it effects the best possible division of duties, by giving youthful zeal and activity to the execution of work, and at the same time placing young officers in a position to gain instruction from more practised and experienced minds; and securing experience and practical skill, combined with direction and control. Practically this has been found to succeed extremely well; but by recent orders from Government this division of duty and labour has been altered, and the Superintending Engineer has again become an executive officer.

183. In the remaining five military divisions, viz. the Northern, Centre and Southern, the Ceded Districts, and Malabar and Canara, comprising the whole of the Honourable Company's own territory under the government of Fort St. George, there are no Superintending or other Engineer officers allowed as a fixed establishment for the works under the Military Board. Up to 1838 there was a Superintending Engineer on the staff of every division; but we have already detailed in an early part of this report, the circumstances which led to the substitution of Civil Engineers for Superintending Engineers in all the divisions of the army within the frontier, viz., that the duties of the latter were extremely light and unimportant, as compared with those of the Civil Engineers, who were overwhelmed with a pressure of business far beyond the power of any man to accomplish.

No Engineer Officers under the Military Board within the Provinces.

In 1833 accordingly, the appointment of Superintending Engineer was abolished in the five divisions within the frontier, and the number of Civil Engineers was increased from four to eight, with divisions correspondingly contracted in extent. The Civil Engineers were vested with the professional charge of the Revenue, Civil and Judicial buildings, *i. e.*, with the duty of making estimates for their repair or construction; while the custody of Military buildings, formerly devolving on the Superintending Engineers, was transferred to the Staff Officers of stations; and part of the establishments previously belonging to the Superintending Engineer's Office, were placed under the orders of the Staff Officer of the Quartermaster-general's department, to assist, under the orders of the Military Board, in preparing plans and estimates and executing works. With respect to the remaining part of the duty of the Superintending Engineer, viz., estimating for and inspecting the construction and repair of military buildings, it was directed that all ordinary repairs and new works within a certain cost, should be estimated for and executed by the Staff Officer; the Civil Engineer affording his professional advice in all more considerable works, or when called to do so, but being exempted from all executive duties.

The existing system described.

184. It cannot be denied that this change was very beneficial to the public service generally. It materially added to the strength of a most important department, far too weak indeed, even with that addition, for the arduous duties laid upon it; and while it weakened a department involving the expenditure of only a few thousands of rupees, it strengthened one charge with the expenditure of lacs. And though in the military branch much inconvenience and some loss were experienced, yet the gain to the country by the increased and more effective supervision in the Civil Department, vastly overbalanced that evil. This was allowed even by the Military Board themselves. They disapproved of the change, which greatly diminished their power and exposed them to difficulty in carrying on their work; but even while strongly representing these evils to the Govern-

The change has been a gain on the whole;

ment, and urgently pressing them to apply a remedy, they yet with honourable candour fully admitted that the change had on the whole been greatly to the advantage of the public service. They believed the arrangement, to use their own words, "to be the most beneficial and advantageous for the public service at large, during the existing scarcity of Engineer Officers;" but they represented that the department of buildings and repairs was seriously crippled by it, and they recommended as a remedy, either that the number of Engineer Officers should be considerably increased, or that a Barrack-master or Executive Officer with a suitable salary, should be appointed to each division. Neither of these suggestions was adopted, nor was any other remedy applied; and in consequence the Military Board have ever since been much hampered and inconvenienced in the repair and construction of military buildings within the frontier; and great delay, unauthorized and injudicious deviations from plans, and excessive cost, have in numerous instances been the results. In several such cases the Military Board, and in others, individual officers in charge of works, have incurred the severe animadversion of the Government and of the Court of Directors; while the parties thus blamed, especially the Board, were in no degree culpable; the fault being in the system, which the Government had neglected to amend, and which the Board were working as well as its radical defects admitted.

But it has much hampered the Military Department.

Practical evils of the present system.

185. Under the order of 1838, the Staff Officer of the station is charged with all the duties of Executive Engineer; but as a general rule, that officer is wholly ignorant of business of that nature. And he has moreover other duties to attend to, which although they do not occupy the whole of his time, yet being immediately those of his office and for which he is paid, receive the principal part of his attention; and lastly, he in some instances holds office only while his regiment is at the station, and is therefore liable to be ordered away at any time, and in fact frequently is so while in the middle of a work. The natural consequence is, that the work of the department is wholly managed by the subordinates of the office; who are under no responsibility, being shielded by that of their ostensible head. This being the state of matters at considerable military stations, such as Trichinopoly, Palamcottah, Cannanore and Mangalore, where there are the head-quarters of one or more regiments, and a Staff Officer, smaller stations occupied by detachments only, are still worse off. At such posts the officer commanding the detachment is charged with the execution of any works required; and as the detachments are relieved every six months, the smallest work probably changes hands at least once; and more considerable operations are often under the ostensible superintendence of four or five different officers, all equally unacquainted with the sort of work, and often very youthful and wholly unequal to a contest with the knavery or chicanery of native trades people or contractors, or of their own ill paid native subordinates.

An example of their operation.

186. As an instance in point, we may quote the case of the Ramnad Sepoy barracks. These buildings, estimated to cost 3,675 rupees, were ordered to be executed in 1847. In 1848 the young officer commanding the detachment at that place received an advance of 900 rupees, which he paid over to contractors for materials to be supplied; but before any materials were delivered, this officer was relieved by another equally inexperienced; the latter found it impossible to induce the contractor to fulfil his engagements; he appears even to have maintained that as his contract was made with the first officer, he had nothing to do with the second, and at the same time he could not be persuaded to take the proper steps to get the contract deed transferred to the name of the latter. Ultimately, after multiplied vexations and delays, the First Assistant Civil Engineer of the division was placed in charge of this trifling work; he has been engaged on it already for many months, and it will probably still engage him for several months more. Thus the plan adopted in this case for rectifying the evils of the new system, was simply a return to those for which the old one was abrogated; one of the two Engineer officers charged with the direction and control of the Maramut expenditure in a division containing 16,400 square miles, and with the professional care of the many thousands of irrigation works and all the roads within it, was withdrawn for nearly two working seasons from these important functions, in order to superintend the construction of a small and simple building, the necessary superintendence of which might have been performed fully as well, at one-fifth of the cost, by an intelligent European Overseer, or by a qualified officer selected from the line, with a small staff allowance. In the course of last year, a rule was passed by Government, on the recommendation of the Military Board, empowering them to

to assign to officers placed in charge of the execution of work, an allowance of two or four rupees a day, according to the nature and magnitude of the work. This arrangement, whilst operating to some extent in correcting the evils proceeding from the want of an executive, does nothing towards providing the Board with the necessary permanent professional assistance; and even this is not made the most of, as the choice of the individual to be employed is restricted to the officers at the station, instead of being made from a list of officers previously examined, and pronounced qualified for engineering duties.

187. The following Table shows how large a number of officers of different branches have stood in the public accounts during the last four years, as having received public money for the execution of works under the Military Board, with the amounts standing against each. The amount of disbursements under "Officers of other branches" is comparatively small, but these officers being constantly changed, and being generally entirely unacquainted with the business of keeping accounts and executing works, and destitute of that kind of knowledge which can only be acquired by departmental organization, the controlling duties of the Board are increased and complicated under the present system to a great degree. Under a good system, instead of 76 officers having accounts open with the Board, and those requiring to be instructed in every part of their duty, there would be only five or six well qualified officers. The difference in the labours of the Board and in correspondence, as well as in the efficiency of the work, would be very great. In reporting on the accounts of the department, we shall propose measures to remedy the evils which we have here pointed out.

Table of advances and of officers responsible for them.

	Advances outstanding on the 1st May											
	1848.			1849.			1850.			1851.		
	No.	Rs.	a. p.	No.	Rs.	a. p.	No.	Rs.	a. p.	No.	Rs.	a. p.
Engineer Officers	13	4,40,210	11 -	16	4,35,068	12 3	13	3,12,192	15 10	16	3,27,337	2 10
Officers employed as Engineers drawing pay.	2	2,429	12 4	-	-	-	2	8,491	9 1	4	66,730	4 -
Contractors	5	75,140	15 9	6	56,434	7 -	9	31,737	9 10	9	86,922	- 2
Officers of other branches drawing no pay.	76	42,604	1 5	65	40,207	11 10	68	62,221	2 4	69	48,653	- 7
TOTAL	96	5,69,384	8 6	87	5,40,705	15 1	92	4,84,642	15 1	89	5,29,642	7 7

188. The subordinates by whom the Superintending Engineers are aided in their work are of the following grades; 1st. Overseer Serjeants, whose duty it is to visit works in progress during working hours, and muster the men, as a check on the Conicopillay; 2d. an Office Writer, or Manager, for correspondence, accounts, &c.; 3d., a Draftsman, who draws plans, both fair for submission to the Military Board, and rough for the guidance of the Maistries; 4th., Conicopillays, who are partly accountants and partly overseers, some of them being employed exclusively in the office of the Superintending Engineer, calculating estimates, preparing bills, drawing up the periodical reports, &c., whilst others visit the works in execution, muster the labourers, check the receipt of materials and keep an account of them; and also in some cases (especially in the case of works at a distance from the head quarter stations), pay the wages of the labourers, and the cost of materials. 5th., Maistries, that is, headmen of bricklayers, carpenters, &c., whose immediate duty is to superintend works in progress. The Executive Officers in the Saugor Division have subordinates of corresponding classes, though in some instances called by different names; and they have also one or more European Overseers, who are employed in the superintendence of considerable works. In the five divisions within the frontier where there are no Superintending Engineers, there are still smaller establishments attached to the office of the Staff Officer of the principal station, and consisting generally of a Draftsman, one or two Conicopillays, and two or three Peons.

The subordinates in the Military Department.

Their qualifications.

189. The qualifications of these several classes may be comprised generally, under the description we have already given of the corresponding classes in the Civil Department. Some officers indeed express themselves satisfied with the character and abilities of their native subordinates; but these are cases where the work of the department is very small, and confined to one station only, so as to be immediately under the eye of the officer: Where the work of the department is larger and more scattered, so as to make it necessary to trust more to the skill of the subordinates, and to confide to them pecuniary responsibility, they are stated to be unworthy of trust and wanting in skill and intelligence, for want of any previous training or instruction; and it is often very difficult to find competent parties to fill vacancies. We may add that their pay is very small, and requires to be raised, and to this point, as well as to the provision of means of instruction, we shall have to revert hereafter.

The European Overseers.

The European Overseers employed, as already said, in the Saugor Division, are fully as well reported of by their superiors as those employed in the Maramut and Road Departments, of whom we have already spoken. They are described as being skilful, energetic and trustworthy; and it is stated that in works executed under their superintendence, a considerable saving is often effected even where more work is done than the estimate provides for, whereas such a result is very rare in the case of estimates framed on the very same data, but executed by natives, the cause assigned being partly ignorance and laziness in the application of labour, and partly peculation.

Roads and bridges in military cantonments.

190. The construction and maintenance of roads and bridges in military cantonments is under the control of the Military Board, as already said; at division head-quarters the work is usually performed by the Quartermaster-general of the division staff, under the orders of the Board, and at other stations by the station Staff Officer. We would not disturb this arrangement. A small establishment, consisting of a Road Serjeant, &c. &c., is kept up for the work, and the Lascars and bullocks of the Commissariat Department, and in some cases civil convicts, are employed in the work. The amount directly contributed by the Government for the maintenance of these roads is not large, but it is the practice in most cantonments to devote to this object all the fines levied at the Military Police Office, and at some stations beyond the frontier, where there is a considerable extent of cultivated land within the cantonment limits, the Government revenue of such land is laid out on the roads without being brought to account. An order has also been lately passed by the Government, making the grazing rent obtained for the Glacis and Esplanade of Fort St. George available for the repair and maintenance of the railings, &c., and of the Esplanade Roads; and this order is construed to extend to up-country stations also.

Their maintenance how to be provided for.

191. It appears to us very objectionable that the amount available for local improvements should depend on the sum that is levied in the way of fines at the police office; the practice seems to be one very much open to abuse, and we beg to recommend that it shall be everywhere put a stop to. As respects the other funds above referred to, they may properly be made locally available. The plan of allowing a certain sum annually for the maintenance of roads has been approved by the Government and the Honourable Court; it has been introduced in some cantonments, and we think it should be adopted in all. We would propose that in every cantonment certain roads should be fixed to be maintained at the Government charge; that a mileage allowance for them should be settled with reference to the peculiar circumstances of the station; and that from the total at each place a deduction should be made, equivalent to the probable yearly amount of the funds from local sources other than fines, taken at a low estimate so as to be on the liberal side. Even if these miscellaneous sources of income are given up for local disposal as we propose, it seems expedient that the accounts of receipts and disbursements of such funds should be subjected to regular audit by some authority, no less than the expenditure from the mileage allowance.

Where Government servants are employed on the cantonment roads, their services should be paid for.

192. In many cantonments it is the practice to employ Lascars, bearers, and other public followers, being Government servants, on the station roads, when not otherwise engaged. This system appears to us objectionable and open to abuse; under it the real amount paid by Government for the roads is never known; and we believe, that if it were abolished, it would be found practicable to reduce the establishments at many stations. We beg to recommend, therefore, that either the

the practice should be absolutely prohibited; or that whenever Lascars or other Government servants are so employed, whether for whole days or parts of days, their labour shall be paid for out of the road allowance, at the rate of the Government pay which they respectively receive; the amount to be received by the Paymaster, and placed to the credit of the Government, in diminution of the charges of the department to which the servants so employed belong.

At some stations, again, a certain number of carts are allowed at the cost of Government for the maintenance of the roads; and all tools required for the same purpose, pickaxes, maties, jumpers, baskets, &c., are supplied from the Government stores as required, and all repairs required to the carts are in the same way performed at the Government workshops without any charge. This practice likewise appears to us a bad one. Independently of the fact, that here again the Government is put to a constant expense for the roads, of which the amount is never brought to notice, the inevitable tendency of the system is to promote extravagance and waste. It would be contrary to all experience to suppose that where implements are obtained for nothing; they will be taken as good care of as if they had to be paid for out of a limited fund. We think that the practice should be discontinued as regards both the supply of carts, their repair, and the tools; that, in short, the aid given by Government to the maintenance of the Cantonment roads should be restricted to a money allowance. Where tools are required from the Government stores, we recommend that they should be supplied, if convenient, but only on payment in cash. This is already the practice in the Engineer Department and in the Road Department, and we think it should be made universal. It simplifies the accounts, affords the Government a correct knowledge of its expenditure, and tends to promote economy.

Tools and assistance obtained from the Government arsenals and workshops should also be paid for.

193. The military branch of the Public Works Department will share in the improvements to be made in the department generally; especially in the advantages of an establishment, more efficient, both as to numbers and qualifications. But we have to propose some changes in the structure and internal arrangements of the military branch itself; these we may conveniently detail in this place, and we will begin with the Presidency.

Some changes proposed in the military branch of the department.

We have already remarked, that the duties of the Superintending Engineer under this Presidency are purely executive; and this is eminently the case at the Presidency itself. And from the absence of any department for inspection or superintendence, and the non-existence, already noticed, of any officer to perform at the Presidency the functions which, in the interior, are discharged for the Civil and the Military works respectively, by the Collectors and the General Officers of Divisions, much local detail is thrown upon the Board, which is unsuitable to its position of general control, which hampers its discharge of such general functions, and which, after all, it cannot perform satisfactorily.

In the duties required of the Chief Engineer, there are similar anomalies, partly produced by the same absence of an Inspecting Department, and equally inconsistent with his position.

194. We must explain our meaning in detail, and we will begin with the Board. The local duties now imposed on the Board, and from which, in our opinion, it ought certainly to be relieved, are as follows:—

A detail of the merely local duties now imposed on the Military Board.

1st. Inviting, receiving, and deciding on all tenders for doing work by contract at the Presidency. We have already said that a large part of the work at the Presidency is done by contract; * with every endeavour to secure fairness in the competition for contracts, and the decision on tenders, it is found practically impossible to shut out intrigue. If the management of contracts rested with the Executive Officer, matters would be very much worse, as the people of his department are as a matter of course opposed to all contracts; under existing circumstances it is therefore necessarily in the hands of the Military Board; but the result is that their own people are mixed up in the contract transactions, and all effective appeal is cut off.

2d. From there being no Inspecting Department, the duty of inspecting all work done in the Presidency Division is imposed by the Regulations on the Military

* In our Second Report we shall offer some remarks on the system of executing work by contract with reference both to the Presidency and to the Interior.

Military Board; and this, it must be remembered, though the Board has very rarely contained any professional member, except the Chief Engineer, *ex officio*. As a consequence, the Board have almost invariably devolved the duty of inspection on the Chief Engineer; but its performance by this latter officer is only nominal in the great majority of cases, and practically it may be said that there is no inspection at all. As respects works done by contract, the Government have lately, on the recommendation of the Military Board, authorized the Superintending Engineer to inspect works done by contract, on the ground that he had no concern with the execution. But this is hardly true as a fact, because such work is performed under the direction and supervision of the Superintending Engineer; and the arrangement seems further objectionable, because the Superintending Engineer's office servants, as already said, have a personal interest in opposing all contracts, and discouraging and discouraging all contractors.

3d. The duty of authorizing repairs to individual buildings, which in the interior, is the part of the Generals of Division, falls at the Presidency upon the Board, for all buildings, civil as well as military, except repairs under 200 rupees to buildings within the fort, or belonging to the garrison. The buildings within the Presidency Division are 622 in number; and it may easily be conceived how great a mass of petty details must be involved in considering and disposing of every case of the most trifling repair to this large number of buildings of so many kinds.

4th. Another function nearly allied to the last mentioned, is that of ordering the necessary advances of money, in the case both of repairs and of new works and improvements. Under the existing rules for making advances, the Board are charged with a great deal of minute details as respects works at up-country stations as well as at the Presidency; this inconvenience exists in a greater degree, indeed, at the Presidency, from the absence of an officer vested with power to order advances in the case of small works, but it is not wholly owing to that cause. In our second Report, on the accounts of the department, we hope to be able to propose a plan which will relieve the Board every where from all connexion with the detail of sanctioning advances for works; but, in order to effect that separation at the Presidency, it will be necessary to have an officer to perform the duty.

5th. Another purely local duty imposed on the Military Board is that of opening the bars of the Cooum and Adayar Rivers in due time. The former has always been under the Board's charge, the latter was so placed only last year. This is not only a local duty, but it is one which a Board, from its very nature, cannot really perform. It must of necessity do it by deputy; and it appears the wiser course to invest the officer who must be the Board's deputy with the direct charge, and a direct responsibility for the performance of it, and to leave the Board in its proper position of control. The duty and responsibility should, in our opinion, be laid on the Inspecting Engineer.

6th. There is still another duty of detail from which we think the Board ought to be relieved, and which we will mention here, though it is not of a local character. It is that of allotting tools and implements to the Engineering Departments. This is not a duty for a controlling office; it appears to us that it ought to be transferred to the Chief Engineer.

The Controlling Board ought to be relieved from all such.

195. From all the details above described, and from any similar which we may have omitted to notice, the Board of Public Works should be relieved. Some of the duties, we have seen, cannot really be performed by the Board, and it is obliged to do them by deputy, others are such in their nature as to require to be exercised under independent control; but all control and appeal are lost, when the Controlling Board itself does the act and so becomes concerned to uphold it. Of all it may truly be said that they embarrass the Board with details which it cannot duly attend to; and if even the Military Board has found itself hampered and impeded thereby, how much more will this be the case with the proposed Board of Works, with so much more extensive duties? It is a sound principle that a controlling office should not be mixed up with local matters; should have no more concern with details on the spot than in the most distant part of its charge. In most departments this rule is rigidly observed, and the Public Works Department ought by no means to be an exception.

196. The

196. The following is a brief summary of the separate duties of the Chief Engineer in connexion with the Public Works Department :—

A summary of the duties of the Chief Engineer in connexion with the Public Works Department.

1st. He has charge of the Glacis and Esplanade, and it is his duty to prevent encroachments on either; he also collects and pays in the grazing rent.

2d. He has charge of the mines under the Glacis and Esplanade.

3d. All alterations in the fortifications are first submitted to him.

4th. Up to a very recent period all repairs to the fortifications were executed by the Chief Engineer; now they are done by the Superintending Engineer, but chiefly by contractors under him.

5th. The Chief Engineer has the general control of all the fortifications throughout the country; the local Engineer Officers in charge of them report to him.

6th. He has charge of the waterworks for the supply of the fort, and collects the water payment.

7th. As the delegate of the Military Board, he has the inspection of all work done by the Superintending Engineer's Department, except contract work.

8th. In the case of contract works, all the necessary plans, elevations and sections are to be prepared by the Chief Engineer, who is also to prepare the samples of materials, to be exhibited to contractors.

9th. He is the Inspector of the Government roads at the Presidency.

10th. He has the direction of the operations at the Paumben Channel.

11th. He directs the annual practice and experiments of the Sappers and Miners.

12th. All the estimates and bills of the Military Department are examined and calculated in the office of the Chief Engineer.

13th. He regulates the supply of instruments and stationery to the Engineer Officers in the Military Department.

14th. The lithographic press is in his office.

15th. He is in charge of the Surveyor-general's Department.

16th. The data and price lists of all the stations in the Military Department are recorded in his office.

17th. He has charge of all plans and maps in the Military Department.

18th. He is required to report his opinion in writing on all projects whatever in the Military Department, and on new projects in the Revenue Department, when he considers it necessary to do so.

197. It will be observed, that several of the items in the foregoing list are entirely of a local character, some being such as to require a great deal of time, while others are of trifling importance. We think that the Chief Engineer should be relieved from all such, and that they should be entrusted to local officers, leaving him at liberty for his general duties. The immediate charge of the fortifications of Fort St. George, of the Glacis, Esplanade and mines, and of the waterworks, would properly vest in the Inspecting Engineer of the Presidency, as would also the inspection of all the work performed by the Executive Engineer, and to the Government roads.

He ought to be relieved from mere local duties.

The Chief Engineer should have the general control of the fortifications, not only of Fort St. George, but of all the forts in the Presidency, and should be connected with them all in the same way; not in immediate charge, but as the controlling head to whom all the local Engineers in immediate charge should make report, and with full power to visit all when on the spot. There are five fortresses besides Fort St. George, viz., Bellary, Bangalore, Vellore, Cannanore and Paulghaut. It might be well to require that all, including Fort St. George, should be annually reported on to the Chief Engineer by the Inspecting Engineers of the divisions in which they are respectively situated, and that the Chief Engineer should make an annual report on the whole to the Honourable Court of Directors. All alterations in the fortifications of Fort St. George should still be submitted to him, and the same as to all the other forts; but the channel should be the same in all these cases, viz., the Inspecting Engineer of the division. At

present an annual committee, composed of the Chief Engineer, the Commandant of Artillery and the Quartermaster-general, assembles to consider any alterations required in the fortifications of Fort St. George; this might still continue.

As for the operations at Paumben, no reason is apparent why the charge of these should be in the hands of the Chief Engineer more than of any other purely local undertaking in the Provinces. We are of opinion that they should henceforward be under the direction of the local Engineer Officer, like any other works in his division, and under the general control of the Board of Works.

The general duties which he will retain.

198. By the arrangement now proposed, the Chief Engineer will be relieved from all immediate connexion with mere local matters. The duties which will remain to him out of the foregoing list will be as follow:—

1st. The general control of all fortifications throughout the country; to receive annual reports on them from the local engineers, and to make an annual report on them himself to the Honourable Court.

2d. To record his opinion in writing on any new project of any kind coming before the Board of Public Works whenever he may consider it necessary to do so, independently of giving his vote upon it as a member of the Board of Public Works.

3d. He will regulate the allotment of instruments and stationery to all Engineer Officers; and this also should be extended to all branches of the department.

4th. He will continue to direct the practice of the Sappers and Miners.

5th. He will still have charge of the department of the Surveyor-general.

6th. The duty of examining and reporting on the estimates and bills in the Military Department.

7th. And of recording the data and price lists of the same department.

8th. The maps and plans of the Military Department will still be deposited in his office; and the same might properly be the course with respect to the maps and plans of the whole of the Public Works Department.

Some other duties to be assigned to him.

199. And to these duties, we are of opinion that the following may properly be added:—

1st. In the data and price lists both of the Civil and the Military Department, but much more especially in the former, there is very great room for improvement. In the Civil Department, indeed, hardly any attempt has ever been made to systematise or arrange them, and we believe none at all to compare the rates and prices of contiguous districts.* There is much to be done therefore in this direction; and as the services of European Overseers come to be more extensively used in the execution of work, the very best materials will be procurable for constructing tables of prices and rates, as a guide in the future projecting and estimating of works, and in a degree in checking bills. Such tables can never be considered perfect, for every year, and almost every work, will furnish additional information, either for new localities, or in correction of former records of old localities; but still they are of no inconsiderable value. The collecting, recording, comparing and circulating the information thus obtained, will require constant care and attention; and it appears to us that the task may properly be assigned to the Chief Engineer.

2d. A kindred duty to the foregoing will be the examination of estimates and bills. At present this examination, as respects the fairness of rates and arithmetical correctness, is made in the office of the Chief Engineer, in the case of all estimates and bills before the Military Board. This course of proceeding has the advantage of relieving the office of the Controlling Board from a great mass of detail; it is found to work well in the Military Board, and

* In the Road Department, the late Superintendent had commenced to form a systematic register of the actual cost of the various parts of all works constructed; in the course of time this would have formed a valuable record of materials for constructing tables of data and prices.

and to prevent delay; and it may well be matter for consideration, hereafter, whether it will not be advisable to continue the practice under the new Board of Works, and to extend it to all branches of the department.

3d. We have seen that the allotment of tools and implements to the various Engineering Officers is a part of the duty of the Military Board. We think that it should be transferred to the Chief Engineer.

4th. When an efficient department of subordinates is organized, it will be essential to provide for fair promotion in it, and we conceive that this will be best ensured by a system of periodical reports as in the Ordnance Department. It appears to us also that the record of the services, qualifications and character of the members of the corps should be made and kept in the office of the Chief Engineer; and that he as the head of the Engineer Corps, is the officer to whom both the promotion, and the distribution and transfers, of the subordinates ought to be entrusted, subject to a certain amount of control on the part of the Board of Public Works and the Government.

We beg to recommend accordingly that the periodical reports on the qualifications and services of the subordinates should go to the Chief Engineer, and that on the occurrence of a vacancy, it should be the duty of that officer to recommend promotion to fill it. It should also be his duty to propose transfers and exchanges when they may appear to him to be necessary; but not so as to exclude the Board from the power of originating such proposals. We further propose that recommendations for promotion in and into the warrant grades should go through the Board of Public Works to Government for confirmation; and that those for promotion below those grades, should have the confirmation of the Board, to be given except on special cause to the contrary.

5th. So also with the commissioned grades; it appears to us expedient that the Board of Public Works should have the recognized power of bringing before Government (when they may think proper) the names of particular officers of the department for promotion to vacancies in it; and that in like manner the Chief Engineer should have the right to lay before the Board his opinion as to the arrangements to be so suggested to the Government. For the transfers of the higher grades, needing the confirmation of Government, the recommendation should go through the same channel; for those of the lower the Chief Engineer should recommend for the approval and confirmation of the Board.

6th. The only other function which we have to recommend for the Chief Engineer is, that of visitor of the College of Engineering, which we shall propose hereafter. It is important that such an institution should have a channel provided by which its wants and defects, and the means of improving it, may be brought weightily to the notice of the Government; and it seems to us that such a channel will be best obtained by constituting the Chief Engineer the visitor of the College; his reports upon it to go through the Board of Public Works.

200. It is certain that the new Board of Public Works with its very much larger duties, will be quite unable to perform the local duties now anomalously discharged by the Military Board. And there is no other office existing competent to assume them; the Chief Engineer, as we have already observed, does not discharge effectively the local duties imposed upon him; under the new arrangements he will have many new and large general duties, and the duties from which it is necessary to relieve the Board, cannot be imposed on him with any possibility of their real and effective performance. In order to provide for the discharge of these duties of local control and supervision, it appears to us very expedient to modify the Presidency Establishment by changing the Superintending Engineer into an inspecting Engineer; to have an Executive Officer under him, with a good establishment of subordinates, for the performance of simply executive duties. The Inspecting Engineer will be charged with the duty of inviting, receiving and deciding on tenders for doing work on contract, as well as preparing plans and samples of materials, and he will have the inspection of all works, whether done by contract or by the Executive Department, as well as of all work on the Government Roads at the Presidency. He will also, on the suggestion offered above, have the duty of authorising petty repairs to buildings, and ordering advances for works to

The Presidency Superintending Engineer to be made an Inspecting Engineer.

With an Executive Officer and distinct establishment.

be done in the Presidency Division, under rules to be stated hereafter; he will be charged with the duty of opening the Cooum and Adayar bars in due time; he will have the immediate charge of the fortifications, the Glacis and Esplanade, the mines, and the waterworks; and, lastly, it seems desirable that the lithographic press, if maintained at all, should be transferred to his charge. There may still be some duties proper to be committed to the Inspecting Engineer we have omitted to notice.

But the number of officers in the Division will need no increase.

201. It does not appear likely that the arrangement now proposed will make it necessary to increase the number of commissioned officers at the Presidency, for though the Superintending Engineer at present has an assistant, yet we think that, with the aid of an efficient subordinate establishment, and especially with some European Overseers, the Executive Engineer will need no Commissioned Assistant, especially if the system of doing work by contract is extended, as we fully believe it may be with good effect when the departments are thus separated. But even if an assistant to the Executive Engineer should be found necessary, the total addition of cost will be very trifling. The number of Government buildings in the Presidency Division is 622, and their present value, as estimated in the books of the Military Board, exceeds 51 lacs of rupees, exclusively of the fortifications and of the works connected with them. And the whole cost of the establishment for the custody and maintenance will be a very small per-centage on this amount; it will be very moderate also with reference to the amount of work done in the division, which averages nearly Rs. 140,000 a year. The details of the salaries and establishments which we propose for this division will be shown in a future section.

Arrangement proposed for Mysore Division and Country.

202. Thus much of the changes to be made at the Presidency; in the interior also it is necessary to make a change in the position of the Superintending Engineers. There are now four Superintending Engineers away from the Presidency, viz., for the Military Divisions of Mysore, Hyderabad, Nagpore and Saugor. The Superintending Engineer of the Mysore Division is purely an Executive Officer as respects the works in the very large cantonment of Bangalore, and in the several subordinate military stations; but, as respects the whole Mysore country, he is also the Consulting Engineer of the Commissioner and of the four Superintendents of Revenue Divisions. Of course he can do little or nothing towards the direct management of the roads and irrigation works of a country 28,000 square miles in extent, especially burdened as he is with executive functions in the military stations, but to a certain extent he is able to give professional advice and counsel. The Mysore country has been for 22 years under direct administration by officers of the British Government, and it is likely to continue so. The same considerations which lead us to advocate a large increase of professional strength in the Company's own territory, make it equally necessary in Mysore. We propose to change the Superintending Engineer into an Inspecting Engineer, with one District Engineer for each of the four Revenue divisions or districts of the country, and an Executive Officer for the extensive cantonment of Bangalore.

Arrangement for the Saugor Division and territories.

203. The Superintending Engineer of the Saugor Division has a charge geographically still more extensive; it embraces the whole of the Saugor and Nerbudda territories, 29,504 square miles, including six small states within the territories and under management; and besides this, there are the cantonments and stations of Mhow, Indore and Bhopaul, and considerable lines of road within the territories of the Indore and Bhopaul States and in Bundelcund. There are large expenditures on some of the great lines of road, and all the buildings in the various stations require to be attended to; but we believe there are no Government works of irrigation. We have already said that the division is subdivided into four circles, of which the Superintending Engineer has immediate charge of one, while the other three are under the charge of the same number of Executive Engineers or Officers; but it is in contemplation to relieve the Superintending Engineer from all executive functions, and restore him to his proper position of general control. We propose that this arrangement shall be completed and made permanent; that each of the four subdivisions shall be under an Executive Officer, and that the title of the Superintending Engineer shall be changed to that of Inspecting Engineer.

Arrangement proposed for the Hyderabad and Nagpore Divisions.

204. The Superintending Engineers of the Hyderabad and Nagpore Divisions are simply Executive Officers, and there is no Inspecting Department. We propose

pose to abolish these two appointments, and to have in lieu an Executive Engineer at Hyderabad and at Nagpore; and we further propose that the Executive Engineer at Nagpore shall be under the Inspecting Engineer of the Saugor Division, and the Executive Engineer of Hyderabad under the Inspecting Engineer of the Third Division; which, as to be hereafter proposed by us, will comprise the districts of Masulipatam and Guntoor. It will rarely be necessary that these stations at Nagpore and Hyderabad should be visited by the Inspecting Engineers; but those officers will be the channel of communication between the Executive Engineers and the Board, and will relieve the latter from some detail. In consideration of the distance of these two stations from the inspecting authorities, and of the military position of the two subsidiary forces beyond the frontier, it seems expedient that these two Executive Officers shall always be from the Engineer Corps.

At present Jaulnah is not under the Superintending Engineer of Hyderabad, but is under the separate charge of the Staff Officer of the station, who corresponds direct with the Board. There is a good deal of work there, more indeed than at Hyderabad itself; and we recommend that it shall be made an out-station under the Executive Engineer of Hyderabad, and that a European subordinate of the department shall be stationed there. The foregoing arrangement will fully provide for all the duties to be done in these two divisions. Each of these two Executive Officers will occupy a sphere of duty much less important than that of a District Engineer within the Provinces or in Mysore, or of an Executive Officer in the Saugor Division.

205. With regard to the stations within the frontier, we do not propose much change of system; the rules of the 26th June 1846, which now regulate this part of the department, are good, and seem to require no alteration. The difference will be in a more efficient working of them, by means of better establishments. At the chief stations, Trichinopoly, Masulipatam, Vellore, Arcot, Bellary, the buildings will still remain under the charge of the Station Staff Officers, who will continue to execute the works required, under the same system of direction and control as at present. The establishments at those stations will share in the general improvement of the qualifications of all the subordinates in the department; and the local Engineer Officers will have much more time to spare to help the Staff Officers with professional advice, and to inspect the work. The Civil Engineers are required even at present to report on the state of the buildings at the military cantonments they may visit; but hereafter they will be able to do this much more systematically and fully. In short, all the duties of the Engineers being performed under the direction of one controlling body, every part of those duties will receive its due attention, and all will be made to harmonize and fit into each other, in the manner the most conducive to economy of time and labour.

The stations within the frontier.

So also of the work at the smaller stations, where there is no Staff Officer: it will often be possible to arrange for the execution of such work under the superintendence of a subordinate of the department, of suitable rank and qualifications; and it will probably be rarely necessary to employ on this duty young regimental officers wholly inexperienced in it, in the mode which we have instanced above in the case of Ramnad. The precise mode of executing work of this description will be spoken of more properly in connexion with the execution of work in the country generally, which will be treated of in our report on the accounts of the department.

SECTION V.

Proposal of a New Board of Public Works.

206. HAVING thus detailed the existing state of the Public Works Department in all its branches, and the defects apparent in it, we now come to the consideration of the changes which we think expedient, in order to increase its efficiency. And in bringing forward our proposals to this end, we shall adopt the following order.

Order of treating the various subjects of Report.

We shall first set forth our recommendations respecting the chief controlling authority, its constitution, and its duties.

We shall then proceed to consider the local or provincial parts of the Public Works Department. And in order to forming a judgment of the strength and organization proper for them, we shall examine into the work to be done as respects both irrigation works and communications; and shall state what appears to us a fitting scale of expenditure on each. We shall then be able to judge what quantity and what kinds of control and superintendence the execution of that work will require; and we shall discuss that question with reference to officers of all grades, commissioned and other, European and Native; stating also our views as to the best mode of providing and training a succession of such officers in the several grades.

Existing defects briefly recapitulated.

207. First then of the supreme controlling authority. In speaking of the Public Works Department of the Board of Revenue as it exists at present, we pointed out how much its business has increased of late years; and we observed that as the revenue members of the Board are much taken up with their revenue work, and as the Chief Engineer has two other offices to attend to, and his own proper office where he usually sits is at a distance from the Board's office, the whole labour of the Public Works Department of the Board, with a very large part of the responsibility, does in fact devolve on their Secretary, fortunately an able and indefatigable officer. We remarked, likewise, that this circumstance, and the constant pressure of matters of detail, have operated to prevent the Board from taking that large and comprehensive view of the wants and capabilities of the country in connexion with this department, which belongs to a controlling authority, and that they have not even collected any general or systematic information as to the condition of the existing irrigation works.

In reviewing the Road Department, we pointed out that the cause which led to the creation of that department under the late Government, was the failure of the Board of Revenue to give that degree of attention to the communications of the country which the Marquis of Tweeddale justly felt to be due to them; an omission, however, excused by the heavy pressure of the other duties of the Board, and by the discouragement with which all proposals for improving the roads had up to that time been received by the Government. We also pointed out the anomalous and false position of the Superintendent of Roads, constituted the controlling authority as respects the great roads, and required also to execute works over a very large extent of country; but yet left dependent for assistance, in those parts of his extensive charge where he could not be present himself, or detach either of his two assistants, on such aid as he could obtain from the Civil Engineers, who were in no degree under his orders, and who had their own proper work to attend to, and that more than enough to occupy all their time. And we showed how completely that department has failed, and from causes inherent in its constitution, to effect the good expected from it.

In speaking of the Military Board branch of the Public Works Department, we further noticed the great disadvantage under which that Board lies, in not having under its orders officers of the Engineer branch of the service to execute work in the provinces within our own frontier, and the damage thence accruing to the public service.

Plan of uniting all public works under one Board.

208. These circumstances led us to discuss carefully the scheme of annulling the present system of control, and creating in lieu of the three distinct superior authorities now existing, one Board to have control over public works of all kinds.* It appeared to us wasteful and unwise to have several controlling offices, each ignorant of the operations and the experience of the others, and two of them at least deficient in professional strength, and other two destitute of agents in the provinces; when by a union of all, the experience of all would be concentrated, the professional skill available would be most efficiently employed, and the local agents would be all under one head, and their services would be turned to the best account.

The total annual expenditure very large.

Our conviction of the necessity of such a change was strengthened when we turned

* The plan of a Board of Public Works is not a new proposal; it has been suggested at various times when the Government have been impressed with the necessity of modifying the present system; and it was lately urged by Major Pears in his Minute in the Military Board of the 24th December 1849, which was sent down for our consideration by the Government. It was also contemplated by the Honourable Court in their despatches, No. 4, of 31st March 1830, and No. 19, of 28th October 1835.

turned to the amount of the annual outlay. The statement in Appendix (Y.) brings together the whole expenditure on public works in all branches for 11 years, as far as we could collect it from the books of the Accountant-general. It will be there seen that the total sum spent in one year, under the control of the public works authorities, has already risen to above 24 lacs of rupees; and there is no doubt that this outlay will and ought to be considerably increased. The control of this large expenditure is now divided among a number of Boards and individual offices, with little attempt at system or order, so that the total outlay is never presented to Government at a single view, and some not inconsiderable items are liable to be left out of sight altogether.

209. We considered the following conditions essential to the efficient administration of this branch of the public service. That the works chosen for repair or construction should be carefully selected; that the aggregate expenditure allowed should be distributed in the best possible manner, with reference to the general interests, and not to local or accidental circumstances; that the control should be sufficiently close to ensure good execution, so far as that could be secured by the diligent use of the best means available; that results should be carefully ascertained and recorded for the information of Government; and that the controlling office should be able to ascertain and to inform Government who among its officers were doing their duty zealously and efficiently; and who in a merely perfunctory manner; so that the activity of all might be aroused by appropriate stimuli. It seemed clear to us, that considering the magnitude of the charge, these essentials of an efficient control could only be attained by means of a Board strong in the qualifications of its members, and having full time to devote to this duty; and the same considerations, viz., the magnitude of the interests concerned, both pecuniary and general, made it clear to us that it would be well worth while to attain the object by that means, especially as the cost would not be great.

The essentials of an efficient controlling authority.

210. Various considerations led us, decidedly, to prefer a Board to an individual officer; in the first place, a Board is permanent, and the personal experience and knowledge of individual cases obtained in the course of business, is not lost to the department on every one of the changes of officers, so frequent in this country:—

Reasons for preferring a Board to an individual officer.

2d. The work to be done would certainly be vastly too much for any single officer, even with an ordinary assistant; and either it must be incompletely done, as we are so anxious that it should not, or the officer at the head of the office must be provided with one or more assistants of standing and experience, who would in fact share his work, though not ostensibly his responsibility, and upon whom he might be tempted to throw too large a share of it.

3d. The Department of Public Works is one in which it is pre-eminently undesirable that all questions should be decided by the judgment of any one man, however able; and many questions would occur, in which Government would justly feel that it could not cordially and confidently accept the decision of an individual at the head of the department.

4th. The variety of the works coming under the Board's cognizance being so great, and the geographical extent of its jurisdiction so large, the varied experience of the members composing it, both as to place and as to species of occupation, would be in itself an advantage.

5. Although the two qualities of promptitude and direct responsibility are supposed to belong only to the agency of individual officers, still it is certain that the former may be secured in a Board also, by proper arrangements; and we believe that the latter may be obtained, in a high degree, in a Board composed of a small number of members carefully selected, by giving the free right of recording minutes of dissent, and of sending up such minutes to Government.

211. Such are the considerations which lead us to recommend most strongly the creation of a single Board of Works. We have looked at the question in a practical point of view, and with particular reference to the circumstances of this Presidency, and it is in that spirit, we think, that it ought to be determined. The Honourable Court indeed (Despatch para. 63) dwell on the importance of assimilating the system of superintendence at all the Presidencies, but we beg respectfully to express dissent from that opinion. We would remark, in the first

We have discussed the question with special reference to the circumstances of this Presidency.

place, that even if any one system could be pointed to as having been tried and proved to answer perfectly well under certain circumstances, yet other circumstances might make it unsuitable elsewhere. And we conceive, that the mere facts that a large part of the revenue of this Presidency depends on the works of irrigation, and that much more than one-half of the whole expenditure on public works is devoted to the maintenance and improvement of irrigation, are alone sufficient to make a system that may be suitable to Bengal or Bombay, not necessarily applicable here.

But even if this objection did not exist, no perfect or even eminently successful system can be appealed to in any part of India. On the contrary, all the objections urged against the working of the Madras system, such as inadequate and ill-considered estimates, long delay in settling bills, and great cost of superintendence, appear to be found in a still greater degree at the other Presidencies. There is no existing system then, that can be proposed as a model; and any new system must be an experiment. We propose that one, which after careful consideration we fully believe to be the best adapted to work well at this Presidency; but we do not recommend it as the best for the other Presidencies, nor, on the other hand, can we admit that the best plan there will of necessity be the best here.

Proposed composition of the Board of Public Works.

212. We will now state what appears to us the best constitution for the Board of Public Works.

Under this Presidency, the class of officers most conversant with the wants of the country, as respects both works of irrigation and roads, are the Collectors. The intimate connexion of the former class of works with the land revenue, renders them special objects of a Collector's attention; and as regards roads, the Collector from his constant intercourse with the people of his district, his periodical tours throughout it, and his familiarity with the natural features, the peculiar products, and the resources of every part of it, both inform him of the actual state of the roads, and give him the means of forming the best opinion as to the want of new lines or of improvements, and of ascertaining the results. It is the duty of the Collector, therefore, to propose projects of improvement for the investigation of the local Engineer, and he is likewise required to give his opinion on the expediency of such as may originate with the latter officer. Thus the two officers work together; the Engineer aiding and co-operating with the Collector; and it appears to us that the same species of combination should be secured in the Board of Public Works. The aid and counsel of an experienced Collector will be valuable there, and the more general views of such an officer will be of use in qualifying the otherwise too exclusively professional character of the Board; a further reason making it expedient to have in the Board a civilian of some standing, is that the Board will have much intercourse with the Collectors, and will be the referee in all cases of disagreement or difference of opinion between them and the engineers.

One member to be from the Civil Service.

213. We inclined at one time to the opinion that these requirements would be met by giving to some one member of the Revenue Board a seat also in the Board of Public Works; but on further consideration, we come to the conclusion that this arrangement would be a failure, that such an *ex officio* member would give nearly the whole of his time to his revenue duties, and would be unable to take any active part in the business of the Board of Public Works, as is actually the case now with the Public Works Department of the Board of Revenue. We felt that the department is of such a degree of importance, that the question of mere economy ought not to interfere with its being made quite efficient; and we resolved to recommend that the new Board should always contain a civil servant, holding that as his substantive appointment. One provision, however, seems necessary; it is undesirable that the changes in this appointment should be very frequent, and we beg to suggest that the holder of it should be eligible and entitled to rise in promotion with the members of the Revenue Board, without quitting his seat at the Board of Works. In other words, we propose that the civil member of the Board of Public Works should be regarded as on the same list with the members of the Board of Revenue, and that he might be either 2d, 3d or 4th in the list, according to circumstances. It may be expedient that the highest on the list should always be at the head of the Board of Revenue.

The Chief Engineer;

214. The Chief Engineer should be *ex officio* a member of the Board of Public Works, both in order to keep him in his proper position as head of the Engineer Corps,

Corps, and to give the Board the advantage of his experience. His services being no longer required in the Military Board, and as he will be relieved from all concern with the miscellaneous work of that Board, he will be able to give more time than at present to the Public Works Department. His counsel and opinion will often be very valuable; but considering that he will have his own duties as Chief Engineer to attend to, and bearing in mind the contingencies of an appointment, the succession to which is regulated wholly by seniority, it would be unsafe and inexpedient, in an office of such importance as the Board of Works, to reckon upon much real work in that Board from the Chief Engineer.

To complete the Board, we propose to constitute two salaried members, taken from the Engineer Corps; and as it will be essential to the right working of the Board that both these members shall be really efficient men, we consider it to be of the first importance that they should be selected, not on the principle of seniority, but with sole reference to their proved talents, activity, and special fitness for the office. We are aware, indeed, that no formal rule of this kind can entirely shut out the possibility of an occasional misuse of patronage in the appointment of an ill-qualified officer; but we cannot but hope that in so important an office private interests and regards will generally be postponed to a regard to the public good, and we think it far safer to trust to this reasonable expectation than to give any place to the other alternative, a nomination in virtue of seniority.

Two salaried professional members;

Lastly, the Board must have a Secretary, who should be an Officer of Engineers; but as we think it essential that all the real work of the Board shall be done by the members, more particularly by the Stipendiary Engineer Members, the Secretary will be strictly a ministerial officer, and his duties will be confined to conducting all routine business, and superintending the office establishment. We are of opinion, therefore, that he need not, and indeed ought not, to be an officer of very high standing. He should be one who has had some experience in the department in the Provinces, that he may be familiar with its work, and he should be in such a position as to salary, that his next step in promotion would be the post of Civil Engineer, and not a seat in the Board.

And a Secretary.

215. A Board thus constructed would be found, we think, fully equal to the efficient discharge of the important duties entrusted to it; but we also think that those duties would fully occupy its time and attention. We may add, that part of our plan is, that of the three Engineer Members of the Board, one or other should be available, at the pleasure of Government, to travel occasionally into the interior, to report on any large project before the Board, to visit a large work in course of execution, or for any other suitable object.

One of the members might travel.

Considering also how important it is that Government should fully understand the bearing and merits of projects laid before them by the Board, and how much more readily and effectually this knowledge may be conveyed by a little personal explanation than by correspondence, we think it very important that whenever any such project shall be before Government, one or more of the professional members of the Board of Works shall be called into the Council-room to furnish the explanation required. The adoption of this plan would do very much, we think, towards expediting the dispatch of business, and avoiding much tedious correspondence.

Personal communication with Government.

216. With regard to the salaries to be given to the new Board, that of the Civil Member must be such as to make the appointment an object of desire to a Collector; such as to enable Government to select the fittest from the Collectors. Associated with the condition or tacit understanding that progressive increase of salary should be given in the mode above explained, Rs. 2,800 a month would probably be sufficient to ensure a willing acceptance of the office. We would propose that as the salary of the new appointment, to be held indifferently by the civil member of the Board of Public Works, or by the junior member of the Board of Revenue, as the case may be. We propose that the salaried engineer members of the Board shall receive Rs. 1,100 each, in addition to the full regimental pay and allowances of their rank; and that the Secretary shall receive Rs. 500 a month, in addition to his full regimental pay and allowances. All staff salaries in the Engineer Corps are in addition to full regimental pay and allowances, and it seems to us inexpedient to introduce a new practice for these three appointments, even if the old one were not the best, as we think it is.

Proposed salaries of the members;

The Chief Engineer receives Rs. 1,250 a month staff salary, and the Superintending Engineer at the Presidency receives (with his salary as Civil Architect)

Rs. 1,063. 10. 11.; all other staff salaries in the corps are inferior to these. It is obviously right that the post of Chief Engineer should be the most lucrative in the regiment; but no less certainly, the appointments in the Board of Works ought to be inferior to none but that. Again, when we compare the emoluments which we propose for them with those received now by stipendiary members of the Military Board and other officers at the Presidency, we find the former to be the smaller. A member of the Military Board receives *Rs.* 2,000 a month staff salary, in addition to his regimental pay only, and the comparison of the four appointments will be as follows: *

RANK.	Chief Engineer.	Superintending Engineer, Presidency Division.	Stipendiary Member of the Military Board.	Member of the proposed Board of Public Works.
	<i>Rs. a. p.</i>	<i>Rs. a. p.</i>	<i>Rs. a. p.</i>	<i>Rs. a. p.</i>
If a Captain - -	1,714 - -	1,497 4 11	2,121 12 -	1,533 10 -
If a Major - -	2,039 3 -	1,824 13 11	2,183 10 -	1,850 3 -
If a Lieutenant-Colonel	2,282 4 -	2,014 14 11	2,243 8 -	2,102 4 -
If a Colonel - -	2,545 5 -	- - -	- - -	2,396 5 -

It is obviously expedient that the emoluments of the appointments in the Board should be liberal, and we think that those which we propose cannot be considered by any means exorbitant.

And of the Secretary.

217. With regard to the Secretary, the staff pay of Civil Engineers is *Rs.* 700; that of a First Assistant Civil Engineer at present is only *Rs.* 200; but we shall propose below, for reasons to be stated, that it shall increase by gradations as far as *Rs.* 500. Our object being to give the power of selecting the best man from the First Assistant Civil Engineers (or District Engineers, as we propose to call them), for the office of Secretary to the Board, we would fix the salary of the appointment at this latter sum. It is true that this would not attract one of the highest grade; but if a man be of superior excellence, he will have been selected for the post before he has reached that grade; and, again, an officer of that grade, if put in, would hold the situation but a short time before he became eligible for that of Civil Engineer, and then he would be anxious to get away. On the other hand, *Rs.* 500 will be an object to all the First Assistants below the highest grade; and yet, considering the necessary expenses of the Presidency, it will be no exorbitant offer; and, being once settled at the Presidency, an officer will generally be disposed to stay till he can go up country as Civil Engineer. We will only add, that, in order to insure the services of men with some experience, we would limit the appointment to officers who have been not less than six years in the service, and who have had not less than three years actual work up the country as Assistant to a Civil Engineer.

Appointments to be abolished.

218. Our plan will relieve the Military Board of all concern with public works, and this will so much diminish its duties, that one of its stipendiary members may be dispensed with; and we should observe that our third member, Major Balfour (himself a stipendiary member of the Military Board), fully concurs in this opinion, provided the departments still remaining to the Board are brought into fully efficient

* We annex also a statement of the salaries of some other of the Chief Staff appointments at the Presidency.

RANK.	Quartermaster-General.	Commissary-General.	Deputy Commissary-General.	Mint Master.
	<i>Rs. a. p.</i>	<i>Rs. a. p.</i>	<i>Rs. a. p.</i>	<i>Rs. a. p.</i>
If a Captain - -	2,121 12 -	- - -	1,479 - 11	1,750 - -
If a Major - -	2,183 10 -	- - -	1,822 13 4	1,750 - -
If a Lieutenant-Colonel	2,243 8 -	2,432 13 0	2,065 14 11	1,750 - -
If a Colonel - -	- - -	2,493 13 9	- - -	- - -

efficient working order before the change takes place. The part of the office establishment now allowed for the Engineer branch in the Military Board may be spared to the Board of Public Works. We may add, that as the new arrangement will take two members from the Military Board (the Chief Engineer and one Stipendiary), leaving only two members (viz., the Commandant of Artillery and one Stipendiary), it may be expedient to strengthen it by again giving seats *ex officio* to the Adjutant-general and Quartermaster-general of the Army. The appointments of the Superintendent of Roads, and of the Secretary to the Board of Revenue in the Public Works Department, will likewise be discontinued, and the salaries of those appointments will cease.

We may add, that, considering the present salary of the Secretary to the Board of Revenue in the Department of Public Works (viz., Rs. 1,240) and that now proposed as sufficient for the Secretary to the new Board of Public Works (viz., Rs. 756), we think it open to inquiry whether the salary of the Secretary to the Military Board, which now amounts,* with regimental pay and allowances, to Rs. 1,540 as Captain, may not properly be diminished. It seems doubtful also whether the services of the Assistant Secretary, who receives Rs. 500 staff pay, might not be dispensed with.

219. The new Board should have the whole control and direction of all public works, civil, military and miscellaneous, throughout the Presidency; viz., all irrigation works, roads, canals, railways, barracks, fortifications, revenue, judicial, military and general buildings, lighthouses, harbours, beacons, &c. With regard to the immediate functions of the Board, it appears to us that the duties of such a Board should be controlling only; and the more we look into the practical working of the existing system, the more the conviction is forced upon us that the present Board has too much forgotten its position of control. One of the chief duties of a controlling Board should be to take a general view of the whole country, and of its capabilities and requirements in every part, and to see that every province and every branch of improvement shall receive its due share of attention. This important duty appears to have been too much neglected. We have no periodical reports as to the state of the existing irrigation works; no record of their past and present condition of repair and productiveness; nothing to show whether they now yield more or less than formerly, and for what reason. Again, there are no comparisons of the scale of expenditure in one district with that of an adjoining one; no inquiry why so many projects of improvement came up from one division, and few or none from another; why one Civil Engineer inspects three-fourths of the work of his division, and another not one-fourth. And so also with roads: it must be admitted that the position of the Board of Revenue with respect to road improvements has been very discouraging, from the disfavour with which such proposals were received by Government; but still it might have been expected that the few which they did send up should have been the best possible. But the selection seems, in fact, to have been based on no general view; where a deserving project was sent up to the Board, it received their support; but no general inquiries appear to have been made as to the course of trade, or the most productive lines of road to repair or open. In short, the adoption of roads or districts for improvement has depended almost entirely on the accidental circumstances of the character of the local officers. Where the Collector and the Civil Engineer were active and able men, much improvement was effected; but where they were indifferent, nothing was done.†

The Board's duties should be those of control; and it should not be burdened with detail.

220. We

* The Secretary to the Military Board receives Rs. 1,400 staff pay, in addition to his bare regimental pay, which latter varies a little, according to his rank and the branch of the service to which he belongs.

† In connexion with this subject, we beg to subjoin an extract from Lieut.-Colonel A. Cotton's reply to one of our queries; "I think, however, there is the most serious possible deficiency in the documents called for by the Board, inasmuch as the fundamental one, an annual complete report prepared by the head of the department from the divisional reports of the same kind, has never yet been prepared. While the business of the department is carried on by detached pieces, without a concentrated view being taken periodically of the whole, there cannot possibly be anything but confusion and anomalies throughout. How has it happened that one district, and even one talook, has been watched over and improved at a great expense, and another without any conceivable reason has been totally neglected; but from this unaccountable neglect of so obvious a measure, as that of calling for a document which should show the progress that had been made in every part of the Presidency, at one view. Nothing can be more obvious than this principle, a principle acknowledged in almost every other branch of the service, that at least once a year we should thoroughly examine our position;

Proper mode of exercising control.

220. We are most anxious to obviate this evil in the new Board. We propose to lay upon it large duties of control, such as have never been exercised by the existing Boards; but we think it essential that it should be relieved from duties of detail.

It should be the duty of the Board rather to control and direct operations, and to check and examine results, than to interfere with details which may be better left to the local officers. We conceive that the proper method for a controlling Board to exercise its functions is by general rules, leaving cases and details within those rules to the discretion of the subordinate authorities, whose proceedings should be brought annually under review by detailed reports. In the Public Works Department in particular, the essential character of the work makes it necessary that power should be entrusted to the local officers. And Government have in the Collectors and Civil Engineers a body of able and zealous servants, well qualified to judge of the wants of their districts and divisions, and to devise means for supplying them. A Collector is thought competent to exercise very large discretionary powers in connexion with the settlement and collection of the revenue, and is vested with the chief control of the magistracy and police among a million or a million and a half of people; his opinion is almost necessarily adopted as to improvements to be made, whether in irrigation works, roads, or buildings; and the expenditure of very large sums annually on public works is left to his management. But, though thus largely trusted in these various ways, the Collector is inconsistently devoid of any power to authorize an improvement to the most trifling amount; and even as respects mere repairs, his powers are very much restricted, with the single exception of irrigation works, in which more latitude is necessarily allowed. This system appears to us to be very impolitic. After all, the Government are obliged to act on the opinion of the local officers; and the evil of the present system is, on the one hand, that work admitted to be necessary or beneficial is delayed; and on the other, that the zeal of officers is chilled by the display of want of confidence on the part of Government. In this and other similar instances, it appears to us that it would be better to give power and so derive advantage from talents and activity; and to take due notice of all cases of its misuse or abuse, and so maintain a guard against carelessness or misconduct.

Present absence of power in the local officers, Civil and Military, as to authorizing repairs.

221. Under the present rules no repairs to buildings in the Civil Department, even of the most trifling and ordinary character, except petty repairs under *Rs.* 20, can be ordered by the Collectors, without the previous sanction of the Government, obtained through the Board of Revenue. The delay thus occasioned increases, almost of necessity, the damage to be repaired; and it sometimes happens that when the authority for the work is received, the estimate has become insufficient, and a fresh one has to be prepared and sent up for sanction. It is the same with roads; except in the few cases where the Government has granted a yearly allowance for keeping in repair a certain pass or piece of road, no repair of the most trifling character can be executed without a formal and detailed estimate, which must pass through the various offices of the Civil Engineer, the Collector, the Board of Revenue, and the Government, and back again, before the work can be put in hand.

In

position; see what progress we have made in the different districts; what results have been obtained; what has been overlooked; what remains to be done; what mistakes have been made; what encouragement there is to go forward, &c. &c. Is it possible that if such a review had been regularly made, some districts, many talooks, and thousands of works could have been almost or altogether neglected or lost sight of? Who, at this moment, can answer these questions; what amount of revenue is dependent upon irrigation works? What ought the existing works to produce if in good order; what, if certain obvious alterations or improvements were made in them; what proportion are now in tolerable order; what in a moderately effective state; what in a disgraceful state of neglect? What have been the results upon the whole, of the management and expenditure in the department? What proportion of new works or alterations have been profitable, and in what degree, and what proportion have been failures? What has been the loss of life, or revenue, or property, clearly attributable to neglect of obvious means? How often do we hear men talking of making a saving by spending less money on public works, without the knowledge of a single fact that would show whether the waste of public property is occasioned by spending too much or too little? How is it that every cook-room in a cantonment is examined, to ascertain whether sufficient money has been spent on it in the past year to prevent a needless waste in repairs in the following one, while any amount of loss may be incurred in the neglect of the most important and valuable works upon which the very lives of the population depend, without any document being required which should secure such a mistake being brought to notice."—Letter, 26 April 1851.

In the case of irrigation works, the importance to the revenue of their timely repair has led necessarily to the concession of a much larger amount of power to the Collector; and all repairs to those works, whether of an ordinary or emergent nature, may be authorized by the Collector. But even here the meaning of the term "ordinary repairs" has been narrowed of late years, so as to exclude some things formerly included in it. And we cannot but observe how inconsistent it seems that an officer who is empowered to expend 20,000, 50,000, and even a lack of rupees a year, at his own discretion, on works of this nature, is not permitted to disburse so much as even Rs. 100 on buildings or roads,* although those works from their very nature need repair not less certainly than tanks and channels, and although there would be precisely the same guarantee for the right exercise of the power.

In the Military Department, as we have already seen, there is considerably more license; Commanding Officers of Divisions are empowered to expend Rs. 50 every six months on each building, however small; and in case of any repair that can be said to be "emergently" required, they are authorized to lay out Rs. 500 on any one building. Here again is an inconsistency, to allow a measure of power to one class of officers, which is refused to another class, who in other ways are entrusted with much larger powers than the former.

222. Thus much of estimates: as regards bills, there is a still more jealous concentration of power. In the Civil Department every bill is required to be submitted for the special sanction of the Government. The expenditure has already been authorized on the estimate; but still, whether the actual cost exceeds the estimated, or whether it falls below it, the submission of a bill for the actual amount is alike imperative in every case, and the charge is not passed in the offices of account and audit till this has been done. The only exception, if such it can be called, is that in the case of the bills for petty repairs executed without previous sanction to travellers' bungalows, those of each district are submitted in a single view. But the amount of expenditure under this discretionary power is extremely small.

All bills require the special sanction of Government.

In the Military Department, again, there is rather more license than in the Civil. The Military Board is empowered to pass the bills for all the petty and emergent repairs spoken of in the foregoing paragraph, merely notifying the amount for the information of Government. Another instance, showing that these two branches of the Public Works Department have been too little considered together, and that there has been too little pains to apply to one of them, general rules adopted in the other and equally applicable to both. In that branch which is certainly the more orderly and systematic of the two, this small measure of independent power has been accorded to the controlling Board; while in the other branch, in which a much larger license of expenditure on certain classes of works is given to the local officers, this trifling power is withheld.

The Government has not the means of really dealing with the details of bills; and it is almost superfluous to say that the real check afforded by their submission in that form is nothing at all, as we shall explain more at large in speaking of the bills. But it bears the semblance of effective check; and with that prevailing jealousy which so much characterizes the system, the power is, for the sake of that semblance, taken from the controlling Boards, which have the means of exercising it efficiently, and added to the mass of detail which from all departments takes up so much of the time of the Government.

223. We are of opinion that the practice may beneficially be altered, as respects both estimates and bills. It appears to us to be a waste of time for the Government, or the Boards, to be engaged on operations which could be done as well or better by the subordinate authorities, viz., by the Boards or by the local authorities respectively. And it is more than waste, it is a positive evil, for either the Government or the Boards to be charged with duties which they cannot perform in reality; that their sanction and approval should be necessary in cases wherein the real decision must be made by a subordinate authority, and wherein not only the facts

More latitude should be allowed on both points.

* To avoid the appearance of unfairness, we may here advert to the fact that every Collector has a small sum annually at his disposal for the repair of the roads. The amount is almost too absurdly small to be spoken of in serious terms: it is equal to one anna (three half pence) a year to each square mile of territory, or one rupee a year for every 2,750 inhabitants.

but even the opinions on which the resolution of the higher authority is based, must be obtained from such subordinate.

It is certain that all works need repair from time to time; but as to the exact time and species and amount, neither the Board nor the Government can possibly form an opinion; they necessarily take that of the local officer. So also with bills; Government has not at all the means of judging whether the sum charged is exactly right; the controlling Board has the means of doing this in a degree, but the Government not at all; it must necessarily adopt the Board's opinion, or differ from it on grounds of supposition only. One valuable guarantee for the right exercise of power is responsibility, when those who have the means of forming a judgment have the duty also of carrying that judgment into act; under the present system a superior power steps in, adopts the opinion without an intelligent knowledge of the grounds of it, and relieves the subordinate authority from the responsibility.

General principles recommended.

224. In treating of estimates and bills, we shall hereafter notice this matter in more detail; we will here only state the general principles which we think should be adopted. They are; 1st. That all repairs to buildings as well as to irrigation works should be undertaken by the local officers without the previous sanction of higher authority. 2d. That the same should be the case with regard to made roads; but that the plan of a permanent allowance for the repair of every such road, a plan which has been fully approved by the Honourable Court, should be generally adopted. 3d. That bills for repairs should be passed by the controlling Board without a reference to Government. 4th. That in the case of new works or improvements; when an estimate has been sanctioned by Government, the bill for the work should be finally passed by the Board, unless it exceed the estimate by a certain per centage to be fixed. 5th. That the operations of the Board under the preceding four rules shall be brought under the review of the Government in periodical reports. We are fully convinced that an annual report from the Board showing the expenditure in repairs to the various buildings, and the time when last repaired, and explaining any particular circumstances, would be far more useful to Government, would be a far more real and effective check on wasteful outlay, than the present plan of submitting all the bills in detail for sanction.

Already for the most part in operation in Bengal.

And we may observe that although these propositions may have an air of strangeness and novelty here, they are nearly coincident with the long established practice in Bengal. We give in Appendix (O.) a letter from the Military Board at Calcutta to the Board at Madras (dated 22d June 1852), certifying the practice there, as to the sanctioning of estimates and passing of bills, and we request attention to it.

Some power should be given to the local officers and to the Board of Works, in authorizing improvements also.

225. Nor indeed is this all that we shall propose; we think it will be expedient to go further, and to allow some discretion to collectors in undertaking not merely repairs, but also improvements in irrigation works and roads within certain limits. Several of the Collectors whose opinion is most worthy of consideration press the necessity of this measure, as essential to enable them vigorously to carry out improvements, and in order to prevent the delays which under the present system often postpone for years the execution of projects of acknowledged utility, and of insignificant cost. We fully concur in this opinion. Hitherto, indeed, though the ruling authorities have admitted in general terms the importance of promoting improvements, yet the view practically acted on has been that all expenditure is an evil, and that it is the duty of the controlling authorities to check it with but little reference to the valuable return to be obtained. But if this view is abandoned, and if it comes to be cordially recognized that such improvements are desirable, and that they are worth more than their money cost; if in short the Government really determines to enter on a course of increasing the resources of the State by investing capital in the roads and irrigation works, then it will be absolutely necessary that the power to authorize such expenditure should be in some degree localized, and should cease to be exclusively centred in the Government. In treating of the accounts of the department, we shall state the measure of discretion which we would propose at present; it will not be large, and if it is granted, it will probably be found expedient to extend it in a few years. With the same view of diminishing centralization, and of giving power in proportion to knowledge and the desert of confidence, we shall also propose that the Board of Public Works shall have the power to sanction new works and improvements, within certain limits larger than those prescribed to the Collectors.

226. We have stated our opinion that the control of Government over the ordinary proceedings of the Public Works Department should be exercised, as in other departments, rather by means of periodical reports, general and detailed, than by an investigation of individual cases; we will now describe the reports which for this purpose we think should come before Government :

Annual reports to be made to the Board of Works ;

1st. Detailed annual reports shall be made to the Board of Public Works by the Collectors and Inspecting Engineers, both on the irrigation works and the roads in their districts and divisions. Those of the former will have more reference to the effect of works as exhibited in the revenue and the traffic, those of the latter will have more reference to the professional condition and aspect of the works. Both officers will report the general condition of the works of their districts, and both will detail the work of all kinds done in the course of the year under report, the Engineer Officer referring more to the execution, as to its rapidity, cheapness and efficiency, the Collector giving an exposition of his own proceedings under the discretionary powers of sanctioning work vested in him.

The Inspecting Engineer will also report on the work performed to public buildings :

2d. In the same manner the Inspecting Engineers beyond the frontier and at the Presidency, will submit detailed annual reports of the work done in their respective divisions.

3d. The Board of Public Works will carefully revise these reports, and will lay them before Government, with their own remarks. In these remarks they will specially notice the proceedings of the Collectors under their discretionary power of sanctioning improvements, and state their opinion how far those proceedings have been judicious or otherwise.

And by the Board to Government.

4th. The Board will also make a full report of their own proceedings under the powers vested in them, both as to authorizing works and sanctioning bills. They will submit statements of all the improvements or new works of all kinds which they have authorized, with the grounds on which they acted in so doing. And they will report on all the works for which they have passed bills in the course of the year; especially noticing not only how far the bills individually and collectively have agreed with or differed from the estimates, but also how far the rates charged for work have been fair and proper.

5th. They will also specially notice any cases in which rates may have been higher than ordinary, with the cause; and on the other hand any in which they have been reduced by good workmanship or good management. They will also notice any delay either in executing work or in submitting bills.

6th. They will submit detailed information as far as the nature of the case admits, respecting the result of irrigation works and roads improved or constructed in former years; procuring from the Collectors for this purpose all the information obtainable, and carrying on the record for as many years after the completion of the works, as the Government may be pleased to order.

Lastly. They will notice those districts or divisions in which the work of the department appears to be actively and effectually conducted by the several officers, and those where things are in a less satisfactory state, explaining the cause in both cases as far as they may be able.

227. Another important duty of the Board of Works should be to lay before Government annually an account current of the works under their control, especially of those of irrigation.

An annual account current of the cost and profit of irrigation works.

We trust that we have shown to the full satisfaction of all who shall read this report, that irrigation works are really valuable to the Government; and that the cost of constructing and maintaining such works is not capital thrown away, but so invested as to return a very handsome profit directly into the Treasury. But in order that this quality of that expenditure may be duly kept in mind, it is necessary that the outlay and the return should be periodically shown in comparison. For if the latter appears only as a part of the general land revenue, and is no where shown in its real character, while the former appears by itself, unconnected with its results, the expenditure will be regarded with jealousy and disfavour, and a disposition will prevail to restrain it within the narrowest possible limits. Whereas

if the annual accounts of disbursements is accompanied by a statement of the profits, it will be seen that the outlay is not a source of loss but of gain; and it will come to be regarded as one important means of developing the resources of the country and increasing the revenue, the light in which, we are persuaded, true economy requires that it should be viewed.

How it should be kept.

228. In order to carry out this idea, we propose that an account should be taken of the value of all existing works of irrigation, somewhat resembling the "Dead Stock Account," already kept of buildings; and that all the charges for such works, new or old, and the whole revenue derived from them, should be annually balanced and laid before Government. The value of the old works must be taken arbitrarily at some fixed number of years profit; that of works recently constructed, and of all formed hereafter, would be the actual cost. A certain per-centage of ordinary deterioration must be allowed annually as a deduction from their value, and on the other hand all additions and improvements, and even ordinary repairs, would appear as increasing it. While making this recommendation we are well aware that it will involve no little amount of labour to keep accurately and punctually such an account as we are speaking of, but the end in view seems an important one, and worth the cost and trouble. It would probably not be thought expedient, at least not at first, to keep such an account for every one of the many thousand existing works; but it might well be kept for each of the first-class works, and as regards the remainder a separate account for each talook.

The balance how to be struck.

229. In balancing the annual account of profit and loss, the interest of the capital and the cost of repairs and improvements, including that of superintendence, would appear as debits, while the receipts in the form of increased revenue would appear on the credit side. The amount of this profit would be obtained as respects the old works by deducting the Poonjah assessment of the land at the average rate of the village, from the actual Nunjah revenue received; while as respects modern works, the whole Nunjah assessment of land reclaimed from waste for Nunjah cultivation should be put to the credit of the work, and the difference between the Nunjah and Poonjah rates will be taken as the gain, only when the land had previously been usually cultivated with dry crops.

The above is only an outline of what we propose; if the general scope of it is approved, as we trust it will be, the details will remain to be settled by the Board of Works. In support of our suggestion we beg to cite the example of the canals in Upper India; a debtor and creditor account for which, not dissimilar in principle from that which we propose for the works of irrigation, is already made out every year and laid before Government by the Superintendent of Canals.

A similar account for roads.

230. The financial position of roads differs from that of irrigation works, inasmuch as they yield no direct money return; and even if any roads should hereafter be charged with a toll, they will rarely produce more, as indeed they ought not to be required to produce more, than is sufficient for their own maintenance. Yet even those that produce no direct money return whatever, are not worse in this particular than buildings; and as an account of the value of buildings is carefully kept, of those at least that are under the Military Board, we think that the same might be done in the case of roads and other communications. It would serve at the least to keep it in memory that such works have a value, and it would bring periodically under the notice of Government the financial position of those works which do produce something towards their own maintenance, and show which of them pay their own expenses. We may add, that in order to afford a clearer view of the actual utility of roads, even of those not yielding toll, a formula might perhaps be devised for deducing the value of the road from the number of conveyances using it, and the tonnage borne upon it, to be introduced as an element in the account current.

Procedure within the Board.

231. As regards the mode of proceeding within the Board, we will only specially suggest the following rules:—

1st. All letters, extracts from proceedings, orders and other documents, emanating from the Board, to any authority or office or party whatever, shall be under the signature of the Secretary for the time being.

2d. Questions before the Board shall be determined in cases of difference of opinion by the votes of the majority of the members present, and in case of

of an equal division of opinion the senior member to have a casting vote. Where a member may be absent on duty, his opinion shall be obtained on important questions before the Board.

3d. Members dissenting from the opinion of the majority shall have the privilege of recording minutes; and in case the resolution of the Board goes to Government, the minutes and counter-minutes shall go up also, if desired by the members recording them respectively. As to all other points we think no difficulty will be met with in drawing up a set of rules for the new Board, from those to which practice and experience have led the Board of Revenue and the Military Board. And we would recommend it as convenient that such rules should be drawn up and submitted for the approval of Government as soon as practicable after the Board shall have been constituted.

232. As regards the course of business between the Board of Works and other offices and departments, we beg to recommend the following general rules:

Course of business
with other offices.

1st. In all cases and on all matters connected with the Public Works Department, the Board of Public Works will communicate with Collectors, and with Engineer and other officers, in the same terms as the Public Works Department of the Board of Revenue and the Engineer Department of the Military Board respectively do now; and it will exercise all the powers now held by those Boards respectively, except as they may be modified from time to time.

2d. Repairs to all descriptions of works being for the most part undertaken by the local authorities without the previous sanction of the Board, as above suggested, estimates exceeding the limit prescribed to the former, will be sent up direct to the Board by the proper engineer officer.

3d. In the case of new works and improvements we propose that the course should be as follows:

In the Military Department, as at present, the Commander-in-Chief will represent to Government the necessity for any work that he may wish to obtain sanction for, and the Government if they think proper, will direct the Board of Public Works to submit an estimate for it. Should the Commander-in-Chief desire to know the probable cost of a work before making application to Government, he will apply to the Board, through the Quartermaster-general of the army, for an approximate estimate; and the Board will be able to give such an estimate without much time or labour.

4th. A similar course will be followed with respect to revenue, judicial, ecclesiastical and marine buildings, and all the buildings at the Presidency; the same channels of communication being adhered to respectively as at present in the several departments.

5th. In the case of irrigation works and roads, the practice should be different. Here the project and estimate are so intimately connected that the former cannot be judged of till the latter is completed; and again, it is generally the same officer who conceives a project and prepares an estimate for it. In the case of these works then it will generally be more convenient that the proposal and the estimate should continue to come up together as at present; but it shall be open to an Engineer officer, if he shall think proper, to represent to the Board the general nature of a contemplated improvement and its probable cost, and leave it to the Board or the Government to decide whether the project shall be thoroughly investigated, and the estimate be accurately made.

6th. In all projects coming before the Board of Public Works for new irrigation works or the extension or improvement of old ones of a magnitude exceeding the powers of independent sanction vested in the Board, if that Board are satisfied generally of the judiciousness of the work, and approve the professional part of the plan, they shall transmit the papers to the Board of Revenue and obtain the opinion of that Board on the revenue bearing of the case, before coming to a resolution upon it. The Board of Revenue having considered the papers sent, and procured further information if necessary, from the Board of Public Works or from the Collector, shall communicate their opinion on the project.

The same course shall be followed in the case of projects of new roads or other communications, or extensions of old ones, exceeding the sanctioning power of the Board of Works:

7th. Although, in general, projects of improvements to irrigation works and roads will originate with the local officers, yet it shall be open to both the Board of Revenue and the Board of Public Works to take the initiative in calling the attention of Collectors or Civil Engineers to such improvements of either kind as their local knowledge or other means of information may lead them to think desirable, or to such deficiencies as may attract their notice. And either Board shall have the right to bring before Government for consideration projects of which the other Board may not approve.

8th. In cases where the Board of Public Works are empowered finally to pass bills, they shall communicate an extract from their proceedings to that effect to the Accountant-general; and such extract shall be sufficient authority to that officer to adjust the charge in the accounts.

The same with the Civil Auditor, in the case of tentage and other allowances which may be placed under the control of the Board.

SECTION VI.

The Value of Irrigation to the Revenue and to the general Wealth, and the Importance of maintaining and extending it.

Division of the subject.

233. We have next to consider the provincial branches of the Maramut Department, both the Civil Engineers and their subordinates, and the Executive Agents under the Collectors, and to state our opinion as to the proper numbers and the best organization of the several classes. And in order to do this clearly, it is necessary that we should take a view of the work to be done, as respects both irrigation and the means of communication.

We have already stated our opinion, that hitherto enough has not been done in either way to develop the resources of the country, or turn to account its great natural advantages; we will now state more at length the considerations which have led us to this conviction, as respects both irrigation and communication. The former of these two subjects will occupy the present section, and the latter the following one.

Present expenditure on the maintenance of irrigation works not sufficient.

234. First, then, as to irrigation. The outlay on this account may be divided into two branches; viz., the maintenance and improvement of existing works, and the formation of new works. With regard to the former, it appears certain that even existing works have not been kept in really efficient repair, except in a very few districts, and that the revenue of Government has fallen off in consequence; whereas by an opposite course of policy it would have been much augmented. The total revenue from irrigated land paying directly to Government, and not through Zemindars, Moottadars,* &c., is about 135 lacs of rupees; and, taking the revenue or Government share to be equal to two-fifths of the whole produce, and assuming one-tenth of the Ryotwar irrigated land to be enam or rent-free (a moderate computation), the value of the annual gross produce of the whole cannot be less than 375 lacs of rupees, or 3½ millions sterling. The capital invested in the construction of these works may be assumed at 1,500 lacs of rupees, or 15 millions sterling, while the annual outlay for the repair and preservation of the works amounts, on the average of the last 10 years, to only about Rs. 7,00,000. The cost of repairs, therefore, is less than one-half per cent. on the assumed original cost of the works, under two per cent. on their gross yearly proceeds, and 4½ per cent. on the annual revenue derived from them to Government. Now we believe it will be acknowledged by all persons acquainted with hydraulic works, that one-half per cent. on the original outlay must be too little to maintain in an efficient state works designed for the retention of water, and consisting in a great part of earthen embankments and loose stone revetments, constantly

* In the case of Zemindars, Moottadars, &c., the irrigation works are under the care of such intermediate parties, a proportionate allowance being made on their Peishush.

constantly exposed to the action of water, and that frequently running, or put in motion by the winds. In England, canals and other works in which water is retained require annual repair to the amount of from three to four per cent. on their original* cost, and though that includes the keeping up of towing-paths, &c., and the wear and tear of the banks from the passage of boats, yet, on the other hand, those canals are not exposed to the danger of a sudden and large influx of water like the tanks of this country, nor are their banks exposed to the action of waves raised by a gale of wind on a sheet of several square miles of water, as in the case of our more considerable tanks.

235. *Prima facie*, then, there is a presumption that the sum annually expended in the maintenance of existing works is too small, and this is confirmed by a reference to the actual results. To whatever part of the country we turn, we find the vast majority of tanks, even in a good season, watering far less land than they once did, and far less than they could now irrigate if kept in proper repair; and there is abundant evidence to show, that if the existing tanks were generally restored to their original capacity or efficiency, a very large increase of cultivation and revenue would be the result.

This is proved by the diminished extent of cultivation under the works.

The total extent of Government land entered in the Revenue accounts of Fusly 1259 as capable of irrigation in the 12 chief irrigation† districts, is 26,82,260 acres, bearing an assessment of Rs. 1,84,21,555. The total extent of cultivation in the same year, which was almost everywhere a good season, was only 17,87,909 acres, with an assessment of Rs. 1,12,89,352; leaving waste no less than 8,94,359 acres, with an assessment of Rs. 71,32,203.

In most districts, it appears probable that the whole extent of the ayacut was formerly under cultivation, though not all at the same time. But there are some districts, as South Arcot and Chingleput, in which some land seems to have been entered in the accounts as irrigated, because lying conveniently for irrigation. There is also a considerable extent of land which appears to have been abandoned as of bad quality, perhaps exhausted for the time by over-cropping, without sufficient manuring; and some land in several districts, though entered as "irrigated" in the accounts, is stated to be now destitute of any apparent means of irrigation. Making allowance for these disabling causes by the deduction of even as much as one-third of the whole extent entered as irrigated, there will remain, in these 12 districts alone, 12,62,906 acres of land, with an assessment of Rs. 47,54,802, once irrigated and cultivated, and capable of being so cultivated again if the existing works only are well repaired.

The principal causes assigned by the Collectors as having led to this result, are, 1st. The works having fallen into disrepair; 2d. The want of water in tanks not out of repair; and, 3d. Too heavy assessment.

236. We were desirous to give in this place a succinct view of the present state of the irrigation works of the country at large, and of every district, but we found it quite impossible to obtain the detailed information necessary. As to the roads, the annual reports made by the Collectors during the past six years, under the orders of Government, afford much information, of which we shall be able to make use in the following section. But as to the works of irrigation, no record of the kind exists, except in such an imperfect and incomplete state as to be useless for our purpose; and the only general view of the state of the works which we could obtain was in that Report on the Irrigation by Captain A. T. Cotton, to which we have already referred. He there writes as follows: "So generally, indeed, have I found the works in a defective state, that I believe I may say that nearly all the tanks in the country, and nearly all the channels, except those of Tanjore, and the very large ones of other districts, water less land than they once did; many only one-fourth, and very great numbers from one-half to three-fourths. And the actual revenue derived from several districts some years ago compared with the present, fully supports me in this opinion. By the statement above given, it appears that the Nunjah revenue of North Arcot is 3 lacs below what it was 10 years ago, out of 15 lacs; in South Arcot, 2 lacs out of 12; and in Tinnevely,

The works generally are out of repair.

* The proportion here stated is taken from Captain (now Lieutenant-Colonel) A. Cotton's Report on the Irrigation of the Country, dated 13 December 1837, of which we have made much use in this part of our Report, and which is printed entire in Appendix (B.)

† Bellary, Cuddapah, Nellore, North Arcot, South Arcot, Chingleput, Salem, Trichinopoly, Tanjore, Coimbatore, Madura and Tinnevely.

velly, $\frac{1}{2}$ lac out of 11 $\frac{1}{2}$. But the falling off in the Nunjah revenue has, I believe, been going on for a long series of years. I cannot obtain accounts of the Nunjah revenue for more than a few years, because there are no returns of it distinct from the other items of revenue; however, that it has been falling off of late years is the principal point that it is necessary to ascertain at present, and that this is the case in several districts is shown by the above statement. The question indeed arises, Is this deficiency owing to the defective state of the public works, or to other causes? To this I can only reply, that from what I have seen I have no doubt it is owing to that cause, and I believe that it will be generally allowed to be so by the Revenue Officers and Engineers who have been employed in the irrigated districts.

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“21. As I have remarked above, it will probably be very difficult for many persons to bring themselves to believe the extent of loss that has been incurred by the grievous misapprehension of the importance of this question. I have been compelled to believe it myself by proofs which left no room for doubt. The loss by actual diminution of revenue in the two Southern Talooks of South Arcot in 30 years, has been certainly not less than 26 lacs of rupees; and no reason can be assigned why it ought not to have increased, under the circumstances of peace and orderly Government which they have enjoyed. The revenue is said once to have been four or five lacs, and I feel assured that it ought now to be near five lacs. If they had been managed properly for 30 years, I have no doubt that the revenue would by this time have been at least four and a half lacs; and in that case, the revenue of the 30 years would have been about 100 lacs instead of 56 lacs, a sum saved in the management of two Talooks, sufficient to have covered one-fourth of the cost of the whole tank expenses of the Carnatic for 30 years, at the rate of expenditure allowed of late. That this is not a preposterous calculation, seems to me to be indisputably shown by the improvement of the revenue since the year 1822, as shown in the statement.”

The Northern Division.

237. During the 14 years that have elapsed since that Report was written, much has been done towards improving the works of irrigation in several districts. In the absence of any existing record of the condition of the works we applied to the several Civil Engineers, requesting their opinions as to their present state, both absolutely, and relatively to what it was 15 or 20 years ago. We may observe here, that this means of gaining information on such a subject, is necessarily inferior in fulness and detail, to that of a series of periodical reports. As to the past, few officers would have sufficiently accurate recollection to speak in any but very general terms; and even as to the present information thus obtained on an emergency must needs be deficient. Any single officer's acquaintance with the thousands of works in his division, must be very partial; and, perhaps, there might be in some cases an unconscious backwardness to state the worst. We shall have to show, that if the works are in bad order, the Civil Engineers cannot be blamed: but yet an officer might be unwilling to admit, even to himself, that works of which he had been charged with the oversight for several years were still imperfect; or he might be averse to seem to throw blame on his predecessors. In replying to our question, almost all the Civil Engineers report that much improvement has taken place in the course of the time there specified, which we are glad to say is undoubtedly true; but most of them have overlooked the former part of the question. Most of those who answer it, describe the works generally as being still inefficient. Colonel A. T. Cotton referring to the works in his present (the 1st) Division, speaks in much the same terms that he formerly used in speaking of the country at large. He says, “In this division, there is scarcely a single work that is in a respectable state; and almost the whole of them are without proper sluices, calingalals, &c., so as to secure their supply or efficiency.”

In another letter he writes as follows: “From all that I have learnt respecting the works in this division, they are in all respects, both as to original construction and present condition, in a most imperfect state. With respect to their former state, it is to be observed, that 20 years ago, by far the greater part of these districts was in the hands of Zemindars, and a great number of the estates have only come under Government management very lately; much is still under Zemindars. The state of the works under the Zemindars seems to have been very various, but I judge that almost all of them took much better care of them than our Government has done. In one, the Pittapoor estate, I have satisfied

satisfied myself that the works were in excellent repair under the grandfather of the present Zemindar; but at his death the estate came under Government management in consequence of a minority, and when the estate was given up to his son 15 years afterwards, the whole of the works were in a complete state of neglect and ruin. I inspected several of them at the request of the Zemindar. During the last 10 years, some little has been done to put the Government works in order; but since I came into the Division, my time and attention has been so taken up with the anicut project, that I have not been able to do anything about the whole works out of the Delta, further than to urge a liberal outlay upon them by the Collector's Department. I have reason to believe that most of the tanks are in want of complete revision; they have no proper calingalahs, sluices, supplying channels, &c., and the drainage of the country is in many places as bad as the supply. Below the Colair, numbers of villages are submerged till the rains are over, and begin to cultivate when they have hardly any hope of rain enough to secure a crop. Late last year, at the very end of the rains, I passed in my boat over a great extent of water, many miles together, and if I had not been assured that there was a Talook underneath, I should have supposed I was in the Colair Lake. In one place I saw the people punting in a piece of water, which, I was informed, they were going to bale out, that they might begin to cultivate; this was the only sign of land and cultivation that I saw in 15 or 20 villages that I passed over. The drainage of this tract will, of course, come under our present operations; but it shows the state of neglect which was permitted in these districts; no wonder that under such management, this rich country yielded only one-third of what Tanjore did in revenue, though naturally the latter is much inferior to it." Appendix (C.), para. 8.

238. Lieut. F. H. Rundall, who has charge of the subdivision, comprising the two districts of Ganjam and Vizagapatam, thus speaks of the irrigation works in those districts: "The whole of the irrigation works in the subdivision, with the exception of the two Amauny Talooks of Vizagapatam, have been almost entirely neglected, and stand in great need of repair." In another letter he speaks more fully, as follows: "The condition of the works of irrigation in the two Amauny Talooks of Vizagapatam is decidedly improved, from the late expenditure laid out upon them. Those in the Vizianagarum Zemindary again, have mostly gone to ruin. While those in the Ganjam district, have been almost entirely neglected; and the Commissioners will observe the case could not have been otherwise, with an annual expenditure of no more than about Rs. 2,500, on works yielding a land revenue of five lacs of rupees, being about $\frac{1}{4}$ per cent. of the revenue actually derived by Government. All the tanks and channels that I have inspected in the Ganjam district, are in need of thorough repair; there is scarcely a sluice or calingulah to any one of them, and in the event of heavy rains, they must breach, as almost all of them have done. The river channels are unprotected with head sluices; a calingulah here and there has been constructed; this, however, does not obviate the evil of the bed scouring out, and the head enlarging. The consequence has been that increased quantities of water have been forced down, unusually high freshes have aggravated the evil; and, in one or two instances, the channels have been so enlarged, that they threatened to alter the course of the river itself. They are almost all carried with a very great fall in their bed, and consequently give occasion to a current injurious alike to their bed and sides; an evil twofold increased when there are no regulating works at their head. And as these evils have all been allowed not only to continue, but consequently to increase, the inference naturally is, that the irrigation works must be in a much worse state now than they were 20 years ago."

The works of the subdivision.

239. The Northern Division has certainly been more neglected than any other; but Captain Lawford also, in a Division (the 6th) in which the works have always been better attended to than any where else, writes as follows: "The tanks and channels generally are not by any means in a state of good order; many sluices are out of repair, more are required; the same as to calingulahs. Land is certainly left uncultivated for want of such works, or from their being inefficient." Captain Smyth, in the 5th Division, speaks to the same effect; he says, "The greater portion of the tanks and watercourses are at present in tolerable order, while much improvement is required in their stability, particularly in the works in the South Arcot District. The practice generally obtains of cutting openings in the bunds of tanks and channels for irrigation purposes, and this requires to be checked

The other Division.

by the construction of permanent sluices. A large number of tanks require their sluices to be renewed, &c., and in almost every Talook the revenue accounts exhibit a loss for want of proper means of irrigation." In the 8th Division only, Captain Horsley speaks of the works as being generally in tolerable order; and undoubtedly his own unceasing exertions have been directed to that end for a number of years. But we believe, that if he had more time to attend to improvements, his idea of what good order means, would much enlarge; certainly there is a large extent of land in the 8th Division, now uncultivated for many years, though once irrigated and productive. Again, the Civil Engineer of the 4th Division, speaks of the tanks generally as being "in very fair order;" but he mentions, that in one extensive portion of his charge, many sluices are reported out of repair; and as to the channels, he describes them generally as being neglected. He also mentions having taken measures to clear out the supply-channel of the very large tank of Chembrumbaukum, which had been allowed to become filled up and useless, and to remain so for some years, before it came to his notice; and in this single case, an annual loss of probably not less than Rs. 10,000, for a number of years, was entailed on the Government in revenue, besides a much greater loss to the Ryot.

General view.

240. The experience and observation of the first and second members of our Commission fully bear out the foregoing accounts of the deficiencies of the existing works of irrigation; more particularly as to the disrepair of sluices and the want of calingulahs in a vast number of tanks, and the neglect of their sources of supply. Formerly when all tank estimates were made by the Tahsildars, the repair consisted generally of earth and loose stone work, and sluices and calingulahs were rarely meddled with; and even of late years the restrictions on the execution of masonry work have operated to limit the repair and construction of these necessary works. Consequently many of the old sluices, which were generally much less substantially built than the more recent ones,* having either become leaky, or been choked up by the falling in of the roof, have so remained. This has entailed in the former case constant waste of water; and in the latter inability to use the sluice at all, so that either the land usually watered by it is left uncultivated, or the very dangerous remedy adverted to by Captain Smyth, has been adopted, of annually cutting a passage for the water through the bund, from the top to the bottom. This expedient is resorted to by the Ryots, to avoid the loss of having their lands waste; but it has frequently caused the breaching of the tank, to the great loss of both Government and Ryot, through an unexpected influx of water into the tank while the gap was open.

In short, all the works in the country, with a few exceptions, are in a state that may be called "below par;" that is, they are below their state of full efficiency, and incapable of effecting their proper amount of irrigation. The tanks are in want of sluices, or such as they have are out of order; or they have no calingulahs, or such as they have are too small or too high, and so the stability of the tank is in danger; or the bank is low or weak, and the Ryots are afraid to store a full tank; or their channels of supply have become choked up, and no longer bring a full supply of water. And as to the irrigating channels, many of them are in the condition described by Lieutenant Rundall, from the want of regulating works at their head; or they have become filled up by deposit, or the river has thrown up a bank in front of them and they get no water; or they have too few outlets for irrigation and the Ryots cut through the bank; or the outlets are too large, and a vast quantity of water is wasted. Such is unfortunately the description which now applies to a very large proportion of all the works of irrigation throughout the country, with the partial exception of the favoured districts of Tanjore, and a part of Trichinopoly.

Results of increased expenditure in Tinnevely.

241. As practical proof that the works of the country generally have not been maintained in good condition, and to show the advantage of liberal expenditure (under efficient direction) on this object, we will state the results obtained in some districts where of late years more attention has been paid to the works of irrigation. We will first take the case of Tinnevely. This district has had for the last eleven years a most active Civil Engineer in Captain Horsley. The expenditure on Mar-

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* This remark does not apply to the old sluices of the largest tanks, which were often most expensively and substantially constructed of cut stone.

mut works has largely increased, the works receiving repair or improvement have been carefully selected by Captain Horsley, and the work done thoroughly inspected; he has also taken some pains to improve the Maistries. A considerable part of the outlay has been included technically under the term "Occasional," but few or no large works have been undertaken, or attempts made to extend irrigation to tracts not already possessing it; almost the whole of the expenditure having been incurred in maintaining or increasing the efficiency of existing works.

242. Appendix (Q.) is a statement showing at once the irrigated revenue of the district for the 29 years from Fusly 1232 to Fusly 1260 inclusive (there being no detailed accounts of Fusly 1231) and the Maramut expenditure for the 30 years 1821 to 1850 inclusive. Maramut expenditure in the district.

The average yearly Maramut expenditure in each five years of the series is given in the margin. In the first of these periods the amount was very small, being no more than 2½ per cent. on the irrigated revenue during the same time; the subsequent expenditure has been on a much larger scale, but previously to 1833, that professional assistance and oversight which we have spoken of as so essential both to guide the selection of work to be done, and to control and supervise the execution, were, in effect, wholly wanting. Prior to 1834 there was only a single Engineer Officer to five districts, of which Tinnevely was one; the area of the whole being 38,460 square miles, (larger by one-fifth than the whole of Ireland) and the length from North to South, 500 miles. From 1834 to 1833 the division of the Civil Engineer comprised four collectorates, Tinnevely, Madura, Coimbatore, and Salem, with a total area of 32,880 square miles, being just equal to that of Ireland.

Years.	Average Annual Maramut outlay.
1821 to 1825 -	25,197
1826 to 1830 -	41,388
1831 to 1835 -	43,894
1836 to 1840 -	56,279
1841 to 1845 -	41,033
1846 to 1850 -	64,253

It was utterly impossible that under such circumstances the Civil Engineer could exercise any close or effective control in any part of so vast a charge; and practically the Maramut work was left almost entirely to the Tahsildars and Maistries, of whose unfitness for the unaided discharge of this duty we have already spoken. In 1833 occurred those alterations in the department which we have described in the commencement of this Report, para. 9, and by which the territorial extent of each officer's charge was so much diminished; and it is from that period chiefly, and only in a minor degree before that, that the effects of the larger outlay on Maramut works are to be looked for.

243. The marginal statement shows the average annual revenue from irrigated land in each five years of the period above specified. The average of the first period (four years*) was high, in consequence of two or three very favourable seasons which followed the resumption of Ryotwar settlements in Fusly 1232; in the next period there is a large falling off; but in each succeeding five years there is a considerable increase, and the average of the last period is nearly a lac and a half of rupees above that of the first in the series. That of the last but one, (Fusly 1251 to 1255) would show much better, but for two very bad years, Fusly 1251 and 1252 included in that term. We think we shall obtain a just view of the results of the increased outlay on Maramut improvements, by comparing the expenditure and the revenue from irrigated land in the first two periods of the series, with what they were in the last three periods. The aggregate income of the first nine years was Rs. 94,55,647, or Rs. 10,50,633 annually; and the aggregate Maramut expenditure of the first 10 years was Rs. 3,22,938, or Rs. 32,293 annually. In the last 15 years the aggregate income was Rs. 1,77,33,875 or Rs. 11,82,258 annually; and the Maramut outlay was Rs. 8,07,826 or Rs. 53,855 annually. The total excess of the expenditure in these 15 years over what it would have been on the average of the first 10 years, was Rs. 3,23,419; but the aggregate excess of revenue from irrigated land during the last 15 years, over what it would have been at the average of the first nine, is Rs. 19,74,830.

Fuslys.	Average Annual Irrigated Revenue.
1232 to 1235 -	11,54,218
1236 to 1240 -	9,67,765
1242 to 1245 -	10,03,053†
1246 to 1250 -	11,21,921
1251 to 1255 -	11,32,455
1256 to 1260 -	12,92,309

We think we are fully justified in ascribing this large and progressive increase in the revenue to the improvement of the works of irrigation; since it is spread over far too long a term to be attributable to a series of good seasons, and we have already Highly favourable result.

* There are no accounts for Fusly 1231, as the district was under the decennial village rent.

† Fusly 1241, is omitted in taking the average; as there was so entire a failure of the monsoon in that year, as to reduce the irrigated revenue in this and other districts to little more than half its usual amount.

already remarked that the last 15 years contain two decidedly bad seasons. We have then an increase of outlay to the amount of Rs. 3,23,419, producing a direct return in revenue of Rs. 19,74,830, or about six for one; besides an addition of 30 lacs to the income of the people.

One important and cheap species of improvement.

244. We have already observed that by far the greater part of the gain in Tinnevely was obtained by the efficient repair of existing works; and a very large part of it by rendering supplies of water comparatively certain, which before were precarious. This is a most important species of improvement. There are many works which in a good year will water perhaps 300 acres, and suffice to bring the whole to maturity; but in ordinary years will irrigate only two-thirds of that extent, and even then leave a part of the crop to fail for want of water. In such cases, if the Ryots keep up stock and labour to cultivate the whole extent, they are put to a useless expense in years when the supply of water is deficient; and if they do not, they are unable to take advantage of a good year. Add to this that Ryots always lose more than the Government from the failure of crops, for if it is a partial failure they get no remission of rent, and even for a total failure the whole rent is rarely remitted. Now in many such cases a small sum judiciously laid out will so improve the supply as to reduce the fluctuation to a minimum, and both secure the Government revenue, and ensure to the Ryot the profitable employment of his capital and labour. It must be obvious, however, that such improvements eminently require the skill and judgment of a regular Engineer.

Results of expenditure in South Arcot.

245. The second instance which we will give of former neglect and consequent loss of revenue and immediate improvement on the works being repaired, is that of Manargoody and Chillumburum, the two southern talooks of the South Arcot district. Those talooks form a part of the base of the alluvial Delta of the Cauvery, lying immediately contiguous to the north bank of the Coleroon. They are thus most advantageously situated for irrigation from that river, and have for ages been so watered. The chief source of supply is the Vuddavar channel, which besides supplying direct irrigation to a considerable extent, fills the large tank called the Veeranum; there are also other ancient channels, as the Khan Saib and the Coomaratchy, which water extensive tracts. The irrigation of these talooks had been very much neglected,* so that the channels had become filled up and the Nunjah revenue had declined from an average of about two lacs at the early part of our possession, to Rs. 1,24,000, the average of the 10 years prior to Fusly 1244. In 1834 and the following years the Vuddavar channel was entirely repaired, and in 1836 the lower anicut was built across the Coleroon, immediately at its head. The two other channels already mentioned were brought up to the same point, and in 1839 other channels were dug to complete the irrigation of the whole tract. The Sheally talook of the Tanjore district is on the south side of the Coleroon at that point, and a part of it had been precariously watered from the river. After the anicut was built, channels were planned from it to improve and extend this irrigation, and were excavated in the course of the five years, 1837 to 1841. Appendix (R.) gives the cost and the results of all these improvements; the following are the main particulars.

The lower Coleroon anicut.

Consequent increase of Revenue.

246. In South Arcot the revenue rose immediately, even before the works were fully completed. In Fusly 1243 it was only Rs. 1,19,055; it gradually rose till in Fusly 1249 it amounted to Rs. 2,66,332, it then declined for three years, after which it again began to rise, and in Fusly 1256 was Rs. 3,03,758; it then declined again for three years, and in Fusly 1259 was only Rs. 1,83,488, but in Fusly 1260, the year just expired, it again rose to Rs. 2,62,631. We shall notice these fluctuations presently; we will here only point out how great, notwithstanding, has been the profit to Government from these works. The average annual collection for the 11† years preceding the improvements, (viz. Fusly 1233 to Fusly 1243) was Rs. 1,22,065, while the average for the 14 years following the construction of the anicut, (viz. Fuslies 1247 to 1260) is Rs. 2,37,143, being an annual gain of more than Rs. 1,15,000. The aggregate increase in the whole 14 years amounts to Rs. 16,11,134. The total cost of building the anicut, of

* See also Appendix (B.) paras. 10 and 16.

† We omit from both periods the three years Fuslies 1244 to 1246, because the improvements were then in progress.

of the repair of the ancient channels, the excavation of the new channels, and of all subsequent improvements and repairs, has amounted to Rs. 3,59,015.

On the Tanjore side the average annual collections in the six years Fushies 1241 to 1246, being all those of which we have received accounts, amounted to Rs. 1,26,215; while the average of the 14 years following the construction of the anicut, is Rs. 1,39,868. The average annual increase of collections has been Rs. 13,653, and the cultivation and revenue appear to be steadily advancing; the whole aggregate increase is Rs. 1,91,142. The total cost of the works on this side of the river, including all subsequent improvements and repairs, has amounted to Rs. 97,663.

247. Adding together the results on both sides of the river, the following are the facts. The total cost of the anicut and all the connected works, inclusive of all repairs to the end of 1850, is Rs. 4,56,678. The total aggregate excess of collections subsequently, over what they would have been in the same period, at the average obtained before the improvements, is Rs. 18,00,298. Thus within the short period of 14 years there has been a return of Rs. 375 for every Rs. 100 expended; while the anicut and channels remain permanently valuable works. And taking their total original cost at Rs. 3,50,000, and assuming that annual repair to the amount of even as much as two per cent. on that will be required to keep them in good order, we have the cost of these annual repairs Rs. 7,000, and 17,500, being interest at the rate of 5 per cent. on the original outlay, total Rs. 24,500, to set off against an annual gain of Rs. 1,28,756, being a net annual gain of above one lac of rupees, clear of all expenses, obtained by an outlay of three and a half lacs. And to this large gain to the Government must be added the share of the Ryot, to the amount yearly of Rs. 1,93,000 more; being an aggregate yearly net return of nearly three lacs of rupees, for an outlay of three and a half lacs.

248. But though the increase of revenue in South Arcot resulting from the construction of the lower anicut has been so large, and has already paid the cost of the work several times over, yet the receipts have exhibited much fluctuation from year to year, and much more than the supply of water, which has been remarkably steady and uniform. The statement given in the margin shows the Nunjah revenue of these talooks in each year since the anicut was built, and it will be seen that there is a difference of Rs. 1,32,171 between the highest and the lowest, though the supply of water has fluctuated very little. These facts are of importance, from their bearing on the question how far improved means of irrigation will be taken advantage of by the Ryots when provided; and we therefore thought it our duty to endeavour to ascertain the cause, and we obtained from the Collector a full report in explanation of it; we have also received some useful information and suggestions from the Civil Engineer.

The chief or only cause of the decrease of cultivation whenever it has occurred, seems to be the low price of grain in those years, coupled with a high assessment and an extreme want of good roads. The statement, Appendix (R.), exhibits a singular exactness of proportion between the variations in the extent of cultivation and the range of price for the year, the former varying inversely as the latter with extreme regularity.

249. As to the assessment, the average in these talooks is 50 per cent. higher than in the contiguous district of Tanjore, in spite of the greater advantages of the latter province in almost every particular. The expediency of reducing it not only in these talooks, but throughout the district of South Arcot, has been before the Board of Revenue and Government on several distinct occasions during the last 25 years, but no final decision on the subject appears to have been yet arrived at.

And not only is the Government tax so much higher than in Tanjore, but the communications are in an infinitely worse condition. The Tanjore district is everywhere traversed by excellent roads made during the last 20 years, and in great part out of the surplus pagoda funds; in South Arcot those funds, if any, were insignificant, and Government money has not been given. The talooks of Chillumbram and Manargoody are alluvial, and being almost wholly under wet cultivation, and traversed by numerous irrigation channels, the communications are necessarily difficult unless carefully maintained; in point of fact they appear to have been almost entirely neglected. In 1841, indeed, a proposal was made to

Net results.

But the revenue has fluctuated more than the supply of water.

Fushies.	Revenue in Rupees.
1247	2,30,319
1248	2,52,975
1249	2,66,333
1250	2,58,631
1251	2,02,815
1252	1,71,587
1253	2,01,437
1254	2,21,958
1255	2,45,200
1256	3,03,758
1257	2,93,195
1258	2,25,642
1259	1,83,488
1260	2,62,631

High assessment.

Extreme want of roads.

construct a road from the town of Manargoody to Chillumbrun, and another from the latter place to Bowangherry, the chief town of an adjoining talook. The total length of the two roads was 18 miles, and the estimated cost Rs. 27,276, including a number of bridges. It was stated by the Board in sending up the project to Government that there were no regular roads between the three places; that the country was swampy, and intercommunication consequently most difficult; and for a considerable part of the year impossible; and that this state of things was very inconvenient, as the roads were much used during the dry weather in spite of their bad condition. They added, that the large irrigation channels which intersect this part of the country at short intervals greatly impeded traffic, and ought to be bridged; that the anicut, which had largely augmented the revenue, had added extremely by the increased irrigation to the difficulty of travelling; and that a good road connecting the three chief towns was therefore very much required. The project was sent up to Bengal with the strong recommendation of this Government in its favour; but sanction was refused, and the chief roads in the talooks still remain nearly in the disgraceful state above described.

The navigable channels have been neglected.

250. The main irrigation channel from the anicut was intended to be navigable, and to afford a communication with Porto Novo; but it appears to be little used, as in consequence of the waste of water through mismanagement of the numerous sluices of irrigation, and the neglect to keep the canal itself free from obstructions and accumulations, boats can rarely pass without much difficulty, and frequently cannot pass at all. The letter in Appendix (N.) from the agent of the Porto Novo Iron Company, details the difficulties and delays experienced in this navigation, and will be read with interest as coming from one practically and painfully acquainted with what he describes.

Porto Novo is very conveniently situated for the shipment of the grain of these talooks; and it might be expected that they would take a share in the export of grain to Ceylon, which goes on so briskly from Tanjore. But the higher assessment which they pay, and the want of good means of communication between the villages and the port, tend to disable them from this competition, and the quantity so exported is very trifling. An additional cause assigned by the Civil Engineer, Captain Lawford, is the "deteriorated state" of the port of Porto Novo. "Petitions," he says, "have been presented to me on the subject by the merchants, and a plan of partial improvement is before the Board:" and he goes on to say, that such partial measures cannot produce much effect, and that it would be useless to ask the Government to do the work completely.

Remedies for these evils.

251. Independently of the question of the assessment, which, however, we cannot but regard as very important, a good deal might be done in other ways to neutralize the disadvantages which now bear down these talooks:

1st. The roads should be improved, both the main lines and the cross roads connecting the out-villages with the chief towns, and with the coast.

2d. The canal must be placed under better supervision; the sluices must be better attended to, so as to prevent the waste of water which now takes place through the carelessness or malevolence of the villages nearest the head of the channel; and the canal itself must be kept free from obstructions. For these two objects, both so important, it is absolutely necessary that the canal should be provided with adequate professional supervision; no measures unaccompanied by this can effect any permanent improvement in its usefulness. But this need not be a charge to Government; if duly kept in repair, a very light toll on the boats using it will abundantly pay all expenses fairly chargeable to the navigation, including the cost of superintendence.

3d. The port of Porto Novo is stated to be in want of some improvements which should be attended to.

We may observe, lastly, to show what is required in these talooks, that in the contiguous parts of Tanjore, which are very similar to these, except in those points on which we have pointed out a difference, there is no fluctuation of the revenue. The Ryots grumble indeed at the low prices, but they cultivate their lands fully, and the revenue is kept up to its full standard; indeed both cultivation and revenue seem there to be steadily increasing year by year.

Results of expenditure in Tanjore.

252. The next case of this kind which we will notice is that of Tanjore. This province has always been better cared for in the way of irrigation than any other, both

both as regards the amount of outlay and the talents of the Engineer Officers carefully selected for this important charge. Here then, if anywhere, under our administration, the effects of irrigation would long ago have reached their maximum, and it might have been supposed that no room would be found for further improvement. But such has not been the case; and an examination of the accounts of the Maramut expenditure and of the revenue for the last 30 years, shows that even in this favoured district, an increase of judicious and skilful outlay on the irrigation works in the latter part of that period has produced large returns.

In the 10 years from 1821 to 1830 inclusive (*see* Appendix S.), the Maramut expenditure in Tanjore averaged Rs. 49,200. Immediately after the latter year the expenditure increased, and within a few years the upper anicut and the works connected with it were constructed; the annual outlay has continued permanently higher than in the former period; and the yearly average of the 20 years, 1831 to 1850, is Rs. 91,523, or little less than double that of the preceding 10 years. The aggregate excess of the outlay in this 20 years, above what it would have been on the average of the preceding 10, is Rs. 8,99,370.

253. During the 10 fuslies, 1231 to 1240, the revenue from irrigated land averaged Rs. 29,44,685; in the following 20 years it averaged Rs. 30,83,448. (*see* Appendix S.) Its aggregate excess in the latter period over what it would have been at the average of the former period, was Rs. 27,75,250, being a return directly into the Treasury of more than three for one on the aggregate additional Maramut expenditure. Nor indeed does this by any means justly represent the case; for it must not be forgotten, that about the period when this increased expenditure began, the revenue of Tanjore was decidedly declining from failure of water, and serious apprehensions were entertained that the sources of irrigation would fail altogether; and there is strong reason for believing that such a consummation would speedily have followed, but for the works then undertaken.

254. In this collectorate also, the Ryot and the general consumer have gained by the improvements even more than usual in proportion to the gain in revenue. In the first place, the assessment in Tanjore is very much lighter than in any other district. Again, in part of Tanjore the demand on a given field varies from year to year with the selling price of grain, and this fluctuation was still larger under the Amaany system, which formerly prevailed; and the price of grain having materially fallen during the last 20 years, a given amount of revenue indicates a larger extent of cultivation and produce now than formerly. Thus the average extent of land annually cultivated during the 10 fuslies, 1231 to 1240, was 5,57,556 acres; during the following 20 years it was 6,36,425 acres; being a much larger proportionate increase than appears in the revenue; for whereas the average yearly revenue of the second period was 4½ per cent. above that of the first, the average extent of cultivation in the later was 11 per cent. greater than in the earlier. And it is shown by returns which we have obtained from the Collector, that the average produce per acre cultivated, is not only larger than formerly, but less variable.*

It

* The following small Statement shows the average extent of cultivation and revenue in Tanjore for each five of the last 30 years; it will be observed that the average extent cultivated exhibits an increase in each successive five years.

PERIOD.	Cultivation in Acres.	Revenue in Rupees.
Fusly 1231 to 1235	5,38,800	32,56,705
" 1236 to 1240	5,76,214	26,32,575
" 1241 to 1245	6,04,447	20,93,315
" 1246 to 1250	6,20,178	30,90,031
" 1251 to 1255	6,49,682	30,78,878
" 1256 to 1260	6,71,304	32,30,067

The high revenue in the first period, and in a minor degree in the third, is owing to the famine prices of Fusly 1233 and 1234, and Fusly 1242 and 1243. In 1234 Fusly, 5,40,489 acres paid Rs. 41,22,742; in 1259 Fusly, 6,76,079 acres paid only Rs. 31,66,739.

Total gain. *

It is difficult to compute accurately the gain to the cultivator and the consumer from these various causes: but supposing the profit of Government in revenue to be in other districts two-fifths of the whole gain, we think it may safely be assumed that in the present instance it has not been more than one-fourth of the whole. On that supposition the total gain from the outlay of the additional nine lacs of rupees, has already been not less than 105 lacs, or nearly twelve-fold.

The effects of the attention always paid to the irrigation of Tanjore.

255. The following striking passage takes the whole term of our possession of Tanjore, and shows what vast improvement has resulted, not less to the condition and comfort of the people than to the Government revenue, from the steady attention which, in that province, has always been given in a greater or less degree to the works of irrigation. It is extracted from a Report, dated 12 August 1844, by Colonel (then Captain) A. T. Cotton, on the irrigation of the Rajamundry District, when he first brought forward his plan for improving and extending the irrigation from the Godavery river:—

“ 4. Before attempting an outline of the system of works that would be required to irrigate this district, it will be well to consider what has been done in Tanjore, the cost of the works and their results. When we got possession of that district, it was in a far more advanced state than Rajahmundry is now; there was already something like a system of irrigation, and especially one main work, the grand anicut, built to prevent the Cauvery rejoining the Coleroon: so that the district, or at least those parts of it which were irrigated, were not dependent merely upon the high freshes of the river, as is the case now in Rajahmundry, but received a supply of water almost as long as there was any in the Cauvery. It was, however, all in a very imperfect state, as is shown by the returns of produce, which in different years varied 50 per cent. according to the seasons; many tracts were not irrigated at all; many were not drained; much water of the Angunda Cauvery flowed to waste by the Coleroon; there were very partial embankments to the rivers, and not the trace of a passable road through the district. Soon after the assumption of the country, the grand anicut was raised; by degrees, innumerable small works, such as sluices, &c., and new channels, were executed; the river banks were extended and strengthened; raised roads, with small bridges and tunnels, were constructed; the ferries were put in an efficient state, many large works for the better distribution of the water within the district, and the control of the level of the beds of the rivers were added; and at last two new anicuts were constructed on the Coleroon to prevent the escape of any water to the sea, when it was wanted in the district. During the 40 years that these works have been constructing about 32 lacs of rupees have been spent on the irrigation, or Rs. 80,000 a year; allowing that one-half of this would have kept the works in repair, the improvements have cost 16 lacs, a most insignificant sum compared with the population of the district, its revenue, and the effects produced. It amounts to about 1½ rupee a head on the population, it is equal to one-third of one year's revenue, and it is less than one year's increase of revenue, if the first years of the period are compared with the last. The average yearly revenue of the first four years of this country was 31 lacs; the average of the four years ending in 1839, which is the last year I have an account of, is 47½ lacs. Still more insignificant does the expenditure appear compared with the saleable value of the lands of the district; which, calculated from the average price obtained from about 60 estates sold in all parts of the district, was in 1839 about 260 lacs of rupees, and of this about 100 lacs had been added in a few years, so that probably the lauded property of the district had been increased in value during these 40 years, 150 or 200 lacs. That the foundation of all this improvement was the attention to the irrigation is perfectly evident to all those who are acquainted with the district; and there is no other way of accounting for the fact that such improvement has taken place while every other district in the Carnatic has fallen off. Circumstanced as the eastern side of the Peninsula is with respect to the rains, it is impossible that any considerable improvement can take place, unless the irrigation is attended to; while the crops are dependent upon the local rains which are so extremely uncertain, almost the whole population must necessarily be employed in cultivation. Few countries in the world are more liable to the destruction of the crops by drought or floods; perhaps none in the world more sure of abundant harvests, if proper attention is paid to irrigation and drainage. The total quantity of rain in the Carnatic is in general very deficient, being only on an average about 48 inches; and even this falls with the greatest irregularity, almost always coming in violent bursts, with long intervals; a fall of five inches in a night is very common, and I have

I have known 10 inches fall in one day, and a fortnight afterwards 12 inches in 36 hours; nearly half the supply of an average year thus coming within a fortnight. It is on this account that Tanjore, which alone has been properly attended to, has so remarkably advanced; while the other districts, in which the irrigation has not even been kept up, have retrograded. It may be asked how much of this improvement has been owing to the revenue management; the answer is, the whole of it; for undoubtedly the finest system of irrigation possible would avail little, if the district is mismanaged, but on the other hand the ablest Collector can do little unless his district is supplied with water. But the superior revenue management of Tanjore has been especially shown in this very point, that the Collectors, I believe, without exception, for 40 years, have considered the irrigation of the first consequence, and have most diligently and ably watched over it."

* * * * *

"If we take the increase of revenue in Tanjore at 16 lacs, and consider it to have been progressive, as it has been upon the whole, the total additional revenue in 40 years, was 320 lacs, and the total irrigation expenditure 32 lacs."

256. We give the foregoing as it stands; it is lucid and conclusive by itself, and needs no remark from us. The following passage, taken from the same officer's second report on the same subject, dated 17 April 1845, gives some more details of the comparison, and of the happy effects of the steady attention paid for so many years to the irrigation of Tanjore, obtained too at a cost quite insignificant in comparison:

Further details of those effects.

"The revenue of Rajahmundry is now just what it was 40 years ago; viz., 19 lacs. That of Tanjore has almost regularly increased from 31½ lacs to 47½, being an increase of 16 lacs per annum, or 336 lacs in 42 years, showing the difference between a district of inferior advantages, but wisely managed, and one of greater capabilities, but allowed to go to ruin for want of a liberal expenditure in its irrigation.

* * * * *

"But this improvement in Tanjore has been an advance upon a state in which the resources of the district had already been developed to a very considerable extent. The grand anicut, upon which the irrigation of the district mainly depends, had been constructed ages before, and multitudes of channels and works of masonry were in use at the commencement of this century.

"In Rajahmundry, nothing at all had ever been done to lead the water from the bed of the Godavery upon the country; and, excepting two or three small channels to lead off the water in the high freshes, the district was wholly unimproved. Yet upon that state of things, 42 years of peace under our Government have done nothing for the district; and with the same extent of delta land nearly, and a much greater extent of good high lands, the district now produces 19½ lacs, while Tanjore, with much inferior capabilities, yields, with much less hardship to the people, 47½ lacs.

"The statement of produce in Tanjore shows much more distinctly the progress of things and the cause of its improvement, because the revenue, as before observed, fluctuates with prices. The last column, showing the amount per cent. which the fluctuations in each five years bear to the average produce, is the most striking proof of what may be effected by due attention to the irrigation. The seasons are now just as variable as they were 40 years ago, yet the fluctuations have been gradually reduced from 52 per cent. to almost nothing. What can have caused such a change as this, but the due application of the water of the Cauvery? and can it be imagined that if the same wise and liberal system had been adopted with respect to the Godavery, something like the same effect would not have been produced?"

We cannot but add that it is very much to be regretted that these and the other valuable report and papers connected with the Godavery improvements are withheld from general circulation. They are documents with which every officer of the revenue and the Engineer's Departments ought to be familiar; but they still remain, with many other most valuable and instructive documents, locked up in the Records of the Board of Revenue.

257. The next instance which we will take is that of the Rajahmundry district itself. In all the foregoing cases a great part of the work done must be considered as directed only to the maintenance and improvement of existing works. In Tinnevely, as already said, this was emphatically the case; the works consisted of the careful repair of tanks and channels, and even among improvements there were few works of any magnitude at all. In South Arcot and in Tanjore the principal works which conducted to the striking results noticed, viz., the two anicuts on the

The new works on the Godavery river.

Coleroon river, were indeed new works; but even their design was only to render existing works more efficient, by giving them a more entire command of the waters of the river. The instance now before us is of a different character, viz., a case in which the object was to give irrigation to a tract of country not possessing it at all before, except to a very limited extent, and of a very precarious and uncertain kind.

The Godavery, like the Cauvery, flows to the sea through a flat alluvial delta; and this tract has been for many years partially and imperfectly irrigated from the river; but the irrigation had never been laid out on any comprehensive plan, and of late years the works had been almost wholly neglected. The revenue was declining, under the operation of a combination of causes, of which this neglect of the works of irrigation seems to have been the chief; and while Tanjore under the beneficial effects of the lately constructed anicuts was paying with ease a revenue of 45 lacs, and annually increasing in wealth, Rajahmundry, of similar extent, with a far more fertile soil, and inferior in no one natural advantage, was paying with extreme difficulty a revenue of 19 lacs, and its people were in the lowest state of poverty.

Origin of the project.

258. So long ago as before the close of the last century, an Engineer (Mr. Topping) had observed the facility with which the Godavery might be made to irrigate the districts on its banks, and had brought to the notice of Government how desirable it was to throw an anicut or dam across the river, so as to raise the water, and thus make it available for that purpose. The project was allowed to sleep for half a century, but in the year 1844, the district and its revenue being in the declining state already noticed, it was again taken up. The Civil Engineer Captain A. T. Cotton, first made a general report (12th August 1844) on the feasibility of the project and the probable results; and having been directed to collect and submit more specific information, he made a second and more detailed report on the 17th April 1845, with detailed estimates of the cost of an anicut across the Godavery river, and a more general statement of the probable cost of a system of channels and other works in connexion with it, for the distribution of the water. The project received the approval of the Government, and ultimately of the Court of Directors; and the construction of the anicut, the only part of the works at first sanctioned, was commenced early in 1847.

Nature of the undertaking.

259. The undertaking was a gigantic one; a river exceeding two miles in actual width, besides the islands which at that point divide it into four branches, and running over a bed of pure sand of unknown depth, was to be arrested in its course by a dam 12 feet high thrown across it; and a large part of its waters was to be diverted, and distributed over an extent of 3,000 square miles, by means of a net-work of channels, each one of which must not only be taken at that elevation which would enable it to perform its allotted part, in conjunction with the rest in bringing the whole tract of country under irrigation, but must be adapted as to size and gradient, to convey exactly the quantity of water required, and no more. And all this was to be done in a country where such works had never been heard of before on a scale of any magnitude, or at least only by tradition, and to be effected by the agency of workmen most ignorant and unskilful, who had to be taught almost everything, with a very scanty number of skilled or professional Superintendents, and where almost all the means of abridging or facilitating human labour, if obtained at all, must be fabricated on the spot by means of the same defective agency. The difficulties encountered in the prosecution of the work from the combination of all these unfavourable circumstances, can certainly be fully realized only by those who had a part in the task of overcoming them; some glimpse of their character and amount may be obtained from Colonel Cotton's reports. But our business here is not with the difficulties of the undertaking, but with its cost and its results.

The cost of the works.

260. Captain Cotton's estimate for the works amounted to 12 lacs of rupees, distributed as follows:—

The anicut, with locks, sluices, &c.	-	-	-	-	5	lacs.
Embankments to the river	-	-	-	-	1	"
Irrigation channels	-	-	-	-	2	"
Drainage works	-	-	-	-	1	"
Sluices, locks, and other small works of masonry	-	-	-	-	1	"
Roads and bridges	-	-	-	-	2	"
TOTAL	-	-	-	-	12	lacs.

But

But his more accurate estimate for the anicut itself amounted to Rs. 4,75,572. He supposed that the whole of the works would be completed in five years; and he calculated that at the end of the first 10 years the works would have afforded a net surplus income, above the average revenue of the district in the preceding 11 years, to the aggregate amount of Rs. 26,80,000, after deducting their first cost and repairs.

The completion of the works has required a longer time than was then anticipated, partly from delay in obtaining sanction for the channels and other works of distribution, partly because the extent of the operations necessary was found to be larger than was at first computed, and partly in consequence of the very insufficient means placed at Captain Cotton's disposal for laying out and planning the channels and other works. The cost too has been larger than was expected. The work had not proceeded far before it was found that the anicut would cost more than the estimate; the stone quarries turned out to be deceptive, and the material could not be laid down at the price supposed; a larger quantity than the estimate provided was found to be necessary; and lastly, a more finished and substantial style of construction was adopted. Upon the recommendation of a Committee appointed to consider the question, the Government in February 1849 sanctioned a supplemental estimate for the anicut, to the amount of Rs. 4,07,506, in addition to Rs. 5,03,703 already expended; and in the same month of 1851, a further sum of Rs. 65,742 was added for the purpose of extending one end of that work. Thus the total estimated cost of the anicut itself became Rs. 9,76,951, and that may be taken as its actual cost. The total expenditure on all parts of the project, up to the present time, is about 13 lacs; and it is calculated by Colonel Cotton that about 11 lacs may still be required; making 24 lacs for the whole system of works, including a most important line of navigation, and a lac and a half of expenditure on roads.

261. In exhibiting the results of this project, we will first show those already realized in comparison with the expenditure up to the present time, and then state the very much larger advantages which we are thereby fully warranted in anticipating, when the whole of the works shall be completed and in actual operation. And here we must observe that a comparison of the expenses and returns up to the present time is very unfair to the project, for two reasons; 1st., because the total cost of the anicut (a work which will supply the means of irrigating the whole tract) is now shown against the gains from a very small part of that extent, in consequence of the present incompleteness of the channels for distributing the water; 2d., because the large sums expended even on the works of distribution, in the last year at least, have not yet had time to give a return in revenue, and yet their whole cost also is included on the debit side. But even viewed under these disadvantageous circumstances the benefits from the work are seen to be very great; we will first take the whole revenue of the district, as shown in statement I, in Appendix (D.) It is there seen that on the average of the 11 years preceding the commencement of the works, the whole land revenue of the Rajahmundry Collectorate was Rs. 19,08,129; and even that is too favourable a statement, for in the last two or three years of that period, the revenue of parts of the district had improved greatly, in consequence of the clearing out of some of the old channels, previously very much choked with deposit. In 1847 the work at the anicut commenced, and the revenue instantaneously felt the benefit of it. In that first year the collections were larger than in any one of the preceding 11 years; and each of the succeeding six years has shown an advance above the preceding one, with the exception of the single season 1849-50, in which there was a destructive flood in the Godavery; and even in that year the collections exceeded those of any one of the 11 years before the anicut was begun. Nor is this all; in the very first year of the works, and in every subsequent year, the increase of revenue above the previous average exceeded the sum expended on the works, so that the net revenue, after deducting the amount of that expenditure, has been actually greater in every year, even while the works have been in progress, than the average of the antecedent 11 years. And up to the close of the revenue year 1850-51, with which the statement closes, the aggregate amount of such net gain was no less than Rs. 6,89,391. The total expenditure on the works had been Rs. 12,65,361, and the total increase of revenue above the previous average was Rs. 19,54,802; leaving a net surplus gain, as already said, of Rs. 6,89,391.

The results hitherto
in increase of
Revenue.

The cause of the immediate large increase of revenue.

262. This striking fact deserves special notice. To what are we to ascribe the instant rise of revenue and the sudden spring of prosperity of which it is the index, taking place immediately on the commencement of the works. It could not then be wholly the effect of irrigation, for in the first year the benefit in that way must have been very small; and even now, the increase of irrigation, large as it has been, is not sufficient to account for the whole gain in revenue. Another cause then must be sought, and we believe it may be found in the condition of things repeatedly noticed by Colonel Cotton, viz., in the vast stimulus given to industry and production by the employment of labour and the circulation of capital, involved in the expenditure of large sums in a depressed and poverty-stricken district. This is an important element among the incidents of such undertakings as the present, which has been too little recognized; Colonel Cotton indeed dwelt upon it in his very first Report on the Godavery irrigation,* and his expectations of profit from the works were framed with reference to it; but in general it has been entirely overlooked. In the present instance indeed its operation has been increased by the fact that a large Madras firm which has a sugar factory near Rajahmundry, has been enabled very much to augment its purchases, as the extension of irrigation made it possible to extend the cultivation of the cane. But though this fact explains the otherwise strange circumstance that the increase of revenue exceeds the sum expended, it does not weaken but confirms the great and important fact, that the outlay of capital in a district in the employment of labour, whether by Government or by private persons, produces an immediate and powerful effect on the revenue. Practically indeed this has long been known, every Tahsildar in the country is well aware how much more easily his collections come in years when merchants are making large advances in his talook for sugar; indigo, cotton, &c., but it has not been adequately recognized by the Government, or seen in its real bearing on the outlay of money by Government on the works of irrigation or on the roads. In future it is to be hoped it will not be lost sight of, in that relation.

Probable future results of the works.

263. We will now briefly state what appear to be the future prospects of benefit from the anicut. We have already said that Captain Cotton computed that at the end of 10 years, it would show an aggregate net gain in revenue, of Rs. 26,80,000 over and above all charges, in excess of the average revenue prior to the improvements. We have seen that one of the elements of this calculation, viz., the cost of the works, was very materially under estimated; and the period for the completion of the works being much protracted through the causes already noticed, another element of the calculation was modified, for this delay necessarily postponed the time when the whole system of works would be in operation. But though the estimate was thus disarranged, there still seems good ground for believing that the anticipation of net results will not be found to have been too sanguine. Captain Cotton's calculation in 1845 was as follows:

Expenditure

* The following passage is taken from the first report on the irrigation of Rajahmundry:—"In examining the question of the propriety of such an outlay as this, there is one point which I consider deserving of particular attention; we are apt, generally, to think of a Government expenditure as if it were precisely similar to one made by a private individual; but in countries circumstanced as these are, there is a vast difference, and especially in this particular case of Rajahmundry. A lac of rupees cannot be spent in any district without a large portion of it immediately finding its way back to the treasury; but in this district, which is now suffering such difficulties from the immense diminution of specie, probably the greater part will be paid back in the course of the year. This additional circulation will enable many to pay their kists who would otherwise not have done so; and perhaps there would be little more difference made by its disbursements, in respect of the state of the treasury, than that such portion of the population as would otherwise have been either not at all employed, or to little effect, would thus be usefully occupied. During three or four months the great bulk of the population are employed to very little purpose, where there is almost literally no capital to enable the landowners to make improvements; but an expenditure of three or four lacs a year would put life and activity into the whole district. That part of the population which are just now, from the impoverished state of the district, a dead weight upon the rest, from want of employment, would be provided for, and the supply of specie would give a great stimulus to the remainder. Indeed, I would state it as my opinion, that, independently of the ultimate returns, the treasury would not be at all the poorer at the end of the year for such a disbursement, in the present state of the district; such an outlay seems to me more nearly allied to a loan from a landlord to his tenant, to be expended in improving his farm, than to a simple expenditure." The revenue accounts of recent years show how singularly accurate this prediction was. Some later remarks on the same subject will be found in Appendix (D.) to this Report, para. 3 (near the end), and 10 and 11.

Expenditure in the next five years (<i>i. e.</i> dating from the commencement of actual work) to put the Delta in order	- -	12,00,000
Ditto, annual repairs from that time for five years, at 1 per cent. yearly, on 24 lacs of revenue	- - - -	1,20,000
Total Expenditure	- -	13,20,000
Increase of Revenue in 10 years at an average of four lacs yearly	- - - -	40,00,000
Net gain in the next 10 years by a liberal expenditure	-	26,80,000*

The calculation at present may be stated as follows :

Outlay.

Actual expenditure up to the present time (five years)	-	13,00,000
Estimated further expenditure in the next three years	-	11,00,000
Ordinary repairs and minor improvements for two years, at Rs. 1,20,000 yearly	- - - -	2,40,000
Total	- -	26,40,000

Income.

Actual increase of revenue up to the present time	- -	19,54,802
Probable increase during the next five years at an average of seven lacs yearly	- - - -	35,00,000
Total	-	54,54,802

Probable net gain in 10 years from the commencement of the works -	- - - -	28,14,802
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It will be seen by statement 1 in Appendix (D.) that the excess of collections in the single year 1850-51 over the average before the works were begun, was five lacs and three quarters; the revenue has largely increased since the very first year of the improvement, and there is no doubt that it will continue to rise at an accelerated ratio. Not to mention other channels and works, one single work constructed this year, the Ganarum Aqueduct, will convey water to a tract of country of 30,000 acres, which alone will yield a revenue of little less than a lac of rupees. We feel sure, therefore, that we are quite safe in assuming seven lacs as the average yearly excess of collections during the next five years, over the average before the works were commenced; we fully believe that in point of fact it will be still larger. If then Captain Cotton largely under-estimated the cost of the project,† there seems good reason to believe that he also greatly under-rated its benefits; and that after deducting the increased expenditure, the net gain at the end of 10 years, will be even larger than he expected.

264. And if we carry our views further, and contemplate the probable eventual results, we cannot but feel persuaded that his largest anticipations will be realized, both as regards the direct profit in revenue to Government and the vast accession of wealth to the people. We cannot forbear to glance hastily at this promising future.

Probable eventual results, when the works shall be in full operation.

The

* See the second report on the Delta of the Godavery. Besides the above, Captain Cotton also took credit for the prevention of an annual loss of revenue to the amount of Rs. 90,000, which, as he inferred from the accounts of past years, would take place in the 10 years in question, in the absence of the projected works. The Board of Revenue do not deny the justness of this estimate; and they specially notice the then declining state of the revenue as one principal reason in favour of undertaking the works. But we take no account of this part of the calculation, because we do not feel ourselves in a position to speak confidently upon it, and the amount may be open to dispute. We confine ourselves to the increase over the previous average revenue; but it is evident that this is to take too limited a view of the results.

† It is an apt illustration of the mode in which undertakings of this nature are regarded at Madras, that while the Committee who investigated the causes of the insufficiency of the estimate, and the probable cost of completing the work, received the thanks of the Government, and very deservedly, there was nothing but severe censure for the officer who devised the project, and superintended its execution, at enormous and incessant labour to himself, both mental and bodily. No matter that he had given a net addition of several lacs annually to the revenue, and that he had brought industry, enterprise and wealth, to a community of a million persons, previously poverty stricken and desponding, he had committed the grave offence of making too small an estimate; by an error of judgment which might have been supposed pardonable in an undertaking of such vastness and such novelty, he had represented the money price of all the enormous advantages of the work, utterly insignificant in reality, as more insignificant still.

The tract capable of being watered from the anicut is 3,000 square miles, or two million acres; and there is more than sufficient water for this extent. But as a part of it is capable of being watered also from the Kistnah, by means of the anicut to be constructed at Bezwarrah, Colonel Cotton takes 12,00,000 acres as the actual extent to be irrigated. And out of this there will be water for about 100,000 acres all through the dry season, which will probably be all cultivated eventually with sugar cane, betel, chillies, plantains, and other valuable products. The richness of the soil adapts it admirably for the sugar cane, the cultivation of which has very much extended since the anicut was built; and a Madras mercantile house has a large sugar factory very near Rajahmundry, as already noticed. The growth and manufacture of sugar are likely to increase immensely. Colonel Cotton reckons that after the works have been completed, a yearly outlay of *Rs.* 1,20,000 will be fully sufficient to maintain these works in good order; and adding to this sum *Rs.* 50,000 for the yearly cost of the engineering and Maramut establishments, being on a liberal scale and at an outside estimate, and the further sum of *Rs.* 1,20,000 as the interest at 5 per cent. on the capital invested, 24 lacs, the total annual charge will be *Rs.* 2,90,000, which will give less than four annas per acre as the yearly cost of conveying the water to the land. The increased income to Government is reckoned at only 2½ rupees an acre, though it will hardly any where be less, and will be very much more over a great part of the tract, because a large part of the newly irrigated land will be such as was never cultivated at all before, and never paid anything. Even at that moderate rate, however, the total increase of revenue will not be less than 30 lacs annually; being more than cent. per cent. annually on the outlay, after deducting all charges; and large as this appears, there seems nothing impossible or incredible in it, if we look at Tanjore, which now actually pays with ease and alacrity a revenue of 47 lacs.

Vast gain to the people.

265. And this triumphant success, this magnificent addition to the revenue, is not to be gained by exaction, by trenching on the fair rights of property or industry; on the contrary, the noblest feature of all is that this vast gain to the Government is to be obtained by adding in a far higher degree to the wealth, comfort and happiness of the people. The value of the crop on an acre of dry land does not exceed *Rs.* 6, but that of an acre of rice is *Rs.* 20, and of an acre of sugar cane it is *Rs.* 230; being a gain of *Rs.* 14 an acre in the former case, and *Rs.* 224 in the latter. The gain to the producer therefore, by the improvements in question, may be stated as follows, at a low estimate:

1,00,000 acres of sugar cane and other valuable products	<i>Rs.</i>
at <i>Rs.</i> 200	2,00,00,000
11,00,000 acres of rice at <i>Rs.</i> 12	1,32,00,000
Total	<u>3,32,00,000</u>

Reckoning the value of the crops at these moderate rates, and taking no notice of the fact that much of this will be land now altogether waste and unproductive, or of the certainty of the crops under river irrigation, compared with their precariousness at present, we find that the gain to the Ryot is 332 lacs, and if he pays 30 lacs in revenue, he will still be a clear gainer of 300 lacs a year. It is no wonder that the greatest anxiety is displayed to get a share of the irrigation, or the greatest alacrity to use the water when so obtained; nor is there anything surprising in the striking change which Colonel Cotton so prominently remarks on in his later reports, as exhibiting itself in the character of the people, activity, enterprise and life, having taken the place of their former apathy and despondence.

The Samulecottah Channel.

266. In further illustration of the effects of the improvements in Rajahmundry, we will detail the results of particular parts of the whole project; and the first work which we will take is the Samulecottah Channel. This is an entirely new branch taken off from one of the old irrigating channels, called the Toolia Bagah; it is 27 miles in length, and eventually will water 15 villages; but as yet the water has not reached all of them, from the incompleteness of the subsidiary works. The channel was excavated in 1846, at an expenditure of *Rs.* 13,472; its supply was first increased by the operation of the anicut in 1848, which affected the revenue of 1849; the Table No. 2, in Appendix (D.), shows the results, being a comparison of the revenue from the 15 villages concerned, before and after the excavation of the channel. The total sum expended on the improvements was *Rs.* 29,226, spread over five years, but of which *Rs.* 22,000 was spent in the first two years; and

and the increased collections up to the end of the third year far more than covered the whole outlay. But as this channel has benefited by the anicut, we will add to its own cost a share of that of the anicut proportioned to the area watered by it, compared with the whole extent to be irrigated by the anicut, viz. 1-18th, or Rs. 11,300. The outlay will then be Rs. 40,526; and the increase of revenue in the third year from the first commencement of the improvement exceeded this whole outlay, much of which was in fact incurred after that year. The average yearly collection in the six years preceding the improvements was Rs. 25,280; in the fifth year from that time it was more than double, being Rs. 51,245; in the sixth year (1851), as we learn from the Collector, it was Rs. 56,882. The aggregate excess of revenue in those six years, above the average of the preceding period, was Rs. 1,13,876; and the net gain in revenue, after deducting the cost of the improvements and repairs (including Rs. 4,217 expended in 1851), was Rs. 62,433.

Lastly, to compare the yearly increase of revenue with the outlay. The total first cost, taking as such the whole outlay of the first two years, and the share of the cost of the anicut, was Rs. 33,237. The marginal statement shows that the increase of revenue over the average before the improvements, has been larger and larger in each succeeding year as the works advanced; and undoubtedly it will continue to advance, because the minor works for distributing the water are even yet far from being complete. The increase in 1851 above the average prior to the improvements was Rs. 31,602, and deducting from this Rs. 2,000 as the average cost of repairs, there remains Rs. 29,602, being 95 per cent. on the first cost. But the revenue, as already said, is still increasing; and there seems no doubt whatever that in a few years the net amount, clear of the cost of repairs, will reach at least Rs. 38,000, being more than 111 per cent. annual return on the first cost.

	Rs.
1846 - -	5,306
1847 - -	10,813
1848 - -	17,660
1849 - -	22,630
1850 - -	25,065
1851 - -	31,602

267. As another instance, we will take the Woondy Talook. This Talook lies on the left bank of the Godavery, just below the anicut; a part of it is high, while the rest is so low, that being undrained, it has always been liable to much injury from floods. The latter part of the talook, was watered by two anicut channels, called the Boopiah and the Apparow Channels, which passed also through the higher part, but at too low a level to be available for irrigation in that part of their course. Both channels had been totally neglected for many years, and were much choked up with deposit. The improvements commenced in 1839 with the clearing out of the old channels, and they have been continued every year. In addition to that clearing out, the works have been chiefly of three kinds: 1st. Constructing locks and dams of masonry across the channels in their passage through the high grounds, so as to irrigate the lands there. 2d. Excavating branch channels to reach tracts not formerly irrigated; and 3d. In guarding against floods in the low part, by embanking the river and forming drainage works.

The Woondy Talook.

The following Table shows the expenditure and the results :

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.
Years.	Collections.	Increase of Revenue above Average of the Six previous Years.	Decrease of Revenue.	Total of Increase at the End of each Year.	Cost of the Improvements to the Two main Channels.	Total Cost up to the End of each Year.	Half debited to Woondy.	Expenditure in the Talook.	Total Expenditure in the Talook up to the End of each Year.	Total Cost of the Improvement.	Share of the Cost of the Anicut.	Net Profit to Government at the End of each Year.
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
1833	69,394	-	-	-	-	-	-	-	-	-	-	-
1834	87,982	-	-	-	-	-	-	-	-	-	-	-
1835	64,533	-	-	-	-	-	-	-	-	-	-	-
1836	78,143	-	-	-	-	-	-	1,846	1,846	-	-	-
1837	77,412	-	-	-	-	-	-	988	2,834	-	-	-
1838	37,886	-	-	-	-	-	-	1,907	4,741	-	-	-
Average -	69,223	-	-	-	-	-	-	-	-	-	-	-
1839	84,349	15,166	-	15,166	795	795	897	3,801	8,542	8,939	-	6,227
1840	80,877	11,454	-	26,620	2,505	3,300	1,650	4,508	13,050	14,700	-	11,920
1841	90,024	20,861	-	47,421	3,650	8,950	4,475	6,872	19,922	24,397	-	23,024
1842	93,465	24,242	-	71,663	485	9,435	4,718	2,729	22,651	27,369	-	44,294
1843	62,895	-	-	65,338	610	10,045	5,023	1,337	23,988	29,010	-	56,328
1844	95,512	26,289	6,325	91,627	2,920	12,965	6,483	6,090	30,078	36,561	-	55,068
1845	1,02,962	32,839	-	1,24,466	2,987	15,852	7,976	2,991	33,069	41,045	-	83,421
1846	1,08,384	39,161	-	1,63,627	54	16,006	8,003	2,938	36,007	44,010	-	1,18,617
1847	1,12,989	43,766	-	2,07,393	-	16,006	8,003	3,886	39,893	47,896	-	1,59,417
1848	1,19,252	50,009	-	2,57,402	1,190	17,196	8,598	1,458	41,351	49,949	-	2,07,453
1849	99,983	30,772	-	2,88,174	13	17,209	8,604	754	42,103	50,709	-	2,57,465
1850	1,25,000	55,777	-	3,43,951	983	18,192	9,096	1,154	43,259	52,355	60,000	2,91,596
1851	1,36,662	67,459	-	4,11,390	-	18,192	9,096	1,689	44,948	54,044	-	3,57,346

Results obtained.

268. The total outlay in improving the old channels has been *Rs.* 18,192; but as they water lands in Masulipatam also, half of that amount is deducted as due to that district, and the remaining moiety only, viz. *Rs.* 9,096, is debited to the Woody Talook. The minor improvements of the various kinds above stated, have cost on the whole *Rs.* 44,948 in 16 years, but the greater part of it, viz. *Rs.* 25,337, in the six years, 1839 to 1844. Turning now to the revenue column, we find that the average yearly collections in six years preceding 1839, when the improvements were commenced, is *Rs.* 69,223, while since that period they have been steadily rising, with the exception of two bad years, when there was much loss, until, in 1851, they amounted to *Rs.* 1,36,662, being nearly double the average prior to the improvements. In the earlier of the two bad years just spoken of, viz. 1843, the cause of the loss was drought, or rather it was the want of an anicut, as there was plenty of water in the river; in the latter year, the cause was an extraordinary flood, or the insufficiency of the embankments.

The anicut first affected the supply of water to these channels in 1850; we will therefore compare the outlay with the results both prior and subsequently to that period. The total excess of revenue in the 11 years, 1839 to 1849, above what it would have been at the average of the preceding six years, is *Rs.* 2,88,174, being more than five and a half fold the whole amount expended on the improvements up to that time; but we must add again, that the real effect is much greater than is thus shown, because year by year improvements were going on and producing fresh increase of revenue, which increase is unduly diminished by being spread over the whole period.

But now to include the cost of the anicut. The area to be ultimately watered by these channels is about 1-15th of the whole tract that will be irrigated by the anicut; and we therefore take 1-15th of the cost of that work, or *Rs.* 60,000, as debitable to them. Add to this, *Rs.* 9,096, the cost of the improvements to the main works and 22,474, being half the amount of expenditure in the talook, and we obtain the first cost of these improvements; the other half of the latter sum is the probable amount of repairs, being at the rate of *Rs.* 1,404 annually. The total first cost of the work, then, is *Rs.* 91,570. The total increase of collections in the two years, 1850 and 1851, above the average prior to 1839, is *Rs.* 1,23,216, or *Rs.* 61,608 a year; and deducting from this *Rs.* 1,404, the annual expenditure on repairs, the net gain in revenue is *Rs.* 60,204, or 65 per cent. per annum on the first cost of the works, including the share of the anicut. But this is trifling compared with what may be expected with certainty in a few years. For from the want of the detailed works for distributing the water over the Talook, which could not be attended to for want of officers and surveyors to lay them out, the water does not yet reach to nearly the whole extent of land which will ultimately be watered by it.

The importance of this case as an example.

269. We have given a somewhat lengthened notice to the works on the Godavery, because their great importance seemed to us to deserve it. They afford a most instructive instance of the vast benefits to be obtained by extending irrigation, and an emphatic encouragement to advance boldly and vigorously in that course of improvement. Even while the works are in progress and far from being complete, and while a large part of their effect is of necessity still undeveloped, the direct return in revenue have amounted, taking each year's increase of revenue in comparison with the whole expenditure up to that time, to above 62 per cent. per annum on the capital laid out;* and there is no doubt whatever that the future returns will be enormously larger. While to the people the change may be described as one from death to life: at so low a point were they before in poverty and indifference, so great is the contrast now in activity and energy. And all this has been obtained, it should be remembered, literally without any outlay, without any sacrifice of income whatever; for in every year of the progress of the work, the increase of revenue has been materially in excess of the expenditure. It would be

* The comparison is here made with the average revenue of the 11 years immediately preceding 1846-47, the year in which the improvements began. But this, as already observed, is unfair to the works, because the improvement of several of the large old channels was commenced several years before, and not only arrested the downward progress of the revenue, but raised it somewhat. A fairer comparison would be to omit the last three years immediately preceding, and take the previous eight, viz., 1835-36 to 1842-43; the average revenue for comparison would then be *Rs.* 18,59,354, and the annual per-centage of direct profit from the works 71 per cent. on the sums expended.—See Statement 1, in Appendix (D).

be unsafe to reckon upon an equal measure of success in every instance, for the circumstances of Rajahmundry were peculiarly favourable; but we are bold to declare our firm conviction that there is no district in the country in which a similar expenditure would not be largely remunerative to the Government and a blessing to the people, though not in all in the same degree.

270. In closing our remarks on this case, we may observe, lastly, that there is one essential species of improvement in connexion with improved irrigation works, which has not yet been adequately attended to, and which was neglected in the present instance; we mean the facilitating of the transport of produce. We have seen that in Rajahmundry the additional income every year exceeded the outlay; yet a trifling sum, under Rs. 10,000, for the formation of a most important piece of road to connect the producing parts of the district with the shipping port, was once and again refused by Government, on the ground that the expenditure on the irrigation works was so heavy. Had it not fortunately happened that the principal irrigation channels themselves form a valuable line of communication though as yet very imperfect, this policy must greatly have retarded the beneficial effects of the irrigation improvements. No time should now be lost in perfecting the canals for navigation and in forming a system of communication throughout the district.

The roads of the district must be improved.

The port of Coringa also requires attention. This valuable harbour has hitherto been utterly neglected, and it is no wonder that it has rapidly deteriorated within memory; yet a very small expenditure, and the application of those principles of treatment which have been developed by attention to similar works in England, would restore and greatly improve it. We shall recur to this subject hereafter. Many concurrent circumstances point to Coringa and its port as likely to become hereafter one of the largest and most important centres of commerce in the whole Indian Peninsula.

And the port of Coringa.

271. This seems a suitable place to offer a few observations on the statement given in Appendix (Z.), showing the revenue results of the outlay incurred by Government, during a number of years, in improving irrigation. The statement was drawn up under the orders of the Board of Revenue in the Department of Public Works, with much care and labour; but we have changed its form, and put it in a shape which appears to us more convenient than its former one. It is not a perfect statement, being wanting in some details: but it embodies all the information which the Board could obtain after a great deal of trouble and correspondence; and in all that it gives it may fairly be taken as authentic. It is a point of no little importance that even a commencement has been made in collecting such information; and the reports of each succeeding year may be expected to be more and more complete.

Remarks on the statement of the results of improvements in irrigation.

The present statement covers a period of 14 years; viz., from 1836 to 1849 inclusive. It includes all completed works of any magnitude executed within that term, for the improvement of the irrigation; not merely new works, but enlargements and extensions of old ones; a number of even very small works are entered in it. Lastly, we are assured by the Board's Secretary, that it comprehends all works coming within the foregoing description, whether successful or otherwise; and is not in any sense or degree a selection. It includes a number of improvements in connexion with the Godavery anicut, but it does not include the anicut itself, because that was only in course of construction at the time when the statement closes.

272. An examination of this table places the good policy of improving the irrigation in a very striking point of view, even confining our regards to the narrow object of the revenue. Taking as single works one or two entries, each of which in fact refers to several small works, it contains 39 works, of which three only have been unremunerative; viz. Nos. 13, 14 and 27. The first of these three, the Moonunghy Channel in Guntoor District, designed for the irrigation of a certain tract, was never completed, having been superseded while in course of excavation, by the better and more recent project of the Toongabudra Channel (No. 10 in the list), which waters the same land and other besides. The second, the Ivany Tank in the same district, exhibits a trifling loss, in consequence of having been breached in a most unusual flood in the year 1849; the repair of this accident materially raised the average cost of repairs in the few years since the restoration of the tank; but there is no reason to doubt that the work will still be a profitable

A very few works in it have not been profitable; the reasons of this.

one. The third work, viz.; the new Iyen Voykal in Trichinopoly District, has been apparently the worst of all; but in point of fact it is not a failure at all, inasmuch as increase of revenue from the work itself was no part of the intention when it was undertaken, but another object, which has been fully attained. When the Upper Coleroon anicut, alluded to above, was undertaken for the benefit of Tanjore, the old Iyen Voykal, a valuable and very productive channel in the Trichinopoly District, taken off from the Coleroon about 10 miles below the site of the proposed anicut, would have been thereby deprived of a large part of its supply of water, unless it had been prolonged upward, so as to bring its head above the anicut. This prolongation is the present work, styled the new Iyen Voykal. The work was a necessary part of the plan for improving the irrigation of Tanjore; and properly the expenditure ought to have been charged against that district; in which case the very large rate of profit from the upper anicut now shown would have been slightly reduced. Thus this channel cannot in any sense be considered a failure, because the very important object with which it was undertaken was fully attained. In point of fact, the revenue from the channel fell off after this improvement (for improvement it undoubtedly was), but for this that improvement is obviously not responsible. Some remarks will be found below (*see para. 303*) as to the probable real causes of this decline.

A large part of the outlay has been enormously profitable.

273. With the exception of the three works above noticed, all the others in the list exhibit a profit in revenue, and some an enormous profit. The following are those which display the highest rates of return on the capital invested, and among them are several of the largest works in the whole list.

DISTRICT.	WORKS.	First Cost.	Average Yearly Outlay in Repairs and Minor Improvements.	Average Yearly Increase of Revenue by the Work.	Average Yearly Net Increase, deducting the Cost of Repairs, &c.	Per Centage of the Yearly Net Gain to the first Cost.
		<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>
Rajahmundry	Samulcottah Channel -	13,472	2,840	13,289	10,440	77 $\frac{2}{10}$
	Boopiah Calway and other works.	19,259	1,362	18,975	17,613	91 $\frac{7}{16}$
Masulipatam	Pullairoo Channel -	13,713	1,739	27,600	25,841	188
	Apparow Channel -	8,756	577	23,287	22,710	259 $\frac{1}{2}$
Guntoor	Cochinapoody Tank Channel.	366	450	1,181	722	197 $\frac{1}{4}$
	Vellatoor Channel -	7,087	723	7,013	6,290	88 $\frac{1}{2}$
Nellore	Veroor River Channel -	1,751	83	2,393	2,310	132
South Arcot	Lower Coleroon Anicut and connected works.	74,234	2,855	1,01,641	98,786	133 $\frac{1}{16}$
Tanjore	Upper Coleroon Anicut -	63,401	18,169	1,38,861	1,20,702	144 $\frac{1}{4}$
Coimbatore	Pillioor Tank and other works.	6,511	248	5,862	5,614	86 $\frac{7}{16}$
Madura	Improvement to a small anicut on the Vigay River.	2,466	470	2,681	2,211	89 $\frac{1}{2}$
Tinnevelly	Teroovengadanadapoorum Tank.	643	-	1,048	1,048	163
	Autoor Tank.	3,242	623	3,684	3,061	94 $\frac{1}{2}$
	TOTAL - - - <i>Rs.</i>	2,34,901	30,158	3,47,515	3,17,357	134

Thus the aggregate cost of those 13 improvements was *Rs.* 2,34,901, and the total net annual gain in revenue, after deducting the annual charges, was *Rs.* 3,17,357, being at the rate of 134 per cent. per annum on the capital expended.

And the result of the whole is a very large profit.

274. Of the remaining works in the list, the rate of net annual profit ranges from 3 $\frac{1}{2}$ per cent. in one case, to 47 $\frac{1}{4}$ per cent. But it must be borne in mind that in many of those cases which now show the smallest rate of profit, the works have been in operation only a very limited term, and it often takes several years to develop the full effects of improvements of this nature.

Taking the whole of the works in the list, the successful and the unsuccessful, the following is the result: the total first cost was *Rs.* 5,41,116; the total average yearly

yearly net gain in revenue, after deducting charges, was Rs. 3,76,737, being a net profit direct to Government at the rate of 69½ per cent. per annum on the cost. This calculation indeed does not include the charge of the Engineering and other Establishments, but if we add 25 per cent. on that account both to the first cost and to the annual repairs, &c., a proportion which we know (*see Appendix AA.*) to be in excess of the actual truth, we still have a clear direct profit to Government of 53½ per cent. per annum on the outlay. Had there been a more sufficient engineering establishment to make more careful previous inquiries, and to oversee the executive more efficiently, some few of the works in the list might possibly not have been undertaken, and certainly all would have been more cheaply accomplished. But taking the list as it stands, it cannot be denied that the result shown is most satisfactory; a most convincing proof of the value of irrigation, and of the ease with which the resources of the Government as well as of the people may by that means be immensely increased.

275. Before quitting this subject we cannot forbear recording a few observations on the very small amount of the expenditure shown in the statement. During the whole period of 14 years included in it, the sum of the expenditure on the very important objects to which it refers, was no more than Rs. 5,41,116 in the whole of the 18 collectorates which possess Government irrigation works, being at the rate of the insignificant sum of Rs. 2,137 a year to each district.* And, in point of fact, four of the 18 districts did not participate at all in this niggard expenditure, and among the four is the large and important one of North Arcot, with its 12 lacs of revenue from irrigation. And yet the result of those expenditures even in the narrow aspect of revenue return, was such as to afford the most ample encouragement to a further advance in the same profitable course of investment, had it only been duly attended to. In particular, the two noble anicuts on the Coleroon are among the earliest works of the period. We trust that the new practice of preparing statements of results (and it is to be hoped of publishing them also), will have the effect of attracting more attention to the subject. Indeed we fully believe that this neglect by the Government of undertakings so remunerative, is to be accounted for in a great measure by the extreme paucity of engineers. Superficially and imperfectly as those officers are compelled to perform even their ordinary and routine duties, these are yet quite sufficient to engross all their time, and to leave them none to attend to new undertakings. Here and there indeed an officer is found with energy to take up the investigation of great projects, but this cannot be done except by the neglect of the ordinary duties of his charge, and this is no slight evil, though, perhaps, the lesser of the two. In the case of the Godavery works, not only were the ordinary duties of the division entirely neglected, as we learn from Colonel Cotton's own correspondence, but other divisions were deprived of no inconsiderable part of their far too scanty establishments, in order to provide for carrying on that one undertaking, and still the number of officers employed upon it was far too small, and the progress in consequence very slow.

The whole expenditure on such works has been very scanty.

An examination of this list of works suggests humiliating reflections. The ancient rulers of the country, with resources of science and skill immeasurably inferior to what we can command, raised those numberless magnificent and valuable works, to the possession and the advantages of which our Government has succeeded. It is too evident that had the present powers always ruled, the country would never have possessed these additions to its wealth; or the Government that large accession of revenue, both of which are due to the enlightened intelligence of princes whom we are accustomed to style barbarian.

276. Having given the foregoing examples of great and immediate gain from increased outlay on irrigation works, it might be interesting and useful to quote some instances of the converse; viz. of the actual loss both to the revenue and to the general wealth from the past neglect of the works of irrigation. But we are unfortunately without the materials necessary to carry out this inquiry completely, as there is no record of the former and present revenue from the various tanks or watercourses. The decay of cultivation and revenue under a particular work, indeed, will occasionally attract the notice of the Civil Engineer or the Collector, and

Losses through the neglect of the works of irrigation.

* On inquiry, it appears that part of the expenditure set down as "subsequent repairs" was, in fact, for radical improvements; but even allowing that this is so much as two lacs (and we believe it is much less,) still the total is very meagre.

and the cause of evil will be removed by repair, but commonly no record is made, even then, of the past history of the work, and the circumstances are soon forgotten, even by the officer himself, amid the pressure of other calls on his attention. Very many cases must have occurred in Tinnevely during the gradual revival of its irrigated revenue which we have described, where the revenue under works had fallen off from their being in need of repair, and rose again when the repair was made, but unfortunately the particulars of those cases have not been preserved. A few instances of this nature which have casually come to our knowledge will be found in a subsequent part of this report (*see* the early part of section 9). The various ancient channels of Rajahmundry, and still more those of Ganjam, would all supply striking examples of vast loss by the neglect of irrigation works, if we were acquainted with the particulars.

Loss to the Ryot.

277. And in connexion with the subject of loss of revenue from neglect to repair works of irrigation, it must never be forgotten that for every hundred rupees of revenue so sacrificed a further loss of fully *Rs.* 150 is entailed on the Ryot; indeed the loss to him is often total ruin, in cases which the Government only regard as a decline of revenue to the amount of a few hundred or a few thousands of rupees out of their hundreds of lacs. For if the tank or channel on which the value of his land depends is permitted to fall to decay, he has no resource, he cannot even, under the existing revenue arrangements, cultivate it with dry crops, for if he did so he would have to pay the full rent for irrigated land, and the ground is therefore left untilled. The following is an instance of this, and not a very rare one: the tank of the small village of Poottivauripilly in North Arcot District was breached in 1847 so as to be incapable of holding water; it was not repaired till 1851, the delay being chiefly in consequence of the Civil Engineer Department having had no time to visit it, as the Board of Revenue would not sanction a talook estimate sent up. The Ryots, who are poor and hard-working people, deeply felt the loss of their tank, and did their best to get water from wells to cultivate a little of the land. The land thus cultivated has yielded *Rs.* 67 a year, while the average collections prior to the breaching of the tank were *Rs.* 426; the estimate for the repair of the tank was only *Rs.* 750.

Thus, in this petty case the Government sustained a positive loss of above *Rs.* 1,400 in four years, for want of a proper person to estimate for this trifling and simple work. But the loss to the Ryots has been much more heavy; they have been reduced to much actual distress. Indeed, we cannot but think that in neglecting or refusing to keep works of irrigation in repair, the Government commits a positive wrong. The Ryot has invested his labour and capital in the land under the tank or channel, on the implied contract that it shall be kept in efficient repair, and if that is not done, and so his property in the land becomes valueless, we think he may fairly charge the Government with breach of faith.

A recent case of hesitation as to repairing certain tanks.

278. We are induced to dwell more on this point, in consequence of the order recently passed by Government (Revenue Department, 6th September 1851, No. 905), directing the stoppage of the repair of two very large tanks in the Bellary District, which were much damaged in the gale in May last. One of these tanks, that of Darojee, yields an average revenue of *Rs.* 7,524, and the estimated cost of repairing the damage done by the gale is *Rs.* 37,998; the other, that of Singanamully, yields an average revenue of *Rs.* 12,239 to Government, besides revenue alienated as enam, to the amount of about *Rs.* 10,000, being a total of *Rs.* 22,000. The estimate for the repair of the tanks amounts to *Rs.* 60,500. The Right Honourable the Governor in Council considers the amount of the estimates enormous, with reference to the revenue at stake, calls for information whether that amount cannot be diminished, and directs that pending the receipt of orders, on reference hereafter to be made to the Government of India or to the Home authorities, the repairs which have been some time in progress shall be stopped.* The annual revenue from the two works, including that portion which has been alienated or granted to private persons, is *Rs.* 30,000; the Ryot's share of the produce of the land, assuming the proportion before taken, *viz.*, two-fifths to the Government and three-fifths to the Ryot, is *Rs.* 45,000, being a total annual value of *Rs.* 75,000. The expenditure necessary to repair the tanks, that is, to recover

* The details of the revenue and extent of cultivation under these tanks are taken from statements furnished to us by the Collector of Bellary, showing these particulars for the last 10 years.

recover this amount of income now lost, is Rs. 98,500 less than one year and a quarter's purchase; and this is withheld.

279. Now on this resolution it occurs to remark, first, that on the very narrowest view of the subject, a return of 20 per cent. annually on the amount to be expended, may be regarded as absolutely certain, being the average annual amount actually received during the last 10 years.* And the value of this fact is not affected by the consideration, that the outlay is not for the formation of a new work, but for the repair of an old one; a most extraordinary natural visitation has rendered useless valuable works, yielding a certain amount of revenue yearly, the repair of the injury requires a large sum, and unless it is done the works will continue useless. It may be wished that the accident had not occurred; but having occurred it must be repaired, or the whole revenue from the works must be sacrificed. And it must not be forgotten that even the delay of a year, which, at the least, this order involves, will certainly cost the Government the whole revenue of the year, viz. Rs. 20,000, besides a loss of Rs. 55,000 to the Enamdars and Ryots.

Large profit to be obtained to Government.

280. But our principal object in noticing this order, is to point out how completely it ignores the rights of those Ryots who have a property in the land watered by these tanks. The sanction of the Government of India or of the Home authorities, may or may not be necessary for an outlay actually required for ordinary repairs; the estimates may or may not be exorbitant, as the Right Honourable the Governor in Council is under the impression they are; but what we wish earnestly to call attention to, is the fact that in the consideration of the question of their repair, the question indeed whether they shall be repaired at all, or allowed to lie in ruins, no account whatever is taken of the saleable and heritable property of the Ryots, in the lands dependent on the tanks.

The rights and interests of the Ryots affected.

The lands cultivated by means of the water of these tanks comprise about 3,200 acres, and are probably owned by above 600 separate proprietors. They have for ages been irrigated by the tanks, and derive almost the whole of their value from that capability and right of irrigation; they have been inherited through many generations, and have been purchased probably again and again in dependence on that right. If they are now left without irrigation, they become utterly valueless under the existing revenue settlement; and even if the assessment is re-adjusted to suit them as dry land, still at least three-fourths of their value will be annihilated. And yet the question of restoring the tanks is discussed, as far as appears, without any reference to these interests.

We cannot but declare that this appears to us too contracted a view. We think that in all cases of a proposed work the views of Government should not be limited to the direct revenue return, but should comprehend and allow some value to the addition made to the public wealth in the Ryot's share of the increase; and further, that in the case of existing works the Government is in a degree morally bound to maintain them in repair, independently of, and in addition to the consideration of revenue, for the sake of the capital, which, on the faith of their virtual engagement to do so, has been invested in the land under such works.†

281. The importance and value of irrigation to the prosperity of the country, is a point which is to be decided rather upon argument and proof, than by reference to any authority, however deserving of respect. We will, however, here quote the opinions of two officers, who as well from their character as from their particular position, are entitled to be heard with much deference on this question. In July 1838 Mr. C. R. Cotton, a member of the Board of Revenue, was appointed a Commissioner to report on the cause of the decline of the revenue of the Madras Presidency. In the discharge of this duty he instituted detailed inquiries, and had collected much information when his health gave way, and in the beginning of 1840 he was compelled to relinquish the task and quit India. Before his departure he drew up a general report (dated 20 February 1840), embodying the result of his inquiries as far as they had proceeded; and in that paper he thus records his opinion

Opinions of Mr. C. R. Cotton as to the value of irrigation.

* Major Henderson, the Civil Engineer, also states respecting the Singansmully Tank, that during the half century that the country has been under the British Government, it has yielded a revenue to Government of six lacs of rupees, clear of all charges; this again comes to exactly 20 per cent. per annum on the sum now proposed to be expended, viz., Rs. 60,000.

† After the above passage was written the repair of the two tanks was ordered, under authority obtained from Calcutta.

opinion as to the essential importance of improving and extending the works of irrigation:—

“ 61. There is no country in the world where the items constituting an unfavourable season are so few, and where the means of obviating them are so extensively within the power of the Government. The commanding position in which we now stand in the Peninsula of India, gives us such complete control over the sources and direction of all the streams which traverse it, and which are fed by the various monsoons of the east and of the west, that there is no part of any one district which cannot with the greatest facility be brought under the fertilizing influence of a river; and so long as one drop of water is allowed to run waste into the sea, we must take blame to ourselves for not exerting our best efforts to obviate the evils of poverty or the dreadful effects of famine.

“ 62. We have hitherto taken far too limited and illiberal a view of this important object; attempts have been even made to throw a doubt on the policy of extending works of irrigation, as tending to push on the agricultural interests to the detriment of others; but experience, and a moment's consideration, convince us that such an impression originated in error, and has been supported by false notions; and as long as it is allowed to have weight, so long will the advance of the prosperity and revenues of this part of India be seriously impeded.

“ 63. By irrigation every species of product is improved, and the labour of tillage reduced, while the amount of produce is increased on any given space; and if the extent of population does not keep pace with that increase, or new varieties of crop do not prevent a superabundance of the grains now commonly cultivated, the decrease of price must be followed by a corresponding decrease in the commutation at which the assessment is noted, whereby both grower and consumer will be directly benefited, and the Government repaid by the extension of cultivation and the improved means of the people.”

Opinion of Mr.
John Sullivan

282. After Mr. Cotton's departure Mr. John Sullivan, an officer of long revenue experience, was employed to prosecute the inquiry left incomplete by the former gentleman, and he made separate reports on several districts. In his report on Coimbatore the following passages occur, in which Mr. Sullivan states, in strong terms, his opinion of the importance of giving more attention to the improvement of irrigation works, and urges various arguments and proofs in support of that opinion:—

“ 3. * * * * *
The degree in which lands watered from the rivers that are fed by the south-west monsoon are affected in a bad season, depends entirely upon the locality of the rivers. If the sources of those rivers are far to the westward, the lands under them yield an abundant harvest, in what may be the worst of seasons for other lands.

“ In Coimbatore, the rivers which possess this advantage in the greatest degree are, 1st, the Cauvery; 2d, the Bhowany; 3d, Allyoor; 4th, Minor Streams; in a less degree, ‘ the Umrawatty;’ partially, ‘ the Noel.’

“ 4. It will be seen from the accompanying statement, that comparing the good season of Fusly 1236 with the very bad season of 1246, there was an actual increase in the latter year in the revenue from the land watered by the rivers ‘ Bhowany’ and ‘ Allyoor,’ a very trifling decrease only in the revenue dependent upon the ‘ Umrawatty,’ and an immense defalcation from the lands of every other description. With this incontestable proof that the prosperity of the revenue of Coimbatore depends entirely upon the degree in which the district can be brought within the influence of artificial irrigation, it is very extraordinary to hear an opinion from the Acting Principal Collector that it would neither be for the interest of the Government nor the people that any considerable expense should be incurred in improving or extending the works of irrigation. His reasons are, that, as regards the Ryots, a considerable extension of cultivation would, by reducing the prices, be detrimental to the interests of those who did not share in it; and with respect to those who have the means and inclination to extend their cultivation, there appears to be quite sufficient waste land in the district, both wet and dry, which they may bring into cultivation without Government incurring any expense to enable them to do so.

“ 5. For nine out of ten years, this fine district has been reduced to a state of extreme misery, simply because the usual supplies of water for the cultivation of the land have been withheld; wherever these supplies have been furnished, the country

country is in a flourishing state, the revenue of Government is steadily increasing, the value of land is enhanced, and there is a total absence of that misery which prevails in every other part of the district; and yet the Collector thinks it would be better to risk the periodical return of this misery, than to do anything that might hurt the interests of the favoured few who thrive upon famine prices, while the bulk of the people are in jeopardy for food,

“ 6. The Collector shows that there has been a steady increase in the prices of the principal articles of agricultural produce since the first cession of the province to the British Government, and that the rise of price during the last 12 years is to be attributed to deficiency of produce from bad seasons. Comparing the prices of paddy which prevailed in 1802, when the survey assessment was introduced, and in the five succeeding years, with the prices of the last eight years, there is an increase of upwards of 20 per cent. upon the average in the last period, notwithstanding the very large increase that has been made in the interval to this species of produce, in consequence of improved irrigation. In some of the latter years, famine prices have prevailed; the produce of the country has been quite insufficient for the population; and yet the Collector doubts whether any attempt should be made to increase the quantity of food.

“ 7. He seems to forget that, at all events, population is likely to keep pace with increase of produce; that the produce, therefore, of Coimbatore might be made as large and certain as that of Tanjore, without any permanent effect being produced upon prices, famine prices being left out of consideration.

“ 8. Every fourth or fifth year the Government lose a large revenue, the people suffer from a scarcity of food, and the cattle perish for want of water; if we are to do nothing to supply this want, it is evident that these evils are irremediable. When the people of Coimbatore are starving, the people of Malabar to the west, and the people of Tanjore to the east, have abundance, simply because their lands are well watered.

“ 9. The Collector appears to forget that the waste land, wet and dry, which he speaks of as available for cultivation, cannot be cultivated without water; the more certain the supply of water the better the cultivation, but no supply can be certain that depends upon the falling rains. When dry land is converted into wet, the produce is increased fivefold; if the supply of water be never-failing, this increase is certain, and the revenue of Government increases in nearly an equal proportion.

“ 10. It is quite clear, therefore, that instead of standing still, the Government should never relax their efforts until they have succeeded in turning upon the land all the water that is now permitted to run waste to the sea. When all has been done that can be done in this way, by far the largest portion of all the districts, Tanjore alone excepted, will remain dependent upon the monsoon rains for its produce, liable therefore, or rather sure to be visited periodically with scarcity, and not certain in any one year of yielding a full harvest.

“ 11. The records will show that there is not a single district, Canara and Tanjore excepted, in which a failure of crops to a certain extent does not occur every year. The people of the Northern districts have suffered severe privations for several successive years. In Ganjam, scarcity prevails at this moment; and yet in that and in other districts, rivers are rolling through them, filled with water for many months in the year, which, if turned upon the land, would ensure them abundance at all seasons.

“ 12. In Coimbatore * “ The great fall in the revenue from the Nunjah lands in Fusly 1246 was owing entirely to a deficient supply of water in the river. Lands bearing the assessment of Rs. 29,847 were not cultivated, and on lands which were cultivated and assessed at Rs. 13,487, remission for shavi was granted to the amount of Rs. 11,032.”

“ The decrease of Rs. 266 was occasioned by lands situated in the village of Munioor, in the extreme limits of the irrigation of the Nunjah Pagaloor (Cavery) Channel, not being cultivated, owing to the want of water.

“ The decrease of Rs. 7,896 was owing to lands dependent on the Codivairy Channel (Bhowany River) in the village of Perindaloor of Sattemengal Talook, and to lands dependent on the Calingaroyen Channel, not being cultivated, from deficiency of water.

“ This decrease of (19,757) arose from lands assessed at Rs. 9,529, in 19 villages dependent

* Report from principal Collector, 4th January 1841, Para. 2.

dependent on the Umrawutty River, in the Caroor Talook, not being cultivated, and from remission being made to the amount of Rs. 10,228 in lands, the crops in which failed from deficiency of water.

“ The decrease of 652 in the assessment of lands left waste in the Talooks of Danaickcottah, Cheyoor and Pullachey, owing to the failure of these (the jungle streams).

“ The decrease (22,589) from lands being left waste, and from remissions having been made for withered produce.

“ 13. No one who reads these details can hesitate, I imagine, as to the expediency of expending money upon the improvement of the irrigation of this district; it is by such expenditure alone indeed, judiciously made, that we can hope to see it restored to its former prosperous state. The means of making this improvement is obvious; viz. the formation of reservoirs in the most favourable positions for storing the surplus waters of the rivers which are filled from the south-west monsoon, as proposed by the Engineers, Colonel De Havilland and Captain Cotton.

* * * * *

“ 24. Referring to what I have said of the advantage to be derived from a judicious expenditure upon works of irrigation, I beg to enclose a statement which has just reached me from the Principal Collector, and which shows that from Fusly 1209 up to Fusly 1249, a period of 40 years, the sum expended in improving and extending the works dependent upon the ‘ Bhowany’ and ‘ Umrawutty,’ two of the rivers which are well supplied by the rains of the south-west monsoon, was Rs. 1,00,405, and that the actual net gain from this expenditure has been Rs. 10,60,340; that is, gain after deducting the charge of the works, and the revenue which the land was capable of yielding when it was dependent upon the periodical rains for its produce. This is an increase of more than fivefold to the revenue, and of more than double that amount to the proprietor.”

Minute in Council
by the same gentleman.

283. Mr. Sullivan was indeed deeply imbued with a conviction of the necessity of this course to the improvement of the country; and previously to the Report above quoted, he had, while a member of the Council of Fort St. George, recorded a valuable minute in reviewing the Report on Irrigation by Captain A. Cotton, to which we have so often adverted. In that minute, Mr. Sullivan set forth in forcible terms the value of irrigation both to the revenue and to the people; the heavy loss which had been sustained through the long-continued neglect of it by our Government, and the very great advantages which the existing Government possesses, as compared with former ruling Powers, for carrying on such undertakings on a large scale. The whole paper is well deserving of attention, and we print it in Appendix (L.); we quote the concluding paragraphs in this place.

“ 53. It was long ago recommended by Colonel De Havilland, an officer of the highest talent and most extensive experience, that this Government should not cease in their efforts to improve the irrigation of the country, until they had turned to account all the water which now rolls in volumes to the sea by the rivers which intersect the Peninsula, and he proposed to effect this object by excavating extensive canals, which should serve at once for purposes of irrigation and communication.

“ 54. This recommendation has its foundation in the fact that our provinces prosper or decline, according to the supply of water which they receive. Tanjore, Malabar and Canara are liable to all the incidents which affect the welfare of the other districts, with the important exception of water, of which they have always abundance, the former by artificial works, the latter from the natural rains: in them, therefore, famine and all its concomitant evils, are unknown, and in point of agricultural wealth they will bear comparison with many parts of Europe. No year passes without our having melancholy experience of the contrast which is afforded by the state of the other districts.

“ 56. It is plain, from these facts, that an increased expenditure upon the Engineer Department would be the sure means of filling the public Treasury. I am persuaded, therefore, that the attention of the Government cannot be directed to a subject of greater importance; and that it would be wise, without delay, to investigate it thoroughly, with a view to the undertaking of all such works as promise results equal to what have followed from the construction of the alicuts in Tanjore.

“ P.S.—

“ P. S.—Since the preceding sheets were written, the report of the Collector of Tinnevely upon the settlement of that district for Fusly 1848, has been submitted. It appears that the revenue lost in that year from deficiency of water in the Nunjah lands alone was Rs. 1,58,471. This example is of itself sufficient to show how necessary it is to the finances of Government that every effort should be made, and made without delay, to put the works of irrigation in the most efficient state, particularly that we should take measures for storing up the water which now runs waste at one season of the year, in order that we may have the means of making up for deficient supplies at other seasons.”

284. In concluding our remarks on the general subject of irrigation, we will add a few considerations as to the national benefit from such works; and first we will look at the actual result on a large scale, comparing the Province of Tanjore with any other district. The soil of Tanjore is not naturally fertile; it is a sandy alluvium, and towards the coast especially, it contains a great deal of sand. The district contains under 4,000 square miles, and though the assessment is lighter than elsewhere throughout the Presidency, it yields a land revenue of 40 lacs annually, and contains a population of nearly 1,700,000 persons, and that in more wealth and comfort than is to be met with in any other part of the Presidency, except Canara and Malabar.

Beneficial effects of irrigation;
Comparison of districts.

The district of Chingleput is also on the coast, and the soil not greatly different from that of Tanjore: it is lightly assessed compared with the adjoining districts, and enjoys the great advantage of being close to the large market of Madras. The extent is 3,000 square miles: it is not by any means without irrigation, but is very far inferior, in this particular, to Tanjore. It yields a revenue of 10½ lacs, and contains a population of 583,460 persons.

Again, take the inland district of Cuddapah, its extent is 13,000 square miles; but, perhaps, a sixth of this is mountain. The soil generally is good, in some parts very rich, and it is not altogether destitute of the means of irrigation. The land revenue is 21 lacs, and the population is 1,450,000.

The following Statement shows the three districts in comparison:—

DISTRICTS.	Extent in Square Miles.	Land Revenue.	Population.	Revenue per Square Mile.	Population per Square Mile.
		<i>Rs.</i>		<i>Rs.</i>	
Tanjore - - - - -	3,936	40,00,000	1,700,000	1,000	438
Chingleput - - - - -	3,000	10,50,000	583,460	350	195
Cuddapah - - - - -	13,000	21,00,000	1,450,000	161	111
Cuddapah, deducting Mountain -	11,000	21,00,000	1,450,000	190	131

These figures cannot be depended on for strict accuracy, but they are sufficiently near the truth to afford a fair comparison. It is seen that Tanjore yields a revenue for every square mile of its surface, nearly three times as large as Chingleput (which is itself a favoured district), and more than five times as large as Cuddapah, while it maintains a population nearly two and a half times as dense as that of Chingleput, and four times as dense as that of Cuddapah; and the larger revenue is paid with more ease in Tanjore than the much smaller revenue of the other two districts, and leaves far more to the people. This superiority of Tanjore can be ascribed mainly only to one cause; viz., that capital to a vast amount has been, in the course of ages, invested in it, in bringing water to irrigate its lands.

285. And such investment of capital cannot but be profitable both to the Government and to the cultivator of the soil. We have seen above, that on the average of a considerable number of works, costing on the whole about 5½ lacs of rupees, the clear annual return of revenue to Government has been 71 per cent. on the outlay. But we will suppose that the return in revenue is much smaller, that it is no more than 25 per cent. on the outlay (and there is a vast field for the expenditure of money on the formation of works which would pay more than that), even on this supposition the profit is very great. It may safely be assumed that for every rupee of revenue paid to Government, the total value produced is not less

Such undertakings benefit both the Government and the people;

than Rs. 24; therefore an increase of revenue to the amount of 25 per cent. represents an increase of produce: in other words, an addition to the national wealth to the amount of 62½ per cent. on the outlay. Now when it is remembered that of the total area of the Madras territories, only one-fifth is cultivated; that of the whole cultivation only one-fourth is irrigated; that millions of acres of good land require only water to make them richly productive; and that immense volumes of water, which might be turned to this use, now flow to waste into the sea; when these facts are considered, some idea may be formed of the vast extent of that field of improvement which is before us.

Largely add to the revenue;

286. It is universally allowed to be judicious in a landlord in England to lay out money in draining, or otherwise improving his property, if he can get a proportionate increase of rent; and those landlords are looked upon as wise and prudent who even borrow money at five per cent. to expend on such improvements, when there is a reasonable probability that the outlay will return eight or ten per cent. Now, in this Presidency, the Government are in the position of landlord as regards the irrigation works; they and they only in general can undertake the construction of such works, and there are vast numbers of undertakings, to a large amount, which would return, not 10 per cent., but 30, 50 and even 100 per cent. directly into the Treasury, besides a vast addition to the comfort and wealth of the community, in advancing whose prosperity the Government has an interest (not here to speak of the duty), which does not exist in the case of the English landlord.

And multiply the produce and the value of the land.

287. Again, at a very moderate computation, irrigation quadruples the produce and the value of land; and thus though acre for acre somewhat more labour is required, yet food is raised at less cost of labour, and a larger fund is left, after paying the cost of production, to be expended on other articles of comfort and convenience besides food. Then the comfort of the people at large increases, new wants spring up which were unknown before, and new branches of industry arise to minister to those wants. Thus a market is created for the surplus produce, and the producer and the consumer mutually profit by each other's prosperity; and this process can go on to an unlimited extent; for the power of consumption is limited only by that of production, the necessary conditions being that the producers of all kinds shall be placed within reach of the consumer by good communications, and that labour shall be free. Thus capital accumulates, and with the accumulation of capital come the love of peace and order, activity of invention, the cultivation and enlargement of the mind, the fine arts, and, in a word, civilization.

Irrigation tends to prevent famines.

288. But, in speaking of the benefits of extending irrigation, we must not omit to notice its efficacy in preventing famines. We have already pointed out the happy peculiarity of the Peninsula of India, that all its principal rivers have their sources under the influence of the south-west monsoon, which never fails; and so their waters, if duly turned to account, afford the means of preventing those distressing scarcities which would otherwise arise from the frequent, entire or partial failure of the more uncertain north-east monsoon. In such times of dearth, the irrigated districts are not only comparatively exempt from distress themselves, but are the resource of all the country around. The drought of 1833 affected, in some degree, all the districts east of the Ghauts, though not with the same violence in all; and thousands of persons in that year, as well as in the scarcity of 1824, left their homes and their lands in the neighbouring districts of Salem, Coimbatore, and the inland parts of South Arcot and Madura, and even North Arcot, and betook themselves with their families to Tanjore and Trichinopoly. There they remained for years, and many, probably, have not yet returned to their own villages; and the benefits of the abundance there might have been extended to far greater numbers, but for the badness of the roads. People were dying by the roadside in hundreds in Salem and Coimbatore districts, of sheer destitution, while the price of grain was not nearly doubled in Tanjore, and yet it could not be conveyed to the relief of those districts because of the cost of transit.

The late famine in Guntour.

289. But it was in Guntour that the effects of that terrible season were most severe; and though that time has long passed away and the district is recovering from its effect, it will not be uninteresting to consider briefly what those effects have been on the wealth and happiness of the province, and the revenue of the Government.

The

The district of Guntoor lies on the south bank of the Kistnah River; its extreme breadth north and south, is about 80 miles, and its greatest length east and west, about 110 miles, and it contains an area of 4,700 square miles. One-fourth of the surface may be taken as hill and jungle, one-fourth as sand and poor soil, while the remaining half is extremely rich land; being situated on the confines of both monsoons, this district receives a full supply of water from neither; but on the other hand its soil is of such a nature as to require less moisture than ordinary. The supply of water generally during the dry season is scanty, even for domestic purposes; while in a large part of the district (viz. in the rich black cotton soil), wells are useless, as the water is brackish and undrinkable. The gradual slope of the country from an elevated centre, is favourable to the construction of tanks for irrigation, and the large number of ruined tanks in all parts of the country indicate that formerly the extent of irrigated land was considerable; at present it is only four per cent. of the total cultivation. Till within the last eight years the district was almost wholly under large Zemindars, and the destruction of the tanks is owing to the neglect by those proprietors.

290. In 1832 the north-east monsoon failed throughout the whole Presidency; but the failure was felt with most severity in Guntoor, where it produced all the calamities of famine. The Population Returns of the district for a period of years, are given in the margin, as obtained from the Collector.

In Fusly 1241 (1831-32), the population was 512,000; in the following year it was only 357,038, and in 1833-34 it fell to 255,511, being less than half what it was two years previously. Many people left the district during the prevalence of the famine, and removed to the coast districts and to the Presidency; but making every allowance for this, it appears certain that the number of those who perished by starvation, and by the fever which followed the famine, was not less than 200,000. After that period of calamity had passed away, the people who had left the district mostly returned, and the population has gradually risen. In Fusly 1258, it was 487,172, according to the Returns; in 1259 there was no census, probably because a very accurate one was intended in the following year; and in Fusly 1260 (1850-51), the Returns, taken with very unusual care, gave a result of 569,968. Thus, assuming the Returns

Fuslies.	Males.	Females.	TOTAL.
1232	246,413	211,274	457,687
1233	247,699	213,344	460,943
1234	249,316	216,157	465,473
1235	249,105	213,021	462,126
1236	254,292	222,495	476,787
1237	256,926	221,433	478,359
1238	256,514	221,539	478,053
1239	256,483	222,125	478,608
1240	269,684	239,681	509,365
1241	270,433	241,884	512,317
1242	189,659	167,379	357,038
1243	135,417	120,364	255,781
1244	119,876	104,587	224,463
1245	125,004	109,665	234,667
1246	135,582	119,320	254,902
1247	141,794	125,632	267,426
1248	159,630	142,525	302,155
1249	163,051	145,809	308,860
1250	166,697	148,696	315,393
1251	166,573	152,315	318,888
1252	177,480	167,249	344,729
1253	189,027	177,137	366,164
1254	193,148	180,162	373,310
1255	200,049	182,770	382,819
1256	215,605	196,014	411,619
1257	251,432	232,399	483,831
1258	252,193	234,379	487,172
1259	No census taken.	—	—
1260	279,565	290,463	569,968

throughout to be correct, the population has recovered, and is now above what it was before the famine; but these premises are unsound, as the Population Returns were certainly far less complete formerly than now. Prior to Fusly 1256 (1847), very little care was bestowed on them, and, as a matter of course, they were below the truth; in that year the Collector gave them more attention, and the result was an addition of 18 per cent. to the numbers of the preceding year. In 1851 a very careful census was taken under orders from the Government of India, and the result is an increase of 17 per cent. on the Returns of 1849, and this, although the intervening period was one of severe agricultural distress and high prices of grain. It appears certain, therefore, that the increase shown in the statement is in part only apparent, and results from the Returns for the earlier years of the series being incomplete; and it seems a safe conclusion, that even now, after the lapse of 19 years, the population of Guntoor has still not recovered from the destructive effects of the visitation of 1832 and 1833.

291. The loss of revenue, and the destruction of property, were immense. Appendix (U.) is a statement of all items of revenue in each year from Fusly 1236 to Fusly 1259. First, to take the Land Revenue: the average collections in the six years preceding Fusly 1242, were Rs. 13,94,168; in that year they fell to Rs. 6,58,500, and in the following two years they were Rs. 6,71,654,* and Rs. 5,11,593

Of revenue in all branches.

* In Fusly 1243, the sum of Rs. 2,02,978 was realised at Madras by the sale of bonds belonging to Zemindars; this is omitted in the statement of collections, because not derived from the resources of the year.

Rs. 5,11,593 respectively; since that time they have gradually increased, but the average annual amount up to Fusly 1260, is only *Rs.* 9,86,284, being a loss of *Rs.* 4,07,884 yearly, or of *Rs.* 77,49,796 on the whole. Even this statement does not fairly present the whole case; for all the Zemindaries having fallen hopelessly into arrears, the whole of them were taken under management in Fusly 1245, and since that time the Government collections include all that part of the total or gross collections which formerly went as income to the Zemindar, and in payment of his establishments.

It is singular to observe how uniform the falling off was in all branches of the revenue. In the Sayer (*see* Appendix U.) it was very marked, as was to be expected; the average of the six years preceding Fusly 1242, was *Rs.* 1,01,438; in that year it fell to 64,554, and in the following year to 45,707; in salt, the falling off was from 3,85,000 in Fusly 1241, to 1,60,000 in Fusly 1242; in Moturpha, from 63,000 in 1241 to 23,200 in 1242, and 26,000 in 1243; in Abkary, from 13,232 in Fusly 1241, to 12,341 in Fusly 1242, and 4,808 in 1243; in "sundry small farms," from 13,779 in Fusly 1241, to 9,556 and 4,484 respectively, in the following two years. In some branches the revenue has never recovered itself, but is still below its former standard; salt regained its normal amount the soonest, that is, in about 10 years, being less dependent than the others on the local consumption; it has indeed increased materially above what it was before the famine; this is probably owing to a more vigorous management. The average yearly loss on all these sources of revenue as compared with the six years preceding the famine, is 1,02,784; and the aggregate loss in the 18 years, (after deducting *Rs.* 3,18,000 as the probable amount of the deficit through the abolition of the Sayer duties in 1844) amounts to *Rs.* 15,32,112.

And of private property.

292. It is difficult to estimate the actual loss to the Zemindars and the cultivating classes; but an approximate judgment may be formed. According to the theory of the settlement, the Zemindars were to have 30 per cent. of the gross collections from the Ryots; and thus supposing them to have taken from the Ryot half the gross produce of the soil (an outside estimate), the Government revenue would be 35 per cent. of the gross produce. Considering that during the period of distress the Ryots certainly paid to the Zemindars, and they to Government, a larger proportion than usual of their actual income respectively, it might be safely assumed that the loss was in the proportion above given; but we will take the loss of the Zemindars and the Ryots at only 60 per cent. of the whole, instead of 65, and then the total loss to Government, Zemindar and Ryot, from diminished cultivation and failure of crop, will amount to *Rs.* 193,75,000.

Add to this 18 lacs, the value of cattle and sheep that perished in the famine, and *Rs.* 15,32,112, the amount lost to Government as above stated, in the miscellaneous items of revenue (without attempting to compute the loss to individuals in the various branches of trade and manufacture concerned), and the total loss by the famine, up to the present time, is found to amount to the enormous sum of *Rs.* 2,27,07,000, or above two and a quarter millions sterling.*

The Kistnah anicut to prevent such another famine.

293. The prevention of the famine would therefore have been well worth an outlay of 200 lacs of rupees; and looking at the Government share of the loss only, it would have been worth an expenditure of 85 lacs. It was partly with a view to such prevention that the Government recommended, and the Honourable Court sanctioned, the construction of an anicut across the Kistnah at Beizwarah, with a system of irrigation channels on both sides of the river, viz. in both Guntoor and Masulipatam districts. The whole cost of the works is estimated at fifteen and a half lacs of rupees, and the annual return in the shape of revenue, as computed by the committee appointed to consider the project is, *Rs.* 7,32,059, or 48½ per cent.; and even the Government express their opinion, that at the least, the permanent annual gain to the revenue will not fall short of 30 per cent.; far from being a sacrifice, therefore, this project is an investment of capital most profitable to the Government; it will likewise create a vast amount of private wealth, and it may be regarded as certain to prevent the recurrence in Guntoor of such a calamity

* The statistics of Guntoor in Para. 289, are taken from some details of the famine in the Madras Journal of Literature, No. 30, for June 1844, and from the Report of the Guntoor Survey by Mr. Walter Elliot, Commissioner, 18 December 1845. The details of the revenue and population were procured from the Collector.

calamity as we have been noticing; for though it will not entirely obviate the effects of so disastrous a season as that of Fusly 1242, it will greatly moderate them, and reduce them from the horrors of a famine to the mere distress of a scarcity.

294. It is with much pain, therefore, that we find the execution of this most important project indefinitely postponed; and, while we much lament this decision, we cannot but point to the cause of it; viz., the want of Engineer Officers to direct the work, as a most emphatic corroboration of all that we have urged, and have yet to urge, as to the inadequacy of the existing professional establishment, and the necessity of increasing it. Droughts have been observed to recur periodically in Guntoor, and usually the interval does not exceed 12 years; it is now 18 years since the famine, and it is impossible to say how soon another drought may come; it is to be hoped that before that time the anicut will be in operation; and we beg to urge the speedy completion of that undertaking as one both of profit and of humanity. We notice with pleasure that since the Zemindaries came into the possession of Government, a good beginning has been made in restoring the old and long neglected irrigation works of the district, and we trust that this course of improvement will be steadily pursued.*

It has been unfortunately postponed for want of officers.

295. There is in some quarters, however, an opinion adverse to the extension of irrigation works; and as we urge such extension, it is proper that we should here discuss the question. The opinion we refer to is based on the assumption that the quantity of grain now produced is fully sufficient for the wants of the population, as evidenced by the existing low prices, and that any additional production would tend to glut the market; and, by further reducing the price of grain, would disable the cultivator from paying his money-rent, so that in fact the additional means of irrigation would not be made use of. Sentiments to this effect are expressed by the Collectors of Tanjore and Trichinopoly, though qualified by the admission that the introduction of any staple produce other than rice would obviate the objection.

Opinions adverse to the extension of irrigation.

296. First, to look at the subject in an *à priori* point of view, we may observe, that if the argument drawn from the supposed sufficiency of the present supply of grain is good now, it must have been good before the first channel was dug, or the first tank constructed. Then, as now, the existing population certainly subsisted on the food then produced, and it might have been argued then, with as good a show of reason as now, that the increased produce would not find consumers. But what has been the actual effect of the vastly increased powers of the soil caused by the innumerable works of irrigation? Exactly the same that every where follows all improvements in agriculture; the food of a given number of men requires for its production the exertion of a smaller number than before, and those whose labour is thus set free employ themselves on other branches of industry, and so earn a share of the general fund of food. It is certain that the 1,700,000 persons who now inhabit the Tanjore province have not only collectively, but individually, more and better food, more comfort and more intelligence than their ancestors, who were thinly scattered over it in the early ages, or than is now possessed by the inhabitants of the Cuddapah or Guntoor districts; and there is nothing whatever to render this experience of the past inapplicable to the future, or to sanction the admission of a doubt that the cheaper production of food will still create a market for its consumption.

The objection is unsound in reasoning;

297. Again, we would observe, that the actual result of past expenditure on irrigation works does not at all agree with this predicted consequence of future expenditure. All the numerous instances above given of increased revenue by means of such improvements, are forcible contradictions of the anticipation. In the gradual and progressive improvements in Tinnevely and Tanjore, and not less in the more sudden creation of the means of irrigation by the gigantic works in Rajahmundry, the result has been the same; and if in South Arcot there has been less forward and constant eagerness to take advantage of the water supplied, the causes of this difference are obvious and removable; they are a high assessment and an extreme want of the means of transporting produce.

And is directly opposed to experience.

Such is the result, taking extensive tracts of country in a general view; and if we look at individual works we find no more there to support the objection: every one of the

* The construction of the anicut has since been commenced, and is now in progress, officers having been withdrawn from the Godavery works for the purpose.

the cases recorded in Appendix (Z.) contradicts it, except the single one of the new Iyen Voykal, and the failure there is due to peculiar causes, as we shall explain presently; it seems impossible, in short, that a more emphatic refutation could be given by actual facts to a theoretical argument, than is found in the present instance.

It cannot be denied, indeed, that a false and narrow policy will check the development of the prosperity naturally resulting from improvements of this character, as would happen with improvements of any kind whatever: and there seems no doubt, as a fact, that it has been so checked. But if, even under such disadvantages, these effects have still displayed themselves in so marked a degree, how much more abundant success may be anticipated when those disabilities are taken away. If, instead of the whole return to Government from the works being swept away from the district for ever, a portion of it, even a small portion, is laid out in improving the roads, forming canals for navigation, and improving seaports, the outlay will be abundantly repaid in revenue, through that extension of cultivation which cannot fail to ensue on the increased value thus given to the produce of the soil and the increased employment of labour.

The fear of a want of a sufficiency of labour is contradicted by facts.

298. Another objection is entertained in some quarters against the extension of irrigation; viz., that there is not sufficient labour in the country to execute such extra work, and neither labour nor agricultural stock to make use of extended irrigation if provided; and, when a project of this character is brought before Government, special assurance is required that the people of the villages concerned are wealthy, and able to make use of the water to be supplied.

This fear of a want of labour appears very singular, because it seems to us that it is only necessary to observe what is going on around us, in order to see that such an apprehension is ideal. We would remark, in the first place, that this objection, like the former one, receives a practical refutation in all the instances that we have cited of the profitable result of improvement to the works of irrigation; for, in every one of those cases, labour must have been forthcoming, both to execute the improvement and to cultivate the land. But other proofs may be brought forward: the people of this country are proverbially apathetic and averse to change, and have the character of being, pre-eminently above others, disposed to endure a large amount of suffering rather than seek relief in new spheres of exertion; yet, every year, several thousands leave their native land, their families and homes, and go to the Tennasserim Provinces, the Mauritius and even the West Indies, attracted by wages which do not appear very high. So also there is every year a regular migration of about 4,000 labourers from the mainland to Ceylon, at the coffee picking season, and nearly the whole of this is from Tanjore, the very province in which for many years there has been a larger public expenditure both on roads and irrigation works, and greater extension of cultivation has taken place, than in any other under this Presidency, if we except Rajahmundry, during the last few years; and, though the Meerasedars make great complaints that their labourers leave them, yet the cultivation appears to be increasing every year.* Again, within this country, we find no undertaking delayed for want of labourers; the Hussanoor Ghaut, though in a very unhealthy country, was thronged with people anxious for employment, and the same with all the passes in the Western ghauts; and the sudden demand for the great works at the Godavery was immediately responded to, and at first people crowded to the works in far greater numbers than they could be employed; and, to take an instance of a different kind, the coffee planters on the Shevoroy Hills find no lack of hands to gather their crop. These labourers are obliged to go up the mountain to a climate very ungenial to them, and remain all the week away from their houses, and uncomfortably fed and lodged, yet they cheerfully incur all this for the sake of the 12 annas punctually paid at the end of their six days' labour, and on the Saturday evening thousands of them may be seen wending their way down the ghaut to spend the Sunday at their houses many miles away, and return to their work on the Monday morning.

The real want of the country is not

299. In all these cases, and in numberless others, it has been abundantly proved that the one condition necessary to obtain command of labour is punctual payment; a higher

* Almost all these emigrants return within six months, driven back by the poll-tax payable in Ceylon by all persons resident more than that term in the island. But this fact affects the present question very little, for they are away from March to July or September, which covers the early ploughing and planting, and includes nearly the whole time for road repair and other public works.

a higher rate than two annas (3*d.*) daily has never perhaps been paid for unskilled labour, but this is found quite sufficient if paid punctually and in full. The readiness with which labour is instantaneously supplied whenever wanted, without deranging other employments, and its very low rate of remuneration, convincingly prove its abundance; and we are painfully convinced that the great want of this country is not labour, but the very contrary, employment for labour. In England there is a general feeling in favour of promoting emigration, not simply as a means of bettering the condition of the poor, but on the ground that the population is redundant; but it is certain that if this last proposition is in any degree true in England, it is true in a much higher degree in this country; for the question is not determinable by a mere comparison of numbers with area; it depends solely on the relation of the quantity of labour in the market to the effective demand for it. Man is a marketable commodity, and his value, and therefore his means of earning a subsistence, depend on the relation of supply and demand; and this being the case we have only to compare the rate of remuneration for labour (real not nominal remuneration) in any two countries, to find the relative sufficiency of their population. We say that population is redundant in England and France, and deficient in America and Australia, because wages are so much higher in the two latter countries; and, in like manner, we know that population is still more superabundant in India, because the wages of labour, the real wages in the comforts and conveniences of life, and after making allowance for the difference of climate, are vastly lower in India than in England.

300. It is conceivable that Public Works, and consequent extension of cultivation and other employments for labour, should advance so far as to raise its market rate; but surely that is not a thing to be feared or deprecated. The labourer may claim to share in the general gain; and, not to mention that such a state of things would lead to the introduction of means for saving human labour now unthought of, the hypothesis presupposes that it would be well worth while to pay such advanced rates; this would certainly be the case on public works, and they would provide the funds which would enable all sorts of produce to pay them; but, in point of fact, the probability is that the workmen would earn better wages, without any increase in the price of labour. To explain this seeming paradox, we would observe that, owing to their wretched implements, and still more to their indolent, sauntering way of working, the labourers of this country do very much less work in a day than they might do with but little more exertion. We have mentioned above that a bricklayer, working under a European Overseer, often lays double and even treble the number of bricks in a day that he would otherwise, and it is the same with other sorts of labour; and it may safely be said that a man will do 50 per cent. more work under the eye of an intelligent European Overseer than he would under other circumstances; and this result, we must again remark, is not obtained by severity; on the contrary, the men work cheerfully and willingly under the Overseers. It may be conceived, then, how large an addition will be made to the quantity of labour performed, without any increase in the number of labourers, as the habits of steady working, learnt on the public works, become gradually spread over the country.

And even this is not all; it is well known that in every part of the country there are whole classes and tribes of the population, not addicted to any settled occupation, but who habitually prey on the community, either by open robbery or secret theft. It may confidently be hoped that a steady demand for labour would have the effect of gradually reclaiming a large proportion at least of these mischievous classes to honest pursuits.

301. As to the absence of agricultural stock or ploughing cattle, the argument scarcely needs a reply. No prudent farmer anywhere maintains more horses or bullocks than he has occasion for; but if his occasions for employing such stock increase he enlarges the number. And it must be remembered that no large and sudden increase of demand will arise; all improvements such as we are contemplating must be gradual, and the enlargement of cultivation in any one year must be atomic compared with the total agriculture of the country. Both individually and with reference to the whole community, the demand for stock will ensure the supply; and it would be as reasonable to suppose that the present number of plough cattle always existed in the country, when the whole region was unreclaimed and covered with forest, as to feel any doubt that the present number will

Under an active demand, a very large increase would take place in the amount of labour performed by the existing population.

There is no want of agricultural stock.

be enlarged, with the increase of the demand for them, and of the fund for their maintenance.

The Ryots are forward to cultivate where irrigation is provided, unless prevented by a too high assessment on the land.

302. With regard to the readiness and ability of the Ryots or land-holding class to take advantage of the means of irrigation placed at their disposal, we may again appeal to the numerous cases already adduced, in which the futility of this objection is practically demonstrated. We may be quite sure, indeed, that though less active and enterprising than some communities, the people of this country are not blind to their own interest, and that we have only to open to them a way to profit, or to remove obstacles from it, and there will be no want of readiness to use it; and this is more particularly the case in agriculture, to which the natives of India have a national predilection. It is true, no doubt, that if the Government assessment on the land is so high as to leave no margin of profit to the Ryot, the land will not be cultivated; and from this very cause, thousands of acres of the very best land in the country are now utterly useless and unproductive, and have been so for many years, without benefit to any, to the Ryot or to the Government. But it is equally certain, as has been abundantly proved in Tanjore and Rajahmundry, that if the Government is content with a moderate rate of rent or tax, there will be a forward willingness to cultivate; and there need be no fear that the required capital will not be forthcoming. The people are well aware that cultivation itself will produce the capital; and if it should happen in any case that they have not the means at hand themselves, they will either sublet the land or borrow the necessary funds, wisely and providently trusting to the returns of a grateful soil for the means of repayment; and this is no theoretical or supposititious case; it is one of frequent occurrence, even now.

Exceptional case in Trichinopoly.

303. There is one instance, however, on rather a large scale, in which improvement of irrigation has not had the same satisfactory effect on the revenue which has been observed generally; viz., that of the works of the Trichinopoly district, connected with the upper anicut, the revenue under which exhibits a decline subsequent to the construction of that work, when compared with the years preceding it. As we earnestly advocate the extension of irrigation, on the ground that it is beneficial to the revenue as well as to the interest of the public at large, we thought it proper to make inquiries respecting this exceptional case; and the following is the result.

The Upper Coleroon anicut.

304. The Upper Coleroon anicut, though situated within the Trichinopoly district, was constructed for the benefit of Tanjore alone. About 12 miles west of the town of Trichinopoly, the Cauvery parts into two branches, one of which retains the same name, while the other takes that of the Coleroon. The former flows by Trichinopoly, and irrigates almost the whole of Tanjore, while the latter is of comparatively little use for irrigation. For many years past it had been observed that the bed of the Coleroon was gradually deepening, while that of the other branch was rising, and the effect of this change was increasing difficulty in securing a sufficient quantity of water in the Cauvery for the irrigation of Tanjore.

It was built solely for the benefit of Tanjore;

From the very beginning of our possession of the country the difficulty was felt; and one of our ablest Engineers (Colonel Caldwell) predicted in 1803, that in not many years the Cauvery would be dry and the country ruined. Various expedients were resorted to from time to time to stop this evil, but the benefit from each was only temporary; the supply to Tanjore became more and more scanty and precarious, and it seemed as if the consummation foretold by Colonel Caldwell was near at hand. At this juncture, Captain A. Cotton proposed an anicut across the head of the Coleroon; such a work was accordingly constructed in 1836, and it has most completely effected the end in view. Not only was the downward tendency of the Tanjore revenues at once arrested, but signal improvement has been obtained; the irrigation was not only rendered more abundant, but much less fluctuating, and both the Government revenue of the province and the prosperity of its inhabitants have attained a higher point than ever before.

But did incidentally benefit Trichinopoly.

305. Thus, as already said, the anicut was built solely and exclusively for the benefit of Tanjore, and the cost of it has been recovered there, over and over again; but it did also incidentally benefit parts of Trichinopoly district. The Lalgoody Talook is watered by the Coleroon, and its principal channels being now taken

taken off at the anicut,* received a better supply than before, and a part of the Connad Talook is watered by the Cauvery below the anicut, and those lands also are consequently better supplied than before. It was to be expected, therefore, that the revenue would improve as it did in Tanjore; but this has not been the case, and we proceed to consider the cause of this disappointment.

306. Appendix (E E.) shows the revenue from works in the Trichinopoly district, connected with the anicut, for 20 years, as well as the yearly average price of the best sort of paddy in the town of Trichinopoly for 42 years. It will be seen that on the whole there is a considerable decrease in the cultivation and revenue in the later years; there is a small diminution in the extent of cultivation and a larger in the amount of revenue.† This is explained by the Collector to be owing to low prices; it appears, certainly, to be so, and the low prices seem to be owing to the contraction of the market, through peculiar and extraneous causes. On looking, indeed, at the price list, it is not found that any fall of price has taken place, taking the whole period of 42 years included in the statement. On the contrary, not only is the average price of the 5 and 10 years periods maintained, but the lowest annual prices within the last 10 are not so low, with one exception, as the lowest about 30 and 35 years ago. Unfortunately, however, we have not the accounts of the revenue under these channels for more than 21 years back, and we are thus compelled to confine our comparison of prices with cultivation and revenue to this limited period.

Causes why an increase of revenue has not appeared there.

307. Of the 21 years included in the statement the anicut has been in operation 14; and during this time the cultivation and revenue of the lands influenced by it have ranged considerably lower than in the seven years which preceded its construction. Now, if we look to the price list we shall discover an obvious explanation of this; the average price of the best sort of paddy during the seven years, was 101 rupees, 1 anna, a garce, while that of the 14 was 90 rupees 11 annas. We may also observe, that the earlier period includes several years (Fuslies 1242, 1243, 1244), in which there was a dearth in the adjoining dry grain countries, which would naturally give an impulse to cultivation in lands possessing irrigation. Generally, an intimate relation between the extent under cultivation and the range of prices is very observable; modified in some years when, though prices were high, a somewhat scanty or unseasonable supply of water limited the cultivation. This observed sympathy between the price of grain and the extent of cultivation, both directly confirms the Collector's explanation, and also affords ground to suppose, that if we had the means of carrying the comparison over a more extended term, we should not find that decline of revenue which appears on the shorter period.

The accounts obtained do not go far enough back.

308. The cause which appears to have led to the diminished demand for grain is as follows: Trichinopoly, which is the one great market of the district, contains, with its suburbs, a civil population of 60,000 persons, besides a considerable military force. Till within a few years the garrison comprised, besides a detachment of artillery, one regiment of native cavalry, and one of European and three of native infantry; in 1843 one of the infantry regiments was withdrawn, and in 1849 the cavalry was withdrawn also. It is stated by the officer commanding the division, that the united local monthly expenditure of these two corps amounted to Rs. 21,000, besides 1,200 for grain. Now it is certain that nearly the whole of the former sum, and no small part of the latter, would be spent directly or indirectly in rice; and there cannot be a doubt that the cessation of this large expenditure would affect the demand for that article, much more seriously than the mere numbers of the troops withdrawn would indicate. For a large

Effects of the withdrawal of troops from Trichinopoly.

* One of these two channels was already immediately above the site of the anicut; the other had to be prolonged upwards, about 10 miles to that point. The cost of this prolongation was debited to Trichinopoly, but properly it ought to have been charged to Tanjore; for it was strictly a necessary part of the anicut project, though it is true that incidentally this channel, as well as the other, did benefit by the construction of the anicut. This latter is the new Iyen Voykal noticed above, in para. 272.

† This is the case not only under these channels, but on the whole of the river irrigation talooks. The larger decrease in revenue than in cultivation is stated by the Collector to be owing mainly to the abandonment of lands assessed as two crops, and taking instead those assessed as one crop land; we believe that under the rules prevailing in the Trichinopoly district, this single assessed land may be cultivated with two crops without any extra demand.

large part of the civil population are in great part dependent on the military; and the expenditure of the latter being so much diminished, the former also would have less to spend, and many of them probably would find no means of livelihood, and leave the place.*

Grain supplies from Tanjore.

309. The Collector informs us also, that since the road from Tanjore to Trichinopoly has been completed, grain is brought to the latter place from the Western talooks of Tanjore, which are much nearer to it than many parts even of the irrigated talooks of Trichinopoly district itself. And the Trichinopoly Ryots lie under a double disadvantage in competing with those of Tanjore, since, not only the assessment is 25 per cent. lighter in the latter district, but a part even of that light assessment is remitted when the price of grain falls below a certain point, an indulgence unknown to the Trichinopoly settlement. Still the arrivals of grain from this quarter appear to be extremely limited; and we cannot conceive that they have had any perceptible influence on price.

Summary of the facts.

310. The following then appear to be the facts of the case:—

1st. Though there is such a falling off of revenue since the construction of the anicut, in comparison with the years immediately preceding it, yet the latter were years in which cultivation was stimulated by unusually high prices; and there is reason to believe that there has been no falling off in comparison with earlier periods.

2d. Still it does not appear that the irrigation, undoubtedly improved, has yielded increased revenue. And the cause seems to be, a diminished market in consequence of an extraneous circumstance, entirely unconnected with the operation of the works of irrigation; viz., the withdrawal of troops from Trichinopoly.

Grounds for expecting improvement.

311. It is evident that the Ryots are somewhat discouraged by the prevalence of such low prices; but there are some circumstances to justify us in expecting that this state of depression will not be permanent. In the first place, as a good road from Tanjore has brought Tanjore rice to compete with that of the Trichinopoly Ryots in their own market, so improved communications, which ought to be given on every account, will enable them to send their grain with advantage to the eastward and southward, to Salem, Coimbatore and Madura.

2dly. Trichinopoly has always been a favourite residence of pensioners and others having income to spend, for the very reason of its cheapness; and it is now likely to be still more resorted to by such classes.

And 3dly. It is to be hoped that the low state of the grain market will lead to the introduction of some other agricultural product, an innovation which is much required, and which would be very beneficial. Both the Collector and Civil Engineer, and we may add, the Collector of Tanjore, are quite sensible of the expediency, and indeed the necessity of this change, and Captain Lawford in particular has experimentally shown the Ryots that cotton can be grown successfully on their Nunjah land; the Meerasdars themselves are quite alive to the benefits to be obtained to themselves by the change, and are deterred from the cultivation of cotton or sugar, chiefly by the uncertainty of always finding a market for the new product. The change of system would be more rapid among a people more enterprising and self-relying; but there seems no reason to doubt that it will ultimately be effected even here.

Concluding suggestions.

312. We will conclude this section with a few suggestions; first, with a view to the reduction of excessive inequalities in the land assessment, and, second, as to some

* The effect of this withdrawal of troops may be roughly stated in figures as follows:—Supposing Rs. 18,000 a month out of the Rs. 22,200 above specified to be spent in grain, this would give Rs. 2,16,000 a year; and that would purchase 2,400 garce, at Rs. 90. It would take, on an average, fully 3½ acres to raise a garce of paddy; and, of the whole crop, not more than half would annually come to market, the remaining half being devoted to the payment in kind of the expenses of cultivation and carriage, village dues, and the consumption of the cultivator's household; thus it would require the cultivation of 5½ acres to bring a garce of paddy to market, and 2,400 garce would represent the cultivation of 12,600 acres of land. In this country, bad roads confine the market for produce within a very narrow circle, and hitherto rice has been almost the only crop raised from irrigated land; and it is no wonder, therefore, that the diminution of the garrison of Trichinopoly should have been followed by a fall of price and a diminished extent of cultivation.

some other means by which the pressure of the land-tax may be indirectly lightened, impediments in the way of general improvements removed, and the revenue benefited.

And first, with reference to the objection to irrigation extension stated in para. 295, based on the supposed present sufficiency of food. No one probably who holds such an opinion will contend that the people are too well fed, or even sufficiently fed; as a very little observation is enough to show that such is not the fact. The objection, then, to the extension of irrigation works, on the plea that the grain market is already fully supplied, amounts simply to this, that grain must be kept up to a monopoly price in order that Government rent may be paid. But the cheap grain of Arracan is now brought into all the ports of the east coast in very large quantities, so as greatly to affect the price in the districts near the coast; so that if this objection is admitted, we shall have the Government withholding improvement from these territories on the one hand, in order that the price of food may be kept up, and (as they think) the revenue be paid, and on the other keeping prices down, by letting in a flood of cheap grain from another more favoured part of their possessions, where the land tax is no more than a fourth of what it is in most parts of this Presidency. It seems impossible, however, that such a course can be persisted in; and if the objection under notice is founded on fact, a remedy must be found. But it would be impossible, and even if practicable, we think it would be inexpedient, in every point of view, to shut out foreign grain, and steps must be taken, therefore, to lighten the pressure of the rent or land-tax in our own provinces. This is the mode in which matters are adjusted in countries where rent* is private property: it is that in which they are actually adjusted very generally by the owners of rent in this country, viz. by Zemindars, Jagheerdars, and extensive Enamdars; and it comes into operation spontaneously in some of our own districts; *i. e.* in parts of Tanjore and parts of Tiunevelly, where the money assessment varies with the price of grain. In the other districts there is no such self-adjusting process.

Real nature of the objection as to the present sufficiency of food.

313. Independently of all reference to foreign competition, and even independently of the state of prices, some circumstances of the existing settlement call for such a revision. The first of these which we will notice is the inequality of the tax in the several districts, one compared with another.

The land tax is unequal in the several districts;

In Tanjore, the supply of water may be said never to fail; the roads are good (by comparison) throughout the district; and the coast is at hand for export by sea: yet here the land rent averages under *Rs.* 4½ an acre.

In the river Talooks of Trichinopoly, where the irrigation is the same as in Tanjore, the soil perhaps better, where there is no sea-coast, but a populous town, and military station, which has till lately afforded an unfailling market, the assessment averages nearly *Rs.* 6 an acre.

The two southern Talooks of South Arcot district, separated from Tanjore only by the Coleroon River, possess precisely the same soil and the same irrigation, and have also a seaport (Porto Novo); but they want the important advantage of good roads, being almost destitute of any: yet in these Talooks the rent of irrigated land averages above *Rs.* 7½ an acre.

In North Arcot, the irrigation is much more precarious, being chiefly derived from the local rains or from rivers of second or third rate, less influenced than the first-class rivers by the south-west monsoon; the district is very ill provided with roads, and has no water carriage: here the assessment averages above *Rs.* 7½ an acre.

Lastly, in Cuddapah, the irrigation is about equal to that of North Arcot, being partly derived from the Pennar and other minor rivers, and partly dependent on the local rains; it is much worse off for roads than even North Arcot: and here the assessment of the wet land averages *Rs.* 8½ an acre.

314. Now, when it is remembered that in all these cases the basis of the settlement was the same, viz. an equal division of the crop of grain between the Ryot and the Government, after certain deductions which do not vary very materially from place to place, it seems impossible to avoid the conclusion that this great diversity

And requires to be equalized.

* Though not professing to constitute the whole "rent," the land assessment, except on the Western coast, is so heavy as to leave scarcely anything as rent, except in Tanjore, Chingleput and parts of some other districts.

diversity of the assessment in different districts is not due entirely to real variation of circumstances, but in great part to diversities in the mode in which the general principles of the settlement were applied by the different Collectors. Whatever the cause, indeed, it is an undeniable fact that the assessment is much more burdensome in some districts than in others; and we think this inequality ought to be removed or materially diminished, not less as a measure of justice than as a necessary step to the improvement of the country: for even where the tax is not so high as to keep the land out of cultivation, it is in most districts so high that it almost or entirely absorbs rent, and leaves but little inducement to the extension of cultivation. Nor do we entertain apprehensions that such reduction of the land assessment, if coupled as it ought to be with the improvement of the works of irrigation and of the roads, would at all reduce the total amount of the land revenue. The people of this country, though not enterprising, are peaceful, industrious and eminently fond of agriculture; and we think there is no room to doubt that large extension of cultivation would follow any material reduction of the assessment.

And the best lands are waste because too highly taxed.

315. There is another sort of inequality in the assessment, which acts still more injuriously; viz., that in several districts the best soils are so heavily taxed as to be kept permanently out of cultivation, while labour and water are applied to inferior soils more lightly assessed in proportion to their capabilities. This fact has long been known, and the evil of it admitted; but under a system of centralization which requires that before any change every minute detail shall be previously explained to the satisfaction of the controlling Board and of the Government, no progress we believe has yet been made in rectifying it. The remedy required is, to reduce the assessment of such over-taxed lands; and this reduction would not involve loss, even supposing no extension of cultivation to ensue, for high-class land, now waste, would then come into cultivation in place of inferior land; and the exchange would give the Ryot a larger return for the same amount of labour, while the receipts of Government would not be diminished, and perhaps increased.

Some indirect means of lightening the land tax.

316. The following are a few measures, most of them involving little or no cost, which we fully believe would tend, each in its degree, to lighten the burden of the land-tax, and so remove obstacles from the way of improvement.

The scarcity of coin is an evil to the Ryot;

One great difficulty which the Ryot has to encounter in the payment of his rent is the scarcity of coin. We have been unable to procure any definite information as to the amount of coin in circulation; but we have good reason to believe, and we are countenanced in this belief by Major J. T. Smith, the Mint Master, that the whole currency very little exceeds the land revenue; that revenue has rarely amounted to 365 lacs of rupees, and it may safely be assumed, therefore, that the whole currency does not exceed 400 lacs, or four crores; of this amount, no less than about 240 lacs is always lying idle in the various Government Treasuries at the Presidency and in the interior, so that no more than 160 lacs of rupees is left for the payment of the revenue, and for all the private transactions of 22 millions of people. And it must be remembered that in this country paper-money is almost unknown, except at the Presidency; that even private bills are in very limited use; and that large sums are permanently kept in coin by private persons, from the absence of banks or other easy and safe means of investing money. Bearing in mind this hoarding custom, it may be assumed that all the coin circulating in a district has to be paid into the Treasury fully three times over in the course of the year.

And large sums are annually transmitted to the Presidency, only to be carried back again.

317. A part of the coin paid in returns into circulation directly and promptly, in the salaries of public servants, the pay of troops, and the outlay on public works; but large sums are sent every year to the Presidency. The amount annually thus withdrawn from the districts, including sums sent direct from outports to Calcutta or Bombay, considerably exceeds 113 lacs on the average of the last five years. The amount remitted from each district varies from two or three lacs to 50 or even 20, according to the total collections and the local expenditure; these large sums must find their way back into the provinces, for there is no other way of supplying the coin for payment of revenue; but it is difficult to say exactly by what means this transmission is effected, especially in the case of those districts which do not produce articles for the English market; it takes place in great part in the ordinary course of trade, and much of the coin would probably return even if there were no Government kist to be paid; but it is seems clear, that to ensure the punctual presence of the proper quantity of coin, at the proper time and place, to pay

pay the monthly kists in every Talook of the 20 districts, must require on the part of the Shroffs or money dealers, no little trouble and cost, for which they must be remunerated. This charge is in fact borne by the Ryots; it results from the necessity laid on them of paying the rent or land tax in a commodity limited in amount, and consequently at a monopoly price. That the payment of the Government land revenue is rendered difficult by the scarcity of coin, is proved by the results experienced wherever large sums are brought into a district by English merchants, as in the case of sugar works, indigo factories, or the purchase of cotton, or where large sums are retained and expended on public works; in such cases, coin becomes cheaper, the Ryot's produce is easily converted into money, and the revenue is collected without difficulty.

318. It is obvious, therefore, that anything tending either to increase the quantity of coin circulating in the provinces, or to save the cost of its transmission from the Presidency, will be a boon to the Ryot. Coin is now brought to the Presidency at the cost of the Government, and carried back again at the cost of the Ryot, ultimately at his cost, though proximately at that of the merchant; both operations might be entirely dispensed with by a more liberal use of Accountant-general's Bills.

Bills on the up-country treasuries should be more liberally issued at Madras.

These bills are already in use to a certain but limited extent; a great deal of coin is taken back into the interior by people bringing produce to Madras, or is sent up by merchants making purchases in the interior of the country: various contrivances being employed to conceal it, but still with no little amount both of risk and of expense. There is no reason to believe that the amount of coin in any given part of the country varies materially from year to year; and it seems certain that if the Government were to adopt a more liberal system as to Accountant-general's Bills, it would become unnecessary for them to bring specie to Madras. It would only be necessary that such bills should be given to the full amount of the funds available in the up-country treasuries; and that within certain limits they should be given on any treasuries where they might be applied for, even beyond the amount of the surplus collections of those districts respectively, arrangements being made to place funds there from other districts. This may at first appear a startling proposition; but there would be no more cost or risk in proportion to distance and amount in sending coin from one up-country treasury to another, than from the up-country treasuries to the Presidency; and the distance and the amount would both be less. Treasure detachments now come to Madras every year from the inland districts, even from the most distant, such as Cuddapah, Bellary, Coimbatore and Salem; and from other districts it is brought the whole or a part of the way by sea. Under the plan proposed, the whole of these operations would be put an end to; and in their place, a part of the whole sum now conveyed would be carried shorter distances from one district to another. Such an arrangement would be economical as regards the Government, and it would benefit trade; and it cannot be beneath the Government to consult the interests of commerce, the advancement of which is so intimately connected with the increase of the revenue.

319. Some improvement might be adopted in the mode of granting bills at the Accountant-general's office:—

Some improvements suggested in the mode of granting such bills.

1st. The fee now paid should be abolished, for the issue of the bill is itself a gain to the Government, as it saves the transmission of so much treasure: and there is no excuse, therefore, for demanding a fee. The fees go to the Deputy Accountant-general, and as that appointment is shortly to be abolished, it will be a good opportunity to abolish these fees also.*

2d. Bills should be given not arbitrarily, but under established rules as to time and mode of application, &c., to all applicants indifferently, and without any delay.

3d. It might be a good thing to publish in every issue of the Fort Saint George Gazette the amount available in any treasury; and a similar statement

ment

* The amount of Accountant-general's bills on the up-country treasuries, issued annually during the last five years, was Rs. 90,80,000; and the amount of specie actually brought to the Presidency from the up-country treasuries, in 1859, was Rs. 1,10,01,190, at a charge of Rs. 9,929. At this rate, the similar transmission of Rs. 90,80,000 would cost Rs. 8,170; and thus Government have saved that amount annually during the last five years, by the issue of the Accountant-general's bills. This fact takes away all plea for the levy of a fee on such bills.

ment should be made up daily, and a copy given for insertion in the local newspapers on application.

4th. The money is received at the General Treasury before the bill is granted; the bills ought therefore to be at sight.

5th. Bills should be paid, as far as possible, in any Talooks where the money might be wanted; and with this object similar arrangements between Talook and Talook might be adopted to those already spoken of as between district and district.

6th. Promptitude in paying bills should be enforced on the local subordinate officers; and care should be taken that neither in issuing nor in paying bills any subordinate should have power to create delay or raise obstacles, either of which might become a source of exaction.

The introduction of some other crop than rice.

320. Another most important means, not only of increasing the quantity of coin in circulation, but of creating employment for labour, and directly and indirectly increasing cultivation, will be the more extended introduction of some agricultural product, not a common article of food of the people of this country, and having a fixed and permanent value in the European or other foreign market. Although we hold it to be indubitably true that a cheapening of the supply of food greatly and constantly enlarges the demand for it, leading both to the increase of the population and to the advancement of civilization, yet it is clear that other branches of industry must be in existence, by applying themselves to which that part of the labouring class, whose exertions are not required to raise food for the community, may obtain something to exchange for the food which they themselves require. Now it is notorious, that in this country this market for food is extremely small; and as the want of capital and other circumstances prevent India from becoming a manufacturing country, the true means of developing her resources lies in the production of exportable raw produce,* and this cannot take place without directly and indirectly increasing the land revenue. The growth of such a branch of industry, indeed, in order to be healthy, must be spontaneous; yet in a country where both capital and commercial enterprise are so scanty, the aid of Government may be serviceable, not indeed to take a direct part, and so discourage and paralyse individual exertion, but to remove disabilities, if any, and to spread information.

Cotton and sugar.

321. Among the most important of such branches of industry are the cultivation of sugar, cotton and indigo. It has been fully ascertained that cotton, of such a quality as to compete on equal terms with that of America, can be produced at a paying price in Bellary, Cuddapah, Coimbatore and Tinnevely; and a considerable export actually takes place from all these districts, both to Liverpool and to China. The cultivation of sugar, too, has made much advance during the last eight or nine years, though it is still extremely limited compared with the capabilities of the country.

Now one or other or both these products could be raised in large quantities, and to great profit, in every district. The sugar cane will thrive well in the rich irrigated lands in every part of this Presidency; and there is scarcely a district in which cotton also could not be grown to much advantage, especially in land possessing the means of receiving an occasional watering in the dry season, which is often found valuable to the crop; but all along the east coast of the Peninsula in particular, there are thousands of square miles of land admirably adapted to the growth of cotton, and bearing a very low assessment, because of little value for other sorts of produce. These lands are sandy in soil, near the sea, and possessing, or capable of being easily made to possess, the means of occasional irrigation.†

The Ryots are well aware of the large profits to be obtained from the cultivation of sugar; but they are not generally acquainted with the mode of culture and preparation, and they want the energy and enterprise necessary to seek the information, and to try a new species of industry. As to cotton, again, they are aware that it would

* It seems highly probable that the rapid increase of cultivation and revenue in Tinnevely, when the means of irrigation were improved, and the similar immediate results in Rajahmundry, when the ancient canal even to a small extent into operation, are due partly to the extensive cultivation of cotton in the former district and of sugar in the latter. This fact obviously affords no argument against the policy of improving and extending irrigation; but it forcibly shows the importance of encouraging the cultivation of exportable produce.

† Dr. Royle's book on the growth of cotton in India contains some interesting details of the operations of Mr. Lees of Manchester, in the culture of cotton on lands of this description.

would be a gain to them to have this crop, especially when the price of grain is low; but they are deterred from entering on the cultivation, partly by the novelty, and partly by the fear of not readily finding buyers for the produce. An intelligent and fair dealing buyer on the spot might constantly command a very large quantity of either cotton or sugar.

322. What is chiefly wanted then on the part of Government, in connexion with this important object, is the publication of all the information in their possession, or obtainable, as to the capabilities of particular localities, and the formation of good internal communications between the interior and the coast. The European merchants of the Presidency are at present far too little informed of the state of matters in the interior; and good roads, and still more railroads, would dispose them to go and see things for themselves, which they are now little prone to do.

Roads are also essential to the bringing to market of various commodities. The opening of a cart-road from Coimbatore to Ponany on the western coast, so that cotton could be shipped there instead of coming to Madras, reduced the carriage of a bale of 300 pounds to the place of shipment, from six rupees to two; making all the difference in many cases between profit and loss on the export. The soil of Cuddapah is very favourable to the growth of cotton; but the demand is very limited, because the communication with the Presidency, only 160 miles distant, is in so bad a state as to be barely passable for wheel conveyances. There are also a variety of articles of raw produce, such as dye woods, oil seeds, hides and horns, already shipped to some extent, and which might be collected and exported in much larger quantities, whereby a value might be given to commodities now worthless, and a large amount of labour might be employed, were not the state of the roads such as to make it commercially impossible to bring such bulky articles from any considerable distance in the interior. But the improvement of the roads and communications is such an important subject, that we must treat of it at length as a separate topic.

323. In connexion with the important object of increasing the class of consumers not directly concerned with the growth of food, we cannot but observe, that the Moturfah, or tax on tradespeople and artisans, appears singularly objectionable. In a country where the classes engaged in trade, manufactures and the useful arts are extremely few in number compared with those occupied in agriculture, the disfavour of the former branches of industry is increased by a special impost levied on those employed in them; and, if the tax be thus bad in its general bearing, it is rendered infinitely more so by the incidents of its collection; it amounts in all only to 116,000*l.* annually; and this trifling sum is collected from no fewer than 9,94,224 individuals, being only 1½ rupee, or 2*s.* 4*d.* from each contributor. It is also extremely unequal, whole classes which are exempt in some localities being liable to it in others; some wealthy traders are free, while the poor and wretched contribute; and, universally the rate is heavier on the poor than on the rich.*

Again;

* The following table of the Moturfah collections, in a few of the districts, will exemplify the inequality of the tax in the different districts.

Names of Districts.	Total Population.	Number of Payers of Moturfah.	Total Amount of the Tax.	Amount per Head on the whole Population.	Amount per Head on the Payers.
			Rs.	Rs. a. p.	Rs. a. p.
Tanjore - -	1,476,086	232,321	43,313	- - 6	- 2 11½
Bellary - -	1,229,599	145,300	2,72,576	- 3 6½	1 14 -
Trichinopoly - -	709,196	5,834	6,325	- - 1½	1 1 10½
Kurnool - -	273,190	12,104	55,992	- 3 8½	4 10 -
Canara - -	1,050,333	23,301	16,567	- - 3	- 0 4½
Malabar - -	1,514,909	211,152	1,15,742	- 1 2½	- 8. 9½

Thus the average per head on the whole population varies in these districts from ¼ pice (less than a farthing) in Trichinopoly, to 3½ annas (5½*d.*) in Bellary; the rate per head on the payers varies from 3 annas (4½*d.*) in Tanjore, to Rs. 4. 10. (9*s.* 4*d.*) in Kurnool. The land assessment is very much more burdensome in Kurnool than in Tanjore. Madura, which does not differ from other districts, except in having a land assessment lighter than most, is altogether free from the Moturfah tax.

A large part of the Moturfah is paid by the weavers, and forms an addition to the difficulties with which they have to contend in competing with the English manufacturer. In this case, too, the tax is more than usually inquisitorial, as the amount varies with the number of looms employed by each payer; houses are frequently entered in order to discover concealed looms, as the Indian loom is easily dismantled and put away.

Again, except in the Ceded Districts, where there is some attempt at system, the tax on each individual is determined in a manner wholly arbitrary, and on the information of very poorly paid subordinate officials; each man's tax is of course liable to be raised or lowered as his circumstances vary; and on the one hand intrigue and bribery are employed to obtain a reduction or prevent an increase, and on the other threats of raising the demand, are made the means of extortion; and thus, in various ways, waste of time, intrigue and corruption are occasioned by this tax. In all the other Presidencies it has been abolished; and it is earnestly to be desired that it should be put an end to here also. There seems no room to doubt that the small amount of revenue sacrificed would speedily be replaced by increase in the land revenue, as has been the result in the case of the transit duties.

SECTION VII.

General View of the present Condition of the Roads of this Presidency; with Remarks on the urgent necessity for their real and effective Improvement; and with some Observations on the Harbours, and their need of attention.

A detailed review is necessary.

324. In a former Section we detailed the treatment of the roads of the Madras Presidency up to the year 1846, and traced the operations of the Road Department on the few lines placed under its charge, up to the month of May 1851. We will now endeavour to show what has been done with regard to the roads of the country generally in the intervening period, and what is their condition at present: unless this be done so as clearly to exhibit the actual condition of the communications, our suggestions regarding their future treatment will scarcely meet with due attention. If we state in general terms that the means of communication are very bad, and the cost of carriage very high in consequence, it may be admitted that some change is necessary, and that an effort must be made to put the Madras Presidency more on a footing with the rest of the civilized world in this all important particular, and we have no fear that the roads hereafter will be as much neglected as they have hitherto been; but if through failure to give sufficient individual detail, we leave the impression that some slight modification of the present system, with a moderate increase of expenditure, will do all that is required, our report will confirm rather than correct, the existing evil.

Sources of information as to the state of the roads.

325. When it was determined that a few of the main lines were to be placed under a separate Road Department, a most judicious order was issued by the Most noble the Governor in Council, that Collectors "should submit, with their annual reports on the extra sources of revenue of their respective districts, a separate report on the roads and communications; and point out distinctly the actual advantages to the Foreign and to the Home trade of the country arising from the improved means of transport." They were also called upon "to make such suggestions for the formation of new lines, and for the extension generally of the means of communication throughout their districts, as may appear to them to involve important results." And, in like manner, the Civil Engineers were directed at the same time to report annually on the roads in their divisions, after an examination of their condition.

The former of these orders has been acted upon with tolerable regularity, but the latter has not been enforced. The Board of Revenue (letter 7th May 1846) represented to Government that it would "be impracticable for the Civil Engineers to carry into effect the instructions of Government on this subject, and at the same time to attend to their other important duties. The divisions," the Board observe, "are severally of such great extent, and the more important works under execution at different points require such frequent visitation, that the officers in charge are rarely able to undertake any lengthened course of inspection of particular parts, but are obliged to be in constant readiness to move rapidly over great distances whenever calls are made for their services. Under these circumstances there would be no probability of their being able even to see all the branch roads of their respective divisions in any year; much less could they carefully inspect them, so as to be enabled to prepare a useful report upon their actual state. The Board are indeed persuaded, that it is in vain to expect from the Civil Engineers the invariable performance of any routine duties, considering how much more important it is that these officers should be available upon all occasions where superior professional knowledge is required. It is certainly highly desirable that the ordinary

Duties

duties of divisions should receive regular attention, and that the annual inspection of the roads should be included in these duties; but there are not enough officers, both for these and for the more important demands of the state, for Engineer's service, and it does not therefore appear expedient to assign to the present Civil Engineers additional labours of annual recurrence, which it is not possible for them to perform."

Before March 1847, however, a report had been received from each of the Civil Engineers, and a general summary of their contents was prepared by the Board of Revenue, and forwarded to Government on the 15th of that month. From this paper, the annual reports of Collectors, and the answers received by the Commission from the Civil Engineers, regarding the state of the roads in their respective divisions, we are able to give a tolerably accurate account of the operations on the communications of the country during the last six years, and of their condition at the present time.

326. This seems a convenient place to mention another important measure in connexion with the improvement of the roads, which also was adopted in 1846; we refer to the allotment of a large part of the accumulated surplus pagoda funds to such improvements. While the Hindoo Temples were under the official management of the Collectors, a large surplus accrued in some districts, in consequence of the income from the endowments being much in excess of the expenditure; and when it was determined to dis sever the connexion of Government with the Temples, this surplus considerably exceeded 12 lacs of rupees. Of this amount it was resolved to set apart eight lacs (80,000 *l.*), for the purposes of general education; and we may observe that this fund has remained unemployed to the present time. The remainder was given up for local improvements, one lac of the amount being expressly devoted to the formation of a road to connect the cotton districts of Tinnevely with the port of Tutecorin.

The surplus pagoda funds.

The following statement shows the distribution of the expenditure of the surplus pagoda funds:—

	Rs.	a.	p.		Rs.	a.	p.
Vizagapatam	713	15	4	Madura	20,000	-	-
Masulipatam	209	13	1	Tinnevely	10,000	-	-
Guntoor	7,937	6	2	Chingleput	40,234	-	-
Nellore	4,310	1	9	Trichinopoly	40,234	-	-
Madras	3,420	8	-	Coimbatore	38,835	6	7
Cuddapah	4,919	3	10	Bellary	12,872	7	2
Salem	39,004	11	4	South Arcot	26,687	3	11
Canara	7,124	12	10				
Tanjore	80,000	-	-	Total	4,26,584	10	-

327. In the Board's report of March 1847, a statement is given of the "made roads," which, however, includes certain spaces where the natural surface was so favourable, that no disbursement was considered necessary for the formation of a road. The roads mentioned in the list being in fact only such as were considered worthy of repair.

Extent of made road in 1846.

Extent of made roads (or roads naturally practicable for carts) in 1846:—

	No. of Miles.		No. of Miles.
1 Ganjam	40	15 Salem	400
2 Vizagapatam	0	16 Coimbatore Neilgherry Ghauts	49½
3 Rajahmundry	8½	Low Country	482
4 Masulipatam	2	17 Canara	80
5 Guntoor	39	18 Malabar, Neilgherry Ghauts	63½
6 Nellore	15	Low Country	70
7 Bellary	9	19 Madura	682½
8 Cuddapah	3½	20 Tinnevely	293½
9 Kurnool	0		
10 North Arcot	36½		2,880½
11 Chingleput	11½	Made roads under the Road Department, about	230
12 South Arcot	9½		
13 Tanjore	533½	Total	3,110½
14 Trichinopoly	50½		

The real condition
of the so called
"made roads."

328. Although 3,110 miles of road, extending over the 138,249 square miles which constitute the area of the Madras Presidency, would be totally inadequate to its wants, it might be inferred from the foregoing statement, that with that length actually under management, an extension of the system might be gradually proceeded with, till the means of communication were complete. To guard against such an idea, we must explain that nearly the whole of the made roads (so called) are only so far made as to be just practicable for carts. Even when in what is called "good" or "fair" order, they are only in such condition as to be classed, where indeed we find them, with those lines through a favourable country, where "no disbursement for the formation of a road is required." They admit of carts moving in dry weather, with light loads, at a very slow rate, and by very short stages. But by far the greater portion of these roads are unbridged, and a heavy shower cuts off the communication wherever a stream crosses the line, and they are, in many cases, so unfit to stand the effect of wheels while the surface is wet, that in the monsoon months they are out of use except for cattle or foot passengers. The draft on such roads is far greater than on the most ordinary roads and lanes in England; and we need not observe how great a decrease in the expense of transport is effected there, when such ordinary roads or lanes are brought by bridges and a surface of metal, into the condition of the turnpike-roads, a condition in which we have scarcely a mile of road in the whole Peninsula. This will be seen clearly by the annual reports already mentioned, which we now proceed to review, commencing with the most northern district, Ganjam.

State of the roads
in Ganjam district.

329. The first report upon the roads of Ganjam was sent in by Mr. Bannerman, in October 1848. He says, "With the exception of what is called the Northern Trunk Road, upon which a considerable sum has been frittered away in the last six or eight years, there is not a single yard of made road in the Ganjam District; the lines of communication from village to village remaining in their original primitive state." He mentions one Pass on the Northern Road (the Kerdamooloo Ghaut), as being of use in facilitating the communication with Cuttack; but the line of road not being completed to any of the large towns, little or no effect on the trade of the country seems to have been produced by it. In 1849 no report was sent in. In 1850, Mr. Onslow quotes Mr. Bannerman's report of 1848, and says that nothing has been done since that time; and in 1851, the same gentleman states that no progress has been made, except in the trimming of an avenue, which he considers objectionable. The Assistant Civil Engineer, in answer to the questions regarding the roads of the district in his subdivision, corroborates these accounts.

Both Mr. Bannerman and Mr. Onslow speak of the necessity for roads in Ganjam; the latter remarking especially upon the importance of opening such as would lead from the interior to the coast; which lines, he very justly observes, are more needed than the only line (the Northern Trunk Road, parallel to the coast) which has, as yet, had any attention paid to it.

The importance of
roads to save mili-
tary operations;

330. Mr. Onslow also adverts to an important use of such lines; he says, "If the products of Purlah Kimidy could have been transported to the coast with facility, and if troops could have been passed into it along good roads years ago, much treasure and many lives might have been spared." He alludes to the Khoond country, which, when in a disturbed state a few years ago, led to such severe loss both of men and money. And there can hardly be a doubt that if the same enlightened policy which induced Lord Elphinstone to open a first-rate road through the rebellious Talooks of Canara, had been extended to that country, after the conclusion of the first disturbances, there would have been no necessity for taking a force into the field a second time.

The expenditure by Lord Elphinstone's Government on the Sumpajee Ghaut, was considered large, and so it was, compared with the sums spent on roads in general under this Presidency; but it was a trifle in comparison with the cost of an army in the field, even if every movement were successful. And if such a course of policy was wise in that part of the country, where the climate is not such as to interfere with the operations of our forces, how much more urgent was the necessity for such improved means of communication in this fever infested district, where every night spent by an army in its progress to the scene of action, entails so much certain loss of life.

And to civilize bar-
barous tribes.

331. Even in a military point of view, the effect of roads opened from the sea coast

coast into the wild country of the Khoonds would be a measure of true economy; but the benefit derived from them would be greater still, in giving an outlet for the produce of the land, by bringing that peculiar people into more intimate communication with their neighbours, and affording them the means of learning the inutility as well as barbarity of their human sacrifices. It has been the opinion of those engaged in the suppression of these dreadful rites, that if the country were thrown open by roads leading to the coast, as well as to the territories of Nagpore upon the eastern frontier, prosperity and better intelligence would do more to correct the ancient superstition than force or persuasion can be expected to effect in any length of time. Mr. Russell, Special Commissioner to the Northern Circars in 1837, writes as follows: Report, dated May 1837, para 70: "I have already remarked, in another place, that the prejudices of caste have little influence among them (the Hill tribes); there is therefore less drawback to a free intercourse with them than with any other people on this side of India, and there seems every reason to hope that this peculiarity in their national character, and their taste for foreign productions, by leading to more frequent and unreserved communication with the officers of Government, and the inhabitants of the Low Country, and thus extending their knowledge, will gradually wean them from this barbarous superstition, more especially, as even among their own caste, the rite, though very general, is not an universal practice; it has no existence in Degee, Goododaye, Barée, the Maliahs of Bodayhodo, Coradu or Sooradah. It is true that this is a very confined tract, compared with the great extent of territory wherein it prevails, but the exception, small as it is, is a fortunate circumstance, and seems to offer a better groundwork for our exertions, than remonstrances, to be enforced by the sword."

Mr. G. E. Russell's opinion.

332. "The importance of direct communication with the interior, in a commercial point of view, may seem too obvious to need comment. As a single proof, we give an extract from the Jammabundy Report of the Principal Assistant to the Collector of Ganjam, 1st November 1850. A gentleman lately mentioned to me that he had agreed for a large quantity of gingelly oil seed, to meet the demand which has sprung up in France, where the seed is made into olive oil; but the parties declined the contract, when they found it (*i. e.* the seed) was to be delivered in December, as they declared the roads were impassable, and the seed has been purchased elsewhere. I would, therefore, beg leave to urge the necessity of the immediate formation of a good road leading to this port (Calingapatam) lest the trade, from which so much good is to be expected, should be diverted into other channels."

The want of a road to the port of Calingapatam.

The Commissioner, Mr. Walter Elliott, in his proceedings on that report, dated 9th October 1851, states, that the road from Calingapatam to Chicacole, the largest town in the district " (only 12 or 14 miles distant) passes through a swamp about four miles broad, which is impassable for carts or beasts of burden for several months of the year, and is traversed with difficulty by unencumbered travellers, although it forms a part of the old line of the Great North Road, to within a mile of the port."

333. Lieutenant Rundall, the First Assistant Civil Engineer, has lately made an estimate for a new road from Berhampoor, through Aska to Russelcondah, to the amount of Rs. 1,42,246 for 45 miles. The road would form part of a main line between the coast and Nagpore. It would pass through the most fertile part of the Ganjam district; would give the extensive sugar works established by Messrs. Binny & Co. at Aska, an uninterrupted communication with the shipping port, and would enable troops at any season to move rapidly on Goomsoor. If extended to the westward it would supply the long required passage through the country of the Khoonds, open a most extensive market in the Nagpore country for our salt, give a direct road from the sea to the capital of that territory, and would raise a traffic between the interior and the coast, to the benefit of a vast population both within and beyond the Company's frontier.

Road from Russelcondah and Aska to the coast.

The value of a free communication in this direction would be incalculable; and in forwarding the estimate both the Collector and the Engineer wrote most strongly to recommend it. The Government, however, considered that so expensive a road was not necessary, and ordered the estimate to be amended for a second class road; and this term signifies a road without bridges or a surface of metal, which, in the locality in question, where there is a long season of rain, would be out of use four or five months of the year.

While writing on the roads of Ganjam we had the advantage of a conversation with Mr. Boothby, then just arrived from Aska, where he has the management of the sugar manufactory above alluded to. This gentleman pointed out forcibly the advantage that would be derived, not only to the undertaking in which he is engaged, but to the country generally, by this road being opened and rendered efficient through the year. We have since received from Messrs. Binny & Co. a letter addressed to them by Mr. Boothby on the same subject, which so clearly illustrates the stagnation resulting from the want of roads in the country, that we have thought it advisable to print it with this Report (Appendix P.), and we would call attention to it as containing matter of the deepest importance. We find from it, that when in full operation the manufactory at Aska will annually spend a sum equal to half the revenue of the district. The effect on the prosperity of that collectorate from the circulation of so much capital, can only fully be realized by those who know the universal want of employment for labour and of a market for produce. It will be seen that Mr. Boothby's operations would not be limited to sugar, if other and more bulky commodities could be transported to the coast at a moderate cost.

The roads of Vizagapatam district.

334. Mr. Smollett, the Collector, in his report of 1847, says, "Throughout Vizagapatam there is nothing which deserves the name of a road; that is to say, that except in cantonments there is no road or highway from one station to another, along which a carriage or gig could be driven for a mile." In 1849 the report states that nothing has been done, and in 1850 there is still no change. In 1851 the Collector states, that a road from Vizianagarum to Bimlipatam has been commenced; and the First Assistant Civil Engineer says, "With the exception of a road lately made by His Highness the Rajah of Vizianagarum," (viz. that just spoken of to Bimlipatam) "there are no district roads throughout the subdivision." The subdivision alluded to comprises the two Collectorates of Ganjam and Vizagapatam, having an area of about 14,000 square miles. Here again, we find a whole Collectorate without any tolerable approach to either of its shipping ports, or any single road practicable for carts leading into the interior. And this district (Vizagapatam) has a coast line above 100 miles in length, and contains above 7,650 square miles. It materially exceeds in extent the united counties of Northumberland and Durham, with the North and East Ridings of Yorkshire. That populous and busy tract resembles it in position, and would resemble it also in condition, if its ports and its admirable internal communications were totally destroyed, and it were separated from the rest of England by a mountain barrier.

The roads of Rajahmundry.

335. Mr. Prendergast, the Collector, reported upon the roads in Rajahmundry in 1846, 47, 48 and 49; the terms used are nearly the same in all. In his first report he says, that the only good made road in the whole district, is a small portion of the north road in the vicinity of Rajahmuggur, where, for a distance of 10 miles, the convicts have gravelled the line. With the exception of this one stage, the north road is described as "in a wretched state, in some parts sandy, in others passing over black soil, crossed by bridgeless nullahs, and some parts so deep as to be almost impassable after a heavy shower." Irrigation channels are recklessly cut across the line, rendering it dangerous at night. This is the Northern Trunk Road." The most hopeless account is given of the cross roads; and there were no approaches to even the principal seaports. In the succeeding reports some trifling improvements are mentioned; but they are so absurdly out of proportion to the wants of the district, that they only show in a more glaring light the utter inefficiency of the present system.

Sanction for improvement refused.

336. In one case (the road from Samuleottah to Cocanada) where Mr. Prendergast had pointed out the urgent necessity for a road, and the Civil Engineer's Department had prepared an estimate for it to the amount of Rs. 9,799, the Government withheld its sanction for two reasons (extract Minutes of Consultation, 30th March 1849). One was "The absolute necessity for limiting expenditure; especially in Rajahmundry, with advertence to the works of the Godavery anicut;" the other, disapproval of Captain Orr's attention being occupied by any other duty than the anicut. The road was earnestly petitioned for by all the most wealthy and influential native merchants and others in the neighbouring towns of Cocanada, Samuleottah, Peddapoor, &c.; and their representations of its necessity were fully avouched by the Collector and the Civil Engineer. It was only eight miles long, and was to cost less than 1,000 £, and it would have completed the connexion

connexion between the grain growing parts of the Delta of the Godavery and the shipping port; and at that time there was nothing in the shape of a road "on the line;" it lay "across swamps and nullahs, and could not be used even by common bullock bandies, except at the driest season of the year;" the grain for exportation was all brought to the port on pack-bullocks, and the road was "often impassable, even for them, for weeks together;" yet this road was refused. Towards the end of the same year the Civil Engineer, the Collector, and the Board of Revenue, again brought the subject before the Government, praying that at least sanction might be given for the earth-work, leaving the bridges to be constructed afterwards; but even this request was rejected. The Government simply quoted their previous order, and intimated to the Board "that no expense of this nature will be sanctioned in Rajahmundry, until the works of the Godavery are completed." The large expenditure in progress on the works of the Godavery ancient was much more than replaced, year by year, in increase of revenue; yet it was thus made the plea for withholding improvement of the roads. Such a policy was both short-sighted and inconsistent; for all increased facilities for the production of food must greatly depend for their success on the means of carrying the produce to market; to refuse to improve the roads, therefore, is powerfully to check the benefit to be obtained from the outlay on irrigation works. The more irrigation is improved the more are good roads required: and, as clearly seen in the case of Rajahmundry, the larger are the funds available for the work.

In that portion of the Rajahmundry district, which will be under the influence of the Godavery irrigation, there will ere long be a most valuable system of water communication; and already much use is made of the embankments of the new channels, as roads, though they are not in their present state practicable for wheels; but this will do but little towards facilitating traffic between the centre of the continent and the coast, and will benefit only a portion of the Collectorate.

337. Mr. Porter's first report, dated December 1847, shows that there was no tolerable road in the whole of the district of Masulipatam. He designates two "main lines" with reference to the necessities of the country. To one of them, viz., that from Bezwarrah towards Rajahmundry, 73 miles in length, which forms a part of the Northern Trunk Road, he calls special attention, and cites several passages in the diaries of the Civil Engineers during the previous 10 years, in which "the lamentable state of this line" has been brought to the notice of the Board. The other road is from Masulipatam towards Hyderabad. Of this most important Military and Commercial line, leading from the Port and Arsenal of Masulipatam towards the capital of the Nizam's dominions, he says, "it may with truth be said to be in many parts impassable in the rains, and not to be traversed without difficulty and danger in the dry weather."

He calls attention, also, to one other line, from Masulipatam to Ellore; the former a populous town and seaport, and the latter a large manufacturing and commercial town, containing 30,000 inhabitants, and the great entrepôt of trade in that part of the country, between the coast and the interior. He states, that the distance between these two places in a direct line is under 50 miles; but, in consequence of the badness of the road, and the want of means for crossing the watercourses which intersect it, it is frequently necessary to make one of two circuits; which increase the distance, in one case to 67, and in the other to 87 miles; and even those circuitous routes are only just passable.

338. In the same gentleman's subsequent reports in 1848, 1849, 1850, and 1851, he urges the necessity for something being done, and records a few such improvements as the following: the prickly pear bush, which covered the road between Masulipatam and Nedomole, and from thence partially towards Weyoor, has been removed at an expense of Rs. 275. 2. 2., which has been defrayed from the sum of Rs. 400, allowed annually for the whole district. Mr. Porter continued to urge improvement, but as yet nothing has been done. That he had not given an exaggerated account of the wants of his district, will be seen by the following extract from the reply of the Civil Engineer of the 1st Division, to our query on the subject; his remarks have reference to his whole division, comprising (without the sub-division, which is a separate charge), the three Collectorates of Guntoor, Masulipatam and Rajahmundry: "There is a very small extent of road in this division that is in a practicable state in the monsoon; a very large part of the Great Northern Road is quite impassable in wet weather, most of it neither metalled, nor bridged, nor drained; and in the Delta the roads are in the same

state; indeed they are not in general even marked out for bandies, so that there is scarcely any bandy traffic even in the dry season; twice I have been able to average only a mile an hour in a palanquin; on the great Northern Road I have known a gentleman take four hours to travel seven miles on horseback. The superintendent of roads has applied to me several times about the roads, but I have not been able to do anything that he required."

In this district no mention is made of cross-roads, or of any passes into the interior, except the one leading to Hyderabad, which is so ill reported of. Like the three districts already spoken of, it has no tolerable communications with the country inland, or even the means of conveying its own produce to the coast, though so close.

The roads of Gun-
toor.

339. In Mr. Stoke's report for 1846, on the roads of Guntoor, he names four principal roads, one a part of the same Northern Trunk Road already so often mentioned, from Madras towards Calcutta, one from Madras towards Hyderabad, a branch of that last-named, one from Guntoor inland to Cuddapah, &c., and the fourth, a line parallel to the coast. "Of these," he says, "only one has been regularly made, and while in good order the advantages were very great, but in its present state, from the month of June till October, bandies can only pass with very great difficulty, if at all." Of the second, he states that it was improved when Mr. Whish was Collector "(about 20 years ago), since which little or nothing has been done to it." In parts it was still pretty good, but in others almost impassable. The third road, running directly inland, is of the greatest importance to the trade of the district, and although "it appears never to have been repaired, running over a tolerably hard soil, bandies pass without difficulty." The fourth is a sandy track, which has had an avenue planted along it, but has received no other outlay.

In 1848, the Collector expresses a hope that something will be done for the main roads. In 1849, the Superintendent of Roads passed through the district, and inspected the Northern Road, as well as that towards Hyderabad; estimates were supposed to have been prepared, and hopes were again expressed regarding the other lines. In 1849, four small bridges were built, and one mile of road made. The Superintendent calls for data, which raises new hopes, and the Assistant Civil Engineer prepares estimates for the repair of two very bad pieces of road, but these were "not sanctioned," and the orders of Government (18th November 1848), prohibiting all but necessary disbursements, were thought unfavourable to further recommendations.

In 1850, Mr. Newill, the Acting Collector, writes as follows: "The state above described, of the two main roads, continuing as it has for the last eight or nine years, and the defects of the two other roads to Masulipatam, cannot but have a very bad effect upon the trade of this district with other parts of the country, being sufficient to damp what little enterprise may exist in its commercial transactions." This gentleman sees the importance of cross roads in the district, and speaks of the laying of them out as an "important preliminary to the survey."

The road of Nel-
lore.

340. Mr. Smith reports, in 1847, that the Northern Trunk Road through the Nellore district has had repairs to the value of Rs. 3,051, and that an Overseer has been appointed to manage it; and the Superintendent having seen it at its worst, he hopes it may be satisfactorily repaired. In the south east side of the district he was able to carry his tents and records on carts. The only other lines mentioned are, that leading inland to Cuddapah and the Ongole and Hyderabad road, but the condition of these is not specified.

In 1848, considerable improvement of the Northern Trunk Road is reported south of Nellore, but north of that station, nothing had been done; and the only improvements of the other roads are enumerated in the following items:—

	<i>R.</i>	<i>a.</i>	<i>p.</i>
Roads and Bridges about Nellore	48	11	8
Ditto - - ditto about Ramaipatam	50	-	-
Raising a Parapet-wall on a Bridge over the Daroor Channel	23	10	-
Opening a Road to Kistnapatam	304	-	-

In this report the Collector again mentions that he has used carts on his tour, that mode of conveyance being apparently a novelty.

In 1849 between Rs. 7,000 and Rs. 8,000 was spent on the North Road south of Nellore, but nothing north of that station, or on the other lines in the district

under

under the management of the Road Department. The expenditure on the cross roads consisted of six trifling items, varying in amount from Rs. 196. 15. 5. to Rs. 12. 6.

In 1850, the Superintendent of Roads traced a new line between Nellore and Ongole, and an estimate amounting to Rs. 6,156 was sanctioned for the improvement of the important line into the Cuddapah district.

341. In 1851, the Northern Trunk Road south of Nellore is reported by Mr. White to be in a fair state. North of that station it has still further deteriorated; and on the Cuddapah road, the repairs sanctioned have not advanced sufficiently "to admit of its usefulness being reported upon." Thus in this district of 8,000 square miles, there is, up to 1851, only one short piece of road in good order; viz., a part of the Northern line from the Southern boundary of the district to Ulloor, a few miles north of Nellore. Of this road the Civil Engineer of the Division writes as follows: "The only made road in the Nellore district is the high Northern road, the southern portion of which, from Arumbank to Ulloor, a distance of about 88 miles, has had, from its first formation in 1833 to the present time, several lacs of rupees expended upon it. It is now under the charge of the Superintendent of Roads, and that part from Arumbank to Ulloor is in better order now than it ever was. But that to the north of Ulloor has had nothing done to it during the last 10 years, and is in very bad state of repair. From Ulloor, northward, to the boundary of the district, with the exception of a few bridges near Ramiapatam, Ongole and Singarrycondah, it has never had anything done to it. From Singarrycondah, northward, it runs through black cotton soil, and is almost impassable in the wet weather." He goes on to speak of the line to Cuddapah: "The only other road in this district is that from Nellore to Cuddapah; nothing has ever been done to this road until the present year, with the exception of a few bridges erected in 1834. This season a sum of Rs. 10,769. 15. is being expended on it, agreeably to estimates sanctioned by Government." When these repairs are completed this most important road will be but an "improved track," such as would not bear the name of a made road in any other country.

342. Mr. Cochrane, in 1847, wrote as follows of the Cuddapah road: "As with the exception of a small portion of the road leading to Cumbum in the subdivision (the formation of which has lately been undertaken on an estimate of Rs. 1,867. 8. 0.), there is not a made road of any description throughout the whole length and breadth of this extensive province, in which so much trade and commerce are carried on, particularly in cotton, sugar and indigo; and as the great difficulty of transport, occasioned by the total absence of good roads, must necessarily, in a great measure, consume, in the mere cost of transit, the value of the goods at the port of export, it is most probable that no district in the Presidency is in greater need of improved means of transport being afforded for its produce for exportation." Mr. Cochrane points out the most important lines that he would have improved, and gives the best reasons why some such means should be adopted for reducing the cost of carriage.

In 1848, he suggests that as the roads were "in the worst possible state," and as Government had shown no disposition to do anything to improve them, and "as the want of facility of transit is so severely felt as to render the adoption of remedial measures indispensably necessary;" that, therefore, if Government was not prepared to meet the exigency, funds should be raised for the purpose by a local tax, and he proposes a scheme by which he estimates that a sum of Rs. 54,662 might be levied annually from the payers of land revenue and of the *Moturfah*, and from the holders of *Enam* land.

In 1849, he reports the improvement of the Goolcherroo Pass as in progress, to open a direct communication between Cuddapah and the Carnatic. In 1851, Mr. Murray (Acting Collector) reports that work as still in progress, and gives the same lamentable account of the roads in general, complaining that there is still no direct road even to Madras, and he might have added to any other seaport.

343. In November of the same year, Mr. Forbes, the now Collector, writes, "The Board are well aware that, with the exception of the work on the Goolcherroo Ghaut, nothing whatever has been done to improve the communications in the past year, and they will, therefore, be prepared for my stating that roads, properly so called, can hardly be said to exist; and that in Cuddapah the communications have not to be repaired, but made."

The Goolcherroo Ghaut has been "completed, and nothing can possibly be better than the execution of the work; but until it can be approached on either side with somewhat less difficulty than at present, its value to the merchants must, of necessity, be comparatively small. It is, doubtless, something gained to be able to ascend the ghaut with safety and ease; but the distance from Cuddapah to Chittoor is 106 miles, and so long as the road is good for only $18\frac{1}{2}$ miles, and the remaining $87\frac{1}{2}$ miles remain such as to make the overturn and fracture of carts a common occurrence, it cannot be expected that traffic on the line will very greatly increase."

"My Cutcherry has been for some days at Koilgoontah, and it is only necessary that I should join it, for the settlement to commence at once. There is nothing whatever to detain me in Cuddapah, but the impossibility of moving my tents after some very heavy rain which has lately fallen; and if this be the case with all the means and appliances at the Collector's disposal, the Board may conclude what is the obstruction offered by the state of the roads to the ordinary traffic of the country."

The Engineer's Report.

344. The First Assistant Civil Engineer, in his report on the roads of this district, says, "The state of the roads in the Cuddapah district is execrable. The most important line from Bellary passing through the town of Cuddapah to Madras (which is the Tappal road from Bombay to Madras), is allowed by all travellers to be the very worst in the Presidency. Within the last 10 years it has been surveyed and reported on by a head Maistry, by Captains Buckle and Lawford; and again, in 1849, by Captain De Butts and myself: but nothing has been done to improve it, although large quantities of cotton, indigo and other valuable products of this and the Bellary district are sent yearly by this road to Madras. When treasure parties are sent by this road to the Presidency, 10 per cent. of the bandies break down daily. The road from Cuddapah to Nellore is nearly as bad; that leading from Cuddapah to Cumbum and the Northern Circars is the best in the district, small sums being yearly expended in improving the worst portions of it. The road from Roychoty to Bangalore, and from Roychoty by Peelair to Arcot are mere tracks; but lately Government has sanctioned the construction of a carriage-road through the Goolcherroo Pass, between Cuddapah and Roychoty. It is, however, impossible for an Engineer to give a proper share of attention to the roads in this district, in addition to the usual Maramut works." And again, "in the Cuddapah district, nothing has ever been done to the roads beyond marking out the Madras and Cuddapah line by an avenue of trees, which was done when Sir Thomas Munro was Collector (about 50 years ago), the Goolcherroo Pass opened and improved last year, and still further improved this year."

Size and importance of the district.

It only remains for us to point out the facts, that the district of which we are treating, the largest but one in the Madras Presidency, contains 13,000 square miles, being nearly twice the size of the whole of Wales, and with a population larger by nearly one-half; that it is at a distance from the sea, with no navigable stream or other natural facility for transport, and that its products are of the most valuable description. It is famous for its cotton, sugar and indigo, commodities which form no slight portion of the exports of Madras, in spite of the heavy expense of carriage they are subjected to, and the deterioration they frequently suffer in the journey. It is quite impossible to overrate the benefits which would result from opening good and direct roads from all parts of this fine district to the port of Madras.

The roads of Bellary.

345. Mr. Mellor's report upon the roads of the Bellary district, in 1847, points out the neglected state of the communications in the most forcible way. He reminds the Board that that large district of above 1,300 square miles has only had, on an average, Rs. 1,580 a year spent upon the whole of its roads during the previous 20 years. Two sums, amounting together to Rs. 13,202, he states, are the only considerable expenditures that have been made during the eight years of his holding the Collectorate. He specifies the roads he would have first restored, and refers the Board to a former communication, 2d October 1846, wherein, while writing upon the Ryotwar system, he urged the advisability of improving the means of transit through the district.

Mr. Pelly's Reports.

346. In 1849, Mr. Pelly, the Acting Collector, calls attention to Mr. Mellor's Report, just quoted, as pointing out the wretched state of the roads, and brings forward a suggestion for the formation of 700 miles of the principal lines of road in the

the district. In doing this, he refers to the excellent roads made in the adjoining country of Mysore since it came under administration by British officers, from the advantage of which his district is cut off by the bad state of its own roads. He says, "The Board are, doubtless, aware, that excellent roads have been made in many directions throughout the Mysore country, which borders for a distance of about 200 miles along the southern boundary of Bellary. These roads open communication through the territories of Mysore, to Madras, Southern India, and the Western Coast; feasible not only for common carts but for spring carriages. The Mysore roads have been brought up to the borders of the Bellary district (or within a few miles), and connect the two at four different points; but there are no corresponding roads to meet them in Bellary, and consequently not only the large and central town of Bellary, but the whole district is cut off from the advantages offered by an open and easy communication with the Mysore territories, the ports on the western coast, and the whole Southern Peninsula."

Mr. Pelly begs that the sum of Rs. 50,000 a year may be allowed him for the repair of roads, with an officer who understands the work, to lay out the lines. He did not expect, at first, to be able to spend more; but with such a sum at his disposal, he might organize a Road Department, and have, in a few years, experienced men to work with. His proposal is only to improve the road-ways, apparently leaving the bridging of the rivers as beyond his hopes. He says, "I have not mentioned bridges as forming any part of my plan: we have no arched bridges out of the town of Bellary but one; a few flat stone bridges are all that we can boast of."

In November 1850, Mr. Pelly says, in the annual report, "I have nothing further to add to my report, dated 22d October 1849, the orders of Government on which I am still expecting." He refers to some repairs on a small part of the Bellary and Dharwar road, on an estimate to the amount of Rs. 6,177. 13. 0. as on the point of completion; and notices that the further estimate (for Rs. 25,200) for this road had not yet received the sanction of Government. He closes his short and hopeless report, with a repetition of his request, "that some plan for making roads through Bellary may be authorized and commenced upon."

347. Bellary is in extent rather larger than Cuddapah: in fertility and natural resources it is not less important; and being farther from the sea, and equally difficult of access, it has the greater occasion for a reduction in the cost of carriage: it is one of the greatest cotton producing districts in the Madras Presidency. It is of such a district, be it observed, a country measuring 13,000 square miles, or nearly double the size of the whole of Wales, and containing a population of 1,250,000, that the Collector states that there is but one arched bridge throughout the whole country, out of the town of Bellary.

Size and importance of the district.

The loss and impediment to trade resulting from the absence of a road from this immense district to the port of Madras, was strikingly exemplified a few months ago, when freight having fallen to an extremely low point, the cotton of Bellary was in great demand as an article of profitable shipment. There was abundance of cotton in the district; but in consequence of the tardy and uncertain means of transport to the port, the merchants could not venture to send for it, lest shipping should have become scarce and dear before it could arrive; and yet the distance from Madras to the very centre of the cotton country is not more than 250 miles.

348. The first report upon the communications of Kurnool by Mr. Septimus Scott, in 1846, mentions two lines of road ("though," as he observes, "they scarcely deserve that denomination") which pass through the district, and lead into the town of Kurnool. The roads are said to show no indication of ever having had any money spent on them, and are now, for the most part, "little better than tracks through the fields, marked out principally by their being worn down to a lower level than the surrounding country, though here and there the hedge of a field or a few trees mark the line. In dry weather these roads are said to be easily travelled, but in wet weather, where the soil is rich, the roads have little advantage over the field, to which, in many places, they form the channels for drainage." Mr. Scott adds, "there is not a single bridge in the whole country, and as no sanction has yet been received for the two small ones for which I submitted an application 20 months ago, I have abstained from recommending any other improvements." He recommends a pass being opened through the Nellamulla Hills, which form the eastern boundary of the district, over which at present carts cannot be used.

The roads of Kurnool.

Mr. Phillips reports in 1847; but having only slight personal knowledge of the district, he says little. Referring to the report just noticed, he says, "since the transmission of that communication, no expenditure whatever has been sanctioned for the roads, and the two bridges for which Mr. Scott then stated that he had 20 months previously submitted an application, and which in my opinion are most obviously necessary, are still without sanction." In 1848 he reports the two small bridges as sanctioned, and one of them in course of execution. He urges further improvements, and again presses upon the Board the necessity of opening a pass through the Neelamullah Hills, explaining that it is a great object to have such a road in that direction as will admit of the inhabitants of Kurnool taking their exportable produce to the coast on carts. In 1849, for the fourth time, and still without effect, he urges on the Board of Revenue and Government the importance of the pass to be made through those hills.

Mr. Lushington's
Report.

349. In 1851 a full and valuable report upon the communications of Kurnool was made by Mr. T. D. Lushington, who writes as follows: "Eleven years have elapsed since Kurnool became a British province, and I believe I am correct in declaring that during the whole of that period nothing has been done towards the improvement of the existing lines of communication, beyond the construction of two single arch bridges over two nullahs, involving an outlay of Rs. 5,186. On that point no steps have been taken to show the people that they have fallen under the rule of a Government possessing a higher degree of civilization and skill than did their late Patan rulers, of one which attaches importance to the improvement of the means of commercial intercourse, and which has at heart the interest of its subjects.

"The province is small, thinly populated, and generally ill cultivated, with an excessive rate of assessment on much of the Circar land, and the inhabitants are generally in a very impoverished condition; but notwithstanding these disadvantages, and the large drafts upon its revenues to meet the very liberal allowances granted to the relatives and dependents of the late rulers, the expenses of a regiment of native infantry, and the Rissala of Kurnool irregular horse, it cannot be regarded as one which does not furnish its fair quota to the general expenses of the State. On examining the revenue accounts for the last seven years, I find that, after the payment of every expense within the province, upwards of 16 lacs have been remitted to the Presidency as surplus revenue; and, as pensions continue to lapse, the annual amount may be expected to increase. I mention this fact, because I am about to express my hope that a spirit of liberality in regard to roads and other important public works, similar to that which has so frequently been shown to newly-acquired provinces on their falling under the Company's Government, may be now extended to Kurnool; for which, irrespective of the repair of works of irrigation yielding a direct return, so little has hitherto been done."

He points out many important improvements immediately necessary, and lays great stress on the pass through the Neelamullah Hills mentioned in every report of his predecessors. Indeed, he considers one insufficient, and gives his reasons for suggesting a second. While pressing this upon the Board, he says, "it is difficult to conceive a district running almost parallel to the coast, and only 80 miles in a direct line from the nearest point, more entirely cut off from all such communication with it as the requirements of progressive civilization demand, than the district of Kurnool."

The roads of North
Arcot.

350. Bad as the communications are in North Arcot, and though the district is without cross-roads, it has a great advantage over all the districts above reviewed, in having one comparatively good road through it from the coast to the eastward. This is the Western Trunk Road from Madras to Bangalore, which traverses the southern parts of North Arcot.

Mr. Lovell, who reports upon the roads of this district in 1847, mentions that road as the only complete line of road to be found. He says, "It is the only one which appears to have been thoroughly made and kept up for any distance." One pass, that of Moogly, is also spoken of as being kept up by a small annual outlay (Rs. 2,300), and the road from the foot of that pass to Chittoor, 19 miles, is described as "tolerably good," with loose stone bridges over some of the nullahs. Above the pass, the road has been made as far as Palmanair, four miles; and another road of four miles is spoken of in the direction of Cuddapah from Palmanair; but this small amount of tolerable road-way, which is all in the vicinity of the Collector's

lector's stations, could be made comparatively little use of, the communication being interrupted by the very bad state of the road from Arcot to Chittoor.

351. The report of 1848 by Mr. Bourdillon, omitting detail of the operations under the Road Department on the Great Western Road, mentions several minute expenditures; it also notices that small estimates sent in for the repair of two important approaches to Arcot, one from Cuddalore, the other from Trichinopoly, had been refused sanction on account of the financial circumstances of the time, and points out several roads as urgently requiring improvement. Early in the following year, a more detailed report was written by the same gentleman, in which it is said of the roads of North Arcot, "they are in truth not roads but mere tracks, picking the best way they can through the obstacles they meet with, whether swamps, quagmires, rocks or jungles; many parts in all of them may be fairly styled impassable in the wet season, and even for half the year or more as long as the Nunjah lands which they pass are under cultivation; and though such parts are comparatively firm and level when dry, the rocky and stony parts are equally bad all the year round." It is stated that one important line of trade has altogether disappeared in consequence of the neglect of the road from Chittoor to Vellore. A list of roads accompanies this report, which, exclusive of 194 miles under management of the Road Department, measure 515 miles. To repair these in a satisfactory manner, without, however, any expensive correction of the lines, was estimated in a general way to require *Rs.* 400 or *Rs.* 500 a mile; but as the work must proceed gradually, it was suggested that only 50 or 70 miles should be repaired annually, at a cost of *Rs.* 20,000 a year, which "would be less than one per cent. on the revenue of the district; and that, or double that, would be no extravagant outlay on the communications of the district, from a Government which for nearly half a century had done scarcely anything for them, though it had received revenue from the district during that period to the amount of 10,000,000 *l.* sterling." The Collector, at the same time, urged upon the Board the necessity for more help from the Engineer Department. He required money for carrying on the works that might be proposed; but his first want was engineering skill, to ensure the right lines being adopted, and the best means being taken to overcome the difficulties met with.

More detail of their condition and wants.

352. In speaking of the Madras and Cuddapah road, which traverses the northern parts of this district for about 55 miles, and would be a valuable trunk line to it, the Collector says, "The present state of this road is felt to be a very great evil by the native community using it or living near it; frequent and deep complaints of it have been made to me, and the same would probably reach the Board and Government were the complaining parties in a condition to make a joint address, and did they suppose that a petition on the subject would be successful." It will be remembered that the necessity for a better road on this line was repeatedly brought to notice in the reports of the Collector of Cuddapah.

The Madras and Cuddapah road.

The late Superintendent of Roads considered one road from Cuddapah to Madras, and that a circuitous one, to be sufficient; and the Government, adopting that opinion, appear to have abandoned the idea of doing much to improve this direct line. As regards the town of Cuddapah, and the northern and western parts of the district, that view may be correct; but we would remark, that this line forms a valuable trunk road to the north-east part of North Arcot and the eastern parts of Cuddapah (forming together a country nearly as large as Wales), which do not benefit at all by the Goolcherroo line. It is most important, therefore, that even if the last mentioned line is regarded as the main road to Cuddapah, this line also should be made a good road.

353. In the annual report of 1850, the Collector refers to his letter last noticed, and says, "In my letter of the 26th April 1849, I gave a general view of the existing condition of the roads; it would be superfluous to repeat it here, as no change has taken place, except that the already bad state of the communications is daily becoming worse, under the influence of the usual deteriorating causes, and in the absence of measures to arrest such deterioration."

General condition of the roads of the district.

In July 1850, the Collector addressed the Government direct on the subject of the improvement of some important lines under the Superintendent of Roads, for which he urgently requests that sanction may be granted. He observes, "with the exception of the High Western Road to Bangalore, which passes through a part of this district, and the sums expended on the road from Chittoor to Palmanair,

I cannot learn that any considerable amount of Government money has ever been laid out on the communications of this district, out of the 10,000,000 *l.* sterling that has been drawn from it in revenue during the half century that it has been under the British Government. The state of the roads is just what might be expected from this fact; and their wretched condition cannot but operate most banefully both on the revenue and on the prosperity of the people." And in closing his letter, he says, "The land assessment in this district is very heavy, but good communications would do much to lighten the burden to the Ryots." The roads referred to in that letter were a branch line from the Western Trunk Road through Chittoor and Palmanair to the Mysore frontier, and a road connecting Chittoor and Arcot, being a total length of 74 miles. These roads have since been sanctioned, and their construction is in progress; they will form a valuable addition to the means of communication of the district.

In 1851 the Acting Collector reports some small repairs as in progress on the roads from Arcot to Wandiwash, and from Conjeveram to the same place; he also mentions some activity in the works under the Road Department.

The roads of
Chingleput.

354. Mr. Edward Maltby, in his report for 1846, notices the advantages to the Chingleput district from the western and southern roads, both which lines traverse parts of it. He suggests the advisability of opening a number of other roads in the district.

The reports in the following four years by Mr. Freese are very concise. They remark upon the state of the two trunk lines, and explain that the heavy traffic on the western road keeps the surface in bad order. Some slight repairs are alluded to on other roads; and one road, from the Elphinstone Bridge to the southward, which is stated to have been repaired in 1848, is reported in 1849 to be in fair order as far as Trevamore, about four miles. Two cross roads are said to need repair, but of the others in this district Mr. Freese says, in his Report for 1850, that they "are generally in good order, the necessary repairs being performed from the discretionary sum placed at my disposal." This sum amounts to 40% a year, for an area of 3,000 square miles, containing half a million of inhabitants and several large towns. If the roads of Chingleput could indeed be kept in good order at so moderate a cost, the wants of the country, in general, might be supplied at a small expenditure; but we have ample proof under our own immediate observation that it is not so; even if the very fact that the Collector names four particular miles as being in good repair, did not lead to the inference that the roads of his district generally are out of order. We find that with the exception of the two trunk roads, all the roads leading into Madras (the whole of which lie in the Chingleput Collectorate), are in wretched condition; and as to the very four miles specially stated to be in repair, the driver of a country cart is liable to a fine if he uses the only portion of the road which is gravelled; and it is hardly possible to conceive a worse road in a flat country, than that used by the carts approaching the Elphinstone Bridge, to within 400 yards of the bridge itself.

The line leading direct to Cuddapah, which is the same already spoken of among the roads of the Cuddapah and North Arcot districts, is in some parts in even a worse condition in Chingleput than in those Collectorates, and very much worse, considering the level character of the country. The ruts are in many places a foot deep; and although it leads through the quarry that supplies Madras with road material, and is the very road by which that material is brought in, it has never been metalled. Indeed when the nature of the country is considered, there is not a Collectorate in the Presidency where the traffic is carried on under greater disadvantages than Chingleput, as respects all roads, except the two trunk lines above spoken of.

The roads of South
Arcot.

355. The reports on the roads of South Arcot in 1847, 1848 and 1849, are brief, confused and unsatisfactory. Mr. Davis states in these reports that the Southern Trunk Road is under repair by the Road Department; his account of every other road is generally summed up with the words, "but is not impassable." In the report for 1847 we find this paragraph: "The following communications throughout the interior of the district are in a wretched state, and consequently cause great difficulty and inconvenience to merchants and travellers, viz. from Pondicherry to Coleanoor, from Chellumbrum to Shateatope, from Munnargoody to Chellumbrum, and from Chaitput to Teroonamalay." This list is repeated, or alluded to, in each subsequent report, with a remark that "they remain in the same state;" and every year the same paragraph is used almost verbatim, viz. "The Superintendent of

Roads

Roads being already engaged in preparing new lines of roads, and suggesting the best method of improving the present ones generally, I am not prepared at present to recommend any repairs." It is to be remembered that the Superintendent of Roads had nothing whatever to do with any roads in the district, except two lines called Trunk Lines, one of them only a few miles in length.

In February 1851, Mr. Wroughton, the Acting Collector, sent in a general report, of little value, except as showing that no improvements were in progress save those on the trunk roads.

In October of the same year, Mr. E. Maltby reports very favourably of the progress making on the two trunk roads; and mentions a new but incomplete road made between Manargoody and Chellumbrum. "The other district roads remained in the same state as at the date of the last report," excepting only that one had been repaired by means of the annual allowance, amounting in South Arcot to 60*l*.

356. From these reports we gather, that with the exception of the southern trunk road from Madras to Trichinopoly, with its one branch into the district of Tanjore, there are no tolerably good roads in the whole district, containing as it does 7,600 square miles, and 1,006,000 inhabitants; and as regards the interests and the convenience of the district, probably no line could have been laid out of less advantage than this line, passing as it does north and south through its inland Talooks. The Trichinopoly road is important as a military line of communication, and will doubtless be of some benefit to the trade of the country generally; but the produce of the district must find a market in the coast towns, and there does not appear to be one road in good order in the direction required, viz., from east to west.

General view of their state.

The Civil Engineer confirms this unfavourable view of the roads of South Arcot in the following words: "They are totally neglected; a very small share of the attention of the Civil Engineer's Department is available for the roads, pressed as it is with more emergent demands." And the Civil Engineer of the 6th Division, in reporting on the small part of this district which lies within his range, says, "In South Arcot the Manargoody and Chellumbrum road has been constructed, one from the Vellaur to the Coleroon improved, and a few other portions of road have also been repaired, but generally the roads are bad, and our establishments are not sufficient to attend properly to them. The great want in regard to roads is the means of keeping them in the constant repair which they of necessity require. The loss now sustained by delay in repairing roads is very great." There is a canal from the lower Coleroon anicut to Porto Novo, which was designed to be used for navigation as well as irrigation; but we have already remarked (para. 250), that it is in such a state of disrepair as to be very little used for the former purpose."

357. The reports from the highly favoured district of Tanjore contrast in a most striking way with those from other parts of the Peninsula. The First Report, written by Sir Henry Montgomery in 1846, speaks of great improvements having been made in the communications of the district in the previous 15 years; but he truly remarks, that though much had been done, the communications were by no means complete. He points out the vital importance of roads, and reminds the Board of a suggestion made some years before, to lay down a railroad from Negapatam to the westward through Tanjore and Trichinopoly; observing, that "there appears no portion of the Madras Presidency which offers better success for a railroad than this line."

The roads of Tanjore comparatively very good.

Mr. Bishop writes in 1847, and reports still further improvements; one "splendid bridge has been erected over the Cauvery, by his Highness the Rajah (of Tanjore), at a cost of Rs. 18,500," thus completing the bridging between Trivady and Tanjore; and several lines of road are mentioned as completed or in progress. In 1848, Mr. Bird, the Acting Collector, writes, "considerable improvement has been effected throughout the province during the past year, in the formation of roads, and the bridging of streams."

In May 1850, Mr. Bishop begins his report in these words, "Rs. 40,000 have been expended on various works for the improvement of internal communications, since the dispatch of the report for 1847-48; and the main line throughout the district in general is in a very fair state." In the next report, written in September of the same year, the same gentleman writes, "since the date of the last report, Rs. 30,000 and odd have been expended on the means of transit in Tanjore, and every endeavour is made to preserve the existing roads in good repair, as well as encourage the laying out of new lines connecting villages."

The necessity of an allowance for repairs.

358. Mr. Bishop presses on the Board the necessity for a sum being placed at his disposal for repairing roads; the increasing traffic, as he had explained in a former report, causing a considerable loss by wear and tear. "In Tanjore, the difficulty of preserving the roads in repair must be experienced in order to be appreciated; at least three-fourths are raised roads in the midst of paddy land, and gravel is not obtainable except at such an expense as to render its use impossible; under these circumstances constant repairs are required, a single heavy rain cutting deep channels in the sides of the bunds (as the roads may be appropriately called in many places), which require immediate attention to prevent double outlay in repairs at all delayed; for such repairs, and for having a fund at my disposal for other emergent road purposes, I had the honour of soliciting the sanction of the Government, and regret that my proposal met with no encouragement from the Board, as the quantity of gratuitous labour demanded from the Meerasdars is already heavy, and that for the repair of roads may come at a time most inconvenient for them to spare the services of their labourers."

Further improvement still required.

He closes his report in these words, "although the internal communications of Tanjore have been vastly improved of late years, and in general are in good preservation, there is still room for much improvement;" and he adds, "the outlay rapidly brings an equivalent return, by the facility afforded to the transport of grain which must be exported for consumption, the produce of the district exceeding by one-half the home demand."

In 1851, Mr. Goodwyn, the Acting Collector, reports an expenditure of Rs. 12,251 on the roads.

The Civil Engineer says, the "district roads in Tanjore are kept in repair by the Meerasdars, but more is required than they can perform."

Reasons of the difference between the roads of this and other districts.

359. When these extracts are read, and it is remembered that the area of this district is so much smaller than that of many of the Collectories which are without communications of any kind, that it is less than a third of the extent of either Bellary or Cuddapah, the total absence of roads in which we have described, it may be supposed that a better system has been pursued there than elsewhere; but such has not been the case, and great as the improvement of the communications has been, to this day it cannot be said that the roads of the Collectory are under any fixed system of management whatever. In spite of the absence of good road material in an alluvial tract, and the multiplicity of irrigation channels to be bridged, Tanjore is still, from its even surface, and the absence of jungle and mountain, as well as from its denser population, a much easier country to make roads in than most other parts of this Presidency; but still, the fact that the district was well provided with main lines of communication even before 1846, is mainly attributable to two circumstances; first, the existence of very large temple endowments, far beyond the necessary expenses; and second, to the great fertility of the province, and the consequent prosperity of its inhabitants. It is true that Tanjore has had a succession of very able Collectors, men who knew well the value of good roads, and never failed in their exertions to obtain the means of making them; but we have seen that in other districts, Collectors, however able, and however anxious for the improvement of the roads, have failed to obtain the means of doing anything effectual in that direction.

The large surplus Pagoda funds.

360. Tanjore contains several very large and celebrated temples, richly endowed by the former Hindoo sovereigns of the province. The affairs of those institutions being economically administered by the Revenue Officers of the British Government, a surplus accrued annually, and was placed to the credit of the pagodas concerned, as noticed above in para. 326. These accumulations formed a fund, upon which an improving Collector looked with much satisfaction. Primarily indeed it was available for the repair or improvement of the temple buildings; but it was far more than sufficient for that, and whenever a bridge was to be built, or a line of road to be formed, the Government sanctioned disbursements from this source with a liberality which might laudably have been extended to its grants from its own funds. Most of the principal rivers in Tanjore, and very many of the smaller streams, were bridged by this means, and some important lines of road constructed. Again, the light assessment on the land, and the abundance of water for irrigation, have not only ensured a flourishing revenue, but have added, year by year, to the wealth and resources of the inhabitants; thus they have had the means of aiding in the formation and maintenance of the roads; and as their prosperity brought with it a degree of intelligence not to be found generally in other districts, they

they readily saw how much their well-being depended on good roads to convey their staple produce, rice, to a market, and have been willing to do not a little to keep in repair the roads formed by means of the Pagoda Funds, and even to make roads themselves. They appear indeed to take a pride in the fine roads and bridges of their country; and we find his Highness the Rajah of Tanjore signaling his liberality, and contributing his share to the general improvement, by giving, from his own purse, the amount necessary for building several handsome bridges.

Another pleasing result of the general wealth of the people, has been the great body of skilful builders and labourers of all classes that can be collected at any point where works are to be constructed; this has given strength to the Engineer, who having also a comparatively moderate area to travel over, has been able to concentrate his energies on each undertaking; and as every great work was completed, more well-taught artificers were at his disposal for the better execution of his future designs.

361. In Mr. Onslow's report for 1846, he enumerates 23 roads as those of the Trichinopoly district; of which 13 are said to have been repaired by the State at one time or another, *Rs.* 43,590 having been spent upon them in the previous 18 years. Little information is given as to their actual state; but from the subsequent reports of 1847, 1848, 1849 and 1850, it appears that they are in general in very bad order. The only one said to be in thorough repair in 1850, was that from Trichinopoly to the frontiers of the Coimbatore district at Caroor, though some useful efforts have been made each year to improve portions of others.

The roads of Trichinopoly.

Captain Lawford, the Civil Engineer, writes as follows: "In Trichinopoly the road to Tanjore has been lately constructed, that to Caroor improved, also one to Laulgoody and towards Arrialore, but the others are very indifferent." As a report upon the roads of a whole district nothing could well be more unsatisfactory, or show more clearly that the roads in general are in a neglected state.

362. Mr. Lockhart reports on the Salem Roads in 1847. He says, "there are five main, and 15 branch roads; one of the latter has lately been formed, and nearly completed;" he adds, that a 16th road is in progress. He explains, that the roads are principally kept in repair by the Bandy Tax Fund; the work being supervised and reported on by the Civil Engineers' Department. He says, "as a proof of the trade being augmented from the improvement in the roads, I have to adduce, that when the tax on carts was introduced in the district in 1836, the number of carts was 1,189; and the number at present kept by all classes of people, is 3,296; exhibiting an increase of 2,107, and moreover bandy hire has been reduced from 14 annas to 8 annas for every 10 miles, and 40 maunds (1,000 lbs.) is now the usual cart-load, whereas before the roads were put into their present state, they carried no more than 12 maunds (300 lbs.) each." Mr. Lockhart states, that the removal of the transit duties has led to a considerable increase in the import of European goods; but that the grain produced in the district is not more than sufficient for the consumption, there being no object in cultivating more, since the want of roads in the districts between Salem and the coast would prevent its carriage to a market.

The roads of Salem.

In 1848, 80 more carts had been registered in the district, the roads were said to be kept in repair, some more bridges and drains had been built, and others were in progress.

363. In 1850 Mr. F. N. Maltby gives a statement of the made roads in the Salem district, they measured altogether 400 miles, and three other lines were opening, two of which would be paid for by the Bandy Tax Fund, and the other from the grant for Trunk Roads. He says, "of the general state of the district roads I can speak most favourably. The most important are those from the frontier of Mysore to that of Trichinopoly, and from Salem to Ahloor. There are portions in which repairs are required, especially between Salem and Trichinopoly; but generally speaking they are in good order, and offer no impediment of a serious nature to the country traffic; the avenues are very flourishing, and in this neighbourhood the roads are in excellent repair.

Mr. Maltby's Report.

"I would here beg to observe that, from the inland position of Salem, the commercial prosperity of the district is dependent almost as much upon the state of the roads of the neighbouring districts, as on its own. Two of the most important outlets for its produce, are by Ahloor through the Cuddalore district, and by Valiapetty to Trichinopoly and Tanjore; but those roads which are in

excellent order up to the frontier or nearly to the frontier of this district, may be said almost to cease in those of Cuddalore and Trichinopoly." Mr. Maltby approves of the local tax, but objects to its being considered sufficient for the wants of the district, and being made a reason for withholding such grants from the general revenues of the country as are allowed to other Collectorates, the inhabitants of which pay nothing for the maintenance of their own roads.

In this very favourable account of the Salem roads, Mr. Maltby must be considered as drawing a comparison between them and the cross roads of other districts; for if we compare them even with the much abused road from Madras to Waniambaudy we find them very inferior even to that. On the Salem roads it is Mr. Lockhart's boast that a cart can carry 40 maunds, being 1,000 lbs. weight; whereas on the Western road the common load now is 1,600 lbs., and if it were in really good order the same cattle would draw 200 lbs. more, and fully half as far again as they could take the lighter load on the unmetalled roads of Salem.

The roads of Coimbatore.

364. Mr. Wroughton's report upon the roads of Coimbatore in the year 1846 is accompanied by a statement showing that, in the last 10 years, the sum spent on repairs has only amounted throughout the district to Rs. 2. 11. 9. per mile of the roads called made. What had been spent during that period on the formation of new lines and on bridges is not stated. Of the condition of the roads in general he says, "the roads of this district are not in good condition; and probably not worse than the general run of roads in India, or so bad as to seriously obstruct the passage of wheeled conveyances, except in a very few places; the only exception to this is the one proceeding to the Neilgherries from Coimbatore." Mr. Wroughton goes on to say that the Madras road to Coimbatore is very bad; that the Trichinopoly road is in the same state: that the one from Coimbatore to Sattimungalum is in need of urgent repairs, as is also the one from Coimbatore to Polachy, while the road from Bowany to Chickagazanoor "is in many places impracticable for carts." We cannot gather satisfactorily from this report, what the state of the roads actually was; but the lines specially mentioned as bad or impracticable, are amongst the most important in the district. The real condition of the country, as to its means of communication, may perhaps be better understood from the report of the Sub-collector, Mr. C. J. Bird, who says, that in spite of the neglect of the roads, carts in general proceed, "without much difficulty;" adding in another paragraph, that "by far the greater number of villages are approached by narrow lanes, between thorn hedges, many of which are so narrow that even a loaded bullock cannot pass along without brushing his pack against the thorns on both sides." On this account he considers that much of the utility of the broader road is lost, as the cultivators must keep pack oxen for the greater part of their carriage, and cannot afford bandies also for the limited space they can be used upon. In his concluding paragraph, Mr. Bird remarks on the evil effect of this want of roads practicable for carts, as seen in a late season of scarcity, when the cost of carriage greatly enhanced the already high price of grain. In 1848, neither Mr. Wroughton's nor Mr. Bird's report shows any material change in the state of the roads.

Mr. Thomas's Report.

365. Mr. Edward Thomas reports in 1849 that there has been an expenditure on the 510 miles of main road in the low country, amounting on the average of the whole to Rs. 10. 6. 2. per mile; and on the Neilgherry roads and passes, the outlay has been Rs. 70 per mile. A most valuable improvement is mentioned this year, the formation of a new road from Coimbatore, to join the important line opened several years previously through the district of Malabar to the port of Ponnany; a statement of the trade of the district accompanies this report from Coimbatore, as had been the custom previously; but Mr. Thomas observes, that the returns "must have been drawn up (by the Thasildars) on insufficient and inaccurate data, and are not much to be depended on;" which being the case, we do not think it advisable to quote from them.

In 1851, Mr. Thomas commences his report with a satisfactory account of the completion of the Walliaur line, referred to in the report for 1849, at a cost of Rs. 27,894; short as it was, only 16 miles in length, this was a most important improvement to the district, completing a good road for wheel carriages from Coimbatore to the Western Coast; a work which had been a desideratum from the time this fine province came under British rule, more than half a century ago.

Another

Another great improvement throughout the district, is also mentioned in this report: the repair of a great extent of the minor roads, by means of sums which had accumulated in the Treasury, the surplus income of the temples and endowed Choultries; this is a most valuable boon, and is being turned to the best account. Mr. Thomas brings to notice a bandy tax existing in Coimbatore, of which no mention is made in the reports of his predecessors. The amount of the tax, it appears, has been absorbed in the general collections, while a similar impost has been the means of much good in the neighbouring district of Salem, as a fund for repairing the roads.

366. The reports from Canara are more satisfactory than from any other district; for though there are still but few branch roads, no good means of communication parallel to the coast, and almost no cross lines practicable for carts, the district has some very fine passes leading from the interior of the Peninsula to its sea-port towns, which are the real trunk lines of trade, and such as should in all cases be the first opened. The roads of Canara.

Mr. Blane, in his first report, writes as follows: "The Board is aware that much attention has been paid within the last few years to the roads in Canara, and large sums have been sanctioned for opening the communications with the interior. The amount of estimates sanctioned and now under execution, is Rs. 1,74,540, but the greater part of these works are as yet unfinished, and the benefit which will result to the trade will not be fully developed until their completion." He gives an account of a line of road (the Sumpajee Ghaut) practicable for carts throughout its entire length; another pass (the Agoombie Ghaut), he says, had been completed about seven years, but was still little used by carts, in consequence of the roads leading from its foot to the coast not being opened; and two others, the Colour and Devamunny, were then under execution. These were all cart roads; and in addition to them, he mentions the Neelcoond Ghaut, which, although only practicable for cattle, had a greater traffic on it than any other, but was likely to be superseded by the Devamunny when that was completed, such being the object of the new pass. In conclusion, Mr. Blane points out a number of other roads urgently required, stating that "there is no want of places where they" may be undertaken with the greatest benefit to the internal trade and to the country generally. In the same gentleman's report for 1849, further progress is shown, but still the Sumpajee line is said to be the only one by which there is a perfect communication with the interior by means of carts. Several other important works are, however, stated to be "approaching their completion."

367. The third report from Canara is from Mr. F. N. Maltby, who, having been Sub-collector in the district before the passes were opened, was able, on rejoining it nine years after as Collector, to judge fairly of the effect of the work carried on during the interval. This report is so satisfactory and brings to view so clearly the beneficial results of improved roads, and even the direct profit to Government from them, that we have thought it advisable to give the whole of that part of it which details results, and it will be found in Appendix (J.) Mr. Maltby's Reports.

For the same reason we have given (Appendix K.) Mr. Maltby's answer to us regarding the roads of Canara; which is still more clear as to the profits to Government by the improved roads, both in land revenue and that from the salt monopoly.

In 1838, as Mr. Blane notices in one of his reports, there was not a single cart in all Canara, the roads not admitting of the use of wheels; now we find carts largely employed on six mountain passes, and some very important branches from the main lines also in a fit state for cart traffic; indeed so great a change has been effected in the country, that Mr. Maltby was able to make his circuit through a great portion of the district in his carriage, ascending to the plain of the Mysore country, and even crossing from one trunk line to another without difficulty. The good that has been effected by these roads is shown in the papers above alluded to; and the whole sum that has been laid out in the 13 years, 1838 to 1850, in bringing about this great improvement, has been Rs. 5,25,000, of which, no less than Rs. 2,76,468 was spent on the single Sumpajee Ghaut, under great disadvantages from frequent change of management.

368. It must not, however, be supposed that Canara has its communications complete; when its mountain-passes were examined between 1842 and 1846, there were found to be 25 used by laden cattle, though only passable by such as were accustomed The communications are still far from complete.

accustomed to the work. It cannot be supposed that the six new passes will be sufficient substitute for these. Doubtless, much of the traffic which formerly took a direct line by those rugged paths, will now reach its destination more cheaply by a circuitous route on bandies; but that circuit is a loss which may be overcome by opening other passes, and that at no great cost. Nor are the wants of the district confined to the passes only; branch lines are required all over the low country, converging westward to the shipping ports, and eastward to the passes. There is still a great portion of the coast line without a road; the drainage of the country crossing it has none of it been bridged; and the ferries are not so good as they are in Malabar. There are in several parts of the district, both in the northern and southern Talooks, great facilities for inland navigation, by the artificial junction of the back-waters, which now only obstruct the traffic of the country, whereas they might be made very greatly to assist it; these lines would extend chiefly in a direction parallel to the coast, but each river or back-water has some length navigable for boats, in the direction of the hills. A first step has been taken to facilitate transit in the Canara district; and that having been so eminently successful, there is the greatest encouragement to continue the work.

Mr. Maltby makes one proposal as a suggestion, which he might claim as a right: he asks to have the disposal of the surplus ferry funds for the improvement of the roads. The Honourable Court's Despatch of 3d September 1817, already adverted to, expressly devoted those funds to this object, but the order has never been acted on; the ferry funds have never been so employed, but have been uniformly merged in the general revenue; we shall recur to this subject presently.

The roads of Malabar.

369. Mr. Conolly, in 1848, mentions two carriage roads in Malabar, one from the borders of Coimbatore to the coast at Ponnany, and one by the Peria Pass, from the Mysore frontier to Cannanore and Tellicherry; he names also four other mountain passes practicable for cattle, and leading directly into the interior. "There is also a coast road generally available, though in parts very difficult for carts, from one extremity of the district to the other." "Besides this, there are a vast number of secondary roads intersecting the district in various directions;" very few, if any, of these are, however, practicable for carts. Of the other roads, he says in another place, "I have little to say of the coast or other minor roads; part of them have been improved from time to time, but nothing has been effected on a grand and general scale, such as evidently was the intention when the Board called for the detailed information adverted to above."

In his report for 1851, Mr. Conolly mentions the new Perumbaddy Pass (alluded to in our Report upon the Trunk Roads), as "not quite completed, but in good working order throughout." The other trunk road, from the borders of Coimbatore to Ponnany, is, he states, "working admirably." Of the cattle passes he reports that they are maintained with the annual allowances sanctioned for them respectively.

Water communications in Malabar.

370. Mr. Conolly does not notice the improvements made in the means of transit, by cutting canals to connect some of the extensive back-waters of the district; but it is proper to mention them here. The cuts were three in number, to the aggregate length of 21 miles, and at a total cost of Rs. 29,904. Though their own length is so little, yet, with the intervening back-waters, they form a connected navigation 90 miles in length. These works were sanctioned during Lord Tweeddale's Government, and besides greatly promoting trade and intercourse in general, they are of great importance to the district in facilitating the transport of grain from the southern Talooks to those in the north, the staple of which latter is pepper. The canals are very narrow, and sufficient only for the very small boats in use; but it will, no doubt, be most advisable to improve them eventually for steam navigation. It was a part of the original design to unite in one continued navigation the back-waters of Malabar, Cochin and Travancore, from Baragherry to Quilon, a distance of above 200 miles; and the project for this purpose was sent in by the Board of Revenue for the approval of the present Government. It consisted of the cutting of a canal, and the improvement of a back-water, for a distance of 15 miles, involving an expense of Rs. 8,995 (900*l.*), but the Right Honourable the Governor in Council saw "no sufficient reason for incurring the expense." He was also "of opinion that the time and attention of the Civil Engineer should not be called off from more important works by projects of this character;" but it would be difficult to find a project holding out more important results than this, and at such an utterly inconsiderable cost of either time or money.

371. But.

371. But though Malabar has now two good carriage-roads through it, leading into the interior of the country, and some good miles of metalled road near the coast, with very efficient ferries throughout the district; and though it has what few other districts have, fixed annual allowances for the maintenance of its mountain passes; and though it has nearly a hundred miles of inland navigation; yet, in one respect, it has been worse used than any district of the Peninsula in regard to its internal communication, because the surplus income from ferries, accorded by the Honourable Court for the promotion of local improvements, but withheld by the Government, is larger in this district than in any other: we shall advert to this subject presently. We will here conclude our remarks on the roads of Malabar, by observing that the present state of that district brings before us in a painful way the consequences of omitting to use this or other means to open the interior of the country; and were the Government under the necessity of sending troops through the district to overawe the Moplah population, they would find that the want of roads added a hundred-fold to the difficulties and losses. From its steep wooded knolls and deep swamps, Malabar is naturally one of the most difficult countries in the world to march an army through; and as each considerable house is surrounded by a wall, and each garden by a ditch of great depth, it is hardly possible to imagine a country where troops would move to greater disadvantage. As it now stands, it is almost every where inaccessible to artillery, from want of roads of sufficient breadth for the axle of a gun-carriage; cavalry could not be employed; and infantry would in many parts be obliged to advance in single file, commanded on all sides by jungle-covered eminences. But a still more important consideration is, that if the country had thus been opened by good roads, the likelihood of any military operations would have been very much diminished; for the same national energy of character which now impels the Moplah cultivator of the secluded village to martyrdom, would then have been turned into the peaceful and beneficial channel of active enterprise in trade, as we find so eminently the case with their brethren on the coast; and the ignorant and mad enthusiasts of the Ernaud Talook would be found displaying the same care for security of life and property as the thriving inhabitants of the coast towns.

The surplus ferry funds in Malabar.

372. Mr. Blackburne, who, like Mr. Orr in Salem, gave his constant attention to the roads of his district, writes a detailed account of the roads in Madura in 1846; but full as the statement is, we cannot gather from it what was the actual condition of the lines he writes of. Some are said to be "excellent," some "good," some to contain all the grades "from bad to good," and some "to be sufficiently passable, &c." We believe, however, that all the roads he speaks of are practicable for wheel carriages. Mr. Blackburne reckoned altogether 1,472 miles of what he termed principal roads as existing in 1840; between which time and 1846 he brought to completion, without any expense to Government, another line measuring 65 miles. Upon the whole, it is evident that the roads of Madura were in better order than in most districts, and that the Ryots gave assistance both in making and repairing them, when called upon to do so. The amount of unpaid labour employed, is not stated; but Mr. Blackburne, speaking of No. 4 Road, says, "I fear a small annual outlay may be necessary to meet the wear and tear which cannot, on such a road as this, be sufficiently met by the forced labour of the agriculturist." As there is no annual allowance for the maintenance of the 1,500 miles of road, it is evident that the work done by the villagers must be very great, if the roads were really kept in repair, which they are not.

The roads of Madura.

Mr. Parker's reports, for 1847 to 1851, on the roads of Madura, are all in tabular form, giving the improving or declining condition of each line, with the expenditure for the year. From these reports it appears that the 23 roads named in Mr. Blackburne's list are in fair order; and the Civil Engineer's account of them is as follows: "The roads in Madura district are in very tolerable order; a good deal of attention having been bestowed on them by the late Principal Collector (Mr. Blackburne), and considerable sums sanctioned from time to time for their repair." It must not be supposed, however, that the roads of this district are in a condition to bear any but a light traffic, or that they can be used without impediment all the year round; they are neither metalled, nor by any means fully bridged. The sum spent upon them in the six years, 1845 to 1850, was Rs. 56,374, being at the rate of Rs. 6½ a mile per annum. This, however, includes the cost of improvements, and bridges built; and in point of fact, so far as the roads are kept in repair, it is chiefly by the unpaid labour ("forced labour" as Mr. Blackburne calls it) of the Ryots.

The roads of Tinnevelly.

373. Mr. Parker, the Acting Collector, reports upon the roads of this district, in 1846; he says: "In the Tinnevelly district there are two main, six smaller, and six branch roads." One of the main lines, which is a part of the road from Madras to Quilon, he reports as undergoing repair in certain parts, in others to be still impassable by carts after rain, "and in consequence of the state it is in the tappal arrives at Palamcottah frequently two days after the regular time." And this although the tappal (post) is carried by men on foot, which mode of conveyance is of course less affected by the state of the roads than any other. Of the other main line, that from Madura to Quilon *via* Ten-causey, he reports 24 miles as requiring to be made, 7 miles to have been made in former years, 44½ miles to be in a bad state, and the remaining 63 miles as requiring "no very urgent repairs." This road, he explains, besides "connecting several Zemindaries or large villages, leads to the passes into Travancore, and is the route of a considerable portion of the trade with that country, which in piece-goods and betel-nuts is considerable." The descriptions given of the six smaller roads show that two of them have been repaired, and are in fair or good condition; and that carts can be employed upon the others, when the country is dry, but that there are parts of each impassable after rain. The six branch roads spoken of, are very short and incomplete; one of them is one mile in length, another 10, and so on. Mr. Parker concludes with an earnest recommendation that a yearly sum may be allowed to keep the made roads in good repair. This is the measure which has been fully approved and enjoined by the Honourable Court; but it is still a desideratum in Tinnevelly and everywhere else, with few exceptions.

Subsequent Reports.

374. In 1847 Mr. Elton, Acting Collector, reports some small repairs in progress; one estimate sanctioned so far back as July 1842, was only just acted upon, although its amount was but Rs. 3,313; in another case an estimate of Rs. 3,770. 8. had been sanctioned in March 1844, and the work was still in progress in 1847. In striking contrast to the road-making operations of Government in the district, Mr. Elton mentions two bridges, costing together Rs. 90,000, built at the charge of two native gentlemen. The annual report for 1848 is by the Collector, Mr. Edward Thomas, who speaks of some very slight repairs in progress, and recommends greater improvements. In 1849 some more extensive repairs are noted, as in progress on the first of the two main roads above specified, but there does not appear to have been any idea of bridging and completing the line throughout: of the second road, it is said to be "in the same bad state as reported in previous years." No account is given of minor roads, as no change has taken place in them beyond such as might be expected from wear and tear. In 1850 the amount stated to be expended on the repair of roads is about Rs. 19,000, which has been laid out on four of the 12 lines enumerated in all previous reports as the roads of Tinnevelly. Mr. Bird mentions, as a step in advance, that 25 roads have been "selected and numbered" by the Civil Engineer.

The maintenance of the roads by the Ryots.

375. In 1851 the only expenditures from the Government Treasury mentioned by Mr. Bird are one or two items, amounting together to about Rs. 8,500. With regard to the repair of the cross roads Mr. Bird says, "with reference to the concluding part of para. 8 of the Minutes of Consultation, dated 11th February last, I have the honour to state that the Ryots have shown no disposition to maintain the branch roads in repair; and, indeed, unless they are first put into good order at the public expense, it is not within the means of the inhabitants along the several lines to place them in anything like an efficient condition." It must not be inferred from this passage, that the inhabitants of Tinnevelly are backward in giving aid for the improvement of the communications. We have seen that individuals have spent very large sums on bridges; and a further letter from Mr. Bird, shows that, generally, they are willing to come forward in a liberal way. He says, "My letter of the 27th August 1851, will have informed the Board that a number of wealthy individuals have united to raise funds for erecting a bridge, estimated to cost Rs. 10,708. 4. over the Chittaur, on Road No. 2; and I am happy to add that a small bridge is now in course of erection on the same road, over a channel at Ramiamputty, near to Tinnevelly, on an estimate, including some earth-work in its neighbourhood, of Rs. 535. 2., being part of a sum of money in dispute between two parties, who agreed to have it applied to the above purpose. Subscriptions are also being offered to build a smaller bridge at a cost of about Rs. 2,000, on the new line between Ten-causey and Shencottah." But as Mr. Bird truly says, the Ryots cannot and will not make the roads; that must be done by Government.

The

The utmost that can be expected of the Ryots is to perform ordinary repairs, and even that not to the main roads, but only to the district or local roads.

376. In 1846 a lac of rupees had been set apart from the surplus pagoda funds, as we have already mentioned, for the purpose of constructing a road to connect the cotton district of Tinnevely with the shipping port of Tuticorin. The estimate amounting to Rs. 1,00,463 was sanctioned on the 16th April 1850; but in his report for 1851, the Collector states that no more than Rs. 9,030 had been expended. Four years were consumed in deliberating on this project, and the labours of the fifth year have effected the execution of less than one-eleventh part of it: at this tardy rate of progress it will take at least 10 years more to complete the work.

The road from the cotton district to the port.

The Civil Engineer reports upon the roads of Tinnevely at the present time as follows: "They are, with one or two exceptions, but little more than bandy tracks; the high road from Madura to Palamcottah and Travancore, where it has been made on proper principles, is in very good order, and there will soon be a first-rate trunk road from the cotton districts to the port of Tuticorin. I have neither the time nor the subordinate agency for giving the district roads their proper share of attention."

The Civil Engineer's opinion.

377. Such is the purport of the Collectors' reports; and from it we collect the following general sketch of the present condition of the roads of the country. In 1846 there were 3,110 miles of road called made road; but a large part even of this small extent was unbridged and totally unmade, consisting of tracks over a firm soil, not considered to need making for the light traffic then using them. The extent of made road constructed since that time has been very small indeed; in fact, scarcely any additions have been made except the southern road, some passes or roads in Canara, a few miles of the cotton road in Tinnevely, the road from Arcot to Palmanair now in course of formation, and a few short pieces of road in other parts of the country, the whole probably not exceeding 400 miles. And the term "made" must be understood in a very low sense: at this time there is probably not a single mile of road throughout the territories under this Presidency equal to an ordinary English turnpike road, and certainly not above 1,000 miles over the whole extent of the country, on which it is possible to travel in a wheel conveyance at the rate of six miles an hour with any degree of comfort.

General view of the condition of the roads.

378. Many of the most important lines of communication have been entirely neglected. Beyond doubt the lines on which there would naturally be the greatest traffic are from the interior of the country to the coast; because, as the products of the several inland districts bear a general resemblance, there is little occasion for interchange between them; whereas, the products of the coast are every where different from those of the interior, and the coast is the place where home and foreign commodities naturally meet. Yet, for a distance of 650 miles along the coast, from the Cuttack frontier to Madras, there are only two lines running inland; viz. the road from Masulipatam to Hyderabad, which is in such a state as "not to be used without difficulty even in the dryest weather;" and that from Nellore to Cuddapah, which appears to be still worse. So much indeed has the value of roads in that direction been overlooked, that but few of the Collectors of the northern districts from Ganjam to Nellore notice the subject, and all give the most prominent place in their reports to the northern road, a line of very little commercial importance; and this apparently only because it is known as a road; while the others can hardly be called so at all.

Many of the most important commercial lines have been utterly neglected.

379. And the condition of many of those which are considered as the great military lines is even more disgraceful in one point of view, because the necessity of these at least has been recognized. The northern road is one of these, and so are also the road from Masulipatam to Hyderabad, and from Madras to Cuddapah. The condition of the first is described in the Collectors' reports; in one part, it is hardly distinguishable from the rice fields through which it passes; in another it traverses cotton ground, and is hardly passable in wet weather; in a third, a gentleman was four hours going seven miles upon it on horseback; and in a fourth, it passes through a swamp four miles broad, and is impassable even for laden bullocks for several months in the year. The Masulipatam and Hyderabad road is of

And many of the great military lines are little better.

still more importance. Masulipatam and other places higher up the coast may be reached by sea, and the difficulties of the land march may thus be avoided; but the road in question is the only means of reaching the large military posts of Hyderabad and Nagpore. Yet what is the condition of that road? it is described in two lines by the Collector of Masulipatam: "it may with truth be said to be in many parts impassable in the rains, and not to be traversed without difficulty and danger in dry weather." This is a great inconvenience even in time of peace, making the relief of troops at the important stations just mentioned, and the conveyance of military stores to them, difficult and expensive: in case of warlike operations these evils would be much magnified. As to the third road, that from Madras to Cuddapah by the Nuggery Pass, its badness has become proverbial even among Madras roads; it is described in the reports above given as "the very worst in the Madras Presidency;" and, again, its condition is stated to be "felt to be a very great evil by the native community using it or living near it." It passes through a difficult country, hilly and rocky in some parts, low and swampy in others; and there is probably not a bridge or an embankment, and hardly a culvert throughout its whole length of 160 miles. The very urgency of its need of repair has prevented its obtaining any; for the estimates repeatedly prepared with that view were of necessity large in amount, and sanction was refused in consequence. Of the other military lines the chief are the Western Trunk Road to Bangalore, which is in very good order by comparison, and the Southern Trunk Road to Trichinopoly, which is now in course of formation; the Road Department is so weak, however, that about 150 miles of this latter road have occupied six years to make.

The roads of the country generally.

380. As to the roads of the country generally, the district or cross roads, those by which produce must find a market, it can hardly be said that any exist; with the qualified and partial exception of the three districts of Salem, Tanjore and Madura, of which the chief lines of their own internal communication are in comparatively good order, and that of Canara, which is provided with several good lines passing through it from the sea to the Mysore country above the Ghauts.

With these exceptions, it cannot be said that there are any roads by which produce can be brought to a market from points off the line of the very few main or trunk roads above spoken of as being comparatively good. For the most part the tracks by which carts travel have never been in any sense or degree made or improved, but are such as the carts have been able to strike out for themselves, winding their way as best they can through the natural obstacles of the country, which are in some parts greater, in others less; in some parts rocks and hills, in others swamps and muddy streams, in others rice flats and irrigation channels. Through or round or over these various difficulties the carts find their way as well as they can, changing their line from time to time at particular points, as the old track there becomes impracticable, and gradually deviating more and more from a straight line. On such roads the carts can only carry one-third of the load that they could on a good road, and travel one-half the distance in a day, and there are many days in the year when they cannot travel at all; and all perishable goods, sugar, cotton, and even grain, are much exposed to damage.

The roads of Bellary.

381. The district of Bellary is nearly double the extent of the whole of Wales, and a great part of the country is of "cotton soil," as it is called, a black loam, peculiarly ill suited to travelling, as it opens into wide cracks in dry weather, and is excessively miry in wet; yet in that extensive province there is only nine miles of made road, and not one arched bridge out of the station of Bellary, the not arched bridges being drains or culverts over the smaller irrigation channels, roofed with slabs of stone, and seldom exceeding a yard and a half in breadth. A reference to Appendix (W.) will show that the amount annually expended by Government on the roads of this valuable province, during the last 25 years, was Rs. 2,180, being at the rate of less than one-tenth per cent. of the revenue drawn from the district: during the last 10 years of the period the expenditure has slightly increased, being on the average Rs. 3,461 a year, or about one-seventh per cent. on the revenue. The Cuddapah district is of similar size, or more than a fourth of the extent of England, and with a population of a million and a half of persons; and here, too, a large part of the surface is cotton soil, and another large part rugged and mountainous. In this district the whole extent of made road is 22 miles, and it is very little better off for bridges than Bellary. Such is the condition of these two fine provinces; in their whole extent of 26,000 square miles, being more than

The roads of Cuddapah.

half

half the size of England,* they possess only 31 miles of made road, the whole remainder of the roads being in the state described in the last paragraph, and in large portions of the tract wheeled conveyances are unknown:

382. Such is the state of the communications in the extensive countries forming this Presidency; a condition necessarily fatal to any attempt at improvement in wealth. We have not exaggerated the case; we take Bellary and Cuddapah as examples of the state of the country generally, on account of the large size of those districts; and we believe that with the exception of the few districts already named as better off for roads, their condition as to internal communications aptly represents that of the country at large; and whether we look at the tone and sentiment of the Collectors' reports, or at the views of Government as expressed in their orders upon them, we see no prospect of any material improvement. We fully admit, that compared with the work done in any similar period previously, much has been accomplished within the last 10 years. But it seems considerable in that contrast only; compared with the requirements of the case, the only just comparison, all that has been done hitherto is quite insignificant, so that at the present rate of proceeding it is absolutely impossible to calculate when the country will have anything deserving the name of a system of internal communications.

The tone of the Collectors' reports is not satisfactory;

Among the Collectors we find one here and there who evidently understands the full value of roads, and is urgent that something decisive should be done to improve those of his district; but in general there is a want of a full apprehension of the importance of the subject; some officers speak of some few lines as though those constituted the whole roads of their districts respectively which need attention; one gentleman describes "his roads as not worse than the general run of roads in India;" another admits that all his roads are in a ruinous state, but every year he is unprepared to suggest improvement; a third states that the roads of his district, 3,000 square miles in extent, are kept in good repair at an outlay of 40 l. a year. In general there is no attempt to take up the subject as a whole, or to exhibit the actual state of the roads as they are, prominent mention being only made of some one or two lines, of the sums that have been expended, and of the small improvement thereby effected. We find no comparison attempted between the roads here and in other countries, nor are any statistics given, except in a very few instances, of the traffic on different lines, or any data by which to judge of the rise or decline of trade, as roads are improved or neglected.

383. And the tone of the orders of Government on these reports is still less satisfactory; still less encourages any hope of decisive improvement hereafter. The object most conspicuously observable in them is to get rid of the papers. No real interest is exhibited in the question; no anxiety is evinced to call forth the zeal of officers, or to promote improvement; no help is offered to those officers who display a strong desire for the improvement of their districts in this respect; no interest is manifested in the pictures which they draw of the want of roads, or any sympathy in the feelings with which they cannot but look on the reality daily before their eyes; and on the other hand there is no word of disapproval, of admonition, or of instruction, for those who have no eyes for these vital wants of their districts, or who, seeing them, are indifferent, and make no effort or suggestion for their removal. In short, these orders afford no evidence of any real sense on the part of the Government, of the entire absence of roads, or of the social backwardness and disability which such a state necessarily implies, or of the intimate connexion between the state of the communications and the revenue, or any real anxiety to promote their improvement. On the contrary, there is a manifest unwillingness to recognise the real wretched state of the communications as detailed by some Collectors—a disposition to make the most of the very small improvements reported, or aid afforded by Government, and an anxiety to throw upon the people themselves the task to which they are utterly unequal, of improving the roads.

And that of the orders of Government upon them is still less encouraging.

As instances to prove the indisposition to improvement on the part of Government, we may advert to the refusal in the case of the roads from Berhampore to Russelcondah (para. 333), and from Samulcottah to Cocanada (para. 336). Both of these were cases in which strong special reasons were present, in addition to the general

* England, exclusive of Wales and Scotland, is stated by M'ulloch to contain 50,357 square miles.

general reasons of policy in all cases, yet they were refused, the latter entirely, the former to such an extent as to make the road useless for one-third of every year.

The Government overrate what they have done for the roads.

384. And Government certainly over-estimate the value of the efforts and the sacrifices which they have made, misled apparently by a too limited view of the sphere of operations. Thus, in speaking of the northern road, they refer to various sums sanctioned in the course of several years, and amounting on the whole to Rs. 56,625 (5,662 l.), for the improvement of the road; but it is apparently forgotten that the whole length of this road is little short of 700 miles, and that though 5,662 l. may seem a large sum looked at by itself, it becomes utterly insignificant when regarded as the whole expenditure in four years on such an extent of road; and this not to keep in repair a road already made, but for the most part to make one where there was none at all before, and not only no road, but a surface much worse for traffic than many parts of the country where there is not even the name of a road. But whatever may be thought of the magnitude of the grants, the simple fact of the actual state of the road as already described (para. 379), is quite sufficient to silence all self-gratulations upon it.

Again, on another occasion, the Government quote seven grants made in the course of two years for a variety of works, amounting in the aggregate to Rs. 29,535 (2,954 l.), as proof that they are prepared to sanction the improvement of the district roads, when fitting occasion is shown. But this too must surely be said in forgetfulness; for if it had been recollected that the subject has to deal with a country nearly three times as large as England, and possessing a population one-fourth larger, a boast would hardly have been made of an outlay on the roads of such a country, which many single parishes in England incur constantly, and not at all as anything extraordinary.

And they overrate the improvement effected.

385. And as they over-estimate the means employed, so also they greatly over-rate the progress made. It is great when compared with those years in which nothing at all was done; but we see nothing in the operations of any single year, or any single district, that gives the faintest hope that the present system can supply the great desideratum of cheap carriage generally. Such comparisons as are often made between improvements in different districts, or between those of different years, are dangerous: they stand in the place of those which ought to be made between the state of the communications in this country and in England, or even in the most favoured parts of the Company's possessions in India. No one talook, as yet, has nearly roads enough for its wants; and the improvements made, though they appear considerable when taken singly, are very partial: they affect only a few districts, and that very partially, while they leave the country, generally, unaware of their existence. Ganjam, Vizagapatam, Rajahmundry, Masulipatam, Guntoor, Bellary and Kurnool, with an area equal to that of England, know nothing of the late improvements; nor do many other districts, except over an extremely limited portion of their extent.

The main roads cannot be made or maintained by the people.

386. A point much dwelt upon in the orders of Government is that the people, *i. e.* the Ryots, should make the roads; and it is declared that if they will do so, the Government will be willing to aid them. It is very desirable, we may even say it is essential to a complete system of communications, that the people should perform their part in forming and maintaining them; but their part in the work is quite distinct from that of the Government, and all that has been attempted yet is very far within the latter. We contend that the Government ought to make and maintain the main roads, not only of the country at large, but of the several districts, *i. e.* those connecting principal towns or points in the same or contiguous districts; and that the duty of the Ryots is confined to the formation and preservation of the village roads connecting the outlying parts of the country with such main lines. More than this they cannot fairly be required to do. In countries where the rental of the land is in private hands, the whole charge of the roads may properly be made local; but in this country almost the whole rent is taken by the Government, thus they have a far greater interest in improving the roads than the Governments of other countries, and they also absorb a very large share of the means of doing it. In other parts of India, this duty or interest on the part of the Government has been recognized, and in the North-West Provinces in particular, enormous sums, such as have never even been dreamed of in this Presidency, are expended on the great lines of communication. This one fact decisively settles the question of right; for if this is done in North India, where the Government demand

on the land is so moderate, much more must it, in common fairness, be done here, where the land-tax is so much more burdensome?

The very fact that the idea is even entertained of devolving the chief part of the task of maintaining the roads upon the people, proves a most inadequate conception of what is required; for no one having a correct idea of the extent of road required, would think of laying the burden of making it on the people; and no one taking an enlarged view of the vast benefit certain to accrue to Government from a good system of roads, could object to that Government bearing its fair share of the expense.

387. The districts of Tanjore, Madura and Salem are pointed to as examples to be imitated by other districts; but if we examine these cases, we find nothing in them to lead us to hope much from the unpaid system. We will briefly investigate the results in each of those districts, and we will first take Tanjore: The improvement or transformation of the roads of that district has been effected, for the most part, within the last 20 years, and it has been less the result of unpaid effort than, perhaps, is thought. During the term stated, the average outlay by Government on the roads of the district has been about Rs. 8,000 yearly; but this is not, by any means, the whole of the extraneous aid; this single district, received no less than Rs. 1,58,519 out of the accumulated Surplus Pagoda Funds, divided after the severance of the Government connexion with the temples; and before that time, the assistance derived from the same source was very large, probably not less, on an average, than Rs. 15,000 a year. All these large sums were spent, for the most part, in building bridges, the earthwork having been, in great part, performed by the Meerasdars, under the constant urging of the Collector. And we may observe that the making of unmetalled roads is a very easy operation in Tanjore, for the country is perfectly level, the soil is a soft and easily worked alluvium; and the process is simply raising a causeway two or three feet in height, and covering it with a layer of sand, always to be found within a convenient distance, in the large irrigation channels: a surface thus formed bears a light traffic very well. And what are the results of this 20 years of exertion, partly indeed by the people, but with very material aid? Tanjore, with an area of 4,000 square miles, has 534 miles of road, such as we have described, not metalled, or capable of bearing a heavy traffic, or such as to enable cattle to work, by any means, to the best advantage, but still immeasurably superior to the common country roads. And it must not be forgotten, in estimating the powers of the voluntary system, that although the Meerasdars have been induced to give assistance towards making this very limited extent of road, they profess themselves unable to maintain it. These roads, though easily made, are also easily injured by rain, and though the labour of the annual repair is trifling compared with that of the formation, the Collector declares that it is too much to be done by voluntary labour, and he is urgent on the Government to grant an allowance for the purpose, and the Government recognize the claim.

The results of such a system:—In Tanjore;

This then is the state of things, after 20 years, a limited extent of road has been made, with no inconsiderable amount of extraneous assistance, but it cannot be kept in repair; and all this, be it remembered, under peculiarly favourable circumstances. The district is small in extent, and the population denser than in any other; the roads are easily made; the assessment is very light, and the people wealthy; food is cheap, and the labourers are all in the service and at the command of a body of comparatively large holders of land.

388. In Madura the improvements commenced about 15 years ago. The contribution by Government to the work has averaged about Rs. 10,300 annually during that period; and the district also received Rs. 20,000 from the accumulated Surplus Pagoda Funds, when they were distributed in 1847. What the annual aid from that source was before, we have not the means of knowing: it was certainly much less than in Tanjore, probably a few thousands annually. A large part of the Madura Collectorate is similar in the character of its surface to Tanjore: in other parts, there is more inequality of surface, but with an improved soil for roads. The result of 15 years' labour in Madura is that the district, which contains 10,700 square miles, possesses nominally 683 miles of made road; but only a small part of this extent has ever been made in reality, and a large proportion of the so-called making consists in merely mending the most impassable parts. A very small extent is even gravelled, and all the gravelled that has been done has been out of the sums granted by the Government.

In Madura;

In Salem.

389. But Salem is the district which is generally regarded as the model district with respect to roads, and which is certainly better off than any other, and it is there that the employment of unpaid labour has been pushed the furthest. Mr. Orr went to the district, as Principal Collector, in 1829: he very shortly commenced his endeavours to improve the roads, and it was he who introduced the existing system, and worked it with much vigour during the eight years that he administered the district. The contribution to the roads, by Government, from 1830 to 1850, has averaged *Rs.* 7,783 yearly, and the produce of the cart-tax also applied to the same object has averaged *Rs.* 1,907 a year since its imposition in 1836. Throughout the whole Madras Presidency, there is no district possessing a soil so favourable for roads as Salem: it is almost everywhere a hard gravel, and in many parts nothing more is required to make a road good enough for light traffic, than to provide for the drainage; and here also, as in both Tanjore and Madura, the rate of the assessment is light. Here, then, the system has had a fair trial: it has been worked with energy, and over a sufficiently long period, to show decided results; and it may truly be said that it has here done all that it is capable of. And what then are the results? why, that this extensive district of above 8,000 square miles, has 400 miles of road suitable to a light traffic, infinitely superior to the common roads of other districts, but very inferior to first-class roads; and the extent of road made is utterly unequal to the wants of the district, and leaves a very large part of it at a great distance from anything like a road.

The real character of the system.

390. And it is important that the real character of the voluntary system, as it is called, should be known. The labour employed on the roads is commonly termed "voluntary labour;" but in reality it is voluntary only in the sense in which convict labour is so, being given under duress or compulsion, and accordingly Mr. Blackburne, the Principal Collector of Madura, justly styled it "forced labour." When the roads in Salem were first made, the work was done throughout all the most thinly inhabited tracts, under the direction of the lowest paid and most unscrupulous class of Government functionaries, the common Talook peons on from six to eight shillings a month, who were vested with very wide powers for the purpose. Men of this class were employed to collect the labourers; to take them, in some cases, two days' journey or more to the road, and prevent them from leaving the place till the work was done. As a matter of course, the power entrusted to these men was abused, and made a means of benefiting themselves; and exemption from work was obtained by such means as were necessary, at the cost of those who were too poor to bribe, too weak to resist, or too dull to escape. In countries like Tanjore, where the population is more dense, the abuses are likely to be less aggravated; but where the demand of gratuitous labour is once sanctioned by the responsible officers of Government, there is no saying how far it may be carried, or what abuses it may engender, unless placed under the most rigid restrictions.

And as the exaction of the labour is oppressive, so its employment is wasteful; the usual Superintendents are the Talook Peons above described, who have no knowledge whatever how the work ought to be done; and thus in useless work and bad material a great part of the labour expended is absolutely thrown away.

The result would be still worse in other districts.

391. Such have been the results of the unpaid system in the three districts of which we have now been speaking, which were certainly (especially Salem) eminently favourable for the trial, and though a large amount of aid has been given by the Government, large compared with what has been granted in most districts. And so little having been effected there, it may well be judged how utterly incapable the system is of producing any considerable results in other districts, such as Bellary and Cuddapah, Coimbatore, North and South Arcot, and the Northern Districts; in all of which instances the population is more scattered, the soil much less adapted to road-making, the surface of the country more rugged, and the pressure of the land assessment heavier. The forced labour system could not be introduced under such circumstances to any material extent, without an exertion of arbitrary power such as we are sure the Government would shrink from; and even if it could be enforced, the example of Salem, and the very meagre results obtained there after 22 years of effort, is sufficient to show how complete would be its failure as respects the important object in view, viz., that of providing a general and efficient system of cheap conveyance.

Conclusion on the question.

We return to the proposition with which we set out. The village communities may properly be charged with the duty of making and maintaining the village roads,

roads, viz. those to connect outlying villages with the main lines; but the latter, that is, the main arteries, both general and local, both of the whole country and of the district, must be made and maintained by the Government: And we feel no doubt that if this latter duty is duly performed, and the people are thus enabled to see the direct benefit to themselves from completing the system, their part also will be readily performed; that the village communities themselves will for the most part co-operate in enforcing the obligation, and that the aid required from the officers of Government will be chiefly to direct and instruct, to which an efficient department will be fully competent.

392. We may here advert to the unfortunate denial by the Government of one valuable means of local improvement, viz. the surplus receipts at the Government ferries. We have already alluded to the order of the Honourable Court conceding the income from this source as a fund for the local improvement of the roads; that order was given so long ago as 1817, and its tenor was as follows: "The tolls which are collected at ferries, and which in some districts are brought to account as an article of revenue, should be set apart as a fund for providing ferry boats; and building bridges over rivers and nullahs; and in the event of the tolls yielding more than what may be sufficient for these accommodations, the surplus may be appropriated to the repair of the public highways in those districts." This has never been done; the Government, for whatever reason, intercepted the bounty of the Court of Directors, and the proceeds of the ferries have been uniformly swept into the Treasury as a part of the general revenue.

The surplus ferry receipts have been withheld by the Government.

We obtained from the Board of Revenue a statement of the ferry collections in each district during the last five years, from which it appears that they are inconsiderable in all the districts except the following, viz. South Arcot, Bellary, Coimbatore, Canara and Malabar. In the first mentioned four they range from Rs. 3,000 to Rs. 6,000 a year; but in Malabar the average collections much exceed Rs. 35,000 a year. We have no account of the cost of maintaining the ferries in any of these districts except Malabar, for which we obtained from the Collector a statement of the receipts, charges and surplus for 20 years. From this document we find that the whole receipts from the ferries during this period amounted to Rs. 7,02,416; and after deducting all charges, including the payment of half the receipts at the Mahè River to the French authorities, the net amount was Rs. 6,84,161, which was carried to the credit of Government as an item of revenue.

393. It may perhaps be urged, that though the Government has not set apart these receipts as a special fund for improvements, yet that it has made commensurate improvement out of the general revenue; but this is not the case as regards Malabar. A reference to Appendix (W.) will show that the whole outlay by Government on roads, bridges and ghauts in that district during the last 20 years was only Rs. 3,11,664, being considerably less than half the amount of the net surplus ferry funds as above specified; and this amount of Government expenditure includes the cost of some roads constructed less for the benefit of Malabar than for other districts beyond, as the road from Ponnany to Coimbatore. Had the ferry funds of the district been fairly expended, according to the liberal intention of the Honourable Court, the rivers would long ago have been bridged, and the toll might either have been abolished, or, for the sake of continuing so valuable a source of improvement, it might have been levied at a lower rate upon the bridges, and the internal communications of the district, now in the wretched condition above described, might have been very greatly improved.

This has been an injury to the districts concerned.

And even as respects the other districts, where the surplus funds are smaller, it is no sufficient excuse to say that the Government expenditures on the roads have on the whole exceeded them in amount. Those funds were granted for local purposes, and might fairly be claimed independently of the Government grants. And the value of such a fund at the disposal of the local authorities, without the tedious intervention of applications to Government, correspondence, explanations and sanctions, would be far greater than its mere amount indicates. Independently of the advantage of effecting an improvement at once, instead of after two years' trouble and delay, such a fund would often be made the means of calling out the liberality of the people. In Bengal and in the North West Provinces, the ferry funds to a very much larger amount than under this Presidency, are thus given up for local improvements, under the direction of local authorities, and we believe with excellent effect. We beg to recommend that now, at last, the same course may be adopted here also; and we suppose that the sanction of the home authorities to

this step having been given long ago, all that is now required is the order of this Government.

The income from the Cochrane Canal also should be given up for local improvements.

394. And the receipts from the Cochrane Canal, though called by a different name, appear to us to be of the same nature as these ferry funds, and proper to be treated in the same way. The net income from that canal amounts to very nearly Rs. 30,000 a year, and very little indeed has been done to improve the navigation.

It seems to us utterly unworthy of a great Government to make such a work a source of revenue; it would surely be wiser, as well as more becoming, to devote the proceeds to the improvement and extension of so valuable a means of transport. Deducting the amount paid by Government for the canal (Rs. 1,44,893), the aggregate of the net receipt since the purchase in 1836, is Rs. 2,22,915. Had this sum been steadily expended on improvements, instead of being absorbed in the Government Treasury, we should now have a canal navigation of 150 miles instead of only 50 miles, and that in a much higher state of efficiency than the present imperfect work.

We may add here, that the Cochrane Canal appeared to us so important as the first attempt made under this Presidency to introduce canal navigation, and with eminent success, that we were led to investigate the past and present condition of the work with some minuteness. The result of these inquiries was embodied in a paper which will be found in Appendix (II.).

The social value of roads exemplified.

395. The very important and certain truth, that improved and cheapened means of transporting produce do conduce in an enormous degree to the advancement of the wealth and prosperity of a people, is so generally admitted, that it would seem superfluous to go about to prove it. But we cannot forbear to quote a few short passages from a well-known and valuable statistical work, tracing the vast transformation effected within a very limited time by a small piece of road, in a wild district in Ireland, a country much more nearly than England resembling India in its connexion with this subject. The former state of the tract is first described as follows, in 1822: "The fertile plains of Limerick, Cork and Kerry are separated from each other by a deserted country, hitherto nearly an impassable barrier. This large district comprehends upwards of 900 square miles; in many places it is very populous. As might be expected under such circumstances, the people are turbulent, and their houses being inaccessible for want of roads, it is not surprising that, during the disturbances of 1821 and 1822, this district was the asylum for white-boys, smugglers and robbers, and that stolen cattle were drawn into it as to a safe and impenetrable retreat. Notwithstanding its present desolate state, this country contains within itself the seeds of future improvement and industry."

In 1824, only two years later, it is thus mentioned:—"A few years ago there was hardly a plough, car or carriage of any kind; butter, the only produce, was carried to Cork on horseback; there was not one decent public-house, and only one house slated and plastered in the village; the nearest post-office 30 miles distant. Since the new road was made, there have been built upwards of 20 respectable two-storey houses, a shop with cloth, hardware and groceries; a comfortable inn, a post-office, bridewell, new chapel, a quay covered with limestone for manure, a salt-work, two stores for oats, and a considerable traffic in linen and yarn." This gratifying statement describes only the first beginning of improvement. When seven more years had passed, the population amounted to more than 1,100; in 1841, they exceeded 1,500 souls. The 20 houses spoken of were increased to more than 250, forming the flourishing town of Cahirciveen, which is the centre of a considerable import and export trade. These advantages, which are still only beginning to develop themselves, have originated in the making of about 70 miles of new road, on a level line."

The following passage, extracted in the same work from the Reports of the Irish Commissioners of Public Works, describes the improvements in this tract in common with other similar tracts: "These roads have been the means of fertilizing the deserts, and of depriving the lawless disturbers of the public peace of their place of refuge, affording them at the same time resources for an active, honest industry, of which we must do them the justice to observe, they have not shown any indisposition to avail themselves.

"In traversing a country covered with farms, and in a high state of cultivation, showing every sign of a good soil, and of amply remunerating produce, it becomes difficult to credit the fact that 10 or 12 years since the whole was a barren waste, the asylum of a miserable and lawless peasantry, were calculated to be a burthen rather

rather than a benefit to the nation; and that this improvement may entirely be attributed to the expenditure of a few thousand pounds in carrying a good road of communication through the district." Porter's Progress of the Nation, Edition of 1851; pages 294, 295.

There is no room for doubt, that the same measures would produce the same effects in this country also; there are tens of thousands of square miles here, in a state similar to that of the district described in the first of these extracts in 1822, except in having a less turbulent and more industrious population; and it is a moral certainty, that similar improvement, moral and economical, would follow the use of the same means. Government alone can put those means in operation; and setting aside entirely the consideration of profit, it is a serious question what amount of responsibility the Government incurs in so long continuing to neglect to do so.

396. But we would now go on to observe how directly in this country such improvements must operate on the Government revenue. For their immediate and direct effect is to give an increased value to the produce of land, and to bring purchasers into the market; and this again conduces no less infallibly to the extended cultivation of land, and every fresh acre brought under the plough adds to the revenue. We have already observed how desirable it is that some other species of crop should be found than grain, such as would always ensure a demand in a foreign market; and there is no way of effecting this so sure as that of improving the roads, and thus giving a value to produce which is now worthless, because it will not bear the cost of carriage to a market. This intimate connexion between improved transit and the Government revenue exists here in a far higher degree than in the North West Provinces; for here, under an annual field settlement, extension of cultivation gives a direct and immediate addition to the revenue; while under the Agra Government the revenue is for the most part settled for 30 years and incapable of increase during that period; yet, in spite of this difference, an activity in road improvement is in operation there which is wholly unknown here. Indeed the Government here, in its character of landlord, is much more nearly interested in the improvement of the means of communication than even the landlords in England. For there, in general, every acre already pays rent, and the rent of an estate can only be gradually raised; but here there are millions of fertile acres unreclaimed and waste, and only waiting for something to give a value to the produce which they are capable of yielding, to become productive and pay revenue; while abundance of labour, anxious for employment and finding none, from the same cause, remains idle and starving, or emigrates to other countries. Here good roads would at once effect a transformation, by making it worth while to employ the labour on the land; and thus both would become productive and valuable, instead of useless and even mischievous.

The direct and powerful tendency of improvement in the roads to augment the revenue.

397. We have already had occasion to point out (*supra*, paras 248 and 249), how the improved means of irrigation in South Arcot district have been in a great degree rendered unproductive by the want of roads; and it cannot be doubted that their entire absence in Bellary and Cuddapah, as well as in the Northern districts, must have operated enormously to keep down improvement. There is not a district throughout this Presidency which does not yield a variety of products having a value in other markets, either in this country or abroad; and the demand for such articles, and with it their production, would be enormously increased if they could be brought to market at a moderate cost for conveyance. But the cost of carriage eats up all the profit; indeed on many commodities it amounts to what would constitute a handsome mercantile profit several times over. Thus the cost of clean cotton at Bellary, is about 1 anna 1 pie per lb.; the cost of conveyance to the Presidency for shipment, even on carts, is Rs. 25 for 2½ candies, or 1,250 lb.; being at the rate of 3.84 pice per lb., which is within a small fraction of 30 per cent. on the price of the article. There is no doubt that the cost of carriage would be reduced by a good road to one-third of what it now is, for this is no more than has been done already on the Western Trunk Road, imperfect as it is; and it is self-evident how large would then become the inducement to the growth and export of this commodity. In the actual state of the roads throughout the two vast districts of Bellary and Cuddapah, and those connecting them with the coast, it is matter of astonishment that any article of raw produce can be brought to Madras at all at a paying price; and the fact that large quantities of cotton are exported from those districts in spite of those obstacles (a large part of it being still carried on pack

The actual state of the roads directly impedes improvement.

bullocks), opens the most encouraging prospect if only the communications are improved.

Actual gain to Government by the road improvements in Canara :

398. But the proof of the position that road improvements powerfully affect the Government revenue does not rest merely on general argument; actual results can be pointed to, of large improvement in the revenue immediately connected with the formation of roads, and very large when compared with the scale of the operations. We refer to the district of Canara, where during the last 16 years several passes have been opened to connect the coast with the country above the ghauts, and with marked benefit in every respect. Prior to 1836, as we learn from the Collector (Appendix K.), little had been done to improve the roads and passes, and the district was in much the same state in this respect as other districts; but in that year a beginning was made, and ever since a steady course of improvement has been going on. And almost all the measures adopted have consisted in forming communications between the coast and the interior, by opening passes through the mountain range called the Western Ghauts. The total expenditure on these roads and passes, from 1836 to 1850 inclusive, is stated by the Collector (Appendix K.) at *Rs.* 5,25,000.* The Collector quotes various proofs of the consequent advancement of the district in prosperity; but we will here notice only the revenue from the land and from salt.

in the land revenue.

Fusly.	Land Revenue.
	<i>Rs.</i>
1241	16,18,817
1242	16,16,731
1243	16,78,650
1244	16,88,980
1245	17,05,931
1246	17,15,917
1247	17,28,823
1248	17,32,820
1249	17,44,029
1250	17,54,760
1251	17,62,831
1252	17,65,883
1253	17,72,127
1254	17,77,811
1255	17,80,090
1256	17,85,313
1257	17,93,733
1258	18,03,681
1259	18,13,618
1260	18,20,466

399. We find (Appendix K.) that the land revenue, which, on the average of the five years ending 1802-03, amounted to *Rs.* 16,90,705, was *Rs.* 17,10,621 on the average of the five ending with 1836-37, showing the insignificant increase of less than $1\frac{1}{4}$ per cent. in 35 years. While during the subsequent period, throughout which, as already said, the improvement of the communications was systematically pursued, the revenue of each year, with one exception, exceeded that of the preceding year, until in 1850-51 (Fusly 1260), it amounted to *Rs.* 18,14,678, being above six per cent. increase in 15 years. The Collector does not give us the details of the revenue of the years during this period, but we have obtained them from the Board of Revenue, and give them in the margin.† It is there seen, that on the whole the increase in the 15 years amounts to *Rs.* 16,39,575.‡ Mr. Maltby enumerates several causes which have contributed to the advancement of Canara, but he ascribes the greater part of this gratifying state of things to the opening of the communication with the interior; and he expressly declares his opinion, that "the roads have paid for themselves." Such truly appears to be the case. Supposing even as much as one-half of the aggregate increase in the land revenue to be due to causes unconnected with the road improvements, the remainder *Rs.* 8,19,787 is 50 per cent. more than the expenditure on those improvements during the whole period. And this is from the land revenue only; there has also been a very large increase in the revenue from salt during the same time; and to this we must next advert.

The salt revenue.

400. The salt revenue at this Presidency is levied by means of a monopoly. The salt is made by a simple process in the open air; the water of the sea is let into square beds, the ground having previously been prepared and levelled, and the heat of the sun evaporates the water, and leaves the salt. These "Pans," as they are called, are private property, like cultivated land, but they can only be used under regulation; the Government officers fix the quantity of salt to be made by each owner, and all the salt that is made is required to be delivered at the Government salt store. A price is paid for it to the makers, varying from about *Rs.* 7 a garce to *Rs.* 15 at the several stations; and it is sold to the public by officers of the Government at *Rs.* 120 a garce. The quantity allowed to be made every year at

* This amount differs from that shown in Appendix (W.), obtained from the Board of Revenue, because the latter is framed from the bills passed in each year. These bills are never passed till a considerable time after the work was completed, and a statement compiled from them, therefore, can never correctly represent the expenditure of each year.

† The marginal statement, like those given by the Collector, excludes the Coorg Talooks, which were added to the district in 1835. A slight discrepancy will be observed between the Board's figures and the Collector's; in the former the actual collections are given, as they constitute the actual revenue; the Collector may possibly have given the amount of the settlement of each year.

‡ In the letter already referred to, Appendix (K.), Mr. Maltby gives the extension of cultivation in three talooks, being the only ones in the district in which the details of cultivation are officially recorded. It shows a total increase of $16\frac{1}{4}$ per cent. in 12 years, which is expressly declared to be the result of steadily progressive improvement, not of accidental circumstances of season.

at each station is fixed with reference to the expected sales, and with the object of having always a quantity on hand, so as to meet a sudden increase of demand.

The selling price at the several stations on the coast is invariable, not varying, that is, with any incidents of the season or manufacture; but in the interior, of course, the cost of carriage forms an important element in the price of so bulky a commodity; everything, therefore, which tends to reduce the cost of conveyance lowers the price of this necessary of life in the inland districts, and so increases the consumption of it; and all improvement of the roads between the coast and the interior acts powerfully in this way.

401. With these few preliminary remarks we beg to request attention to Appendix (C.C.), being a statement of the quantity of salt sold for home and inland consumption in each of the 15 coast districts, in the 20 revenue years, 1831-32 to 1850-51. On looking at the sales of salt in Canara, in that statement, it will be seen that they exhibit not only a rate of increase unknown elsewhere, but a steadiness of progress also, which contrasts with the fluctuations seen in other districts. Not only do the average annual sales of each five years of the period exceed that of the preceding five, but, with few exceptions, there is an increase in the sales of every succeeding year. On the whole, the average yearly sales of the last of the four periods exceed those of the first by no less than 50½ per cent. Mr. Maltby declares his opinion, as already observed, that, among various causes for this increase which he notices, the formation of the passes is the chief, and it clearly appears to be so. No doubt the abolition of the transit duties in 1843 conduced in a great degree to the same end by benefiting trade generally; but against this has to be set off an addition of 12½ per cent. to the monopoly price of salt, which took place at the same time, and which operated seriously to limit consumption, as is seen in the falling off in the sales in that year in this and every other district.

Increase in the salt revenue in Canara.

402. The total gain in the district in this source of revenue in the 15 years 1836-37 to 1850-51, above the average of the five years, 1830-35, amounts to no less a sum than Rs. 15,60,488; and deducting here also even as much as one-half of this, as due to other causes, there remains the sum of Rs. 7,80,244, being half as much again as the whole cost of the road improvements; so that in the short period that has elapsed since the roads were opened, or, more properly, even while the works have been in progress, their whole cost has been repaid to Government once and a half times over in the single item of salt revenue; and, adding the increase in the land revenue, already described as due to the same cause, viz. Rs. 8,19,787, the whole outlay has already been replaced more than three times over.

Total results in that district.

Or, to put it in another aspect, taking the whole cost of these roads as capital, the annual interest on it at 5 per cent. amounts to Rs. 26,250; and if to this is added the charge for repairs and superintendence at 5 per cent., the whole annual cost of the roads is Rs. 52,500. But, taking the average of the last five years, the yearly increase in the land revenue ascribable to the road improvement is Rs. 54,386, and in the salt revenue it is Rs. 52,016, after deducting one-half in each case; so that in this district the Government has received a direct net return on the capital expended of 10½ per cent. in the form of land revenue, and 10 per cent. in the form of salt revenue, being a total net profit of above 20 per cent. on the outlay, clear of all charges.

403. But the effect of the improvements in Canara on the consumption of salt, will be best seen by contrasting the state of the salt revenue there with what it is in another part of this Presidency, very similar to that in its geographical position; we allude to the two districts of Ganjam and Vizagapatam, which, like Canara, stretch along the sea-coast, on a narrow strip of low country backed by mountain ranges, but which differ from that district in being entirely cut off from access through the hills to the level country beyond. These districts, like Canara, manufacture salt, and might make an almost unlimited quantity, but, in the absence of access into and through the hills, the demand appears to be limited to the consumption of the coast tract itself. These districts participated equally with Canara in the abolition of the transit duties; but here that boon failed even to countervail the depressing effect of the cotemporaneous increase in the selling price of salt. A reference to Appendix (C.C.) shows that, compared with the first period of the series of years there exhibited, there is a positive falling off in the last period in

Comparison of Canara with Ganjam and Vizagapatam.

the quantity of salt sold in Ganjam; and that, though there is a slight increase in Vizagapatam, yet the decrease on the two together amounts to very nearly 5 per cent.; and yet it needs only a glance at the map to perceive that the sales of salt in these districts would far exceed those of Canara, if proper roads were opened. Canara, it is true, is backed by the Mysore country, and supplies that country with salt and other articles in exchange for its inland products; but passes through the mountains behind the northern districts would put them in immediate communication with the vast territory of Nagpore, a country producing all the inland products, and especially abundance of excellent cotton, and where sea salt is a rarer luxury than even in our own district of Bellary. Passable communications between the two countries would give value to the peculiar products of both, and the people of both would be vastly benefited, while the example of Canara justifies the undoubting conviction that the cost to Government would be abundantly repaid in augmented revenue. The increase might not indeed be so great, because the good internal communications of Mysore are wanting in Nagpore; but they might be very much less, and still abundantly repay the cost. We have already adverted to the pressing necessity for roads through these mountains for political and military purposes, and to the fearful expenditure of life and treasure which the want of them has occasioned; to those considerations we have now to add the large gain to the revenue to be secured by their formation.

The Western Trunk Road and the salt revenue of the Madras Collectorate.

404. No other district displays the advantages of improved roads in the same degree as Canara, not only because the improvements there have been on so much larger a scale than anywhere else, but also because they have been exactly of the most effective kind, viz., the opening of roads from the coast to the interior, and because these roads are so arranged that in a greater or less degree they affect the whole district. Salem is entirely an inland district, and is still cut off from direct approach to the coast, except from one extremity by the Western Trunk Road; and Tanjore is on the coast, and is equally without access to the inland countries beyond. The Western Trunk Road runs from the coast to the interior; but it is a single line, passing through portions of several districts, and being without branch roads, its effect is limited to those parts contiguous to it; and it cannot be supposed capable of so powerfully affecting those portions, as to exhibit any very marked influence on the revenue of the whole districts. There is one branch of revenue, however, which it is well calculated to affect; viz. the sales of salt at Madras; and we will examine the results there.

Prior to 1847, the manufacture of salt at Madras was confined, under the orders of the Board of Revenue, to the supply of its own population, and the providing a small quantity for export to Calcutta; the issue of Rowannahs for the interior was prohibited. But in January of that year, on the representation of the Collector that there was little demand for the Calcutta market, and that the facilities for inland sale were very great at Madras, the prohibition was withdrawn. This measure opened the Western Trunk Road to the dealers in salt; and was precisely equivalent to making a good road to the salt stores, in lieu of the wretched tracks by which alone the stores before available for the inland supply can be reached. The effect has been most satisfactory; the sales have greatly increased, and are still increasing.

Table of the sales before and after the road was opened.

405. In order to get a fair view of the results, we must take the sales of the Chingleput district, as well as those of Madras; both because a considerable part of the salt sold at the store of the latter Collectorate was drawn from the neighbouring pans of Chingleput, its own being unable fully to supply the demand, and also because the sales at other stations in Chingleput have been in some degree diminished. We take these sales in the five revenue years preceding the change of system, and the five succeeding it, which are shown in the following Table:

Fuslies.	MADRAS.		CHINGLEPUT.		TOTAL.	
	Quantity.	Price.	Quantity.	Price.	Quantity.	Price.
	<i>Garce.</i>	<i>Rupees.</i>	<i>Garce.</i>	<i>Rupees.</i>	<i>Garce.</i>	<i>Rupees.</i>
1841-42 - -	893	93,794	3,702	3,87,613	4,595	4,81,407
1842-43 - -	928	97,467	3,096	3,24,109	4,024	4,21,576
1843-44 - -	1,016	1,26,733	3,476	3,74,503	4,492	5,01,236
1844-45 - -	984	1,22,082	3,257	4,00,154	4,241	5,22,236
1845-46 - -	866	1,03,926	3,828	4,59,388	4,694	5,63,314
Average - -	937	1,08,800	3,472	3,89,153	4,409	4,97,953
1846-47 - -	2,196	2,62,283	3,316	3,97,942	5,512	6,60,225
1847-48 - -	2,260	2,73,600	2,982	3,57,892	5,262	6,31,492
1848-49 - -	3,131	3,74,860	1,942	2,33,129	5,073	6,07,989
1849-50 - -	3,853	4,02,305	2,539	3,04,691	5,892	7,06,996
1850-51 - -	4,156	4,98,711	2,091	2,60,471	6,247	7,49,182
Average - -	3,023	3,62,352	2,574	3,08,825	5,597	6,71,177

Note.—Half of Fusly 1256 was under the restricted system; the change was made in the beginning of January 1847, and that Fusly ended on the 11th July 1847.

406. From this statement it is seen that the average quantity of salt sold in the two districts in each year of the latter period, exceeded by 1,188 garce the average of the preceding period, notwithstanding the increase in the monopoly price in Fusly 1254. The total increase in the quantity sold in the five years was 5,590 garce, and the price of this quantity at Rs. 120, the present rate, is Rs. 7,22,800; this then is the amount of the gain to the salt revenue, in spite of the effect of the higher price in limiting consumption, and excluding from the calculation the gain by that higher price. Now, to compare this gain with the cost of the Western Trunk Road; we have already stated that up to the beginning of 1845, ten and a half lacs of rupees had been spent on the road, and the subsequent expenditure to the end of 1851 amounts to Rs. 3,73,000, making a total of Rs. 14,23,000. The sum stated to be necessary for keeping the road, in its present state of repair, is something under Rs. 40,000 yearly; the cost of maintaining the road for the 10 years since it was completed, will thus be Rs. 4,00,000, and the cost of formation Rs. 10,23,000. Thus the whole annual cost of the road may be computed at Rs. 91,150, being the charge for maintenance added to interest on the first cost at 5 per cent. But the annual gain in the increased sales of salt has been Rs. 1,42,260; being above half a lac in excess of the yearly cost of the road. Thus in this case again, notwithstanding the heavy cost of this road, both from the nature of the country crossed and the quantity of drainage to be provided for, and from the distance of material (all owing to a faulty selection of the line), the charge has been much more than repaid to Government by increased revenue from the single article of salt. Nothing could more vividly illustrate the value of roads into the interior, or more emphatically enforce the necessity of opening such communications.

The increase has much more than paid the cost of the road.

407. Having thus endeavoured to show the great neglect of the communications on the part of Government in time past, their consequent extremely bad condition at present, the urgent necessity of improved roads to develop the resources of our territory, and the great gain to be obtained by the Government itself by a liberal course of expenditure on this object, we will now give an outline of that system of internal communication which seems the best adapted to bring out and unfold the productive powers of the country.

Outline of a general system of roads.

The great lines for trade will be those from the coast to the interior; the cause being mainly that by far the best and the largest markets for produce are the shipping ports, and in a minor degree that the products of the coast and of the interior respectively differ and afford variety for interchange, while those of the districts north and south, whether on the coast or inland, are similar. No doubt the capital collected in the larger seaports, the greater convenience of some ports and the form of the country, will all operate to modify the application of this rule; but the raw produce of the country generally being of such low value that

The great commercial lines will be east and west.

every addition of transit is of consequence, the main object to be kept in view must be to effect the most direct communication with the shipping port.

In Canara this principle was kept in view in designing the new roads; all of which run direct from the coast to the Ghauts, except the Sumpajee, which having another object besides the facilitating of trade, viz., the political one of opening what was then a disturbed part of the country, goes in an oblique line from Mangalore to Mercara. As a consequence, it has been comparatively little used as a trading line; and a new line has therefore been opened, from the foot of the pass direct to the sea at Cossergode, the effect of which is observable in a traffic which otherwise would have made no use of the pass.

And there must be coast lines and connecting lines north and south in the interior.

408. Lines running north and south are of little value for trade, except where there are great markets to be reached, as on both coasts. One great object to be kept in view in sketching out a general system of communication is to provide for the cheap transport of grain in cases of scarcity, from parts of the country where it is abundant to those where it is deficient. On the western coast indeed this is of minor importance, for the south west monsoon which fertilizes those districts never fails; but on the eastern side of the Peninsula it is a matter of the first consequence. On that coast we have several extensive tracts watered artificially by means of the same unfailing south west monsoon, but they are separated by long spaces wherein the crops are almost entirely dependent on the local rains. North and south lines are here required therefore to equalize the supply of food; and they will be supplied by canals parallel to the coast, which can be formed with wonderful cheapness. Besides these lines there must be some in the interior running both north and south and obliquely, to connect military stations and important places for military purposes, and to open the country for general intercommunication; and branch roads will be required to connect these main lines with considerable towns and cross lines throughout the country.

The skeleton, or main lines of the system of communication which we have to propose, will therefore consist of, 1st, a number of lines running from the coast towards the central parts of the Peninsula, reaching to the centre if it be in our own territory, and meeting there the lines from the opposite coast, or stopping short at our own frontier, where the central parts belong to independent powers; 2d, lines of communication, for the most part canals, running along both coasts; and 3d, a system of roads in the interior, connecting principal places. And on these arterial lines the medium of communication should be first class roads, canals or railways, according to circumstances; and in the last case at least, they may properly be prolonged by convention, even into the territory of independent powers.

Number of east and west lines required.

409. As respects the number of east and west lines, we may take as an example what has been already done in Canara, and which has been proved by actual experiment to be not at all more than is sufficient. The length of the district of Canara, along the coast, is about 220 miles, and it now contains six passes into the interior, fit for cart traffic, though still requiring much improvement; thus there is on an average one road into the interior to every 35 miles of coast; and not only are these roads fully used, but more are represented to be still wanting; in one of his letters to us, Mr. Maltby writes as follows: "The great wants of Canara are at present ghauts, roads, bridges, &c." Most emphatically may this be asserted of the country at large; but here we find it maintained, and on the best authority, of that district which already has very far more of such aids to wealth and civilization than any other, and the present condition of which in this respect we now propose as a standard to be attained in other districts; we feel confident therefore, that in doing this, we are very much understating the real wants of other districts, and that more roads will eventually be required than we now propose; but even thus much will be a very great boon and blessing to the country.

The length of the eastern coast of the peninsula in this Presidency, from the frontier of Cuttack to Cape Comorin is about 1,000 miles, and the length of the collectorate of Malabar, on the western coast, is 140 miles; making a total of 1,140 miles. According to the proportion already existing in Canara, this length of coast would require 33 roads into the interior; but there are already three roads in Malabar, while on the whole of the east coast there are not more than two roads that can be considered as made, or as in a fit state for carts; this leaves 28 such lines to be still opened.

410. The length of these lines will vary widely. In the north, that is from Ganjam to Guntour, they will not exceed from 50 to 100 miles in a straight line from the sea, that being the width of the British territories there. In the ceded districts, Bellary and Cuddapah, they will be about 200 miles in length, from each coast to the centre of the Peninsula. South of Madras they will be 120 to 150 miles; and farther south still, where the Peninsula narrows, they will be even shorter. An average of 150 miles may be taken, and this for 28 roads, will give a total length of 4,200 miles.

The lines parallel to the coast will be 1,500 miles, of which at least 1,200 should be navigation by canal and backwater. The inland main lines may be taken at 2,000 miles; thus making a total of 7,700 miles.

Of the probable cost of these lines, and of the time within which we may contemplate their formation, we shall speak in the next section. We will here only add, that for the purpose of opening a communication with the interior of the country, there is at least one of the large rivers which may be made eminently serviceable; we allude to the Godavery; this noble stream flows a course of 700 miles, and its main tributary, the Wurdah, passes through the extensive cotton districts of Nagpore. This line, viz., that of the Wurdah and the Godavery, has been actually navigated for above 400 miles from the sea, and a trifling outlay would remove some difficulties in the course, and very much facilitate the navigation. A proposal, with this object, made by the Civil Engineer of the division, and supported by the Commissioner and the Collector, came before the Government last year; but the small sum of Rs. 10,000 (1,000 L.) required, was refused by the Bengal Government. Were the river opened, the great cotton marts of Oomarawutty and Chandah would be at once placed in immediate communication with the manufacturers of Lancashire; and not this only, it would at once open the whole market of those extensive regions to the rice of the Godavery Delta, and to the salt of the coast. The vastness of the transformation which would follow the opening of that great river to navigation, cannot be adequately conceived; it is no exaggeration to say, that the rapid growth of Liverpool and New York are only examples of what would ensue.*

411. It may seem startling to some, that we should represent so many passes into the interior to be necessary; but we are fully borne out in the statement by the example of Canara; and still the number in that Province is not sufficient; the inhabitants petition for more, and the Collector, Mr. Maltby, supports the demand, and his recommendation is quite enough to guarantee its justice. In 1842, it was found that there were 25 passes by which trade was carried on upon bullocks; grain and other inland produce being brought down, and salt and salt-fish, cocoanuts, &c. being carried up. Since the passes were opened the trade has expanded immensely, and it is no wonder that the six passes now open for wheel conveyances are found insufficient to supply the place of the 25 passes formerly in use.

Nor can any reason be shown why a similar trade should not spring up on the east coast. Not to mention our own Provinces, and especially the ceded districts, Bellary and Cuddapah, heretofore the most cut off of all, the Nagpore country and the Nizam's dominions are not less productive than Mysore, while in area they vastly exceed it.

412. In concluding for the present our remarks on this subject, we would observe that the existing classification of the roads must be abandoned as unsuitable, and liable to mislead. At present, certain roads, arbitrarily selected, are called trunk roads, and are looked on as the first class; while all others are styled branch or cross roads, and if attended to at all, are regarded as only deserving very inferior treatment. Many of the lines called trunk lines, are however by no means of the first importance; while many that are naturally the great arteries of trade have been quite neglected under the general term of branch roads. There are many lines, like that from Madura through Dindigul by the Paulghaut gap to the western coast, along which, though entirely overlooked, an important trade has been struggling for years, in spite of rocks, rivers, swamps and jungles; and which, when once observed, are seen to be great trading lines. And besides existing roads at least practicable, there are foot-tracks such as the Neelcoond pass was a few years

* See below, Paras 433, &c., and Appendix (K K.)

years ago, which when opened to cart traffic, will, like that, in a few years, raise a seaport town on the bare beach; and lastly, there are other lines on which no path now exists, passable even to the foot-passenger; but which if opened, bridged and made practicable for carts the whole year through, would speedily exhibit a traffic equal to that of any existing road. Such would be the case undoubtedly with many lines in the northern districts leading into the Nagpore country. To estimate the value of a line by the traffic on it, when it is in such a state as to throw every possible impediment in the way of traffic, is contrary to reason; yet such was the ground on which bridges were refused to the road from Berhampore to Russelcondah. The way to ascertain the really most important lines is by careful local inquiry, aided by the study of the map; and if the present classification is tested in this way, it will be found that we are treating some of the most important lines as if they were of no more use than to join neighbouring villages.

The question how far it is worth while to make good roads in this country.

413. We have still to consider another question in connexion with the roads. An opinion was broached by the late Superintendent, that instead of attempting to make good roads in this country, it would be much better to lay out the money in making "practicable" for carts the existing tracks, by an outlay of Rs. 100 a mile, thus getting a large extent of bad road, instead of a small extent of good; and Captain Best even contended that metalling the surface was absolutely prejudicial to a road, unless it was done in perfect style. The Government cordially adopted these ideas, to the extent at least of lowering the quality of road to be aimed at; and a report of Captain Best's in which he set forth his views on this subject was thought so valuable, that it was printed and circulated to all officers both of the Collectors' and the Civil Engineers' Departments, together with some remarks upon it by the Government. We, on the other hand, earnestly advocate the construction of really good roads; and it is proper that we should give our reasons for recommending that course, as the wisest and the most profitable.

The order of Government quoted.

414. The remarks of Government on the report of Captain Best, above referred to, are as follows: "Captain Best was of opinion, that the utility of the expenditure in patching up a bad road has been very far less than, perhaps not one half, what it would have been, had a larger outlay been made when it was wanted. The advantage of metalling a road, he observed, depends in a remarkably high degree upon its being not only in tolerable, but in perfect order." The conclusion he had come to, after giving the most anxious consideration to the subject, he said, "was either that the work should stop short of metalling altogether, in all localities which, from the nature of the soil and the vicinity of good material, are not exceedingly favourable, or that no expense should be spared in making the metalling substantial in the first instance, and keeping it in the highest possible order ever after." Speaking generally, he laid down the position that roads are wanted, not good roads, observing, that "the tracks that are in use may be made into roads for Rs. 100 the mile, though they could not be made into 'good roads' for Rs. 1,500 the mile; but the benefit to commerce from 150 miles of road would be many times greater than will ever be derived from 10 miles of 'good road.' In these remarks Captain Best has left much valuable information well deserving the attention of the officers of the Road Department, and indeed of all officers who have charge, or are in any way connected with the repair and maintenance of roads.

"Following Captain Best's observations on the expediency of not metalling cross roads, observations in which the Right Honourable the Governor in Council most fully concurs, it appears desirable that the cross roads of the country should for the most part be made upon the principle suggested by that officer in the concluding quotations given in the preceding paragraph, and that metalled roads for such communications should only be the exception. Captain Best has shown, in his illustration, that a metalled road out of order is far more difficult and distressing to the cattle employed in draught upon it, than a road not metalled, in its ordinary condition. In the opinion of Government, all that such roads require is, that they shall be judiciously traced with bridges and raised embankments where there are swamps, and good drainage; and they will then be sufficiently good for all the purposes of the traffic of the country in its present state.

"In regard to Trunk Roads in general, it would seem to be unnecessary to adapt them to fast traffic; roads so perfect seem to be beyond the present wants of the country. The great Western Road may be considered an exception, as carriages for fast travelling have come so greatly into use upon it; but even this road need not be made so perfect as an English highway. All that is requisite, at present, is

to

to maintain it in such a condition that carriages drawn by horses can pass over it with facility at a moderate speed, although without such ease to the traveller as would be afforded if it were perfectly smooth and even. What is essential is, that the roads should be kept in the intended condition by prompt and effectual repairs, made as they are needed. It is quite sufficient that fast coaches can go rapidly on the Western Trunk Road, although it may not be so smooth and even as the perfect high roads of England.

“ It is a question for consideration, whether trunk roads should always be metalled; whether, where there is not traffic to call for it, or where there are not facilities for obtaining good material, or, where the traffic may be considerable and no such facilities exist, the formation and maintenance of a second road would not be more expedient than metalling a single one.”

415. The roads now existing in this Presidency may be divided into three classes: 1st, roads partially bridged and metalled, but not kept by any means in first-rate order: such is the Western Trunk Road; 2d, roads formed and partially bridged, but unmetalled: such are the best in the Tanjore and Salem districts; 3d, tracks just practicable for carts for two-thirds or three-fourths of the year. Of the first of these classes there is a very limited extent, not more than from 300 to 400 miles; of the second class there is rather more, possibly 2,000 miles; but the vast bulk of the communications of the country are of the third class. Captain Best was in favour of confining expenditure in a great measure to a slight improvement of these last; he stated his opinion that *Rs.* 100 a mile would make the present tracks sufficiently practicable for carts; and that the greater part of them might be kept so at an outlay of *Rs.* 10 a mile annually in repair, while hardly any parts would need more than *Rs.* 50 a mile.

Amount of the improvement that would be effected under that order.

We imagine, however, that no one would contend that *Rs.* 100 a mile would be sufficient to render even practicable for carts any of those important lines which traverse the Eastern and Western Ghauts, heretofore called cross roads and hardly regarded at all, but which, if really opened to cart traffic, would speedily be found to be main lines of trade. Had the passes in Canara been treated in such a niggardly way, the country would have been still as much shut up against traffic and the movement of troops as it was in 1830; and the splendid results already described (para. 402) which have followed a more liberal course, would have had no existence. We must suppose, therefore, that the argument is intended to refer to the plain country only, and we will consider it in that regard.

The improvement proposed could effect no more than to make practicable the places now impracticable, or all but impracticable; it might also suffice to dig side channels, but it could do no more. It could not improve the surface, it could not bridge the nullahs, it could not form causeways across the swamps and rice flats; the swamps, the cotton ground, and the nullahs, would remain as fatal obstacles to traffic as at present. On such roads as these would then be, a cart can carry in fine weather 750 or 800 lbs., or about a third of a ton, and the day's journey is 10 miles; the cost of carriage varies a little, but it may be taken at three annas a ton a mile. In the countries under the influence of the south-west monsoon, such roads must be useless at least 130 days in the year, and under the north-east monsoon about half that period, from the absence of means to cross the rivers and nullahs; and from the bad state of the surface of the road during and after rain, which would be very much aggravated by any increase of traffic. Thus a third of the year in the former case, and a sixth in the latter, is lost to trade and to military movements.

416. If the country were to be left to roads of this description, some sorts of raw produce which seem likely to form staple articles of trade would be to a great extent shut out from a market: such are oil seeds, which are already becoming an important article of export from the tracts on the sea-board, but which would never bear the cost of transport from the inland districts, on such roads as we are now treating of. Mr. Boothby's letter, in Appendix (P.), refers to the loss and inconvenience entailed on the establishment with which he is connected, not only by the want of a good road to send the manufactured sugar to the coast for shipment, but also by the very bad condition of the country roads by which the raw material must be brought to the factory.

The effect of such limited operations.

Merely to state the rate of carriage-hire on such roads, indeed, by no means represents

sents their effect in checking communication and enterprise of every kind. The traffic on them is subject to continual delays and accidents, which greatly enhance the real cost of carriage. They cannot be used by travellers whose time is of value; three and a half, or at the utmost four miles an hour in a palanquin, or, as an alternative, stages of 10 or 15 miles daily on horseback, are all that they admit in the finest weather; while, during the monsoon or in rainy weather, a traveller can never be certain that he will not have to pass the night on the bank of some one of the many unbridged streams which cross them. The difficulty, tediousness, uncertainty and expense of travelling in this country, is probably the chief cause which keeps the European merchants of the Presidency ignorant of matters in the interior, and deters them from extended operations, when they can be so little within their own cognizance; and in this way, not less than by increasing the cost of transport, the bad state of the roads greatly impedes commerce.

the Western
Trunk Road.

417. Such, however, would be the roads to which, under the operation of the order of Government above quoted, the greater part of the trade of the country would be condemned. We will take in comparison with them the best road which at present this Presidency can boast, viz., the Western Trunk Road. We cannot give the actual cost of this road, because during the time that it was in gradual course of formation, it was subject to the continual wear of a heavy traffic, in some parts as much as a thousand carts a day; it is known, however, to have been much more expensive than it need have been, because the line was so unfortunately selected, that in many parts material is not found within six or eight miles. In most parts of the country, and on lines where no mountain-pass or large river is met with, about Rs. 1,500 for construction and bridging, and Rs. 1,000 more for metalling, would make as good a road as this, and the allowance for maintenance, as estimated by Captain Best, would be three quarters of a rupee a year for each mile for every cart passing daily; that is, when 400 carts pass daily, Rs. 300 a mile would be sufficient for the annual repair of one mile.

On this road carriages specially made for the purpose can travel six miles an hour, with much discomfort to the traveller, and no little injury to the vehicle; carts can carry 1,600 lbs. and travel 15 or, in dry weather, 20 miles a day. It is never so bad as to stop traffic entirely; but, at times, in spite of exertion to keep it in order, it is so very much broken up, as to occasion much delay and uncertainty in the time of arrival of passengers and goods.

the low cost of
carriage on that
road.

418. Captain Best objected to such a road as being worse than those altogether without metal; he "showed in an illustration," to quote the words of the Government, "that a metalled road out of order is far more difficult and distressing to the cattle employed on it than a road not metalled, in its ordinary condition." This, however, is a misconception on the part of Government; the drawing or illustration offered and accepted as a proof, was in fact no proof at all; it simply took for granted the whole thing to be proved. That Captain Best was in truth wrong on this point is clear from the fact, that the cost of carriage is very much lower on the Western Trunk Road than on any other road in the country; it is not merely lower than on the common, unmade and unbridged roads to which this order would confine the greater part of the trade of the country, but it is much lower than even on the much-vaunted roads of Salem, and so much lower, as greatly to overbalance all that has been spent upon it. The load carried by a cart on the Western Road is more than one half greater than on the Salem roads; and a longer distance is travelled daily.

the cost of construc-
tion and mainte-
nance of a really
first-rate road.

419. But this road is far from being in first-rate order. It is not even fully bridged, and the surface is so bad, in consequence of the sums allowed for maintenance being quite unequal to supply the wear of the very heavy traffic on it, that carts work on it by no means to the best advantage.* The new road now in course of formation from Madras to Trichinopoly affords the means of judging what would be the cost of constructing a road equal to an English turnpike-road; and upon that data we estimate it at Rs. 3,000 to Rs. 3,500 a mile. And judging from the experience

* We should add, however, that an estimate of Rs. 1,16,000 has lately been sanctioned for re-metalling the 125 miles of this road, which it is hoped will greatly improve its condition.

experience of the Agra and Bombay Trunk Road, and making an allowance equal to double the latest estimate for annual repair on the western road, such a first-rate road will require about 1½ pice (less than a farthing) per ton per mile annually, to keep it in good repair. Such a road would admit of a cart, with a pair of bullocks, carrying 1,800 lbs., and even sometimes a ton, as is actually done on the Columbo and Candy road, and travelling with ease and certainty 20 miles a day. The cost of carriage on such a road, calculated, as in the other case, without consideration of the original cost of construction or of maintenance (to which we shall advert presently), and estimated from the existing charges, would be about one anna (1½ d.) a mile a ton. Such a rate, we may remark, though it may appear low in England, is in reality very high compared with the rates actually current there, if due allowance is made for the difference in the value of money in the two countries. Another great advantage from such a road would be its effect in increasing travelling by rendering fast travelling practicable and moderately cheap. Its effect on the intercourse between the coast and the interior, the merchant and the producer, would be akin to that produced in England by the introduction of railways. Personal communication would be substituted for written correspondence, and commercial operations would be undertaken which now are not thought of.

420. To show definitely and practically how small a traffic will repay the cost of converting the very lowest description of road into the very best, we will take the case of a piece of road rendered practicable for carts by the expenditure stated by Captain Best to be sufficient, viz. Rs. 100 a mile, and with an annual allowance for repair of Rs. 20 a mile; the road being thus kept in such a condition that a cart can carry a load of one-third of a ton 10 miles a day for 300 days in a year without material injury to the goods, or serious risk of accidents. We will take a distance of 10 miles, being one day's journey on such a road, and will suppose that there is a traffic of 30 loaded carts daily. The annual expense of carriage will then be as follows:—

Value of a first-rate road and of an "improved track" compared.

	Rs.
Interest on the first cost of the road, viz., Rs. 1,000, at 5 per cent.	50
Repairs, at Rs. 20 a mile	200
Hire of 30 carts, at Rs. 100 a year	3,000
Total Cost	Rs. 3,250

being at the rate of 1 anna 8 pice per ton per mile.

To carry 3,000 tons 10 miles on a first-class road would employ 5½ carts for 300 days; each cart carrying, on an average, 2,000 lbs. 20 miles: the following then would be the cost:—

	Rs.
Interest on Rs. 35,000, the cost of making the road, at 5 per cent.	1,750
Repairs for weather and a traffic of 10 tons daily, at Rs. 50 a mile	500
Hire of 5½ carts, at Rs. 100 a year	550
Total Cost	Rs. 2,800

being at the rate of 1 anna 6 pice per ton per mile.*

We have here supposed that the carts travel only the same number of days in a year on the good road as on the bad one; but this is giving an unfair advantage to the latter in the comparison, for, in point of fact, travelling is often impossible for days and weeks together on the unbridged country roads. Yet even on these terms it is found that even so small a traffic as 3,000 tons a year would fully pay for the cost of forming a first-class road; and would, besides, give a reduction of 10 per cent. in the cost of carriage, in addition to the still larger and more important advantages of speed, safety and certainty. Nor must we omit that in any such case a large increase of traffic would inevitably follow.

421. A still greater gain, by a good road, would have been shown, if we had taken

A still greater gain would be found in a rainy or mountainous district.

* Carriage could not be procured under these circumstances at so low a rate in either case, as we have in both reckoned only the actual cost, without allowance for loss of time in taking and delivering loads, &c, or for profit.

taken for the comparison a road under the south-west monsoon. Every bridge in such a country is worth double what it is in the dryer districts under the north-east monsoon; indeed, in such localities, there are many miles where no cart traffic can take place at all without some artificial surface, and where neither Rs. 100 nor Rs. 500 a mile would make a practicable road.

In rainy and mountainous districts the difference between the first cost of a good and of a bad road is diminished; while the cost of keeping the well-drained road in good repair is less than that of keeping the soft and undrained track in a state practicable for carts. And if we could show in figures the full advantages of the change in the condition of the roads, it would be found that if Rs. 100 would pay the annual cost of a cart and bullocks on a good road, Rs. 120 would not be too much to allow for the losses incurred from accidents and wear on the unmade track, which we have assumed at Rs. 100 in each case. It would be seen also that the charges for more secure packing, and the loss by injury to the goods, by the overturning of carts and detention in the rain, whenever overtaken by bad weather, would have added 15 or 20 per cent. more to the advantages of the good road. The real difference in the cost of transit being probably more nearly 50 than 10 per cent.

A more careful consideration of this question is necessary.

422. The facts thus brought forward prove to our minds that this subject requires more careful investigation than it has yet received; and we feel sure that if the question had been brought to the test of such simple calculations, it never would have been determined that the direct road from Cuddapah to Madras should be opened as a "second-class road;"* or, in other words, an exceedingly bad road, unbridged and unmetalled, too rough or too soft and miry to be travelled at a greater speed than 2½ miles an hour, closed with every heavy shower, and quite impassable in the rainy months. Mr. Boothby's letter, in Appendix (P.), shows the necessity for a road being rendered equally serviceable throughout the year. We find also that Dr. Wight urged Captain Best (*vide* the Superintendent's letter to Government, 14th February 1851) to place the road from Coimbatore to the western coast in such order that his cotton might reach Cochin early enough to be shipped in the first vessels that sail after the monsoon, "as, in order to do this, the land journey must be made in the monsoon." The loss to trade must be very great when a road is impassable during several months of the year. It is a mistake to suppose that trade ends when the rainy season commences, from any other cause than from the roads being impassable; and Captain Best, in the letter just referred to, attributes the falling off in the traffic on the Palghat line, not to the rain, but to the "muddy" state of the road.

In a military point of view, roads without a hard surface, or bridges, leave the authorities helpless in all the monsoon districts for three or four months in the year.

Estimate of the cost and the effect of perfecting the Western Trunk Road.

423. Having shown that a highly finished road would repay its cost, even where the traffic was only 3,000 tons a year, it can hardly be doubted that it would answer to perfect such a line as the Western Trunk Road, on which the traffic, by late calculations, amounts to 670 carts a day, 80 per cent. of which may probably be loaded; and where making great allowances for light loads, the tonnage cannot be less than 100,000 tons a year. To show the advantage, even to the slowest traffic, of perfecting that road, and keeping it in the highest possible order, we will take the estimate lately sanctioned, amounting to Rs. 1,16,000 (11,600*l.*), which it is expected will render the line (125 miles) quite complete, if sufficient allowance is made for the constant wear of the road while the work is in progress. We will suppose also, what is probably nearer the truth than any of the sanguine estimates yet made, that Rs. 600 a mile a year will be necessary for the maintenance of the road.

The average annual cost of repairs in the last six years has been about Rs. 470 a mile, with which the line has been somewhat improved. The yearly cost of maintenance only is estimated by the Superintendent at Rs. 320 a mile. The comparison now and after the completion of the road will thus be as follows, omitting

* Such was the resolution of Government; but the formation of a road, even of this inferior quality, on that important line, appears now to be indefinitely postponed.

ting in both cases the interest of the original cost of the road up to the present time, which is common to both:

	Rs.
Present cost, 125 miles, at Rs. 320 - - -	40,000
Cost of completion - - - - -	<u>1,16,000</u>
Interest on that amount, at 5 per cent. - - -	5,800
Repairs, 125 × 600 - - - - -	<u>75,000</u>
TOTAL - - - - -	80,800
" - - - - -	40,000
Difference - - - - -	<u>Rs. 40,800</u>

Dividing the additional annual charge, Rs. 40,800, amongst the 100,000 tons on the road, we have 6½ annas a ton; and, as the length of the road is 125 miles, the charge on each ton will be a trifle more than half a pie a ton per mile. And the present cost of carriage to and from Madras, being on the average about 1½ annas a ton per mile, the cost will be repaid if the performance on the road can be increased by 1-32d part; in other words, if 60 lbs. can be added to the cart-load, or half a mile to the distance travelled in a day; and no one who has ever seen the carts moving on the Western Road will doubt for a moment, that if the road was in the condition of an English turnpike-road, each cart would benefit very much more than to that extent by the change, and this is proved also by the Candy road, where, as before said, carts travel at all seasons 20 miles a day, carrying commonly 1,800 lbs., and occasionally 2,240 lbs.

424. The conclusion to which the foregoing considerations conduct us is this: that so far from the common tracks, improved as proposed by Captain Best, being all that the country requires, an exceedingly moderate amount of traffic is enough to make it economical to construct a first-rate road, such a road as we cannot now show a single mile of in the whole country, and to maintain it in perfect order. A vast extent of the roads which, if repaired agreeably to the order of Government on which we have been commenting, would have no perceptible effect in reducing the cost of transport or augmenting the traffic, ought to be made in this perfect style. In every case a careful calculation should be made as to the amount of traffic actual and to be reasonably expected, and the quality of the road to be made should be so determined; and whenever a road inferior to the very best shall, after such careful inquiry, be deemed sufficient at first, its quality should be raised to that standard, as the traffic upon it is found to exhibit or to promise commensurate increase.

Conclusion on the question.

425. Before leaving this subject, we must say, in justice to the late Superintendent of Roads, that the opinions expressed in his report above referred to were apparently based on the supposition that the sum to be applied to the improvement of the roads was to be confined within very narrow limits; and his object seems to have been to make the most of a scanty allowance. But even under this supposition, a consideration of great moment seems to have escaped him: if the sum allowed was to be so attenuated as only to suffice to render the whole of the roads of the Peninsula practicable for carts in fine weather, and to keep them so, how was this improvement to be effected? Government, it is true, had promised help in any instance that was brought before it, but expenditures were not to be made till plans and estimates had been well prepared, or till assurance could be given that "dependence could be placed on the energy and exertion and means of the local officers to carry out the works suggested," or, as in the case of the Cocanada Road, until the Civil Engineer officers could pay attention to their execution. With this condition attached, a general declaration of intention to improve all the roads of the country must necessarily be inoperative, because of the insufficiency of the present professional establishments. It is impossible now, as it has ever been, to make surveys, plans and estimates of extended lines, or to execute work on such a scale under the eye of an Engineer officer, and the result has been exactly what might have been expected, that sanction was granted for a bad road instead of a good one, with no corresponding extension of length. Even, therefore, supposing the total sum allowed to be too limited, it would still be well to make the most of

Under the existing rules, the greater length of inferior road aimed at by Captain Best could not be attained.

the little engineering skill available for road-making, and to perfect each line under repair (as far as the traffic justified the expenditure) while the officer was employed upon it, rather than to talk of the advantages of lines of great length, which under existing circumstances could not be undertaken.

The Harbours of this Presidency.

The harbours have been much neglected.

426. In this place we are anxious to make some remarks on one species of public works, which has unfortunately been more neglected perhaps than any other; we mean the conservation and improvement of the various ports on the coasts of this Presidency. The total number of the ports or places at which cargo is received and discharged is 144, along a coast line of about 1,600 miles. Of this number, 19 are called principal ports, being those of the most importance; the number at which port dues are levied is 57. As regards large ships, the anchorages at all these ports are open roadsteads, but at very many of them country vessels are able to cross the bar into a river or backwater; and a little judicious assistance in controlling and directing natural agencies would very much extend the usefulness of such harbours. Up to a recent period this subject appears to have been entirely overlooked or neglected; and it is no wonder that some of the most valuable ports on the coast have become very much deteriorated within memory. Of late years, some trifling remedies for the evil have been proposed in a few instances, but the applications to Government for assistance have not been by any means invariably successful. We have not the materials, nor would this be the place to attempt a review of all the ports on the coast or their wants; but it may be useful to notice a few where the need of improvement has been most strongly brought to notice.

Coringa: its value and importance.

427. The first which we will notice is the port of Coringa, including Cocanada. This port, for the anchorage is one, is at the mouth of the Godavery River, and from its situation, therefore, of the greatest importance; as the natural entrepôt of the produce of the delta of that river, now in course of being supplied with irrigation, and certain to yield large quantities of valuable produce, and as being also the outlet for the vast country which will be opened up as soon as any attention is bestowed on the navigation of the Godavery River itself. And independently of its position, the port has great advantages. It is the only secure harbour between the Hoogly River and Trincomalee, and is accessible at all seasons without difficulty to ships of any burden: from its nearness to the teak forests on the Godavery, even with the present very imperfect means of transporting the timber, it is a very cheap place for effecting repairs, and ships of 500 tons have been built in the river. Having been entirely neglected, the port has very much deteriorated, and there is now no more than three feet water on the bar at low water, and at the most favourable times of tide vessels drawing more than eight or nine feet cannot cross. So far has this process of silting up extended, that, from the lengthening of the mud-bank abreast of Coringa, a boat is sometimes two or three days in making a single trip from that place to a ship in the anchorage. Even with all these disadvantages, the trade of the port is very considerable; it has expanded very greatly of late years, particularly since the recently-constructed irrigation works have come into operation to cheapen production, and it will infallibly continue to increase, especially when the Godavery is open to inland navigation. The statement in the

Years.	Exports.	Imports.	TOTAL.
	Rs.	Rs.	Rs.
1835-36	7,03,334	48,934	7,52,268
1836-37	6,86,368	1,03,693	7,90,061
1837-38	6,46,114	98,085	7,44,199
1838-39	4,22,141	4,69,898	8,92,039
1839-40	3,64,839	1,23,423	4,88,267
1840-41	3,06,646	9,29,549	12,36,195
1841-42	4,59,362	3,67,356	8,26,718
1842-43	5,64,375	2,42,347	8,06,722
1843-44	6,33,991	92,101	7,25,092
1844-45	7,29,287	3,07,317	10,36,604
1845-46	9,06,554	3,76,930	12,83,484
1846-47	13,53,503	4,00,191	17,53,694
1847-48	10,95,397	6,27,061	17,22,458
1848-49	10,56,737	4,40,620	14,97,357
1849-50	9,76,719	3,28,033	13,04,752
1850-51	13,94,638	3,01,794	16,96,432

margin shows the value of the imports and exports for 16 years. It will be seen that the value of the exports, the true criterion of the thriving condition of the district, has very much increased of late years. In 1835-36 it was about half what it was in 1850-51, the last year in the table; it then fell off for several years, till, in 1840-41, it was only three lacs. Since then it has risen almost every year, and in 1850-51 it was very nearly 14 lacs. The total amount of the trade, both import and export, is now 17 lacs of rupees a year, or 1,70,000 *l.*, and it has increased nearly 250 per cent. in the course of the 16 years included in the table. The number of vessels that visited the port in the year ending 31st July 1850,

was 392, with an aggregate tonnage of 57,511 tons.

428. In Colonel (then Captain) A. Cotton's first Report on the irrigation of Rajahmundry in 1844, the importance of this port is referred to in the following terms: Notice of it by
Col. A. Cotton.
 "Till I visited the district, I had no proper idea of the great value and importance of the port of Coringa; first, as being the only shelter for vessels between the Hoogly and Trincomalee, and secondly, in connexion with the teak timber trade of the Godavery; and I was astonished to see about 200 vessels docked there, many of them large ships. The bay is a perfectly secure anchorage, very large vessels can be brought into the river, and teak timber of excellent quality is brought down at a very low price. Such a port ought to be most watchfully cared for, and every plan that could be thought of to secure the full advantages of it should be adopted by Government. But so greatly has it been neglected hitherto, that not only has no attempt been made to improve it, but from what I could learn, nothing has ever been done even to preserve it; everything has been allowed to take its own course. For instance, the banks of sand have greatly extended off the mouths of the Godavery of late years, as must necessarily be the case with such a river; but no new survey of the coast and roads has been made, nor instructions for entering the port published for many years. When a survey of the district, made 20 years ago, was shown to the commander of a vessel who knew the port, he could hardly recognise it, so greatly had the banks which appear above water extended. Again, I was assured that there is a heap of ballast in the harbour, discharged by some ship, and perhaps there are many others; a vessel also discharged her ballast in the small branch of the Godavery, upon which all the docks are situated, the only one having deep water over its bar, and it has never been removed, forming a serious obstacle to vessels passing up and down.

"But not only ought the harbour to have been preserved from injury, it seems certain that it might have been greatly improved. In the first place, the bar at the mouth of the Coringa branch of the Godavery is not a bar of hard sand, brought down by the river, but simply a flat of the softest mud, so that there can be no doubt that it might be kept down by dredging. There is, I am informed, about nine feet water over it at present, and if it was deepened a few feet, very large vessels might be loaded in the river, instead of at the anchorage two or three miles off. There is also another small river entering the harbour at Cocanada, the mouth of which is totally neglected. Many ships are loaded from this river, and very great additional facility might be given to this, if this river was attended to. It is the more remarkable that nothing has been done for this most valuable port, inasmuch as it would have itself provided the funds. The port dues are at present most insignificant, about Rs. 30 for a ship of 400 tons, I understand. Even with a very moderate charge, such as a quarter of an anna a ton, a very considerable fund could be raised, which, if constantly and judiciously expended, would provide for many improvements being gradually effected. It seems extraordinary that this port should not have been more frequented by European vessels needing repairs than it has been; its immense superiority to Calcutta, and even to Moulmein, in accessibility, the trifling expenses of the port, the cheapness of the teak, provisions and labour, and the excellent quality of the timber, would seem to point it out as incomparably the best port for repairing vessels in the Bay of Bengal. I am informed that it is beginning to be thought more of by the masters of European vessels, and that it is likely to be much more frequented."

429. In 1847, the extension of the mud bank in front of Cocanada, had proceeded so far as very seriously to interfere with the growing trade of that place, by the increased tediousness and expensiveness of communicating with the shipping. The merchants brought the subject to the notice of the same officer, as Civil Engineer of the division, and he, with the concurrence of the Collector, commenced to re-open the direct passage by a cut through the bank, on an estimate of Rs. 1,500. While the work was in progress, it became evident that the cut could not be kept open under the action of the tides and surf, without an artificial work at its outer end. To form such a defence or breakwater, the merchants interested in the port subscribed a sum of nearly Rs. 800, and with this sum a groin of rough stone was commenced; but the funds were insufficient either to complete the cut or to construct a sufficient breakwater.

Some trifling measures to arrest deterioration, undertaken by the local authorities;

When the bills for the work of the year went in, explanation of this item was asked for, and it was supplied by Captain Orr, the Acting Civil Engineer, in the absence of Major Cotton on sick certificate. Captain Orr stated that the work was undoubtedly correct in principle, and that it had answered the end sought, as

far as could be expected from it in the imperfect condition in which it had been left from the want of sufficient funds. He also stated, that from the extension of the bank, a boat could hardly make one trip to and from the shipping in a day;* whereas, if the direct passage were opened, larger boats might be employed, and might make three trips a day. Hereupon the Board of Revenue recommended the expenditure for the sanction of Government, but it was refused till further detailed information should be received:

But disallowed by the Government.

430. In replying to the requisitions for this information, Captain Orr reported, that since his former letter the cut had been made completely effective by turning into it the whole stream of the river, by the expenditure of a small sum of money liberally contributed by the Collector personally; and he solicited the sanction of Government to a small estimate of 1,526 rupees to close the old channel. This request was warmly supported by the Board of Revenue in the Public Works Department, who represented the work as "indispensably necessary to keep the new passage open;" but it was refused by the Right honourable the Governor in Council (11 January 1850), on two grounds; 1st, That until the irrigation works in connexion with the anicut were completed, he would sanction no other work in Rajahmundry; and 2d. That he would "concur in no scheme for improving the port of Cocanada, until complete plans, specifications and estimates of the entire project are submitted." The first of these reasons is the same on which we have already remarked (Para. 336), in speaking of a similar refusal of a road; it is, if possible, even less logical here, because of the extremely small amount of the sum asked for. As to the second reason, plan, specification and estimate of the work contemplated had been furnished, and no additional documents of the kind could make it more plain than it was. It did not pretend to be a general scheme to improve the river, but a merely temporary and emergent work, until the Engineer officers could find time amid their pressing engagements, to investigate the whole subject.†

A trifling improvement has recently been undertaken by the local authorities, on their own responsibility.

431. This order was effectual to stop all attempt at improvement; for such complete investigation and report as it required was necessarily quite impracticable, from the want of officers with the necessary leisure. The progress of injury was, therefore, left to take its course for nearly three years more; till, in September of the present year, the state of the bar had become such as nearly to close the port altogether. The Collector and the Civil Engineer then conferred together; and the latter, Major F. Cotton, having prepared an estimate to a trifling amount (only 427 rupees) for work absolutely necessary, the Collector undertook its immediate execution, purposing to bear the charge himself, if Government should persist in its former refusal; a responsibility in which the Civil Engineer joined him.

The present inaccessible state of the port.

In his letter to the Marine Board, forwarding that estimate, Major Cotton thus describes the necessity for the work proposed, and its nature: "The case is this; the entrance to the port of Cocanada is now almost inaccessible, while there are more ships in the roadstead than have been seen at anchor there before. The entrance used at present is only practicable for loaded cargo boats, about the time of high water, and while the old entrance draws off half the drainage water of the country, the scour will be insufficient to improve it. The season has arrived for the great scour of the year by the freshes of the Yalairoo river; and if this chance is lost, we may feel sure that the water over the bar will be as bad during the ensuing year as it has ever been known, perhaps even worse.

"Under these circumstances, I made the proposal to Mr. Prendergast, that the old entrance should be closed, that we might ensure the full advantage of the freshes in the Yalairoo; and the operation of throwing a dam across the old outlet is now in progress by the means above mentioned. To have waited for an answer from Madras would have been to lose the season, which must account for my having commenced the work before sanction is received for the estimate."

In another passage, he thus speaks of the port: "Had the members of your Board seen the roadstead of Cocanada, as I did a few days ago, with 14 European ships and a number of coasting craft waiting for their cargoes from this wretchedly neglected and all but inaccessible port, I am sure you would agree with me in thinking that every effort to facilitate the passage between the landing place and anchorage

* In strong freshes, a single trip sometimes takes a boat two or three days, as already stated.

† The small expenditure in 1847 has not yet received the sanction of Government.

anchorage was worth the 100*l.* I ask for." He here alludes to a request which he had just made that *Rs.* 1,000 should be deposited with the Master Attendant, to be promptly expended when required in removing obstacles to the flow of the stream, which thus guided will be useful in keeping the entrance open:

It is painful to see the great natural advantages of this place thus sadly neglected. No wonder the local authorities were ready even to lay out their own money in arresting the progress of destruction; and truly it may be said that their liberality and public spirit pointedly rebuke the inaction of the Government.

432. Colonel A. Cotton was anxious to go fully into the subject of the improvement of the port, feeling it to be essential to the prosperity of the district, but the pressure of his duties in connexion with the anicut occupied him entirely. Since he quitted that charge, he has lately drawn up a short memorandum, setting forth his views as to what is required, and the subject seems so important that we place that memorandum in our Appendix (JJ). The irrigation works at the Godavery, which have already operated so powerfully, by facilitating and cheapening the raising of produce, to increase the trade of the port, afford also the means of increasing its accommodation; for the anicut and connected channels will at all times secure water for a scour at the mouth. In his memorandum Colonel Cotton proposes some trifling work to both the Coringa and the Cocanada bars, to the amount of less than *Rs.* 15,000, as being urgently required without delay, and recommends further works of a more permanent character, to the amount of *Rs.* 1,00,000. The merchants and shipowners of the port are so anxious for these improvements, that they are quite willing that the port dues should be doubled, provided only the proceeds are devoted to this object; and Colonel Cotton points out that all the necessary improvements might be effected without any outlay or any risk of loss, by adopting that expedient which has been so universally acted on in England, viz., by raising money on the security of the port dues. The trade of the port will infallibly increase; and those dues, therefore, form an indubitable guarantee; and a judicious expenditure in removing the disabilities and inconveniences of the port will greatly facilitate that extension of commerce, and with it will hasten that development of the resources of the province, with which the increase of the Government revenue is so intimately bound up.

Measures now proposed by Colonel A. Cotton.

433. The opening of the Godavery river to navigation is a subject of such deep importance that we cannot forbear to say a few more words about it in this place.* That fine river, with its tributary the Wurdah, which for this purpose must be regarded as its proper continuation, flows a distance of 700 miles, and passes through the vast and fertile plains of the Berar country, of which it is the natural highway. The great staple of Berar is cotton, of a quality unequalled in any other part of India, and which is similar to Mobile cotton, and when equally well cleaned commands the same price in the Liverpool market. Even now, with the disadvantage of a long land carriage on pack bullocks, the annual export of cotton from this tract to Bombay and to Meerzapore united, amounts to fully 60,000,000 lbs., and the quantity obtainable, or capable of being produced, may fairly be styled unlimited; any considerable reduction in the cost of bringing it to the port of shipment would give it the preference over American cotton, and the demand, and consequently the production, would be enormously increased.† The opening of the navigation of the Godavery is all that is wanted to effect such a reduction. We have already said that this is the natural course of the trade, but the river having been, utterly neglected it has been driven into other channels.

The importance of opening the Godavery navigation.

X 434. Formerly the greater part of the cotton was taken 500 miles on bullocks to Meerzapore on the Ganges, and thence conveyed on boats 450 miles to Calcutta; now the greater part goes to Bombay, still wholly on pack oxen, the distance varying from 216 to 450 miles, according as the cotton is purchased at one mart or another. The hire of a bullock for the journey ranges from about *Rs.* 5 to *Rs.* 16, the chief cause

Present cost of the conveyance of the Berar cotton to the port of shipment.

* We also beg to request attention to Appendix (KK.), being a letter from the Madras Chamber of Commerce to the Board of Revenue, on the importance of opening the Godavery navigation.

† In a paper drawn up for the Royal Asiatic Society in 1837, by Mr. Ashburner, a Bombay merchant, that gentleman states his opinion that, with good roads, the export of cotton from Berar would increase at the rate of 1,00,000 bales, or 30,000,000 lbs. a year, and would probably soon reach the amount of a million bales yearly. In the absence of improved roads, it has, in fact, scarcely advanced at all since that time.

cause of variation being the time of year: a load is about 250 lbs. But this is not by any means the whole cost of conveyance: the indirect expenses are much greater; the cotton is eaten by the bullocks, stolen by the drivers, torn off by the jungles through which the road passes, and damaged by the dust and the weather, as well as by having to be loaded and unloaded every day, often in wet and mud. The Bombay Cotton Committee of 1847 state their opinion, after careful calculation, that the whole charges of conveyance to Bombay, from the mart of Kamgaon, only 216 miles distant, being the nearest of all, do not fall short of *Rs.* 33 a candy (784 lbs.), the original cost of which at the latter place is not more than *Rs.* 50; thus the cost of carriage to the port of shipment is 66 per cent. on the price of the commodity. The usual selling price in Berar is under one anna ($1\frac{1}{2}$ d.) a lb., as we learn from Royle, as well as from the paper just quoted, and various other authorities; the absolute cost of the conveyance from the producing country to Bombay is therefore fully 1 d. a pound. And this, though it seems small, is in fact enormous on so low priced an article, so that in the Report of the Cotton Committee above referred to, the rise of even one halfpenny a pound at Liverpool is spoken of as operating most beneficially on the Bombay market. X

The cost to Coringa by the Godavery.

435. And the opening of the Godavery navigation would effect a reduction in the cost of conveyance very much exceeding that amount. The great cotton marts of Oomrawutty, Hinghaghaut, Arwy and Woony, are close on the Wurdah river, and in those parts the article is even cheaper than at Kamgaon, which is less a centre of the producing tract than an entrepôt for the trade to Bombay. At the four places first named the price does not exceed $1\frac{1}{2}$ d. a pound. The Commissioner of the Northern Circars and Colonel A. Cotton, late Civil Engineer of the 1st Division, directed much attention last year to this subject, and from their reports it appears that even if there were no return cargo, but the boats were destroyed on reaching their destination, and hire paid to the boatmen for proceeding back on foot, still the cost of conveying the cotton from the place of production to Coringa for shipment would not exceed one-third of a penny a pound; and the Chamber of Commerce (Appendix KK.), justly assuming that there would be some little return trade immediately, especially in salt, compute the charge on cotton at one-fifth of a penny a pound. There appears no doubt that this amount of reduction may fairly be expected immediately, and ultimately it will be very much greater; for as soon as a little attention is devoted to the removal of obstacles from the navigation, and measures of improvement are adopted, which will cost nothing in comparison with their results, the river will speedily become a great highway of commerce; the cotton, the timber, and the various other products of the interior, will be brought down in exchange for the salt of the coast and the rice of the Godavery Delta. With a regular navigation established, we are fully warranted by experience in concluding that the cost of transport will not exceed two pice a ton a mile, and at that rate the carriage of a pound of cotton the whole distance to Coringa would cost no more than one-twentieth of a penny.

Immediate saving on the carriage of cotton, by opening that navigation.

436. But without looking so far forward, there is no doubt that as soon as the navigation of the Godavery is at all opened, the cost of transport to the place of shipment will immediately be reduced from 1 d. a pound to one farthing; and this would be equivalent to a reduction from 66 per cent. on the cost price of the commodity to $16\frac{1}{2}$ per cent. The saving in carriage would thus be $49\frac{1}{2}$ per cent. on the cost price, being several times the amount of a good mercantile profit; it may be conceived, therefore, how powerful an inducement would thus be created to the augmentation of the trade. The total gain in the diminished cost of the carriage of cotton only may be thus stated in figures. The present cost of conveying 60,000,000 lbs. of cotton to the shipping port, at 1 d. a pound, is 25 lacs of rupees; the same quantity conveyed by the Godavery route, even with very trifling improvements, would cost only one farthing per pound, and thus three-fourths of the present expenditure, or 18 lacs of rupees yearly would be at once saved, even without any increase of the trade, which however would certainly take place.

Gain in other ways.

And even the large money-saving would not be all; there would be much gain also in convenience of shipping. The land journey to Bombay occupies 60 days, and as the plucking season is the first three months of the year, and the monsoon begins on the western coast in May, great hurry is always necessary in order to get the cotton to the port in time, and save the loss of the season. By the Godavery route all this would be avoided. Not only would the distance to the port be traversed in nine or ten days instead of 60, but delay would be unimportant as regards season;

season; for the Coringa bay is quite sheltered from the S. W. monsoon, and the ships would lie in smooth water to receive their cargoes, and would have a fair wind to put to sea as soon as loaded.

437. Hitherto we have spoken almost exclusively of the cotton trade, and considering the vital importance of that article to the industry of Great Britain, it deserves a forward place; but that is not the connexion in which the opening of the Godavery navigation is most important to the interests of the British Indian Government or of its own subjects, because the cotton is the growth of other than British provinces; but the return trade would directly and enormously benefit the revenue of the Government, by the demand which it would create both for sea salt and for grain. The people of the Berar valley are at present almost entirely cut off from the use of sea salt by the enormous cost of conveyance, and probably their annual consumption does not exceed 3 lbs. a head at the utmost, instead of 20 lbs. Were the carriage cheapened by water communication, it seems only fair to conclude that the consumption would rapidly increase to what it now is in the Madras territories, including Mysore and other tracts remote from the sea, viz., to 13½ lbs. a head. The population of the Berar valley cannot be taken at less than 10,000,000; and their increased consumption of salt at 10½ lbs. a head would amount to 11,000 garce, the monopoly price of which at the present rate would be Rs. 13,20,000, and deducting one-tenth of that for cost and charges, there would remain nearly 12 lacs of net gain in revenue in the single item of salt; and if the present very high monopoly price of the article were lowered, though the net revenue might not rise so high, the blessing of a full supply of this essential to health would be much more widely diffused.

Enormous increase of revenue to Government.

The salt revenue.

And, undoubtedly, the effect of the measures we are considering upon the land revenue would be hardly less powerful. The soil of Berar, so eminently favourable to the growth of cotton, would be, in great part, devoted to that object, and the abundant grain of the Godavery and Kistnah Deltas just now supplied, or in course of being supplied, with irrigation, would be required to feed the population; and it is impossible to exaggerate the influence of such a demand in developing the resources of those rich tracts, and it must be remembered that every acre brought under cultivation adds to the Government revenue.

The land revenue.

438. Nor must we overlook the advantages that would result in a military and political point of view. The relief of troops at the remote station of Nagpore, and the conveyance of military stores to that post are so difficult, tedious and expensive, that it has sometimes been contemplated to render the Godavery River navigable for the sake of that single object; and the importance of improving this line is now much greater than it was formerly; for all the troops in the Saugor Division now belong to Madras, and the communication with the other stations of the army and with the Presidency is by Nagpore. This latter place can now be reached from Madras only by a march of 500 miles from the port of Masulipatam, over such roads as we have described above; whereas if the Godavery were made navigable, troops and stores would be landed abreast of Woony, only 80 miles distant from Nagpore. Five-sixths of the land march would be saved; the distance from the coast to Nagpore would be accomplished in 16 or 18 days instead of two months; there would be a great saving of expense, both in the moving of troops, and still more in the conveyance of military stores; and the ravages of cholera, on the march, would probably be got rid of. The troops at Nagpore and in the Saugor Division number 11,000 fighting men. From inquiries that we have made, we suppose that this force must require about 400 tons of military stores yearly, and their conveyance, by the present wretched roads, cannot be taken at less than three annas per ton per mile, and is probably more. The Godavery route would substitute, for 420 miles of such conveyance, a water carriage of the same length, at not more than three pice a ton per mile. In addition, then, to the great gain in speed, there would be a positive saving in money to the amount of no less than Rs. 29,000 yearly on the carriage of stores for that 420 miles. And that sum yearly represents a capital of Rs. 5,80,000, which would probably be enough to make the Godavery efficiently navigable, so that the mere saving in the carriage of Government stores would pay for that vast improvement.

Military and political advantages.

Such would be the advantages in the ordinary times of peace. In case of any differences between the British Government and the Hyderabad or Nagpore states there would be still greater. A hostile confederation between those two powers would be impracticable: the river would give us the facility of placing a force

on the flank or in the rear of either of them, and resistance would become hopeless.

The cost of the necessary operations on the river would be trifling.

439. And as the objects to be attained are thus important, so also there is good reason to believe that they might be accomplished at a trifling expenditure. The passage down the river has been ascertained to be feasible. About 25 years ago, the enterprising firm of Palmer & Co., of Hyderabad, sent large quantities of cotton and timber down the river, for several years successively, from Woony, 427 miles up, and in the centre of the cotton country, to Coringa, on the coast; but on the bankruptcy of that house, these transactions ceased, and have never been renewed. What is now wanted, in order not merely to open the river to such imperfect navigation, but to make it a really valuable channel of commerce is, first, to clear away trifling obstructions, occurring at intervals, along the stream; second, to increase the supply of water during the short dry season; and, third, to arrange with the chiefs along its banks in the Nizam's country, to prevent the stoppage of boats for their exactions. As a preliminary to all these, it is necessary that the river should be carefully explored and examined; and with this view the Madras Government, in April 1851, laid before the Government, at Calcutta, the valuable information collected by the Commissioner of the Northern Circars; and in pursuance of that officer's recommendation, solicited authority to expend a sum not exceeding Rs. 10,000 on such examination, including the removal of minor obstructions to the passage of boats. This request was unsuccessful, as unfortunately the Calcutta authorities could not see any advantage to be gained by the project. To use their own words, "The President in Council was unwilling, in the present state of the finances, to incur this expense on an object, the utility of which he could not but feel to be doubtful." It is to be hoped that this denial will not be long continued; in its results the project promises to be one of the most important that have ever engaged the attention of the rulers of British India.

As to the cost of the works, the information existing is too slender to enable us to speak with confidence; but there seems reason to believe that all the obstacles to navigation, six in number, between Coringa and Woony, 427 miles up the river, may be removed at the insignificant cost of a few thousand rupees; and that a permanent stream, abundantly sufficient for steam navigation, for this whole distance, may be ensured all the year round, at an outlay not exceeding a few lacs, not more than half the probable yearly gain to Government by salt only, and about the cost of 10 miles of railway; while the same measure would also secure the delta of the river from those destructive floods which are now so lamentably frequent. As respects the third thing to be done, viz., the making arrangements with the chiefs along the banks of the river, it is most unlikely that any material difficulty should be encountered in effecting that, through the Political Agents of the British Government at the Court of his Highness the Nizam.

The port of Masulipatam.

440. Masulipatam is a large and populous town, and may be regarded as the capital of the northern districts of this Presidency. It stands on a shallow inlet, which winds through a marsh, and terminates seven miles from the sea, but the extreme point of which is or was connected with the northern branch of the Kistnah River by the Chinnapoor Canal, 5½ miles long. The town had formerly a very extensive trade, principally in piece goods, and maintained a constant and extensive commercial intercourse with Persia. Within the last half century, this latter branch of trade has almost entirely ceased, and the whole commerce of the port has very much declined.

is great deterioration.

About the year 1790, there was never less than eight feet of water on the bar, and ships of considerable burden took in their cargoes at the fort. After that time, the depth on the bar became gradually diminished, till at present it does not exceed 15 or 18 inches. This lamentable deterioration of the port appears to be entirely due to the diminution of the scour, owing to two causes: first, the embanking of the marshes, about 1795, with the view of reclaiming them; and, second, to the filling-up of the Chinnapoor Canal, through neglect. In 1836, the port was carefully examined and reported on by Captain Buckle, the Civil Engineer of the division, who proposed various measures for its restoration. The total amount of his estimates was Rs. 32,272, and the whole were sanctioned by Government; but only a portion of the work, to the amount of Rs. 19,495, was executed; and among those omitted, were the most important for increasing the scour. The effect was not considerable, or it has not been permanent in consequence

sequence of subsequent neglect. We have already noticed (*see* para. 337), the very bad condition of the roads from Masulipatam into the interior, viz., those to Hyderabad and to Ellore; and there can be no doubt that whatever other causes may have tended to the declension of this once thriving place, the deterioration of the port, and the wretched state of its means of communication with the interior, must have operated powerfully to produce such a result.

The new anicut, now under-construction, across the Kistnah River, at Bezwarrah, will afford the means of easily improving the port, for it will give a permanent flow of water, which, judiciously managed, will speedily lower the bar. It will also greatly increase the exportable produce of the country, of which Masulipatam is the natural outlet, and it will supply water communication throughout the Delta. It is much to be desired, therefore, that the important object of improving the port should not be lost sight of. Masulipatam is even now a place of considerable trade for the Hyderabad country; and with its accommodation improved, with a good road to Hyderabad and Ellore, and with the great advantage of inland water communication, it may confidently be expected that it will ere long regain much of its former prosperity.

Means of restoring it.

441. The next harbour which we will notice is that of Negapatam in the Tanjore District. This port is formed by three streams which there fall into the sea, being the drainage of a large expanse of irrigated rice land. It is a place of active trade, being the chief place of export for the grain of the Tanjore country to Ceylon and elsewhere, and many vessels of small size are built and repaired in the river. The trade of the port has increased greatly of late years, and the Customs revenue amounted in 1849 to Rs. 87,000, and is no doubt more now: in the year ending 31st July 1850, 550 vessels visited the port, with a tonnage of 30,409 tons.

Negapatam harbour.

This harbour, like those already noticed, has undergone much deterioration, by the filling up of the basin and the shoaling of the bar, the most active cause being the diversion of a portion of the largest of the three streams very many years ago, which diminished the scour. Being the head station of so important a province, this place has been fortunate in obtaining somewhat more attention than most of the other ports; and in 1845 some measures proposed by Captain E. Lawford, the Civil Engineer of the division, for arresting the progress of deterioration, received the approval and sanction of the late head of the Government. The chief of those measures was a straight cut to bring back the stream above alluded to into the harbour, and in a direct course; and with this some minor works were combined, for concentrating the effects of this scour and giving them a right direction. These works were gradually executed in the course of the years 1846 to 1849, at a total outlay of Rs. 9,010 (901*l.*); and in the early part of 1849 the Civil Engineer reported their complete success so far, in deepening the harbour and the bar, and the certainty that the effect would be the permanent improvement of the port to the great advantage of the trade; and the Government acknowledged the result of the expenditure to be "very satisfactory."

Its deterioration; some remedies successfully applied.

442. On the 30th May 1850 Captain Lawford proposed some further work to the port, at the small expenditure of Rs. 2,635, the object being to deepen a part of the harbour, so as to provide more room for vessels under construction or repair, as well as for vessels entering the port for shelter in the N. E. monsoon, and so to leave the main channel clear of these obstructions.

Further inexpensive measures proposed, but refused by Government.

The reply of the present Government to this application, which went up with the recommendation of the Board of Revenue, was an inquiry whether the ship and boat-owners and builders of the place would contribute anything towards the improvement, or would pay a fee for the use of docks in the harbour. Those parties, when called upon, were unwilling to contribute towards the expenditure, but expressed their readiness to pay a tax of one anna on every Rs. 100 value of imports and exports, which would yield a sum of from Rs. 1,200 to Rs. 1,500 a year on the existing trade. The Collector recommended that the proposal should be accepted rather than that any fee should be levied on the docks, which were formed wholly by private outlay; and the Board, in supporting that recommendation, again solicited sanction for the trifling sum, 263*l.* 10*s.*, before applied for. The Government refused this application. No reason is assigned, nor is it easy to supply any; for all and more than all that the Government can be supposed to have aimed at in asking for local contributions, had been willingly given by the people. They had declined, indeed, to pay down any part of the expenditure

beforehand; but they had voluntarily tendered a contribution, which would have repaid in two years the whole of the very small sum required, and would have supplied a permanent and growing fund for further improvements. This, however, was not approved, and the port remains in its former condition.

The reasons of that refusal.

443. It does not appear to us singular that this call upon the people of the place to provide a part of the outlay was not responded to. The calling of those people is to make money, and that by certain customary means; it is true that the measures proposed promised to increase their opportunities of making money, but it was indirectly, and by a species of enterprise into which they had never yet entered. It is not fair to expect largeness of view from men of that class. The interests of the Government also were intimately involved in the measure, and, probably on the whole, they would gain quite as much as all the mercantile class taken together; yet they shrank from the petty expenditure required, and it does not appear how they were entitled to look for more comprehensive views in the traders of the port.

Indeed, the proposal was one which probably would not have found acceptance with communities much more wealthy and enterprising. When private capitalists or corporate bodies undertake the improvement of ports, the formation of docks, &c. in England, it is in expectation of direct return in the form of tolls or dues, rarely on the mere general expectation of sharing in the common gain of increased convenience. In the present case the Government were to engross all the direct gain accruing through the increase of port dues, while they called upon the local community to furnish funds for the expenditure.

Cuddalore and Porto Novo harbours: both much shallowed of late years.

444. We will next notice the ports of Cuddalore and Porto Novo, both in the South Arcot District. These are similar in character to Negapatam, but perhaps of greater capabilities. Porto Novo is at the mouth of the Vellour, a river of considerable size; and Cuddalore is at the mouth of a smaller river, but upon an extensive backwater. Both have suffered much from the unopposed action of the same causes already noticed as in operation in the other ports which we have named. Neither of them, however, appears to have obtained much attention till lately; but both the Collector and the Civil Engineer have now written urgently to the Marine Board, representing the decided deterioration of both harbours, and the pressing necessity for some measures to arrest the progress of the damage. At Porto Novo the merchants have also made loud complaints on the same subject. We have already, in our sixth section, in speaking of the Chellumbram and Manargoody talooks of South Arcot District, mentioned the deteriorated condition of the harbour of Porto Novo as one of the causes of the unsatisfactory state of the land revenue of those talooks.

Easy means of improving them.

445. Captain Lawford has examined both that port and Cuddalore, and he expresses the decided opinion that both may be made very good harbours for vessels, and that the communication with the shipping in the anchorage may be very much facilitated. The means by which he proposes to effect this are the same which had been applied under his advice to the port of Negapatam, and with such satisfactory results so far as they were used; viz. by concentrating the land floods, and the formation in each case of a deep unobstructed tidal reservoir, with a jetty or groin for the purpose of continuing the action of the flux and reflux into sufficiently deep water. There is already a canal from the lower Coleroon anicut to Porto Novo, as we have before noticed; and by means of this the water of the Coleroon river may be used as a scour at that port; and Captain Lawford proposes to excavate a canal from Porto Novo to Cuddalore, by which not only the harbour at the latter place may be improved in like manner, but a valuable extension of the water carriage will be obtained. As a matter of course the present extremely defective condition of the first mentioned canal, spoken of above, must be improved.

Both Cuddalore and Porto Novo were formerly places of considerable trade, of which but little now remains. There can be no doubt that if the harbours are improved, and if the communications between these places and the interior of the country is opened, as we have endeavoured strongly to urge that it should be universally, the commerce of both places will again become large. In the year ending 31st July 1850, the number of vessels that visited Cuddalore was 167, with a tonnage

tonnage of 11,806 tons; and the number visiting Porto Novo was 162, measuring 8,040 tons.*

446. The next place which we will mention is Cochin, which next to Coringa, is by far the most important harbour under this Presidency. Cochin is situated at the outlet of a river, within the mouth of which is an extensive basin, having a depth of from 24 to 42 feet, and connected with backwaters and inlets, which give it the means of inland navigation in three directions; viz., southward to Quilon 80 miles, northward to Chowghaut 50 miles, and eastward or directly inland, 30 miles. We have already noticed that a project for connecting these backwaters with those of Malabar, by a cut 15 miles in length, and to cost only Rs. 8,995, was disallowed by the Government in 1849. That work, whenever carried into effect, will extend the water communication of Cochin northward to a distance of 130 miles. Thus, this place is admirably fitted to become an emporium of trade, the centre of a fertile country, with an extensive inland water communication, and immediately contiguous to the teak forests of the Annamalay Hills, full of some of the finest timber in the world. Even now its trade is not inconsiderable: in the year ending 31st July 1850, it was visited by 421 vessels paying port dues, having an aggregate measurement of 33,841 tons; and the vessels exempt from port dues were about equal in number and tonnage.

Cochin harbour; its great natural advantages.

The vicinity of the forests also especially adapts Cochin to ship-building, and it has even already gained a considerable business of that kind. Ships of 700 to 800 tons are frequently built there, and vessels measuring as much as 1,000 tons have been launched, though vessels of this large size cannot easily be got over the bar, even when entirely empty. Lastly, it is excellently situated as a port of shelter in the south-west monsoon. At present there is not a single port of shelter in the south-west monsoon, between Cape Comorin and Bombay, and the vast importance of forming such an harbour has long been felt; that of Cochin is admirably suited to meet this want.

447. The value of the port is very much diminished however by the shallowness of the water on the bar: and it is there that the chief improvement is required. The discharge of water during freshes in the river is so great, and even at other times the ebb tide is so strong from the great extent of the inner basin, that the horse-shoe bank usually found at the entrance of Indian rivers, is a mile and a quarter out at sea, where there is no more than 15 feet at low water in the deepest channel; and at present, consequently, few vessels enter the basin exceeding 250 or 300 tons, except for repair. The bar and the whole harbour have recently been carefully examined by Lieut. Selby, of the Indian Navy, and he has given it as his decided opinion that by means of dredging, a channel may easily be formed and kept always open across the bar, to 19 or 20 feet; and this with a rise of tide of from three to four feet, would enable vessels of a large draught of water to enter the basin. Hitherto nothing has been done to improve this very important port, and it is earnestly to be desired that it should no longer be neglected.

The water on the bar ought to be deepened.

Abundance of stock can always be got at Cochin at a reasonable rate, and the only drawback is the want of good water, which cannot be obtained nearer than 21 miles distant. At no remote time it may be worth while to bring the source of this necessary article nearer to the port. Up to a very recent period the master attendant monopolized the privilege of supplying water to the shipping, and charged an enormous price for it; this very objectionable practice has now been properly prohibited by the Marine Board, and it is to be hoped that the prohibition will be strictly enforced.

448. Madras itself, as is well known, has no harbour or shelter for vessels of any burden, but merely an open roadstead. The anchorage is good, and vessels lie there

Madras roads; a breakwater and a pier required.

* As an example of the great importance of taking advantage of and improving the existing facilities for water carriage, we may quote the conveyance of granite from Trichinopoly to Tranquebar, for the construction of groins on the sea beach. The distance between the two places in a direct line, is 78 miles; by the windings of the river, it is probably 100. The stone was conveyed in basket boats on the river, by contract, at the rate of Rs. 3. 2. a ton, being 6 pice per ton per mile on the distance travelled, and 7½ pice per ton per mile on the direct distance. By land carriage it is very improbable that the cost would have been less than 3 annas a ton, and the actual charge on the direct distance was little more than one-fifth of that. And yet the water carriage was effected under the very great disadvantages of a river entirely unimproved, and of a species of boat almost the worst adapted of any ever invented for the conveyance of heavy commodities.

there securely except in the case of those very violent gales which occur every three or four years, at the commencement of either the S. W. or the N. E. monsoon. At such times it is usual for European vessels, being duly warned by the barometer, to put to sea; but still wrecks are not unfrequent, with melancholy loss both of life and property; and the coasting craft are often lost in great numbers. Various plans have been brought forward both for constructing a breakwater to shelter the anchorage, and for a pier to facilitate the communication between the shore and the shipping, but hitherto nothing has been done. There is no doubt, however, that both projects are quite feasible and at a cost insignificant in comparison with the advantages; and it is much to be desired that they should be effected, either by private enterprise or under the auspices of the Government. The trade of the port is fully sufficient to justify such an undertaking, and there is no doubt of its increasing with the progress of those improvements in the internal communications of the country, which we have advocated. In the year ending 31 July 1850, the number of vessels that paid port dues at Madras was 1,253, with an aggregate burden of 2,13,687 tons; the amount of the port dues was Rs. 36,762. 3. 2.

The improvement of the ports is very important.

449. We have noticed these few cases as instances of what is required; and we believe, that if carefully examined, very many of the ports all along the coast will be found susceptible of improvement at a moderate cost. Of late years something has been done in the way of lighting ports and the coast, but the lights are still very deficient in number, and almost all of them of an inferior description. The little that we have said is sufficient to justify the statement that the very important object of facilitating trade and navigation by improving the harbours, has been more neglected and been regarded in a more contracted point of view than even the irrigation works and the roads; we trust that a change may now take place in the disposition of the Government towards this subject. The prosperity of the revenue is in fact very intimately involved in it. The connexion of Government with the question is not by any means limited to the amount of the port dues, or even of the customs duties; the whole land revenue will feel the influence of measures calculated to remove disabilities from commerce.

A special fund for that purpose exists.

It is the more singular that so little has been done in the way of improving the ports, because a special fund exists for lighting and otherwise improving them, and that actually contributed by the trade itself. Act 13, of 1839, which consolidated the port dues at Madras, and provided for the consolidation of those at the outports, materially increased the rates in both cases; and the additional revenue secured by these enhanced rates was to be laid out in improvements. In point of fact, however, the expenditures have been very small, and exactly the same unwillingness to incur outlay on improvements has been displayed, as seen in the cases of Coringa and Negapatam above spoken of, as if the money had been to come out of the Government exchequer, instead of from a fund specially contributed for this very object by the trading classes.

Its origin and present amount.

450. The Act above specified came into operation at Madras on the 1st August 1839, but it was not extended to the outports till the 1st August 1845, after being tried during the interval at the Presidency, and found to answer well. All the surplus accruing under the new rates, in excess of the average yearly collection in the three years immediately preceding the introduction of the Act in each case, was to be devoted, in the words of the Honourable Court, to "the construction of lighthouses, and affording other facilities to navigation" (Despatch, 13 May 1840). We find, from tables obtained from the Marine Board, that up to the end of the year 1850-51, such surplus receipts amounted to Rs. 1,90,296. 8. 8., while the sum expended on improvements was no more than Rs. 27,351. 1. 2., leaving an unexpended fund of Rs. 1,62,945. 7. 6.

This fund ought to be used instead of being idle in the Treasury.

Under the pressing necessity that exists not only for the improvement of the harbours, but even to arrest their decay, it appears most undesirable that this fund should thus be suffered to accumulate. We beg strongly to recommend that it should be laid out without delay in the measures most urgently required at the various ports of the coast; among which those proposed by Colonel Cotton for immediate adoption at Cocanada and Coringa, and the trifling expenditure refused by Government to Negapatam, ought undoubtedly to have a place. But for the permanent improvement of the ports, we would earnestly advocate the general adoption of the plan proposed by Colonel Cotton; viz., that of raising a capital for the improvement on the security of the port dues; by which means the measures so urgently required would be effected with the aid of the skill and educated judgment

judgment which only the officers of Government can supply, but without any charge to the Government.

451. The merchants and shipowners of the various ports are quite awake to the necessity of stopping the injurious action of natural agents, and removing existing inconveniences; and, as exemplified in the case of both Coringa and Negapatam, we believe that they would universally be found cordially willing to pay an increased rate of port charges, if that should be found necessary to secure the required funds. And undoubtedly they are wise, because, as already observed with reference to the roads, the very improvements themselves will, as their natural result, repay their cost. For, to take only one single instance; we have mentioned above that the bank in front of Coringa has extended so far, that it always takes a boat one whole day, or at times two or three days, to make one trip to a ship in the anchorage; now if the expenditure of a few thousand rupees would have the effect, as there appears no doubt it would, of reducing this time to two or three hours, who does not see that this saving of time and expense would provide ample funds to pay additional port charges?

The native commercial classes would pay higher port charges to obtain such improvements.

But though willing to contribute in this very effectual way to the improvement of their harbours, these people are powerless to carry out such improvements themselves. They have but little capital, and that little is fully employed in their own legitimate callings; they are wholly unaccustomed to act in combination in such undertakings, and they have not the necessary confidence in each other; nor can they command the skill necessary both to devise and to superintend such works, which, as we have already observed, is possessed by the officers of Government alone. It cannot be doubted that the revenue will gain largely by these measures; and on every account it is proper that the Government should not stand aloof from this important class of operations, but should give assistance; that assistance involving no expenditure, but consisting simply in raising money on the security of the port dues (already devoted to local objects) and in giving the counsel and advice of their Engineer officers.

But they are unable to act without assistance.

452. There are a few other points which we will notice before quitting this subject. The first is the absence of any fixed system in dealing with plans for improving the ports. Measures connected with the lighting and providing buoys, seem all to come through the Marine Board; but of the propositions for clearing obstructions from the harbours, &c. only a few come up to that Board, and the greater part of those that have come up hitherto have reached the Government through the Board of Revenue, without the cognizance of the Marine Board at all; this appears decidedly objectionable. The Marine Board controls the Port Establishments, and alone receives returns of the shipping, port dues, &c., and that Board is almost necessarily better qualified than any other Presidency authority, to judge of the merit of any improvement proposed. We think, therefore, that although such work is executed at present under the direction of the Public Works Department of the Board of Revenue, and will be so hereafter under that of the Board of Public Works, yet that the opinion of the Marine Board ought invariably to be obtained on all projects of improvement to the ports; had this been done in the cases of Cocanada and Negapatam above referred to, the existence of a large sum of money specially available for such improvements would no doubt have been brought to notice, and Government would probably have been saved from refusing aid for want of local contributions, when there was at the very time a fund in the hands of the Government itself, contributed by the classes concerned for the very purpose in view.

There ought to be some established system for the conservation and improvement of the ports.

We would also suggest that the Marine Board should be required to report annually to Government on all the ports under this Presidency, noticing their condition as to the accommodation they afford to shipping; their state, whether improving, or deteriorating; the amount of their trade; the improvements of which they may be susceptible; the result of past expenditure, &c. The Board might also be properly required to keep an account of all expenditures connected with the ports, as well as of all receipts and returns for expenditure in any shape, and lay both before Government with their annual report.

The Marine Board should make an annual report to Government.

453. Another point which we wish to notice is the very niggardly scale of the allowances of the Master Attendants. At places like Coringa and Cochin, with an active and increasing trade, much must depend on the efficiency of the Master Attendant's Department, and if that officer himself is an active and energetic man,

The emoluments of the Master Attendants are too small.

he may be the means of very much good; but the present salary of only *Rs.* 105 a month, is quite insufficient to command such qualities. The constant resort of European shipping to the port, not less than the other requirements of the office, makes it absolutely necessary that the Master Attendant should be a European; but a competent man of that class cannot be expected for so small a salary. It was the inadequate amount of his salary which drove the Master Attendant at Cochin to the objectionable means of augmenting his emoluments, to which we have adverted above. Some time ago the Madras Government recommended to the Government of India that the salary of the Master Attendant at Coringa should be raised to *Rs.* 200 a month, the amount already paid at Tuticorin; to this application no answer appears to have been yet received. Even *Rs.* 200 appears inadequate; and the increase ought not to be confined to Coringa, but should be extended to the other ports having Master Attendants; viz., Masulipatam, Cochin and Tellicherry. If the officers holding the appointment of Master Attendant were made efficient, they might be usefully employed in various ways in connexion with the interests of navigation; they might make accurate observations as to tides, winds, storms, and changes in the form of the coast, or of the banks in or near the harbours, and keep registers of all such phenomena; they might also survey the harbours and coasts contiguous to their stations, draw up sailing directions from time to time, examine and report on pilots, &c. In 1837, the Marine Establishments at most of the out-ports were reduced almost to nothing; it may well be considered whether the interests of commerce, and therefore those of the Government also, as involved in them, do not require that those establishments should now be increased. Tuticorin, with a trade of 14,000 tons annually, has a Master Attendant; but Cannanore, with 22,000 tons, Negapatam, with 30,000 tons, Calicut, with 34,000 tons, Mangalore, with 38,000, and Coompta, with 45,000 tons, have no Master Attendants, and generally only one or two Lascars to attend to the lights. It may be thought good economy to dispense with Marine Establishments at all these and other places; but we are persuaded that it is so no otherwise than it would be to abolish all Collectors of Revenue. Such an opinion emanates from the same feeling on which we have already remarked when speaking of "Superintendence," which looks at the mere out-going only, and takes no enlarged view of the services obtained in return.

Legal power for the regulation of the ports is required.

454. Another important requisite is, that proper officers should be vested with power to prevent and to punish wilful injury to any port or anchorage, and to enforce the removal of obstacles, such as sunken vessels, &c. At the present time there is no authority competent even to prevent a vessel from emptying ballast in a harbour or roadstead, except at the single port of Madras. In the extract quoted above in para. 428, reference is made to two heaps of ballast thrown over by some vessel in the Coringa roads and the mouth of Godavery, and forming serious obstacles to navigation; there is no officer empowered to prevent such offence, or to enforce the removal of the nuisance, and it is probable that acts of this kind may have contributed in no small degree to the shallowing of many of the harbours.

The attempts of the Madras Government to obtain such power.

The history of the endeavours made by the Madras Government to obtain power to prevent such offences, well exemplifies the mode in which the interests of this Presidency suffer from their state of dependence on a distant and indifferent authority. On the 25th October 1842, the Madras Government sent up to Calcutta a draft of an Act for preventing and punishing the throwing over of ballast in the inner harbour of Mangalore. The Government of India objected to such partial legislation; and ultimately it was resolved to extend the Act to other ports, and on the 31st May 1843, a list of those to which it ought to be extended was sent up to Calcutta. In November 1848, the attention of the Government was recalled to the subject by a letter from the Marine Board, bringing to notice the necessity of putting a stop to the dangerous and injurious practice of throwing over stone ballast in the harbour of Tuticorin. The Government forwarded the papers to Calcutta, and requested that the proposed Act might be passed as speedily as possible. In November 1849, the same evil was again pressingly brought before Government; and on the 4th December the Government of Bengal was again requested to hasten the enactment; on the 4th April 1851, this request was urged a third time, and lastly on the 10th February 1852, and all without any effect.

The Act then applied for was defective.

455. Thus the draft of this law, which appears to be simple and easy to decide upon, has been before the Government at Calcutta above nine years and a half; and

and four times since it was first sent up it has been pressed on their attention as urgently required; and yet, up to the present time, not only has the Act not been passed, but we believe not a single word of reply or acknowledgment has been elicited.* We may observe that the draft Act appears to us defective. It specifies certain ports where it is to be applicable; but the inconvenience of this restriction is proved by the fact, that within a very few years (viz. in 1848), it was necessary to add the names of two other ports to those first proposed, viz., Tuticorin and Tranquebar; it would surely be better to make the Act general, and to empower the Madras Government to declare, from time to time, to what ports it should apply.

So also it is not sufficient merely to forbid the throwing over of ballast, there are various other things which need to be prevented or enforced in a well-regulated port. It seems highly desirable that a general Act should be passed, empowering the Madras Government to enact bye-laws for the regulation of the ports and the navigation, under the sanction of penalties to be defined in such general Act. This power is possessed by every little corporation in England, and appears essential to good order here; with an increasing trade the present absence of the power of control would be found intolerable, and probably a careful inquiry would exhibit no small amount of evil and of obstruction to trade, as its consequence even now.

456. It is necessary also that proper measures should be taken for preserving the ports and basins and navigable rivers from encroachment and obstruction of all kinds. The limits of the ports should be defined, and the space adjacent to be kept free from private appropriation should be marked out. The ground necessary or likely to be eventually necessary, for the construction of wharves, docks, jetties, &c., should be reserved to the public; and no one should be allowed to acquire a private interest in such spots; at least not by mere occupation or prescription, or without a deliberate grant or cession by the Government. When trade increases, as there is every hope that it will do if the existing impediments to locomotion and transport of goods are removed, land in such a situation will become valuable, and parties will be constantly on the watch, according to the universal practice in this country, to exercise rights of ownership over portions of it, and so establish a title. Not only must it be declared that titles so founded are and will be invalid, but strict watch must be kept up against the very commencement of encroachment; otherwise much trouble and difficulty will be encountered.

Measures should be taken for preventing encroachments and unlawful appropriations of land at the various ports.

The last point that we will notice, is that some of the ports are inadequately provided with boats and other means of assisting ships. Lieutenant Selby mentions that even at Cochin the Master Attendant has no boat capable of taking out an anchor; and that in the attempt to take one to a ship that had grounded in April last, in two of the largest boats of the place, the whole party would have been lost but for the assistance which he was able to render.

The ports are inadequately provided with boats, &c.

457. Though not coming under the term port, we will here briefly notice the Paumbam Channel and the improvements effected in it, because the result shows conclusively that measures for facilitating intercourse are not thrown away in this country. The Paumbam Channel is the principal of the passages through the line of rocks and sand banks which connects the island of Ceylon with the main land; and for the purposes of commerce the only passage. It avoids the sand banks, and passes through the solid rock barrier. In 1829, the passage and the adjoining localities were closely examined by Major Sim of the Engineers, with a view to the improvement of the channel, agreeably to a recommendation to that effect which had been made by the Marine Board. It was a point for consideration whether the operations should be directed to the deepening of the existing channel, or whether an entirely new cut should be made through the spit of land which juts out from the main land. The former course was resolved on; it was that which promised the more immediate results; though for its full completion likely to be more tedious than the other. In 1836, the Honourable Court approved the decision; and an officer was then placed in charge of the work, and active operations commenced.

The Paumbam Channel.

458. In

* The above is not the only instance afforded by the records of the Marine Board of such indifference to Madras concerns. In August 1840, this Government sent up to Calcutta, draft of an Act for regulating the pilots in the Paumbam Channel; and later in the same year another draft Act, drawn up at the suggestion of the Supreme Government, for the regulation of emigrant vessels. No notice appears to have been yet taken of either of these subjects, though three years have elapsed.

Improvement
affected in it.

458. In 1828, the channel contained obstructions, having no more than five and a half feet of water over them at high tide, and except in the finest weather, no vessel drawing more than four or four and a half feet attempted the passage. The operations have continued from 1836 to the present time; they have consisted partly in blasting the rock under water, and partly in dredging a passage through the horse-shoe bank opposite the southern entrance of the passage. The present state of the channel is as follows: the passage through the rocky ridge is now 200 feet broad, and of that width 100 feet is 10 deep at low-water spring tides, except in a few parts where it shallows to 8½ feet; the channel over the bank has been dredged to 10 feet deep, and shows no tendency to fill up. The tide rises 2¼ to 3½ feet, and vessels drawing 10 feet water now pass through the opening without difficulty. The total expenditure on the work up to the 30th April 1851, including the cost of the dredge, was about Rs. 1,53,000; and it was then computed that it would require a period of two and a half years, and a further outlay of Rs. 12,000, to complete the Northern Channel, viz., that through the ridge, to a depth of 10 feet throughout at low-water spring tides.

The results.

459. The results of this improvement are highly satisfactory: in 1834 the total tonnage passing was only 30,000 tons; in 1851, it was 1,68,282 tons, being an increase of five and a half fold in 17 years, and the progress was nearly steady throughout the whole period. And even this does not by any means fully represent the whole increase; for in 1834, the cotton of Tinnevely passed through the channel, being taken to Madras in dhonies, and there screwed and shipped; now there are cotton screws at Tuticorin, and the cotton is shipped direct from that port for the foreign market, and does not go through the Paumbam passage at all.

And concurrently with the increase of tonnage, a gratifying change has taken place in the construction of the coasting craft; the awkward dhonies having been in a great measure superseded by square rigged vessels. In 1834, the only vessels that passed were 738 dhonies; in 1851, there were 959 dhonies, and 1,092 square rigged vessels. Between 1839 (the first year for which we have detailed accounts) and 1851, there is a material decrease in the former class, viz., from 1,148 to 959; while the latter had increased in number from 195 to 1,092, and in tonnage from 10,728 to 111,398 tons. These results of both kinds are a very gratifying proof that the natives of this country are not so backward to avail themselves of improvement or to adopt beneficial changes, as they are sometimes represented; and they afford strong encouragement to the universal improvement of the means of communication. A native pilot establishment is maintained at Paumbam, and a pilotage fee is levied, of which one-fourth is paid to the pilot employed, and the remainder goes to Government. The amount of pilotage fees in 1849 was Rs. 7,921. 6.

The Report of the
Marine Board.

In their general report of the 3d October 1848, the Marine Board describe these results in the following terms: "As a natural sequence to these extensive improvements, the trade through the Paumbam Channel has gradually acquired a vigour which has, in the course of 13 years, more than quadrupled its former amount, and the annexed statement not only exhibits the progressive increase in the quantity of tonnage passing through, but shows that a superior description of vessel is being thereby brought into action. As long as the passage from the Coromandel to the Malabar coast, on the west side of Ceylon, was confined to one voyage in the year, the dhoney, a very frail description of craft, was in general favour as being less expense, and as easily sailed with a fair wind as any other; but now that the communication renders the passage practicable at all seasons, this is giving way to the more substantial brig and schooner, able to work down the gulf of Manaar against the south west monsoon, a feat which 50 years back few English ships would attempt. These are built by natives at Cochin, Negapatam and Nagpore; most are of teak, and many of them coppered, and being generally commanded and manned by natives, afford an interesting specimen of their advance in the science of navigation."

Estimate of the
value of the in-
creased traffic in
figures.

460. We will endeavour to give some idea in figures of the value of this increased traffic, viz., 1,68,000 in 1851 against 30,000 in 1834, or 1,38,000 tons increase. The traffic is between Madras and other ports north of the passage on the one hand, and Ceylon, Tinnevely and the Western Coast on the other. A very large part of it is between Columbo, in Ceylon, and Negapatam in Tanjore. If we take the average distance passed over at 300 miles, a very moderate estimate, the cost of freight, calculated

calculated at three pice per ton per geographical mile, will be about Rs. 4½ a ton, and allowing that one-fourth of the whole tonnage is without freight, it will give Rs. 5,30,000 per annum as the amount annually paid for freight. Now it is certain that the value of this transit must be much more than this amount, as goods are of course not moved unless there is a profit upon moving them. We therefore know that the advantage obtained by the community from this trade cannot be less, but that it must be much more, than 5½ lacs a year. Of the advantage of conveying the goods at different seasons, when they could not be moved in the former state of the pass, of course it is impossible to estimate the value in figures, but it must be immense. To convey 1,38,000 tons of goods 300 miles by land in the present state of the communications, would cost fully 77 lacs. The sum expended in improving the passage, including the steam dredge, has been 1½ lacs; and the charge upon the state is thus only Rs. 7,500 a year, being the interest of the capital expended, for a benefit to the community of certainly much more than five lacs and a third annually.

SECTION VIII.

Proposed Scheme of Expenditure on Works of Irrigation and Communication.

461. IN the foregoing two Sections of this Report it has been our endeavour to show that expenditure by Government on Public Works is not profitless waste, but that whether it be directed to the extension and maintenance of irrigation, or to the effective improvement of the means of communication, the outlay is abundantly returned, directly in the former case, more indirectly in the latter, and with enormous profit. This is opposed to the view practically acted upon by the Government; for though the ruling powers recognize in general terms the policy, and perhaps even in some degree the duty, of undertaking such improvement, yet with a few noble and magnificent exceptions, they have always been most grudgingly conceded, in this Presidency at least.

The expenditure on public works has been increased of late years;

We cheerfully acknowledge indeed that a material change in the views taken of this important subject has gradually supervened, and that compared with the earlier times of British rule the policy is now liberal. We have seen that in the early parts of the present century the roads were utterly neglected, and that, so late as 1831, a deliberate resolution was recorded by the Government, withdrawing from all further attempts at amending the wretched communications of the country; while now we have a sum of four lacs a year set apart for the maintenance and improvement of the principal lines, and sums not inconsiderable in themselves have been granted for other roads. Again, as to irrigation works: in the early times of our power these were totally neglected; by slow degrees, and after a very heavy sacrifice both of Government revenue and private property for many years, the value of these works came to be more justly appreciated; the expenditure upon them, and the attention paid to them have therefore gradually increased, and quite recently two magnificent works have been undertaken, viz., the anicuts on the Rivers Godavery and Kistnah, and the systems of channels and other works in connexion with them.

462. All this improvement we fully admit; but at the same time we feel compelled to maintain that the outlay even now is petty, compared with the object and the opportunity. The splendid instances which we have quoted are only exceptional; the general tone of feeling in the Government is still narrow; there is still the same confined view of the field of operations; still the same feeling, clearly apparent, though not avowed, that every outlay is an evil, no matter what and how great is the benefit to be so secured; still there is the narrowest and strictest economy in refusing trifling outgoings from the Treasury, combined with the same practical disbelief, as of old, in those general truths which point to the sure means of vastly augmenting the income.

But is still far too small.

It has been our endeavour to combat such views; to show that the expenditure both on irrigation works and on roads has been and still is far too small, and that, as a consequence, the revenue has suffered, and the advancement of the country been greatly retarded; and by setting forth the actual results of those cases of improvement of both kinds, in which a more active course has been adopted, to show how truly wise a more liberal expenditure would be.

We now proceed, according to our plan already announced, to state the amount which a careful consideration of the circumstances of the country leads us to propose for the annual expenditure both on works of irrigation and on roads.

Proposed expenditure in maintaining the works of irrigation.

463. We will first consider the amount proper to be annually devoted to the maintenance and improvement of irrigation works. The revenue actually received by Government from land irrigated by the Government works amounts to 135 lacs of rupees yearly; and that alienated in the form of land situated under Government irrigation works, granted on rent free tenure, the irrigation of which the Government is bound to maintain as much as if the revenue were actually payable to itself, may be taken at about 15 lacs, making a total of 150 lacs yearly; and it seems unquestionable that if the existing works were kept in full efficiency, the revenue from them would be materially higher. The sum now expended annually on their repair and maintenance is about seven lacs of rupees; but this is certainly too little now. It would probably be sufficient if the works were once brought into good order; but notoriously, and on the evidence adduced above, they are in general much out of repair, and a considerable expenditure is required to bring them to a proper point of efficiency, so as to yield a maximum return. Supposing it to be resolved, as on every account we trust it will be, that the works are to be efficiently repaired, the question as to the amount to be annually expended on that object is one of time as to the results, and of capability of spending the money to advantage. Looking at the whole subject, considering the other works to be undertaken, the means of superintendence likely to be available, and the quantity of labour to be obtained, we would propose 15 lacs yearly as the usual expenditure in maintaining existing works, and bringing them into an efficient condition, including the furnishing them with proper sluices and calingulahs, improving their sources of supply, and other minor and ordinary improvements.

Fifteen lacs of rupees steadily laid out every year on these objects, under able and judicious direction, would soon produce a marked effect. On the one hand the revenue from the works would increase; and on the other the works thus put in good order would require very little annual repair, and the charge on that account would thus progressively decrease. This proposed expenditure would be 10 per cent. on the present revenue from irrigation; but this rate would be gradually reduced as the effect of the improvement became apparent, and as the whole number of works in efficient repair became larger year by year; and when all shall have been brought into that condition, the cost of keeping them in order will be much less.

The tank fees.

464. In connexion with this part of the subject we may here briefly advert to the "tank fees." It has been usual to regard the cost of maintaining the works of irrigation, as a charge on the revenue; and it has even been represented as a part of the cost of collecting the revenue.* It cannot be included in the latter without a perversion of language and confusion of ideas; and it is certain that it is not even a charge on the revenue to the extent commonly supposed; and it is doubtful whether it is so at all.

The native princes who constructed the tanks and channels of irrigation, knew quite well that from their very nature they must stand in need of constant repair. They

* Among the Papers printed by order of the Committee of the House of Commons, on East India Affairs, in 1861, is a Minute by Mr. H. T. Prinsep, on the finances of India, dated in November 1842. At page 40 is a table, purporting to show the charges of administering the land revenue under each of the four Governments of Bengal, Agra, Madras and Bombay. In each of these four cases, the charges include large sums for one or more of the following items; viz., pensions, poolbundy, revenue surveys, canal charges, or tank repairs. Under Bengal, Agra and Bombay, all those charges are classed as miscellaneous, and there is a note carefully stating the amount of each of those items; under Madras, on the other hand, not only the similar charges, viz., those for pensions and tank repairs, are placed under the head of "Native Deputy Collectors," instead of under "Miscellaneous;" but there is not a word of explanation to show their amount or their real character; on the contrary, the large amount of the charge just shown, under the head of "Native Deputy Collectors," is expressly, though most erroneously, asserted by the writer to be owing to the "Ryotwar settlements and system introduced by Sir Thomas Munro;" and the fact is wholly overlooked that the large amounts of pension and tank repairs (about Rs. 9,50,000) are no more properly a part of the charges of collection at Madras than the similar items so carefully excepted at the other Presidencies. Under the present arrangement of the supreme controlling authority, this most erroneous and injurious statement went home to the Honourable Court, without opportunity to any Madras officer to correct it; and, from its being now brought forward without correction or qualification, it has probably been received as truth throughout the last 10 years, and down to the present time.

They therefore made a special provision for this necessity, by subjecting every acre of land irrigated to a special cess for this particular purpose, which was in some instances contributed by the Ryots, and in others in equal parts from the Ryots' share and the Government share of the produce, the revenue being in those times received in kind. We have not the means of determining whether this constitution of things was universal in all the provinces now forming this Presidency; but it certainly prevailed generally throughout many of those in which irrigation is the most common, and it was probably universal all over the Carnatic at least.

After the assumption of the government by the English, it was determined to consolidate all the items, making up the land revenue into a single demand, and for the most part this was a fixed sum in money for each acre or each cawny, the revenue in kind being commuted. In that operation the tank cess was included in the settlement, and was merged in the revenue; and the correlative duty of maintaining the works of irrigation in efficiency was fully recognized on the part of the Government. The only exception to this arrangement, we believe, was Tinnevely, where, though the tank cess was commuted into money, and the proceeds included in the general revenue, a separate account of its amount has always been kept.

465. These facts place the Government in a new position as to the works of irrigation. It now appears that these works are not by any means generally maintained out of the state revenue. As regards a large proportion of them, the Government are in the position of trustees of a special fund, contributed wholly or in part by the holders of irrigated land, over and above, and independently of the Government rent of the land, which latter was at first actually, and still is, theoretically, a certain proportion of the year's produce for the maintenance of those works, originally constructed at the cost of the Government, by which the additional value was given to their property. Or even granting that Government may be regarded as having contracted to maintain the works in consideration of these fees, and so as not responsible for the unexpended amount, even then the condition of their title to the money is that they shall keep the works in good repair. It thus appears that it is not simply a question of policy whether the Government shall keep the works in repair, nor even that there is a merely implied engagement to do so; but that it is a positive and express obligation to be fulfilled in return for an equivalent received. It must be admitted that this duty has not been performed, and private property has suffered great damage in consequence; and it now remains, therefore, to retrieve past neglect, and bring up the works into a state of full efficiency as rapidly as possible.

Those fees are paid to the Government on the express condition that the works shall be kept in good repair.

We have adverted to the fees, to show that it is by no means universally true that the Government revenue bears the charge of maintaining the irrigation works; but even if it did, there are valid grounds for urging the complete performance of the task. For, independently of the direct and express obligation, there are two other inducing motives: 1st, the fact that capital has been invested in the irrigated land on the faith of the irrigation, involves a moral obligation to maintain it; and 2d, even if that obligation were disregarded, the motive of self-interest would still remain; for we have adduced many facts in our Sixth Section to show how intimately the prosperity of the revenue is connected with the efficient condition of the works of irrigation. And in this respect, this Presidency differs from almost every other part of India, for every improvement or extension of irrigation here, adds to the revenue by what may be called a natural process; while Poolbundy, and some other similar expenditures elsewhere, though incumbent in fulfilment of obligations, and perhaps necessary to the permanent maintenance of the existing revenue, can never add anything to its amount.

466. We propose, then, that 15 lacs a year should be devoted to the restoration and maintenance of the existing works; and the next question is, what sum should be applied to the formation of new works; for, on every account, irrigation ought to be extended. And this question again involves the same considerations as the former one; viz., that of time as to the results and of the means of laying out money to advantage. There is no want of profitable projects to be undertaken, we have mentioned a few, but they do not by any means constitute the whole, or even perhaps the most important. In every district there are favourable openings for such undertakings, and they will be brought forward rapidly as soon as officers shall be available for the important duty of investigation, and the Government shall manifest a disposition to receive such proposals with favour. Looking at the same considerations

Proposed expenditure in extending irrigation by new works.

considerations as in the former case, we would propose that at least seven-and-a-half lacs annually should be devoted to the object of extending the benefits of irrigation; but while proposing this as the usual annual expenditure, we must express our opinion that it would be inexpedient to adhere to the limit too rigidly; latitude should be allowed when any important projects are brought forward, and when there appears reason to believe that more works can be executed. Nothing is gained in such cases by delay, it is only postponing the results, which, on the contrary, ought to be realized as soon as possible. It will be desirable, also, that to a certain extent, at least, the unexpended allowance of one year should be considered as available for succeeding years. This is necessary, indeed, to prevent confusion; it is impossible to determine precisely, beforehand, how much will be spent in any given year out of the amount sanctioned.

Classification and extent of the roads required.

467. Thus the whole ordinary and usual sum proposed to be spent yearly on works of irrigation is 22½ lacs of rupees. We have next to consider what will be a proper amount of expenditure on the communications of the country.

Roads may naturally be divided into three classes: viz., first, the main arteries, such as we have described in the preceding section, which we there proposed to consist of three kinds, viz., those running inland from the coast, those parallel with the coast, and those connecting important posts and places in the interior; and which we have already stated at 7,700 miles, or we may say 8,000 miles. Second, roads connecting towns of inferior importance with each other and with the main lines, and connecting the chief stations of districts with the chief towns of the Talooks, and the chief Talook towns of different districts with each other, where contiguous. We have not the means of stating the probable requirement in this class with any accuracy, but we are not overstating them in fixing them at 20,000 miles. Third, the village roads connecting villages with the towns, or with roads of the first and second classes. It is impossible to state what length will be wanted of roads of this class; it will increase very much with the progress of improvement. But as this Presidency contains 138,279 square miles, with a population of 160 to the square mile, and numbers about 56,000 villages, it cannot require less than 150,000 miles of these village roads.

Comparison with the extent of roads and canals in England.

468. The lengths of road here set down, may appear startling to many who have not much considered the subject; and it seems proper, therefore, to offer some remarks in justification of what we propose, before proceeding further. We will compare the proposed length with that actually existing in England, the only country of which we have the necessary statistics at hand.

We find from McCulloch's statistical account, that England and Wales contain above 23,000 miles of turnpike-road, and 104,000 miles of cross roads and other highways, besides 2,400 miles of canals, and navigable rivers to about the same extent; and, in addition to all this, about 5,000 miles of railways. Even putting aside the railways, we have thus, in the turnpike-roads and inland navigation, 28,000 miles of internal communication, which may be regarded as corresponding to the roads of the first and second classes proposed by us, though in fact very greatly superior to them.

England and Wales contain an area of 57,812 square miles, and, by the Census of 1851, a population of 17,922,768 persons, being 310 to a square mile; the Madras territories measure 138,279 square miles, and, according to the Census also taken in 1851, have a population of 22,281,572, being 161 to the square mile. It is certain that equal areas require more or fewer roads in proportion to the density of their population; but it is also true, that equal populations require more or fewer roads in proportion to the greater or less area of the country which they occupy; and it cannot be considered extravagant to require for this country an extent of main lines of communication, no greater than is found in a country only two-fifths of this in extent, and inhabited by a people less numerous by one-fifth.

Extent of village or cross roads required.

469. The roads which we propose under the name of village or cross roads, may be compared with the "cross roads and other highways" of England, though in truth immeasurably inferior to them, and, indeed, not deserving the name of road at all at present. England having 104,000 miles of such roads, it seems far from exorbitant, in sketching out a plan for internal communications, to assign to this country, with its great extent and scattered population, 150,000 miles of such roads. We know well that there is a great difference between projection and fruition, and that, in the nature of things, it must take many years to create a system of internal

internal communications for a vast country; but we are anxious that at least the realities of the case should be recognized, and that even a beginning should be made in the work. And when we contrast such accounts as the following of the state of the communications in parts of our own country at no very remote period, with their condition now, we are led to hope that a similar period of change may be about commencing in this country also:—

“ In Arthur Young’s ‘Tour in the North of England,’ published in 1770, he gives the following description of the turnpike-road between Preston and Wigan, a spot which is now become a centre for railway operations:—‘ I know not, in the whole range of language, terms sufficiently expressive to describe this infernal road. To look over a map, and perceive that it is a principal one, not only to some towns, but even whole counties, one would naturally conclude it to be at least decent; but let me most seriously caution all travellers, who may accidentally purpose to travel this terrible country, to avoid it as they would the devil, for a thousand to one but they break their necks or their limbs by overthrows or breakings down. They will here meet with ruts, which I actually measured, four feet deep, and floating with mud, only from a wet summer; what, therefore, must it be after a winter? The only mending it receives in places, is the tumbling in some loose stones, which serve no other purpose but jolting a carriage in the most intolerable manner. These are not merely opinions, but facts; for I actually passed three carts broken down in these 18 miles of execrable memory.’—Porter’s Progress of the Nation, p. 296.

“ It is not easy for those accustomed to travel along the smooth and level roads by which every part of Scotland is now intersected, to form any accurate idea of the difficulties the traveller had to encounter in that country a century ago. Roads were then hardly formed; and, in summer, not unfrequently consisted of the bottoms of rivulets. Down to the middle of last century, most part of the goods conveyed from place to place in Scotland, at least where the distances were not very great, were carried, not by carts or wagons, but on horseback. Oatmeal, coals, turf, and even straw and hay, were conveyed in this way! At that period, and for long previously, single-horse traffickers (cadgers) regularly plied between different places, supplying the inhabitants with such articles as were then most in demand, as salt, fish, poultry, eggs, earthenware, &c.; these were usually conveyed in sacks or baskets, suspended one on each side the horse. But in carrying goods between distant places, it was necessary to employ a cart, as all that a horse could carry on his back was not sufficient to defray the cost of a long journey. The time that the carriers (for such was the name given to those that used carts) usually required to perform their journeys seems now almost incredible. The common carrier from Selkirk to Edinburgh, 38 miles distant, required a fortnight for his journey between the two places, going and returning! The road originally was among the most perilous in the whole country; a considerable extent of it lay in the bottom of that district called Galawater, from the name of the principal stream, the channel of the water being, when not flooded, the track chosen, as the most level and easiest to travel in!”—M’Culloch’s Account of the British Empire, vol. II., pages 53 and 54.

470. As we propose that the village roads shall be made by the people, we will say no more of them at present, but confine ourselves to the first two classes of roads; and the cost of those may be computed as follows:—

Cost of the first and second class roads.

FIRST-CLASS LINES.		Rs.
8,000	6,800 miles first-class road, at Rs. 3,500	- 238,00,000
1,200	miles of coast canal and back-water improvements, at Rs. 3,000	- 36,00,000
Total First Class		Rs. 274,00,000
SECOND-CLASS LINES.		
	20,000 miles, at Rs. 2,500	- 500,00,000
Total First and Second Class		Rs. 774,00,000

That is 7,750,000 l. sterling as the cost of forming a system of main roads and canals

Comparison of their performances with those of the common roads.

canals for a country $2\frac{1}{2}$ times the size of England and Wales, and with a population larger by one-fourth. The amount may seem large when looked at by itself, but as the means of attaining an object so vast and so valuable, it must be regarded as quite insignificant. In order to show this more clearly, we will compare the probable performances of both these classes of roads with the cost of the same amount of work on the common unmade roads. We will assume that the average traffic to the mile on the former is 200 tons a day, or 70,000 tons a year, being less than three-fourths of that now actually borne on the Western Trunk Road, though it is almost without branches or feeders; and that the average on the second class will be 30,000 tons a mile annually. The comparison will then be as follows:—

FIRST-CLASS ROADS.	
<i>Annas.</i>	<i>Rs.</i>
$8,000 + 70,000 + 1\frac{1}{2} =$	- - - - - 525,00,000
SECOND-CLASS ROADS.	
$20,000 + 30,000 + 1\frac{1}{2} =$	- - - - - 562,50,000
Total	- - - <u>Rs. 1,087,50,000</u>
Interest of capital	- - - - - 46,40,000
Cost of repair	- - - - - 80,00,000
GRAND TOTAL	- - <u>Rs. 1,213,90,000</u>
COMMON ROADS.	
$8,000 + 70,000 + 3 =$	- - - - - 1,050,00,000
$20,000 + 30,000 + 3 =$	- - - - - 1,125,00,000
TOTAL	- - - <u>Rs. 2,175,00,000</u>
Difference or saving	- - - - - <u>961,10,000</u>

Proposed expenditure on roads.

471. Thus we have in every year a net saving in the cost of carriage, after deducting all surcharges, to the amount of above 960 lacs of rupees, or nearly 10,000,000 *l.* sterling, being a much larger gain in each year than the whole capital laid out in forming the roads, or more than cent. per cent. profit to the community. We are not so sanguine, however, as to expect that this great work can be accomplished within a short period; under any circumstances it must be a work of time, and more particularly in the actual condition of this country, and when the whole has to be effected by the agency of the Government. We are only anxious to point out what there is to be done, and to urge that now at length the task should be entered upon with vigour. With this view we propose that, as a beginning, 20 lacs annually should be steadily expended on the communications, in improving the roads already existing, and in opening new lines; and though this sum seems large, and is truly very much beyond anything ever proposed before, yet we cannot think that any one, duly considering the case, will think it a larger sacrifice on the part of Government, if we can justly regard it as a sacrifice at all, than is required by true wisdom. And large as it seems, it will be many years at this rate before the scanty system of communications which we have sketched out will be completed.

The cost of maintaining the roads.

472. But, besides the cost of formation, it must be remembered that a considerable amount will be required annually for the repair and maintenance of roads. On those of the first class, on which it may be supposed that the traffic will be heavy, probably on an average 70,000 tons a year, the cost of repair cannot be assumed at less than *Rs.* 500 a mile, so that every 100 miles of such road constructed will cost half a lac of rupees annually to maintain; on the second-class roads, with a lighter traffic, suppose 30,000 tons a year, the average cost of the annual repair may be taken at *Rs.* 200 a mile. And if it be thought that these charges appear enormous and exorbitant, let it be remembered that the cost of maintenance varies very exactly as the traffic, so that the larger that item is, the more

more valuable has been the road; and we have shown, in the preceding section, that the value of the use of a good road exceeds, manifold, the cost of maintaining it.*

Hitherto the maintenance of the made roads, so far as they have been maintained at all, has been defrayed by the Government, with trifling exception, and no immediate change in that respect need be made. But when there shall be a large extent of such road that cost will be very heavy; and it will be necessary to consider whether the charge shall continue to fall on the general revenue, or shall be met in any degree by tolls.

473. There is no doubt that a good road provides ample funds for the payment of a toll; this will be evident by a reference to the note to the preceding paragraph, or to the account which we have given above (para. 151) of the reduction of the cost of carriage on the High Western Road. It is seen in the latter that since the Road Department was formed, the cost of transporting goods has fallen about 50 per cent., so that a toll nearly equal to the present hire of a cart might be paid, and yet leave the trader all the benefit of that increased speed, safety, and certainty, which the improved condition of the road ensures. But, in point of fact, a very much lower toll would provide for the maintenance of the road; for the amount of that reduction in the cost of transport, on the 100,000 tons annually carried on the road, comes to the enormous sum of nearly seven lacs of rupees a year; whereas it is computed that if once put in good order, Rs. 40,000 a year would be sufficient to maintain the whole line in its present degree of repair, being only 1-17th of the actual money gain by the road. And taking even the rate of 1½ pice per ton per mile, which the experience of the Agra Trunk Road has found sufficient to maintain a road in perfect order, the cost of maintaining 125 miles for a traffic of 100,000 tons would be only Rs. 97,625, or less than one-seventh of even the present gain in carriage; and that gain, as shown above in para. 423, would be more than proportionately increased by the improvement effected in the surface of the road.

A good road will very well bear a toll.

474. But though it is thus indubitable that tolls might be easily paid for the use of roads, many people are opposed to this mode of providing for their maintenance, from the fear that any power to levy a toll would be made a plea for exaction, and that with the known habitual submission of the people of this country to official oppression, and the assumed difficulty and distance of redress, much more than the authorized amount would be extorted. No doubt there is some ground for this apprehension; and especially so if it is true, as we have reason to believe, that even on the Colombo and Candy road, where there is so much traffic in which Europeans are directly concerned, the tolls are not fairly taken, but exaction is submitted to in order to avoid detention. But even allowing that such a danger exists, we do not think that it is sufficient reason for abandoning the idea of introducing tolls. It seems fair and natural that the repair of roads should be paid for by those who use them, and we believe that the people of this country would pay a toll cheerfully for the use of a good road; and we say this the more confidently, as we have reason to believe, that in Ceylon not only the tolls are willingly paid, but the Poll-tax, so obnoxious at first, is now popular, because it is known that the proceeds are devoted to the formation of roads. Even coupled with a degree of abuse and exaction, we are decidedly of opinion that the introduction of tolls would be an advantage;

Objections made to tolls in this country.

They appear, nevertheless, to be expedient and beneficial.

* This may easily be shown in figures as follows, taking 20 miles of made and of unmade road:—

Cost of carrying 70,000 tons in a year 20 miles on a first-class road,		Rs.
Interest on the cost of making 20 miles (Rs. 70,000)	- - - -	= 3,500
Repairs for one year, at Rs. 500 a mile	- - - -	= 10,000
Cost of carrying 70,000 tons 20 miles, at 1½ anna per ton per mile	- - - -	= 1,31,250
Total - - -		1,44,750
Cost of carrying 70,000 tons 20 miles, on an unmade road, at 3 annas a ton a mile		2,82,500
Difference - - -		1,17,750

Thus there is a clear gain of much above a lac of rupees every year on only this short extent of 20 miles, in a single year; but this does not by any means express the whole effects of the improvement, because it leaves out of sight the great effect of the reduced cost in increasing traffic.

A comparison with the 2d class made road with the unmade would exhibit similar results, but we need not detail it.

advantage; and the danger of such exaction would be reduced to a minimum, by placing the toll-bars only in the vicinity of places where complaints of misconduct could be speedily heard and redressed; and, by having the rates as few and simple as possible, together with the usual precaution of having them publicly notified at every tolling station. For a different reason, those stations which must be few, should be placed where they cannot be easily evaded. On the whole, we are of opinion, that eventually tolls may very properly be made the means of raising funds for keeping made roads in repair; but it is obviously necessary, that before a toll is laid on any road, that road should be placed in first rate order, so that the payers may see at once that they get a full value for their money. Tolls should also be introduced gradually; and for many years to come, and until the extent of roads to be maintained has become very much larger than it is at present, the Government may well be content to bear a large part of the charge of maintaining them. But there seems no good reason why, ultimately, the roads should not pay for their own maintenance in this country as in others; it is to be confidently hoped that in the course of time that characteristic of the people which we have adverted to, as considered by some persons to be a sufficient argument against tolls, will disappear, and that they will learn to resist exaction.

The cart tax in Salem.

475. We may here notice the bandy tax, or tax on carts, existing in the Salem district, the proceeds of which are devoted to the repair of the roads. The origin of that tax, so to call it, is singular. In 1836, Mr. Orr, Principal Collector of the district, who, as already noticed, had interested himself much in the improvement of the roads, forwarded to Government an address which had been delivered to him for that purpose, being a petition from certain bandy maistries and others, praying, that as the roads of the district had been improved, they might also be preserved in repair, and proffering a contribution of one rupee a year for each of their carts, to form a fund for that object; and begging that the Principal Collector might be empowered to collect and receive the amount and lay it out on the repair of the roads, publishing an account of the receipts and expenditure in the Fort Saint George Gazette at the end of each year. It may be doubted how far this petition emanated from the free motion of the parties themselves, and at all events they were very few in number; but its prayer was agreed to by the Government, and the Principal Collector was authorized to receive "voluntary" contributions at the rate specified, "from the cart-owners and maistries of the district." In almost all the proceedings of Government and of the Board of Revenue on this subject for a number of years, the term used for these payments is "subscription" or "contribution;" and in 1839, on a reference from Mr. Gleig, the new Principal Collector, the Board expressly declare their opinion, that being based on a voluntary offer, the demand could not be enforced by distraint. There are other indirect means, however, of enforcement or influence, and practically the voluntary character of this payment seems to have been soon lost sight of. We learn from Mr. Lockhart's letter to the Board of the 31st January 1846, that all "regular carts" (meaning apparently all those with spoke wheels) throughout the district were "assessed" at one rupee each; and the demand was made by the same agents, and in the same mode as demands for the Moturpha or the land revenue. And in the same letter the unpaid "balance" is reported on in the same terms that would be used of an arrear of any species of revenue. In the same letter, also, the Collector, though describing the "tax" as voluntary, recommends that a like "tax" should be levied on the "wudder bandies," or carts on solid wheels, of which he states there were then 2,000 in the Northern Talooks of the district. It is observable, also, that out of Rs. 762. 2. the uncollected balance of these "contributions," Rs. 710. 10., was due by the Government servants of the Collector's Cutcherry and the Zillah Court, or by Europeans; *i. e.* by classes not capable of being influenced to pay, by the same means which would be effective with the people generally.

It is willingly paid.

476. It seems certain, then, that this payment must be regarded now as a tax, and not as a voluntary contribution; but at the same time it seems to be one that is paid willingly, and it is creditable to the people of Salem that it is so. In October 1845, some cart-owners addressed a petition to the Board of Revenue complaining that they were subjected to a "road-tax" as they styled it, of one rupee a year on each bandy, and praying that it might be abolished. The Collector having been called upon for an explanation, detailed, in the letter already referred to, the origin of the "tax," and stated that it had been paid without objection as long as Mr. Orr remained in the district, because he had always applied the proceeds to their proper object, but that discontent had arisen because Mr. Gleig had carried a part of them

to the general revenue; he added his opinion that if the original and proper practice were restored, there would be no further complaints of the tax. This was at once conceded by the Government, and the amount diverted from the repair of the roads by Mr. Gleig (*viz.* Rs. 5,184) was immediately disbursed; and there have been no expressions of discontent since.

The Government ordered, at the same time, in accordance with the Collector's recommendation, that the contribution or tax should be levied on the "wudder bandies" as well as on those of the better construction.

477. The amount of the tax in 1836 was Rs. 1,185; in 1850 it was Rs. 4,222; the increase was gradual, being probably due partly to an increase in the number of carts, partly to increased exactness in collecting the tax, and partly to its extension to the solid wheel carts in 1846, which year showed an advance of nearly Rs. 1,200 above 1845. The amount cannot be materially augmented; it will increase indeed as roads are more extensively made, and carts consequently come more into use, but then the demands on the fund will be largely augmented also.

But it is insignificant in amount, inferior to a toll, and partial; and ought to be abolished.

The tax has been useful as affording a small fund at the unfettered disposal of the local authorities; but it is utterly insignificant as a resource for keeping up the roads of a district 8,000 square miles in extent, or even for maintaining the 400 miles which already exist. If regarded as a tax it is inferior to tolls as a means of raising funds for roads, and in proportion to its amount is fully as liable to abuse and evasion as a toll need be; and if really made a voluntary contribution, it must be uncertain and variable. As existing at present it is partial, being confined to one district only; the measures which we propose will render it superfluous, and we beg to recommend that it should be abolished.

478. In our sketch of the lines of communication to be formed by Government, we have said nothing of railroads, and have only casually adverted to canals. Our object was chiefly to point out what must be looked to as the great lines of traffic, and not to indicate the species of communication to be adopted. But the same course of argument which proves that a perfectly made road is the cheapest, with even so small a traffic as 3,000 tons a year, will be equally effective to prove that when the traffic is somewhat greater, suppose where it is 50,000 or 60,000 tons a year, a railway will be cheaper than a first-rate common road; and this even supposing that the actual traffic was to remain stationary, whereas universal experience shows that it would vastly increase with the creation of such improved means. On such lines, then, railways should be constructed, either by Government or by private enterprise, and with a single or a double line according to circumstances. Again, as to canals; we have noticed that on the greater part of the coast line a canal capable of navigation by steam can be constructed at a cost little exceeding that of a first class road, while it is undoubtedly a very superior instrument of transport. Here, then, such canals should certainly be formed; and, even in the interior situations will be found in which, irrigation and navigation being combined, a canal will be even cheaper than a road; while, though undoubtedly greatly inferior to a railway, a canal would also cost very much less, and might be worked much more cheaply.

Railways and canals.

We merely throw out these suggestions. The object should be, to provide in each locality that species of communication which is there the cheapest on the whole, and reckoning not simply the nominal cost of conveyance, but also the difference in risk of damage and in delay. The determination of these points requires careful local inquiries, both as to the amount of traffic actual and to be reasonably expected, and as to the nature of the face of the country; and these inquiries require the special attention of professional officers, unencumbered with other duties.

A road ought not to be determined upon for any line till it has been subjected to such investigation, to ascertain the best direction to take, and the best species of communication to be adopted. And as such inquiries necessarily occupy much time, we would earnestly press on the Government the expediency of commencing them without delay, as far as the present very limited number of Engineer officers makes practicable, and especially with the view of opening roads from the Eastern coast into the interior.

479. Before leaving the subject of roads, we will briefly revert to the village or cross roads, though it is not our proposal that these should be constructed or maintained by the Government. By this term, as already explained, we intend those

The village or cross roads must be made and maintained by the people.

those local communications which will be necessary to connect the villages lying at a distance from the main lines, with those lines or with the chief towns of talooks. Of these roads, we suppose that a length of 150,000 miles will be required to complete the communications of the country; the total number of villages, exclusively of the small Presidency district, is about 56,000, giving an average of $2\frac{2}{3}$ miles of road to each village. It appears no hardship whatever to oblige the people to make and maintain these roads; the case is quite different from that of requiring them to make the main lines. There they would be giving their labour for the benefit of travellers from distant countries more than for their own; while here, those who make a road will gain by it chiefly, if not almost exclusively. It is true that the Government will also benefit by these roads, for no improvement in the communications of the country can take place without operating on the revenue; but the Government charge themselves with the formation and maintenance of the main lines. In almost all civilized countries the people are under an obligation to maintain the cross roads within their respective villages; and it may probably be said, that wherever the roads of the country at large, the roads of the people, as distinguished from the imperial lines or the roads of the Government, have attained to any degree of excellence or utility, it has been under the operation of this rule. Indeed, it does not appear how these roads could be brought into existence by any other agency. The Government could not effect it: it is usual to expect everything from Government, in this country especially; but daily observation shows that there are many things which a Government cannot do, and many others which it cannot do so well as an individual or an association of individuals. The Government of Madras is charged, indeed, with the maintenance of all the multifarious works of irrigation, and we have seen in some degree how it has performed the duty. We hope for improvement in that respect hereafter; but even if it is attained, that would be no good reason for undertaking the additional charge of all the village roads. The Government succeeded to the charge of the one, and a change of system, even if deemed expedient, might be difficult; but it would be a different thing to assume voluntarily the charge of the still more difficult work of constructing and maintaining 150,000 miles of road, in 56,000 villages, and over 138,000 square miles of territory. And as this is not a work for the Government, so also it is one which could not be undertaken by private speculation; and no other agency remains, except that of the village communities themselves.

The duty will be willingly performed.

480. And though the duty is a new one in this country, yet we fully believe that it is one which will be willingly discharged when it is demonstrated to the people to be for their interest, by the actual operation of the main roads in their neighbourhood; and when they see that from the want of a communication between their own village and such main thoroughfares they are at a disadvantage when compared with neighbouring villages contiguous to the main line. Under such circumstances, their first step no doubt will be to apply to the Government officers to make a road to their villages; but when it shall be pointed out to them, in reply, that the Government make the main lines, and leave the village roads to be made by the village people, we feel sure that they will cheerfully acquiesce in the reasonableness of the rule, and follow the course to which their own interest points; and the example once set, will speedily find imitation.

But it will need to be regulated, and to be enforced on the indolent.

But, as in other countries, so it will be here, the obligation will require to be regulated and enforced by law, so as to compel all the individuals of a community to do an equal share; for the active and industrious will not consent to work, when the idle do nothing, and yet share the benefit on equal terms with them. It will, therefore, be necessary to declare the obligation, and to give power to the Collector to enforce it; and his exertions and influence will also be often called for in bringing parties into harmony when a road has to be made by the joint exertions of the people of several villages. The aid of the Engineer Department should also be freely given in the selection and the laying out of lines. And it will likewise be necessary to prescribe the width of these village roads, and to give power to insist on that width being preserved.

In this work, as on the main lines, a beginning may be made very speedily; but it will necessarily be many years before a general system of such communication can be formed; and it may be expected that not only the standard of excellence in these roads will gradually rise, as the people become more enlightened and more aware of their value, but that the machinery for their management will improve

improve also. Thus, at first every landholder will give his own or his servant's labour; but, in the course of time, the example may be followed of letting tolls as on the main lines, and officers and bodies may be specially nominated for the management of these roads.

481. To return to the subject of the Government expenditure on public improvements. We propose an outlay of 22½ lacs annually on works of irrigation, and 20 lacs on roads; the expenditure on Government buildings is about four lacs and a quarter, and we see no occasion to recommend any special augmentation of that expenditure, what is wanted in the way of repairs being rather promptitude than increased outlay. We may observe, however, that the improvement of the barracks of European troops now at last commenced, will somewhat raise the expenditure on new buildings. The total may be taken at about 48 lacs,* and the present expenditure in the same branches being about 19 lacs,† on the average of the last five years, the increase proposed is about 29 lacs. A considerable increase will also be necessary in the Engineering Establishments. We have already spoken of the present injurious and wasteful deficiency in that part of the Government service; and in pursuing the subject we shall, in the following section, give a detail of the establishment, which appears to us the lowest that true economy requires. The cost will amount to about 14 lacs and three-quarters, including all grades and all classes, as well as an institution for educating and training the subordinates; and as the expense of the present very inefficient establishments, as nearly as we can compute it, is about 5 lacs and 80,000 rupees (see Appendix III.), the increase here will be nearly nine lacs. Thus the total increase proposed is 38 lacs annually.

Total proposed expenditure on Public Works.

482. We are well aware that this will be deemed a very large sum; but after the most careful consideration of the circumstances of the case, we can come to no other conclusion than that this is the very lowest that ought to be fixed as the usual expenditure, and we will not shrink from clearly stating that conviction. It is now to be considered how this expenditure can best be met; from what sources the funds for it can be most properly and most economically provided. All who have followed us through the preceding parts of this Report, and have concurred in the conclusions stated respectively in the last two sections, based as they are on actual recorded facts, will readily agree with us in the sure conviction that the expenditure itself will speedily create funds in a rapidly increasing revenue. But we shall for the present put aside that expectation, and we also discard altogether the idea of imposing fresh taxation to meet the outgoing; a course which, if attempted on the necessary scale, would undoubtedly prove suicidal. The question, then, is simply this; whether the expenditure shall be from revenue only, or whether funds shall be raised for the purpose by loan; whether the advantage to be taken of the unparalleled and hitherto neglected openings for improvement presented, shall be limited to a small part of the surplus revenue of the country, or whether use shall be made of that good credit which the Government enjoys, to secure the benefits of the works in anticipation; whether we shall defer these works till the necessary capital can be slowly accumulated from the ordinary resources of the Government, or whether we shall borrow funds for their formation, thus making them pay for themselves, without any expenditure or even advance of money on the part of Government; whether, lastly, the generation of the present day shall pay for these works by which all future generations will so largely benefit, or whether the cost shall be shared between the present and the future.

From what sources that expenditure should be supplied.

483. And here we would observe in the first place, that in the examination of the public accounts into which our inquiries have led us, we have been brought to the opinion that the surplus revenue of this Presidency when fairly computed, i. e. the surplus over its own expenditure, or over the expenditures of the territories of which

The real surplus revenue of Madras is larger than the accounts shown:

* We do not mention the improvement of the ports among the expenditures to be incurred, because, as we have pointed out, they will themselves so obviously provide funds for the work.

	Rs.
† Appendix (V.)—Irrigation Works	10,37,393
Appendix (W.)—Roads and Bridges	4,20,762
Appendix (X.)—Government Buildings	4,29,491
Total	18,87,646

which it receives the revenue, is much larger than appears under the present mode of making up the imperial accounts. Madras is required to contribute 50 lacs annually, as its quota of the home charges; and this amount of contribution has very rarely been reached. Great efforts have consequently been made by the Madras Government, under constant and urgent injunctions from Bengal, to effect reduction in their expenditure; and it cannot be doubted that one main cause why the sums expended in this Presidency on works of public improvement have always been so small in comparison with similar expenditure in other parts of the empire, has been this constant demand for saving, and the anxiety of the Madras Government to avoid such unpleasant communications.

Because the debits include the charges of territories, of which the revenues are credited to other Presidencies.

484. And yet all this time the real surplus of this Presidency, fairly calculated, was very much in excess of what had been fixed by the Honourable Court, and so rigidly insisted on by the Government at Calcutta. We find by the accounts printed every year by order of the House of Commons, that the charges borne by the Madras Revenue include the cost of garrisoning extensive countries, the whole revenue from which, under whatever name received, is paid into the treasury of other Presidencies; thus the Saugor and Nerbudda territory in Central India, Cuttack and Balasore on the east coast, the Southern Mahratta country, the Tenasserim Provinces in the Eastern Peninsula, the settlements in the Straits of Singapore, and the little principality of Coorg in South India, are all supplied with troops by Madras, and the garrison of Mhow, in the Indore State, and the subsidiary force at Nagpore are also furnished by the same army; and yet this Government obtains credit for no part of the revenue of all the territories occupied, or of the revenue and subsidy for the maintenance of the two latter forces, the whole being paid to Bengal, except the revenue of the Southern Mahratta country, which is received by Bombay. Now, as nearly as we can compute it, from the best information at our command, the whole amount of revenue, and the subsidy from these various countries is, fully 119 lacs of rupees, and the annual cost of the troops occupying them is not less than 75 lacs, which is paid out of the Madras revenues, and not from the revenues of those countries themselves.

It seems no more than fair that whatever treasury receives the revenue of a territory, the same should bear all the charges of the management of that territory, and if this rule were adopted, Madras would be seen to have a surplus of 75 lacs of rupees yearly, in excess of that which is shown under the present system of arranging the imperial accounts. It must be admitted indeed, that Madras is bound to bear a share of those charges of protection from foreign aggression which, from local position, must fall more immediately on other parts of the empire, as well as of other charges required alike by the interests of every portion of it; this should be fairly apportioned, and it would no doubt reduce the surplus above specified; but it would then have also to be remembered, that in addition to the expenses above mentioned, Madras already contributes nearly seven lacs of rupees a year to such general objects, viz., in maintaining the garrison of Aden.

But the expenditure on Public Works ought not to be measured by the yearly surplus revenue.

485. But whether the present surplus of revenue over expenditure be large or small, we would contend against the principle of making the accidental amount of that surplus the measure of the expenditure on improvements morally certain to produce a large increase of revenue by the legitimate and really beneficial means of augmenting the comfort and the resources of the people; and further, we have already pointed out in the concluding part of our Sixth Section, that there are under this Presidency in excessive taxation and pernicious taxation, both unknown in other parts of the empire, depressing causes which ought to be removed in order to allow scope for the expansion of the industry and productive powers of the country. Both species of improvement are essentially required; to invest capital so as to facilitate production and interchange, and to abstain from taking so much in revenue, or from taking it so injudiciously as to overload and press down the productive resources and energies of the country; and the two ought to advance together, and they might be easily made to do so, if only our rulers would exhibit a real faith in those general principles which have not only been demonstrated by science, but have been practically proved by experiment in our own country.

A reference to the example of England.

486. In the commencement that has been made in the reform of the taxation of England, we have seen enormous sums of revenue given up year after year, in the sure and wise confidence that production and consumption relieved from those burdens, would speedily expand and make good the deficiency, and we have seen the

the expected result uniformly follow. Such a confident acting on general principles almost universally acknowledged, we are anxious to see in the administration of this country. It may be said that the cases are different, because there it was only giving up a surplus, while our proposal is to create a deficiency to be supplied by borrowing; but this difference is only one of circumstance arising from the different condition of the two countries, the substantial points of the two cases are the same. Can we suppose that the same far-seeing wisdom and moral courage which largely reduced taxation, and yet promised that the revenue should not fall short, would have hesitated to resort to a loan for the development of the same creative power, if it had been necessary, and if the same reasonings existing in the actual case had supported the expectation that a return of 20 or 30 per cent. might be secured by a payment of 5 per cent.

Now we have already shown, that under the extraordinary natural advantages of this Presidency on the one hand, advantages which in its existing social position no other body than the Government can make use of, and on the other, the extremely cheap and economical and utilitarian mode of constructing all public works, which has happily become the established habit and custom in this Presidency, irrigation works may largely be formed to yield 30, 40, 60 and even 100 per cent. net annual profit in direct revenue, and that the actual gain by making roads, in the only instance wherein the improvement has been sufficiently decided to give precise results, has exceeded 20 per cent. direct return in revenue on the sum expended; and such being the case, the profits to be obtained being so large and so certain, it evidently appears the part of true wisdom to raise capital for these objects by loans, when it can be largely obtained on such easy terms as five per cent.

487. Hitherto indeed the very idea of raising loans for ordinary peace expenditure has been regarded as a thing not to be thought of, and properly so with respect to the usual kinds of Government expenditure, which are mere outgoings, without any expectation or possibility of material return: but the case is different with respect to loans for public improvements, and the same rule cannot be applied to this case without confounding things essentially different; there is no analogy between a debt incurred for the construction of a work morally certain to return a large profit, and a debt for the prosecution of a war, which is a mere sinking of capital; yet the two are often thoughtlessly classed together. We are far from denying that a war may be necessary, or that to borrow money for prosecuting it may be wise and right; but there is obviously an essential difference between raising a loan for such a purpose, and for works which, besides returning a large profit to Government, will be the means of enriching and adding to the comfort of millions; such a debt cannot be regarded at all as a burden on the finances, because it is morally certain that the investment of the sum borrowed will create a fund for its repayment within a short period; it more resembles a guarantee to a railway company, with this important difference however, that the latter may involve loss, but cannot yield profit; while the former holds out sure promise of large profit.

To borrow capital for such objects would be truly economical.

Loans

Good credit, as the fruit of stability and good faith, is one of the advantages enjoyed by a good Government over a bad one; a Government which possesses it and fails to make use of it, willingly surrenders one of the most important advantages resulting from its position and character. People do not act thus in private life. A merchant values his credit as a part of his capital; it stands to him indeed in the place of capital, and if judiciously employed, equally yields a profit. A merchant importing goods, draws a bill against them at three or six months' sight, thus borrowing the value of the goods and his profit upon them; and a man would be thought insane who abstained from doing so from a morbid dread of being in debt. All that we ask is, that the Government should adopt the same rules of action as those which commonly guide prudent men in the transaction of their own private affairs.

488. On the foregoing considerations, we would beg strongly to urge that the sum fixed as proper to be annually expended on public works should be so expended without consideration of the current surplus revenue; that the amount should be considered as no less necessary to be provided, and no less an essential part of the year's expenditure, than the pay of the army or the interest of the debt; and that any deficiency in the year's revenue to meet the charge should be made good by loans. And such loans, we would add, need not even nominally form a permanent

The sum fixed for public works should be provided if necessary by loans.

burden on the finances, but may be accompanied in every case by provisions for their gradual liquidation; either annuities for terms of years might be granted, or, which would perhaps be better, the increase obtained from the particular works, in the case of irrigation, or from the particular tracts or districts affected, in the case of roads, might be devoted to the liquidation of the debt as the primary security, the general revenue to be of course the ultimate security in case that first should fail. It would also be highly desirable that such loans should be raised, not in India only, but in England also; by that means two advantages would be gained,—the loans would be obtained at a cheaper rate, and the deficient capital in this country would not be drawn away from other occupations.

Irrigation works and common roads must generally be undertaken by the Government.

489. The foregoing remarks are intended to refer primarily and chiefly to irrigation works and common roads, both of which will in general be most properly undertaken by the Government itself. The former for the most part involve rights and obligation already existing between the landholders and the Government, which would be complicated by the intervention of any third party; particular exceptional cases may be found where questions connected with such existing rights may be capable of adjustment to the satisfaction of all, and on a small scale parties would be found willing to invest their money in such improvements, if only Government should be willing to concede liberal terms to them; but in general such works must be undertaken by the Government. And as to common roads, they will not hold out sufficient inducement to attract private speculation. To enable them to do this, it would be necessary that heavy tolls should be imposed, sufficient not only to defray the cost of maintenance, but to pay a handsome dividend; certainly they would afford the means of doing this, but from the aversion of people to a heavy toll, its imposition would certainly operate to restrict traffic, and so to diminish not only the total receipts, but also the benefit from the road. The Government would receive its profit in the increase of the revenue of the tract affected by the road, but we do not apprehend that they would be willing to give up to any private company an interest in such indirect return.

Railways and canals by private enterprise.

490. But there are other species of internal communication, in which private speculation would find wide scope; we mean navigable canals and railways; in the former it might be employed partially, in the latter exclusively. There seems no room for doubt that railways would succeed well in this country, as they have actually been found to succeed in countries inferior in density of population and in the quantity of commodities to be exchanged. The surface of the country is peculiarly well adapted for them, being generally plain and the undulations very gradual, with a slight inclination on the whole from the interior towards the coast, the very direction in which there would be by far the heaviest traffic. Again, in this country the purchase of land would be a most insignificant item in the cost, and of any charges corresponding to the legal and Parliamentary expenses so heavy in England, there would be scarcely anything at all. It would be necessary also to abandon the extravagant and magnificent ideas associated with railways in England, and rather to take those of America as a model. Doing that, working with the people to be found on the spot, only intermixing the European element sufficiently to employ their labour to the best advantage, and forbearing to make contracts in England with people who must have extra profit to come out, extra profit for learning the ways of the country, and extra profit to cover the risk of embarking in unknown enterprises, the cheapness of construction would be such as to surprise people acquainted only with the cost in England. At the present price of iron, a single line could be laid down, including all charges, for 2,500 £ a mile, and a double line for 4,000 £. It would be wise for Government to aid such undertakings as far as they legitimately could; and besides guaranteeing a certain percentage of profit, they might take the initiative, after the manner of the French and other Governments, by fixing on lines to be constructed, and then offering the execution to private companies.

Navigable canals might be constructed very cheaply on some lines.

491. As to canals, we have already declared our opinion that, on the coast lines, canals of a capacity suited to steam navigation would be by far the best and cheapest species of communication; the cost of construction would be wonderfully little, and, from the almost entire absence of locks, the navigation would be liable to very little impediment; and the cost of carriage on such canals would be not only far less than on common roads, but much lower than anything that has been thought of for railways. On the Cochrane Canal, firewood, the chief commodity

carried, and which requires no shelter, is conveyed at the rate of three pice a mile a ton; and this would certainly be reduced by better arrangements, and if the canal were in better repair; Major Pears proposes a rate of an anna a mile for the railway, and it is not likely that it will be under half an anna or six pice. In the interior, there may be other lines on which canals may be beneficially made, often in combination with irrigation. Here also the agency of private enterprise might be called in, as above suggested in the case of railways. We may add, that the canal just mentioned, the only one now existing under this Presidency that is regularly used for navigation, was formed by a private individual, and on the terms there suggested. It was planned on the part of Government, and was then given for execution to Mr. Basil Cochrane, who was to enjoy the whole proceeds for 45 years, and then to surrender the canal to Government; his interest in it was, in fact, bought by the Government while the term of his contract had still some years to run. (See Appendix (II).)

492. In concluding this section, we will observe, that it appears to us a matter of the first importance that whatever sum is fixed as proper for the usual annual expenditure in this Presidency on public works, should be at the unfettered disposal of the local Government. That is the authority which must be supposed the best acquainted with the wants and interests of this portion of the empire, and the best able to judge of the wisest mode of employing a given amount devoted to public works. We cannot see that anything is gained by submitting detailed questions of local improvement to a distant power seated in Calcutta. That authority is wholly unacquainted with the internal wants and interests of this Presidency, and this ignorance naturally produces indifference. It is a natural law, that things engage attention in proportion to their nearness rather than to their real importance; and it is only a consequence of this natural law that the providing employment and food for half a million people, or the opening a river navigation of 400 miles length in the Presidency of Madras, is a matter of insignificance in Calcutta compared with any trifling local question. In point of fact, the judgment of the Council at Calcutta is based almost invariably on financial considerations; and it appears to us that this is the only aspect in which that body ought to have any acquaintance with projects of public improvement under this Government. Hitherto, however, such questions have been complicated by the fact that any improvement refused to this Presidency would by so much lessen the general expenditure; and the temptation thus held out, combined with the local feeling or absence of feeling above adverted to, has undoubtedly operated largely to restrict public improvements here, not simply in the refusal of projects sent up, but in preventing many from being sent up at all.

The amount devoted to public works should be at the disposal of the local Government.

493. It is right and necessary, no doubt, that the general Government should control the whole expenditure of the empire. But all that is necessary to that end in this department, is that a total sum should be fixed for the expenditure in it; the distribution of that sum, and the selection of works to be undertaken, may be left to the local Government, without any infringement of the legitimate powers of the supreme controlling authority. The requirements of the case will be satisfied if the amount to be devoted to public works is previously known, in the same way as the amount required for the public official establishments is now known beforehand and duly provided for.

A prospective estimate to be prepared every year, for the information of the Government of India.

The fixing of a general standard for the public work expenditure will meet this rule to a certain extent, but not fully; because the actual expenditure will vary somewhat from year to year above or below the fixed standard. It is very desirable that the actual expenditure of every year should be ascertained beforehand, as nearly as circumstances admit, for the better information of the financial authorities. With this view, we propose that it shall be one duty of the Board of Public Works to prepare every year a budget or prospective estimate of the probable expenditure on public works of all kinds in each of the ensuing two years, specifying the amount required for each of the three branches of the department and for the several species of work. Such an estimate, of course, can be only approximate; it will be made chiefly with reference to the usual expenditure in former years (after a just standard of expenditure shall once have been attained), with additions or deductions for any special works or special circumstances. It should be made on a liberal scale, so that it may not be exceeded; but, of course, the estimate of one year may amend the still future part of the estimate of the preceding year.

When the estimate is within the amount of the standard which we propose should be determined for expenditure in this department, it will not need the sanction of superior authority; but having been approved by the Madras Government, will be communicated to the Government of India as the estimated expenditure to be provided for. When from any special cause it shall be in excess of the fixed standard, we propose that after having been approved by the Local Government, it shall be sent home for the confirmation of the Court of Directors; and having been so confirmed, shall be made known as before to the Government of India. It appears advisable, for the reasons already given, that the confirmation should rest with the Honourable Court rather than with the Government at Calcutta; and with the present rapid intercommunication between England and India, this course is not likely to produce either delay or any other inconvenience.

SECTION IX.

The Necessity of enlarging the Public Works Establishment in all its Grades, with a Statement of the New Establishment proposed; and with some Preliminary Remarks on "Superintendence."

Introduction.

494. WE have thus, according to the plan sketched out at the beginning of our Fifth Section, stated the urgent necessity that exists for a larger expenditure both on works of irrigation and on roads, and the vast benefits which would accrue to both the Government and the people from the adoption of more enlarged and liberal views on this subject; we have also specified the annual amounts which, as it appears to us, ought to be devoted to the purposes of improvement in each of those two great divisions. We now proceed to consider the very important subject of the establishments required by true economy for the effective direction of the expenditure, and for the due preservation of the valuable works from time to time constructed; and after what we have already stated in various parts of our preceding remarks, as to the utter inadequacy of the existing establishments, we need hardly observe here that we shall have to propose a very considerable increase. In dealing with this subject, which we feel to be one of the most important of all those before us, we shall first offer a few considerations to show the necessity of materially enlarging the present establishment, and detail what appears to us to be required; and, secondly, we shall explain the means by which in our opinion the increased number of officers may best be obtained, and the training which appears best for each grade, European and native: the former of these divisions will form the present section, and the latter will occupy the following one.

The nature of "Superintendence."

495. Very erroneous ideas are entertained in some quarters on the subject of superintendence. The outlay on this account appears to be looked upon almost as so much money thrown away; at least it is evidently thought that rigid parsimony can nowhere be so wisely exercised as on this item; and that system of expenditure is thought to be the most economical which exhibits the smallest proportion of outlay on this account. This feeling—for we cannot but regard it as matter of sentiment and prejudice rather than of reason—stands on the very threshold as an obstacle to the improvement of defective establishments, to all attempts at more skilful and more economical modes of projecting and executing works, and to all measures for diminishing or extirpating fraudulent practices. We think it may, therefore, be useful to offer in this place a few brief remarks on the nature and uses of the several things commonly, and often unthinkingly, comprehended in the term "Superintendence," with the view of showing that a saving in this item is often extremely wasteful, and that to measure superintendence by the mere comparison of its cost with the expenditure on work is in every case fallacious.

The various things included in the term.

496. The term, as generally used, comprehends the following five distinct functions:—

- 1st. Projecting works, and making the necessary surveys, lines of levels and estimates.
- 2d. The inspection and check of work and accounts after completion.
- 3d. Directing rude labour, so as to render it most productive.
- 4th. Enforcing a fair day's work for a fair day's wages.
- 5th. Keeping such a watch over the condition of works as shall ensure their being maintained in a state of security and efficiency.

Now

Now of these five operations it is evident that the second and fifth only are superintendence as distinct from the actual cost of a work. The other three are in fact parts of that cost; they are contrivances for cheapening work, and in a degree are even essential conditions of the performance of work at all. We are persuaded that the jealousy with which any increase in the cost and amount of what is called superintendence is viewed, and the wish to diminish it, spring in great part from forgetfulness of its real character as a valuable and necessary means of cheapening work, securing good work, and preventing loss. And we will now show that in all these phases of superintendence, any inference from a comparison of the charges on this account, with the cost of the work, cannot but lead to error, no direct proportion existing between the two.

It cannot be judged of by comparison of cost.

497. Of the first description of superintendence, viz., the projection, &c. of works, it is evident that its cost, instead of being in proportion to the money spent, ought to be exactly in the inverse ratio, since the best engineering skill is that which produces the greatest results at the least cost. If a per-centage upon the outlay were taken as the criterion in this case, it is evident that the less able the engineer was, the higher would be the remuneration that he might claim. It would be like regulating the physician's fee by a per-centage on the apothecary's bill. As an illustration of the loss resulting from the want of skilled and experienced officers for this branch of duty, we beg to refer to the supposititious case put by Colonel Cotton in Appendix (F.) para. 12; which, though itself hypothetical, very aptly presents a large class of actual occurrences under our present system, with the important exception that in very many instances the plan of the inexperienced officer is not rectified but acted on. The very limited scale of our professional establishments compels the employment of young and inexperienced officers in the projection of works, who, as a necessary consequence, fail to see how the object aimed at may be most cheaply and most effectively attained. In short, our engineers are unavoidably put to actual work while they ought to be only under instruction, and they gradually acquire skill and experience by a succession of errors, of which the State bears the cost.

The projection of works.

498. Of the second, viz., the inspection of works, and check of accounts, there are positions in which it would not be so directly wrong to estimate this description of superintendence by the expenditure, as in the former case; but this would be most erroneous as regards the general works of the country, whether roads or irrigation works, because the labour of inspection depends, not so much on the sum spent, as on the facility of visiting the work. A ghant or barrack, costing two lacs of rupees, can be inspected by one officer in two days, whereas the examination of the works of the ordinary estimate to that amount could hardly be done by the existing Civil Engineer Department of a division in as many years. It is evident, therefore, that the amount of the district bills will give no clue whatever to the labour expended in examining the works executed.

Inspection.

499. Of the third and fourth descriptions of superintendence, viz., directing work in progress, i. e. showing in what way work may be executed most cheaply as well as most effectively, and securing a fair amount of work from those employed, we need only instance the bridge at Bowany, to show why these kinds of superintendence cannot reasonably be estimated by a per-centage on the money laid out upon workmanship and material. The bridge was estimated to cost Rs. 48,725, but by the good superintendence it will cost above Rs. 5,000 less than that.* On the per-centage mode of calculating, the Overseer's pay, if correctly proportioned to the estimate, becomes exorbitant in consequence of the great saving which he effected; yet who will deny that his services were more meritorious and more valuable for the very reason of that saving; and who will fail to see, when the facts are thus put before them at least, that it would have been well worth while to give even Rs. 2,000 or Rs. 5,000 to this Overseer if it had been necessary, rather than pay Rs. 150 to a Maistry, who would have spent the whole amount of the estimate? The question of what sum it is advisable to pay for this kind of superintendence in India now is quite incapable of being answered satisfactorily: this only is certain, that

Directing rude labour and enforcing honest work.

* This is the actual amount; in Para. 47, it is stated at Rs. 14,000, which was the sum computed by the Engineer while the work was in progress, including, however, an oversight of Rs. 3,000. The Civil Engineer states that in this bridge the bricklayers laid each 1,000 bricks a day in the arch work, and 1,800 in the walls and spandrels, under the efficient superintendence of the Overseers.

that it should be far higher than it is in England. In the first place, because in all that portion of the work which is done by contract there, the charge for "Superintendence" (directing and overseeing the work-people) appears, as it ought here and every where, as a part of the cost of the work, and not distinct from it; in the second place, because the highly finished works of that country being far more expensive, both from the costliness of material, and the higher price of fine workmanship, the charge for building is raised, without any necessary increase of the charge for supervision.

More such superintendence necessary in India than in England.

500. And, even supposing that there were more similarity in these respects, a comparison could not be drawn, the countries being differently circumstanced in all particulars. The labourers in all branches of the builders' arts in almost all parts of the Madras Presidency are at the lowest point of skill as well as energy, and the superintendents must be teachers as well as managers. In England materials can be readily purchased at short notice of any quality, and at prices regulated by competition; whereas here, the superintendent has to become the manufacturer. There the meanest workman takes an interest in the work he is employed on, which is never found in India. Sir Francis Head points out the energy and devotion shown by the common excavator in cases of danger to the tunnel or embankment on which he is engaged, and every one must be struck on reading his papers with the comparatively helpless position of the Engineer in this country, from the inferior means at his disposal; all which disadvantage has to be balanced, as far as possible, by additional superintendence. There is not at this moment in the whole Madras Presidency, a really good and well shaped brick to be purchased; not one ingredient of any material used is well prepared; and the same description of tools are in use throughout the country with which the temples were built a thousand years ago. Even those labourers who work by contract, have not the energy to put their strength to what they are engaged in, whilst those who are employed on dally wages, work as though they considered it a duty to themselves to do no more than they can help. The money lost by apathy and want of skill, by bad materials, wrought with ill-formed tools, and by waste from wanton carelessness, even in the works best managed in the present day, is a far heavier per-centage on the outlay than has ever been paid for superintendence; and must be so, till we have introduced better apparatus for the manufacture of material, taught the use of modern tools, and by a general employment of Europeans, shown what energy can do when well applied. The sum that might be advantageously laid out in such improvements, cannot be fully estimated. Good bricks would reduce the thickness of walls, and well-shaped ones economise three-fourths of the time now used. Each well-taught bricklayer (as was actually the case on the Cauvery Bridge before mentioned) would lay three times the number of bricks in a day that is supposed possible by the most active native builder. In every portion of a work in progress, losses are occurring; and instead of now reducing the cost of superintendence, our true economy would be to have on all important works European teachers of every trade required on it. In large buildings we could hardly spend more in this way than would be at once repaid; but even if it caused an increase in the first expenditure, the saving by the knowledge gained, would well repay the cost whatever it might be.

Something must be allowed for experiments and for failures.

501. That little has been done to introduce improvements, may be attributed in some degree, to the too strict comparison of bills with estimates, but not less, to the smallness of the sum allowed for skilful "Superintendence." There has always been a rod held over the executive, who (as a natural consequence) have been deterred from spending money upon teachers, apparatus or experiments. The workmen of India are more decidedly opposed to change than any in the world, and when employed upon a novelty, failure is to them a species of success. We may quote a single instance to show the amount of intelligence possessed by the men on whom a Civil Engineer has to rely, to carry out his plans. A new calingula was under construction to the Govindavandy Channel in the district of Chingleput; and, as the quantity of masonry work was large, the Civil Engineer, Captain Collyer, caused a mill to be set up for grinding mortar, to be worked by bullocks. On visiting the anicut while in progress, he found 12 men harnessed to the mill, and 12 women beating mortar in a trough in the usual Indian way; though if properly worked by bullocks, the mill would have supplied more than all the bricklayers employed could use. The cost of the 12 men was Rs. 45 a month, and of the 12 women Rs. 22½, making a total of Rs. 67½, whereas the hire

of

of two pair of bullocks with drivers, would have been only Rs. 14 a month. The mill was put up for Rs. 10, and would last many months; adding, however, Rs. 2 monthly on that account, here is a direct waste of Rs. 50 out of Rs. 67½ through the ignorance, indifference or determined opposition to improvement, shown by the native Maistry. In all countries the history of improvement in the mechanical arts, is a detail of failures, as well as of successes; the former are the most numerous, but the great successes, though comparatively few, vastly preponderate in value. Without experiment, there can be no improvement, but the very term experiment necessarily implies a risk of failure; self-interest, the great incentive to invention, is wanting to the servants of the Government in this country, nor is it merely a negative want: the Government make no acknowledgment of success either in money, honour or promotion, but in case of failure, the unfortunate experimentalist has not only to bear the loss, but to endure censure. Under these circumstances, improvement can come in only as it were by stealth; and if we would shut it out altogether, we have only to adopt the advice of those who would forbid expenditure on better skill by limiting the charge for it to a small percentage on the outlay.

502. The fifth description of superintendence is for keeping watch over the public works to prevent loss from their falling into a state of inefficiency; and by timely repairs to reduce to a minimum the cost of keeping them in order. We need hardly say that as the establishment for this purpose is reduced, the cost of repairs and loss will naturally increase; and if the allowance for superintendence is to be calculated by a per-centage upon anything, it should not be on the actual cost of repairs, but on the amount which would be necessary if there was no watch kept; or rather, as the amount lost from the works being in an efficient state is greater than any sum spent in repairs, we should also take that item into the calculation, and the per-centage should be upon the revenue risked, added to the saving to be effected by careful guard and timely repair.

The custody of works.

503. From what we have said, we trust it will be seen, that the superintendence to which our attention has been called, has hitherto been estimated on a wrong principle; but in showing that, we are aware that we have not demonstrated what sum ought to be spent upon it; nor are we able to do so, but on the contrary we are prepared to say, that in the present state of things, no one could form a correct opinion on the subject. That the charge for superintendence was formerly much too low, is clearly seen by the advantages derived from the increase of late years. That it is so still, is equally capable of proof, and though we cannot say how great the further increase ought to be, we can, without difficulty, point out where a great further expenditure on that account would be advisable.

We cannot specify the proper amount of superintendence.

504. We have been unable to obtain any detailed statement of the cost of superintendence for a longer period than 10 years, during which its proportion to the amount of work done has not greatly varied; but what we have said in the early part of the second section as to the gradual growth of the department is sufficient to show how little was spent upon "superintendence" formerly. But what was the state of things in those times? We may find an example in the case of Cassy Chetty, detailed by the Commissioners of Inquiry into the Frauds in Coimbatore in 1816, and to be found in the revenue selections. We are there told that large sums were debited as laid out in repairs of tanks, and the most complete and unexceptionable accounts and vouchers for the expenditure systematically prepared, for a series of years, while throughout that time, no part of the money charged had been really so expended. This case, we fully believe, was exceptional in degree, but there is good reason to believe, that abuses similar in kind, prevailed throughout the country; and that they have now been reduced to a minimum is owing partly to the increased efficiency of the Collector's Department, but mainly to the activity of the Civil Engineer Establishment. The loss in those days, in a single year, by peculation, by neglected tanks, by money wasted in bad or ill-planned works, if summed up and brought into comparison with this year's cost of superintendence, would show such a balance in favour of the present system, as would induce a fair consideration of the present charge for superintendence, as compared with what it was. While to those who shall succeed to the management of affairs, the expenditure on superintendence now, will 30 years hence seem only a shade less foolishly impolitic, than the absence of all check in Cassy Chetty's day appears now to us.

Much has been gained by the increase of superintendence, hitherto;

But the amount even now, is extremely small.

505. Comparing the present amount of superintendence with what it formerly was, it seems large; but when compared with the work to be done, and the immense extent of divisions, it would long ago, in any other country, have been acknowledged to be absurdly and preposterously small; for truly no other terms adequately describe the state of things at present. In speaking of the Engineer Department we have shown some instances of the losses that have been sustained for want of officers, and given some proofs of what is wasted now upon the same account; but who can picture to himself a Civil Engineer with no assistance except one young officer learning his duty, and three or four half-taught subordinates, aided by 10 or 12 talook Maistries, such as we have elsewhere described them, having the charge of all the roads and buildings, passes, bridges, tanks, channels and rivers, of from 10 to 20 thousand square miles of country, without admitting that the point for discussion is not whether the establishment is too great or not, but how it can be most rapidly and effectively increased. To those who have been accustomed merely to compare one district or talook with another, without looking to the experience of other countries, as is too much the habit of all who have spent much of their lives in India, this may not be clearly seen, say what we will in proof of our assertion; but to those who have watched the engineering, and the executive arrangements of England, this general statement of the case will convey a far more vivid impression of our wants than any individual instances, however strong.

The necessary proportion of superintendence will be less hereafter.

506. In closing our remarks on the several descriptions of superintendence, we may observe that there are two reasons why it will not be necessary hereafter that superintendence should be increased in the same ratio to outlay that is necessary now; that is to say, supposing our suggestions on this head to be attended to. The first is that as the great extent of divisions and the scattered positions of works form one reason why a larger amount of superintendence is required now, so when works become more numerous in a given space, one officer will be able efficiently to control a greater number of works and a larger amount of expenditure than at present; secondly, the spread of skill and information by means of the school we shall propose will so influence all employed in the execution of work that less teaching and managing will be required.

The control of the distribution of water.

507. Hitherto we have spoken of superintendence as it is now understood in the statement of Maramut charges, but there is another description of it that might, to great advantage, be found there; we allude to the management of works of irrigation, for the regulation of their discharge. At present, the distribution of water, collected at great expense, and with more or less care, is left in the hands of men who, though nominally Government servants, are members of the village communities, for the most part paid by the cultivators, and so ill paid that they cannot be considered proof against the smallest bribes; the richer Ryots have the command of them, and all the water that they want they take. Where a number of villages are dependent on the same supply, the bitterest animosities exist between them, as might be expected; and those who have the advantage in position have the means of injuring their neighbours, and a three-fold object in taking more water than they have an honest claim to. They can improve their crop, and injure their enemies, and, as the price of grain depends upon the quantity produced, they are the gainers at the time of sale by all the water they have wasted. The Civil Engineer of No. 7 division, when writing on a channel of Coimbatore, points out this in the following terms:

“The management of these sluices is in the hands of the Neerany Monigars and their subordinates, who receive payment from the cultivators in kind, and are of course entirely under their influence. This was a system which might have answered sufficiently well during the native Governments, when the Monigars were doubtless held responsible that all the lands throughout the channel received their share of water. They had then two fears; one, that they would lose their places, or have to pay a heavy fine if the Circar disapproved of their proceedings; the other, that they would get small measure of their dues if they failed in their duty towards the cultivators. Now the case is altered, and so should be the system. Our Government does not punish men upon an average; and as we cannot bring home to each offender what his share of the mischief may have been, we punish no one; while the cultivator has the same power of punishment that he ever had. There is but one fear now, and that is not of the Circar, but of the Ryots, who do whatever suits them with the water; and, unluckily, it suits them best to monopolize

monopolize the whole stream if they can, as there is but a small portion of the district under paddy cultivation, and reducing the quantity produced, affects the price favourably for those who have it. The wealthy Ryots occupy the higher villages, and they having the command in every way, the lands below are always ill-supplied."

508. This system obtains throughout the country, causing a loss which we cannot estimate; but we may safely say that the water is not made the most use of, in any case where several villages are irrigated from the same tank or channel. It is usual to say how well these things are managed by the villagers themselves, but this is only because we know nothing of the distribution; the answer to all inquiry being that "mamool" (custom) has established the arrangement, and "mamool" settles all such questions in favour of the rich. The system is called good, because it gives no trouble; but the loss that we are speaking of does not affect the villagers only; when water is wasted, it is so much robbed from Government; but as the loss from this cause, being permanent, never appears in the accounts, the matter has not yet been viewed in its proper light. Indeed in Indian finance in general, while there are stringent orders against the expenditure of hundreds, no account whatever is kept of millions, never realized though well within our reach. We economize a writer's penknife, and take no steps to guard against a famine. There are numberless tanks, and channels too, the waters of which, if carefully husbanded, would flow over tracts of land not irrigated now, adding to the revenue very greatly more than need be spent upon a better management.

The present system a bad one.

509. We believe that it would answer best to have a European in charge of every work of the first class; two or three per cent. upon their present revenue would probably be well spent in placing all considerable works of irrigation under individual management, though a less sum would effect the object in many instances. By these officers such a distribution of the water would be made as would be most advantageous to the Government as well as to all ranks of the cultivators; the works would be protected by them from those injuries from wanton carelessness which now lead to so great an outlay every year in what are called the ordinary repairs; and as the season for irrigation approaches, every preparation would be made to secure a good supply of water, and prevent, as far as possible, those fluctuations in the quantity which cause such losses of labour and of seed in all the lands that are in unfavourable positions. It frequently happens in the tank irrigation, that the feeding channels are breached or partially stopped during the few hours that the parent stream is flowing, and in many cases the loss of a single flood is ruin to the crop; such accidents would be guarded against, and where accidents occurred prompt measures would be taken to correct them by the help of the village people, who having no leader to direct them now, are rarely prompt enough to act before the time is past. One of the Commissioners has seen a whole day lost, before any effort was made to repair a breach in one of the Amravutti Channels, though even in seasons when no accident occurs, there is rarely sufficient water to mature the crop. The management of all repairs within a certain limit, would also be entrusted to these officers, whose experience of the work, knowledge of the position in which the best materials might be found, and interest in the efficiency of their charge, would make them in all respects the best aids of the executive.

All important works should be under special management.

510. We have been under the necessity of writing at some length on "Superintendence," because the subject has not hitherto been carefully considered, and is evidently not understood. The calculation of the sum which might with good economy be spent upon it, has been made on wrong grounds, and the consequence has been an inclination to reduce an expenditure which was already far too small. There has been a determined stand made against every suggested increase; and where the want of engineers or any subordinates of the Engineer Department has come so prominently forward that it could not be denied or refused, the addition has been made on a scale too low for thorough efficiency, under an impression that the money spent was to yield no direct return. We have written what we hope will be sufficient to show the fallacy of the ground of calculation, and the waste that is resulting from it; and if we advise such an expenditure on superintendence (using the term in its most extended sense) as has not been contemplated before, we are sure that we propose no larger an establishment than would be profitably

The increase of superintendence proposed, is not larger than necessary.

employed upon the management or improvement of the public works, either in the reduction of waste or increase of revenue.

The want of officers.

511. We now proceed to consider the number of officers required in the various grades. We have shown in another part of our report that the prosperity of the Presidency of Madras is in a great degree dependent on its works of irrigation, and that those works are more or less dilapidated throughout the country; we will now examine how far this evil depends upon the insufficient number of Engineers. There can be no doubt that if money is withheld, any number of Engineers can do nothing to restore the Nunjah cultivation to what at one time or other it evidently has been; but, on the other hand, the means, however liberally supplied, could not effect the end desired, unless judiciously and skilfully expended. It may be objected that the ancient works were constructed without the aid of science, and such was the case; but the result was that, though the object in view was in many cases effected, it was so at an excessive cost. Vast numbers of the great works of former times which pay us well the cost of keeping in repair, would never repay the capital laid out by their projectors; they were built by forced labour, and, for their strength, depend entirely on the quantity of material used. Such is the great Darojie tank in Bellary, to repair a single accidental breach in which, and secure it from future injury, was last year estimated to cost five times its annual revenue. The object in view in the original construction of this work might have been effected at a moderate expense, and such as would have yielded a profitable return; but its actual cost must have been out of all proportion to its value.

No science in the construction of the old native works;

And hence many of them were built at ruinous cost.

512. Were it not for the science employed on them lately, many of the works that we now see in operation would have been out of use like numbers of others which have not had that advantage, in proof of which we may instance many of the most valuable channels in Tanjore, Trichinopoly and South Arcot. Numbers of the most costly works were too expensive even for the rulers of the country to complete, with all their people's labour, and never were perfected in consequence. Such was the great work begun by a native Prince at Nerinjapett, where, on a rocky bed, an anicut was thrown across the Cauvery, at a cost incalculably greater than that of those anicuts which science has enabled us to raise on the same river in places where the bed is of the loosest sand, without a rock in any part of it to aid the Engineer. The dam at Nerinjapett, after being raised to its intended height, was partially destroyed, and was abandoned as a hopeless undertaking; and from that day to this the portion that remains has not been used, although the anicut as it stands at present might even now be applied to water a whole talook in the Salem district, if a scientific officer could give his time to laying out the channels. Numberless ancient native works have been ruined, and must remain in ruins, because they were misplaced or faulty in construction, and many more have had their value increased by modern engineering. In our own time we have seen the waste of money by the native management reduced to a comparative trifle by the improvement of the Civil Engineer Department; and we need no further proof that it would be bad economy to work with any but the best trained Engineers procurable.

The want of officers has long been admitted.

513. The Civil Engineer Department is looked to as the means of improving and extending irrigation, and it has already effected not a little, considering the small means placed at its disposal; but everywhere we find statements made of the insufficient strength of the establishment. And as this has been admitted by all concerned, by the Civil Engineers, by the Board of Revenue, by the Government under Lord Tweeddale, and by the Honorable Court itself, it would seem hardly necessary for us to write upon the subject now; but when we see that what has been universally allowed as an essential want of greater or less extent, for the last 15 years, has only been nominally supplied by an addition of six subalterns to the Engineer Corps, we must take up the subject once again, and treat it as if it had never been understood. In a former part of this Report, we have already touched lightly upon the general duties of the Maramut Department: we will not repeat what we have said, but in as few words as possible give such an account of the operations in a Civil Engineer's camp as will show what the country has to depend upon for the management and improvement of its public works.

The duties required of a Civil Engineer.

514. The Civil Engineers have had no instructions to bring forward projects of improvement,

improvement, since orders to the contrary were issued; but Collectors of districts are anxious to make the best of the countries under their management, and the Civil Engineers working in concert with them, and having the same wish to benefit their divisions, rarely hesitate to offer their suggestions for adding to the prosperity of the country by public works. They do consider themselves as having that responsibility; and many have made it, as others would if they had more time to devote to it, one great object of their labours. Their first duty, as their orders now stand, is to supervise all expenditure in the repair of public works, to inspect them personally, and check, by actual measurement, as many as they can; to examine any that are said to need repair, and to estimate for what may be required, there being certain descriptions of work which cannot be executed unless personally reported upon either by an Engineer or a Surveyor of the Department, such being the condition on which the Government sanction for the work is given. And of late years this condition has frequently been annexed in the case of estimates of very small amount, such as for the building of a Bungalow or a Police Cutcherry, which were not to be commenced till the excavation for the foundation had been seen by one of the department. It is no less the duty of the Civil Engineer to inspect or ascertain, in any way he can, the condition of the works of irrigation, so that he may avert as well as remedy the damage they are liable to. The latter duty is indeed of paramount importance, as on it, in a great degree, depends the cost of keeping the works in repair. The general control over all the works of irrigation has to be carried on in immediate communication with the Collectors of Districts and the Board of Revenue. No work, however small, can be done without a detailed estimate, made either by the Revenue Establishment or by that of the Civil Engineer, and all estimates, by whomsoever prepared, have to be examined and attested by the Civil Engineer himself. With the works of communication the case is similar, except that there being no direct revenue dependent upon them, they have not, in the same degree, been considered the special objects of the Civil Engineer's attention. All estimates, and bills for work connected with them, however, in like manner, have to pass through his office for examination and check. All plans for bridges have to be made by the Engineers, as have also all considerable estimates for roads and ghauts, the latter, in some parts of the country, being a most important item in the labour of the year. All civil, ecclesiastical and military buildings, as well as those under charge of the Marine Department, are in like manner under the Civil Engineer's supervision. A diary in detail of all the proceedings of each day has to be sent in once a month by the officers of the department, besides a number of periodical statements.

515. The actual amount of office work that all this entails cannot be clearly shown, but it may be inferred to be large, from the fact that, in the year 1850, above 5,000 estimates were forwarded to the Board, together with the plans for all the new works. Bills to about the same number were sent in; and in all cases of the bill exceeding the estimate by five per cent., explanations were required and given. The amount of correspondence, extending to the most minute matters, fills the records of the department, and adds very greatly to its labour. This is all that can be said, in a small compass, to give an idea of the office work in the Civil Engineer's Department, an amount of labour which would be considered heavy, if the establishment were stationary, instead of being almost constantly in motion, as is the case with the Civil Engineers' camps in general. With this amount of office work, and a camp moving at the utmost 10 miles a day throughout the year, it may be imagined how little 25 officers of Engineers, with their 25 Surveyors, can do to watch, repair or improve the 70,000 tanks and channels existing in the Ryotwar districts of the Madras Presidency, even if they had not the roads, ghauts and buildings to attend to; and we must explain what amount of engineering these 70,000 "works," so called, require.

Extent of his office work.

516. A great portion are small tanks, the treatment of which is simple enough; but which, if left to themselves, are constantly injured, and their repair has ever caused the chief ordinary expenditure of the year. Mismanaged, neglected, or left for a time unseen by any but the talook servants, they gradually deteriorate, till a sudden fall of rain destroys them, and they have to be rebuilt. Many thousand are tanks of a larger description, having an area of from two to four square miles of surface, which have not only to be guarded against the effects of waves and rain, but require careful attention to secure their having a good supply of water.

All tanks constantly require more or less of his attention.

Danger from works being insecure.

This class of works, as may be supposed, requires the attention of officers of experience, and should be constantly under the eye of the Civil Engineer. Other tanks are still larger, perfect lakes indeed in extent, covering from 4 to 12 square miles. These have large channels for supply, and works of masonry of great size; and on their safety depend lives and property to a vast amount. In the year 1836, when the North Arcot and Chingleput districts were visited by a most violent storm, the town of Madras had the narrowest escape of a frightful visitation from the Cauverypauk tank not being in a secure state. When the gale ceased, it was found that the waves had been thrown over the bund where the water was deepest, and the embankment had been so nearly cut through, that, but for a sudden change in the wind, it would have been destroyed. The breadth of soil left at the top was only half a yard. A few minutes would have washed that away, when the whole contents of the enormous tank, not less than 12 miles in circumference, and in parts 25 feet in depth, would have flowed through 70 miles of country, carrying with it the large tank of Chembrumbaukum, and numberless smaller ones; and their whole accumulated waters would have fallen into the Cooum and Adayar, at that time far above their banks, and already causing great damage in Madras. To report upon the condition of the Cauverypauk bund, it was necessary to send up an officer not belonging to the division, and engaged on other duty at Madras, the Civil Engineer being too far distant. Had the accident occurred, the ruins of a great portion of Madras would have shown to the Government how bad is the policy of leaving the charge of such works to the management of a department admitted by all to be altogether insufficient in numbers.

Extensive losses from that cause occur almost every year.

517. Nor is it always such large and conspicuous works as this which lead to ruinous losses. As tanks are always formed in valleys, they are often in continuous lines, following the natural course of streams, so that the surplus water of one flows into and indeed is the main source of supply to those below it. The danger resulting from this will be clear to every one: the calingulah or outlet for the surplus being a more or less expensive kind of work, is usually made sufficient to discharge the drainage of the valley, and no more, as when all the tanks are in repair nothing further is required of it; but in case of an accident happening to one of the upper works, its water is poured suddenly into that below, the bund of which is destroyed by the flood, and the accumulating waters sweep away all before them, tanks, crops, and not unfrequently villages, with their cattle, and even people. Such was the case in Cuddapah, some years ago, when 16 fine works were swept away in a single valley; the first work that failed being one so small, that nothing but the accident it caused would have then led the officers, who had a thousand others to attend to, to visit and examine it. This year such a flood has happened in several places: indeed it would hardly be too much to say that not a season passes without one or more cases of the kind; and the origin of the accident is often the want of care in some one village, where the bund has not been looked to, and perhaps a cattle track across it has worn away the earth, and let the water over. In many instances, a single cubic yard of earth would have averted the ruin. A small sum spent judiciously would have saved lacs of money lost to the Government in revenue and repairs, and the people of the valley from the loss of all their crops. That much of this results from apathy in the inhabitants and talook servants there is no doubt; but having, as matters stand, no better guardians of the public works, a constant watchfulness is quite as necessary in the Engineer Department to save the tanks entrusted to its care, as skill in managing their repair when damaged.

The channels.

518. Another class of works consists of channels, of which there are very many thousand in the country. Each channel in this list is called "a work," though it is in some cases a system of several hundred separate works, dams, regulating sluices, calingulahs, and sluices for the distribution of its water. There are numbers of these channels, on which it would answer to have the Engineer entirely occupied with a single channel only, rather than that it should be left to the thousandth part of his attention, as is the case at present. We may instance one of the channels of Coimbatore, the Calingaroyen. This channel is 52 miles in length, and depends for its supply upon a rough stone dam between 20 and 30 feet in height. It has a number of calingulahs and sluices to carry off its surplus water where the drainage of the country crosses it, and its water is distributed by 2,000 tunnels in its bank. The extent of cultivation dependent upon it is 8,000 acres; and the value of the crops of one year to the Government and the people

Instance of the Calingaroyen Channel.

is

is little less than two and a half lacs of rupees. There is no part of this channel that does not require some skilful treatment. The anicut, during a part of the year, does not supply it as it might; at other seasons when water is scarce at the lower end of the channel, it is necessary, in consequence of the insecure state of the bank, to allow a great portion of the stream which enters it to be discharged by the surplus sluices; and there is not one of all the 2,000 outlets for the distribution of the water, which does not cause a waste in its expenditure of water very greatly above what is necessary. The irrigation from this fine work ends in an open and well-peopled country, the further portion of which, now without irrigation, only wants water, to be as fertile as the lands which it already reaches; much of the latter land yields to Government a revenue *Rs.* 30 an acre, being more than 10 times what is paid by the former or unirrigated lands. There cannot be a doubt that on such a work as this there is full occupation for an Engineer of the best experience. This, it is true, is one above the average in importance, but it is by no means one in the worst condition. We select it as an instance, because we have the facts regarding it at hand. There are numberless other works, both tanks and channels, each of which would in like manner repay the Government the cost of an Engineer, with no other occupation than to make the most of it.

519. In his report printed in our Appendix (B.), paras. 15 and 16, Colonel Cotton mentions two cases of serious loss from the want of Engineer officers. The aggregate direct loss to Government in revenue in the two cases, before the mischief was corrected, was more than 27 lacs of rupees, though it cost only one lac and three quarters to make the necessary repairs and restore the revenue, as soon as Engineer officers could be spared for the work. Nor was the large sacrifice of revenue by any means the whole evil of this neglect; to the owners and cultivators of the soil it brought impoverishment and ruin, as is vividly described in para. 19 of the same paper. Other instances.

The Tadapully Channel in Coimbatore may also be quoted. In speaking of that channel, in his diary for September 1850, the Civil Engineer of the 7th Division thus expresses himself: "To give some idea of the loss that may result from a bad system of management in such a channel, I find from the accounts brought forward by Kistniah, that from the year 1811 to 1848 there was a loss of about *Rs.* 9,00,000, taking the revenue of the year 1809 as the standard of what might have been collected from first to last; which the collections of late years have proved to be no greater than might have been received annually." Had a Civil Engineer been in charge of this channel alone for the whole of the last 40 years, with *Rs.* 1,000 a month, the Government would have saved four lacs out of the nine, and the cultivators would have been at least 12 lacs the richer for it. But had this been the case not only would the actual loss now spoken of have been saved, but the water might have been turned to so much better account, that it would have been carried on to new lands, capable of producing half as much again both to the people and to the Government as it produced last year, and estimates for effecting this are now under preparation. In giving this instance, and pointing out how well even *Rs.* 1,000 monthly might have been spent upon the management of this channel, we must not be understood to say that so large an outlay was required; we only wish to show that even such extravagant expenditure would have been far better policy than the so called good economy of the present system of no management. The Tadapully Channel.

520. Another instance may be quoted in the Ponnair tank. This tank in the Trichinopoly district, now in ruins for many years, is on a gigantic scale. The bund is 26 miles in length and of great height, furnished with two sluices of substantial masonry, and still in good preservation; it was supplied with water from the Coleroon river by a channel 62 miles in length, as well as by a smaller channel from the Vellour. The whole of the country once fertilized by this stupendous work is now waste, and in great part covered with thick jungle, except a few poor villages scattered here and there, with a limited extent of cultivation attached to each. Since 1832 the restoration of this tank has been repeatedly urged on the Board of Revenue by the local officers; and in 1837 the bund and channel were examined sufficiently to ascertain generally the feasibility of the work. The Board then directed the Civil Engineer to make a thorough survey and estimate as soon as he could find leisure; the present Civil Engineer, too, has been very anxious to do this, but hitherto, owing to the constant and pressing calls on his attention, he has been unable to give the necessary time. The Collector of Trichinopoly, in The Ponnair tank.

writing about this work to the Board of Revenue in 1837, stated that the Ryots of the Oodiarpollicem talook had engaged to bring 9,000 cawnies (12,000 acres) of land into rice cultivation if the tank should be restored; that even this extent would yield between Rs. 80,000 and Rs. 90,000 to Government annually, and that it did not nearly approximate to the whole extent of land that would be ultimately reclaimed.

The Chembrumbaukum tank.

To these cases may be added that of the Chembrumbaukum tank in Chingleput district, which has land under it bearing an assessment of Rs. 62,000, besides Rs. 10,000 of Enam land. During the five Fuslies, 1255 to 1259, the lowest revenue from the tank was Rs. 21,700, and the highest Rs. 47,000; and this large fluctuation occurred within three years, the former being in Fusly 1256, and the latter in Fusly 1258. The sole cause was want of water; for the channel from the Corfiliar river which formerly supplied the tank, had become choked up to the depth of 5½ feet, and the tank was left almost wholly dependent on the local rains. In December 1850 the Civil Engineer visited the tank, and made an estimate for clearing out the accumulation; the work was done in the early months of the following year, at the cost of less than Rs. 4,000, and in three days of rain in May above 5,300,000 cubic yards of water entered the channel; the value of that quantity for revenue to Government being above Rs. 5,000, so that the cost of the repair was much more than repaid in those three days.

The northern districts even more neglected than the Carnatic.

521. Similar instances, though not all on so gigantic a scale, might be brought forward in all parts of the country; but from the reports we have received from the northern districts, there must be even more necessity for the presence of Engineers there than in the most neglected parts of the Carnatic. In answer to our questions on the subject, we have a paper from the Civil Engineer of the 1st Division, which is so full of proof of what we are now stating, that we are induced to append the whole of it to our report (Appendix C.). It will be seen by that paper that not only has the East India Company's own territory been allowed to go to ruin, but even a property held in trust for a Zemindar has in like manner been most seriously injured by the neglect of its works of irrigation. It does not appear that in those districts the Government has withheld the means when asked for; but no applications have been made, because there have been no Engineers to point out what was wanted; and now that the necessity for some expenditure on every tank and channel in the country is brought to notice, there are none to plan the works required. Mr. Walter Elliot, the Commissioner of these districts, urges that more officers may be sent to him; and the native Zemindars have seen enough in the operations on the Godavery and elsewhere in the last few years, to beg that they also may in some way or other have the advantage of the services of Engineer officers, but none are to be had. The present state of the country and of the department shows the wisdom of the opinion declared by the Court of Directors, in their despatch of the 17th December 1833, in the following words: "They attach great importance to all works in the department being placed under the constant personal control of European officers, and they hold it to be an unwise economy to commit the management of expensive and important works to native agents." Since this despatch was written, 18 years' experience, and a loss we cannot calculate, have confirmed the soundness of the view then taken; and we would add our most urgent recommendation to that so often made by the Board of Revenue (and on one occasion, at least, by the Marquis of Tweeddale), that the paragraph above quoted should no longer remain a dead letter on the records of Government.

The roads;

522. What actual loss is occasioned by the want of communications throughout the country it is impossible to say; but in the present day, when the value of cheap and rapid transit is so well understood, we need hardly do more than point out, as we have done in another part of our report, the present cost of moving goods and passengers, to show the want of engineering for improved means of locomotion in every part of the country.

And the Government buildings.

In the Military Building Department there is also a deficiency of Engineers, but the number required will depend upon the new organization of the Civil Branch. As we propose so to arrange the duties of that establishment, that all buildings at present under the Military Board within the provinces shall be under the management of the Engineer of the division in which they are situated; and only under Engineer officers, specially appointed, when beyond the frontier.

523. Our inquiry into the past leads us to the conclusion that, from the want of officers and means, hardly anything has yet been done to bring to light the capabilities of this Presidency; but it affords no data on which to judge what a sufficiency of engineering care and attention might effect. Not only has no account been taken of the works of irrigation in an unserviceable condition, and of which there are many thousands in the country, but till this time it has been found impossible, with the present establishment, to collect and record even the names and value of those in use; and when we attempt to define what additional strength is required for the Maramut Department, we find ourselves altogether at a loss in this the first point of our inquiry. Nothing more can be said at this moment as to the general condition of the works, either of irrigation or communication, than that some slight effort has been made in the last few years to get a portion of them into better order, and, it is supposed, with as much success as might have been expected from the sums laid out.

Great want of statistical information as to the works in the country.

And if we find ourselves at fault as to the condition of the works now used, it may be well imagined how little we can judge of the means required for turning to account the main resources of the country as yet untouched. In the orders of the Board of Revenue or Government, there are no calls now for projects of improvement. There have been times when projects volunteered have been accepted by the Government, and (as will be seen elsewhere) well has the money been repaid that was at those times granted; but, as a general rule, we find the projectors standing before the Government as petitioners, on some occasions to have their offers so refused as to induce them to suppose that such suggestions were obtrusive. It was not likely, therefore, that we should have before us any papers showing, in detail, the capabilities or the wants of Southern India; all we know is, that the communications of the country are in a ruinously inefficient state, that the irrigation of no one district is complete, that the present establishment is not nearly strong enough to keep the present works in order, and that the higher floods of all the rivers filled by the never-failing rains of the south-west monsoon, now flow entirely to waste. These facts are evident; and we have before us sufficient proof that in the extension of the works of communication, as well as those of irrigation, the Government has received as great a benefit as has been conferred upon the people.

524. It may be gathered from the foregoing remarks, that the camps of the Civil Engineers are constantly in motion; and even moving with the greatest speed attainable, every officer in the department feels that he is always wanted where he cannot go, in spite of all his efforts: the more he sees and does, the more anxiety and cause for haste he brings upon himself; and while in this state of restlessness, if he is to advance the country that he travels over, he must find time for projects of improvement, and snatch it as he can from days already crowded with other urgent duties. His information must be taken hurriedly, his observations of the ground must occupy as few days or hours as possible, and, in drawing up his estimate, he must do it with his camp still moving on, out of reach of books of reference, and working with people weary of the constant travelling, and with good reason discontented. Added to this, as has been before mentioned, he has the roads, ghauts and all public buildings more or less under his control; move where he will, he finds more work wanted than he and his subordinates can effect, and he has no season of recess or rest.

All an Engineer's projects are necessarily prepared in a hurry.

525. Having premised these few remarks, we now proceed to consider the establishments which, after a careful consideration of the subject, seem to us necessary for the efficient working of the Public Works Department. In Appendices (D D.) to (F F.) will be found the details of the whole establishment proposed, in all the various grades, with their salaries and distribution. The whole naturally divides itself into four parts; viz. 1st, the Commissioned Officers; 2d, the European Subordinates, warrant and non-commissioned; 3d, the Native Subordinate Department; and, 4th, the Office Establishments. We will here offer a few remarks on each of these divisions, with the view of explaining the grades, numbers and salaries which we propose in each; and we begin with the Commissioned Officers. The following Table shows the particulars of our propositions as respects this branch of the service:—

The proposed establishment.

RANK.	Class.	Number in each Class.	Number in each Grade.	Monthly for One of each.			Total Annually.	
				Staff Pay.	Tentage.	TOTAL.	For One of each Class.	For each Class.
				<i>Rs. a. p.</i>	<i>Rs. a. p.</i>	<i>Rs. a. p.</i>	<i>Rs. a. p.</i>	<i>Rs. a. p.</i>
Chief Engineer			1					
Adjutant of Engineers			1					
Members of the Board			2	1,100		1,100	13,200	26,400
Secretary to the Board			1	500		500	6,000	6,000
Inspecting Engineers	1st	1	1	1,000		1,000	12,000	12,000
	2d	12	13	700	121 10 8	821 8	9,860	1,18,320
	1st	8		500	91 4	591 4	7,095	56,760
District Engineers	2d	8		400	91 4	491 4	5,895	47,160
	3d	8	24	300	91 4	391 4	4,695	37,560
			20	100	60 13 4	160 13 4	1,930	38,600
Assistant District Engineers				600		600	7,200	7,200
Special Assist. ditto ditto	9	1st	1	400	91 4	491 4	5,895	47,160
Permanent Execut. Officers	12	2d	8	250	91 4	341 4	4,095	73,710
Occasional ditto - ditto	30	3d	18					
Total	51	4th	24	150	60 13 4	210 13 4	2,530	60,720
TOTAL Commissioned			113	6,000	699 9 4	6,699 9 4	80,395	5,31,590

What duties require Engineer officers.

526. It appears to us to be essential to an efficient system, that officers invested with the duty of projecting works, and controlling the operations of the department over an extensive tract, should be men with minds enlarged by a liberal, and invigorated and trained by a scientific education; and it further appears to be necessary that, even in positions of secondary importance, but which nevertheless require the constant exercise of engineering science and skill, Engineers alone should be placed.

An Engineer officer and assistant p. each district.

Our scheme for the employment of officers of Engineers is based on this foundation: we propose, first, an officer to every district as the head of the Public Works Department within it, including works of Irrigation, Roads and Buildings. His duties will be similar to what we have already described those of the Civil Engineers to be now; except that, having a less extensive charge, and being relieved of one part of the duties of that by the Inspecting Engineer, he will be able to exercise a much more effective control over the department in all its parts, than it is possible for the Civil Engineer to exercise at present. We have already described the evils inseparable from the present deficiency in the numbers of the department; and without here going over the subject again, we will merely remark that a sufficient and well-organized, professional establishment is all that is required to remove them. We propose, also, that each of these 20 District Engineers shall have an Assistant; the object of this arrangement being partly to give assistance to the District Engineer, but principally to train up a body of young officers in the practical knowledge of Indian Civil Engineering, especially as respects the uses, incidents and management of hydraulic works, the want of which knowledge in officers appointed to the department is now a source of heavy loss to Government. The Assistant being usually with the District Engineer, and seeing his projects and his mode of dealing with works, will gain that practical skill before being intrusted with important duties himself, which is now only to be acquired, as we have already observed, by a succession of mistakes. The Assistants will also be occasionally employed in the execution of important works; and by this twofold training, they will become fitted for the charge of a district.

four District Engineers for Mysore.

527. We propose also to provide four District Engineers for the four divisions of Mysore. Those divisions are not less extensive than the Collectorates of the Honourable Company's own provinces; and though irrigation is not so general there, yet works of that nature are by no means few, and these, with the roads and other public works, are fully sufficient to require this number of Engineers. We have not provided assistants for them, because the quantity of work is smaller, and because we believe that 20 officers of that class will be sufficient to supply vacancies in the department, allowing about two or two and a half years in that grade to every officer.

the Inspecting engineers.

528. The Inspecting Engineers provided are 13 in number; viz., one for the Presidency division, nine for the nine Maramut divisions, one for Mysore, one for the Saugor division and territories, and one for the railroads.

The duties of the Inspecting Engineer of the Presidency division have been already

already detailed; in the interior they may be described as chiefly those of control, though the Inspecting Engineer will himself take a personal share in the investigation of extensive projects. His general duties, however, will be to receive and forward to the Board, with his opinion, estimates made by the district Engineer and his subordinate; to receive, examine, and send up bills for works done, with his opinion as to the style of execution and the charges; to inspect large works executed by the District Engineer and his department, to direct the attention of the latter officer to matters most requiring it, and to guide and assist him with his advice; in short, he will stand between the District Engineer and the Board of Works, relieving the latter from much trifling detail, and both aiding and controlling the former. His duties will vary in the several divisions; for it is evident that the junior of the district Engineers must always be officers of limited experience; and in districts under the charge of such, the interference of the Inspecting Engineer will be more minute than under other circumstances. We have provided for one officer of the rank of Inspecting Engineer for the railway or railways; for it appears to be determined that these undertakings are at length to be entered upon; and whether they are constructed by the immediate agency of the officers of Government, or are entrusted to other hands; in either case, after the example of Bengal and Bombay, at least one Government Engineer Officer of rank will be appointed to control the operations.

529. Thus the establishment of commissioned officers which we propose in the provinces, so far as concerns the general duties of the country, is as follows: 10 Inspecting Engineers, 24 District Engineers, and 20 Assistants. And we are decidedly of opinion, that it cannot be reduced below this without sacrificing efficiency.

Total of commissioned officers.

The late Governor, the Marquis of Tweeddale, was fully alive to the necessity of increasing the Maramut Department; and though he was uniformly jealous of any enlargement of establishments, yet, in a minute which he recorded in Council on the 25th August 1846, after full consideration of the subject, he stated his conviction that it was necessary to have an officer of Engineers attached to every Collectorate, besides the Civil Engineers of divisions.

Opinion of the Marquis of Tweeddale;

The Board of Revenue were called on in the same year to state the wants of the department; and in their reply (15 February 1847, Appendix G.), they declared that the number of Engineer officers required for its efficiency was 28 in permanent territorial appointments, besides four for special duties. This letter from the Board, as well as the Marquis's own minute, was sent home to the Court of Directors, who ordered that the subject should be brought before the Government of India. This was done, and that Government having called for further information, the Board, in supplying it (Appendix H.), reiterated their decided opinion, that the permanent establishment ought not to be less than one Engineer officer to each of the 20 districts, in addition to the eight Civil Engineers. The orders emanating in the course of that correspondence, both from the Madras Government, the Court of Directors, and the Government of India, evinced the strongest disinclination to allow any increase of the establishments, of which feeling, indeed, the repeated postponement of a decision is a sufficient proof; and it is evident that the Board did their utmost to meet the wishes of the powers above in this respect, as far as their practical conviction of what was necessary permitted. But in spite of this anxiety in the Board, although they did not contemplate any enlarged system of operations, and evidently did not keep in view the necessity of doing something to improve the roads; and though they then had nothing to do with the trunk or main roads, notwithstanding all these circumstances, they felt themselves compelled to state the foregoing numbers as the minimum establishment of Engineer officers.

And of the Board of Revenue.

530. We have given the subject our most earnest consideration, being not less anxious to observe true economy, and to recommend nothing not required by that; and though we have in view larger operations than the Board then contemplated, and though we have to provide for the trunk roads as well as the branch roads, we propose no larger a permanent establishment of commissioned officers than they did, except that we consider it necessary to divide the present enormous 1st Division into two, and that we ask for assistants to the District Engineers, chiefly with the view of providing a succession of trained officers for the district appointments; as it would obviously be most absurd and ruinous to place a young officer totally new to the duty, in immediate charge of an extensive department.

We propose no more than we are persuaded true economy requires.

But though we have made no material addition to the number of commissioned officers required by the Board, we propose a much larger and more efficient establishment of subordinates than they contemplated, although it is shown by other papers that the Board were quite alive to the importance of strengthening that branch of the service. We shall come presently to notice our proposals in this grade, and meanwhile we will only observe, that with a sufficient establishment of superior officers such as we propose, these subordinate grades present the means of increasing the efficiency and extending the operations of the department with very small proportionate outlay. The commissioned officers, indeed, will form a frame or skeleton of control, quite necessary, even at present, for the extensive countries over which they have to operate; but which can be filled in from time to time as necessity may require, with officers of inferior ranks and qualifications, without by any means a corresponding augmentation of the duties of the controlling officers, and consequently without a proportionate increase of their number.

If the foregoing appointments could be always kept full.

531. We say, without any hesitation, that a smaller permanent establishment of officers than that which we propose, would not be efficient; that is, that it would be bad and losing policy to make it less. And one thing must be especially insisted on in connexion with this establishment, viz., that all these officers must be considered permanent; and on the occurrence of a vacancy it must be filled up as a matter of course, just as much as the office of Judge or Collector, or subordinate Judge or Sub-collector, is always kept full. This branch of the public service is not less essential to the prosperity of the revenue and the well-being of the people, than the revenue or judicial establishments; and it ought no less than they to be regarded as a permanent department always to be kept up at its full strength. This was justly put forward as a principal point by the Board of Revenue in their letter to Government last referred to (Appendix II.); and unless it is made the invariable rule and practice, there can be no security for the efficiency of the department. It may occasionally be absolutely necessary, in case of war or other emergency, to withdraw the holders of these appointments to other duty, though that should be avoided as much as possible; but whenever that happens the vacancy should be filled up, *ad interim*, according to the general rule of the service in other branches, so that its ordinary duties at least may be conducted without hindrance.

Reasons for dividing the 1st Division.

532. Our reasons for thinking it necessary to divide the present 1st Division are its enormous extent, and the great value and importance of the works it contains. As to its extent, it consists at present of five Collectorates, having an aggregate area of more than 30,000 square miles, very little less than the whole of Ireland, which measures only 32,000 square miles, and its extreme length, in a straight line, exceeds 450 miles. As to its works, it contains the deltas of the Godavery and the Kistnah rivers, in both of which very extensive operations have been ordered, and are already in progress, for turning the waters of those rivers to use for the purpose of irrigation on a large scale. The heavy pressure of duty even in connexion with the works on the Godavery only, was such as to occupy almost the whole time of the Civil Engineer, aided as he was by a number of additional officers. The Government was induced, therefore, in 1847, to constitute the two districts of Ganjam and Vizagapatam a separate charge; and recently, when the Kistnah aicut and its connected channels and other works were about to be undertaken, a further division was most properly made, by nominating an Engineer officer with the rank and allowances of a Civil Engineer, to the separate charge of those operations, and of the districts of Guntoor, and nearly the whole of Masulipatam; thus leaving to the Civil Engineer of the 1st Division, only the Rajahmundry district and the small part of Masulipatam which is to be watered from the Godavery.

How to be divided.

533. And if efficiency is to be attained, this partition must be permanent and not merely temporary. The Board of Revenue have deliberately declared their opinion that the delta of Tanjore requires the full professional complement of a division, and undoubtedly it does so. And yet the greater part of the works there are completed and actually in operation, while on the Godavery, and still more on the Kistnah, almost everything yet remains to be done. We propose then to subdivide the present 1st Division by separating from it the Guntoor district, and the whole of that of Masulipatam, except the small part of it which is included in the delta of the Godavery; and the 1st Division will then consist of the districts of Ganjam, Vizagapatam and Rajahmundry, with a small part of Masulipatam.

patam. We propose that the newly formed division shall be called the 2nd Division, the present 2nd to be called the 3rd, and so on; we have already mentioned, para. 204, that we propose to place the Executive Officer of Hyderabad under the Inspecting Engineer of the 2d Division.

534. Ganjam and Vizagapatam will each have a District Engineer and an assistant; they will be an integral part of the 1st Division, and will receive their due share of the attention of the Inspecting Engineer. Those two districts, like the rest of the Northern Division, have been hitherto far too much neglected; but there is very much work to be done in them of an engineering character. They comprise an area of 14,000 square miles, being double the size of Wales; they contain nine military cantonments, and a multiplicity of civil buildings. It is true that a large part of each district is under Zemindary tenure, and the irrigation works in those portions are not the property of Government; but it is equally true that many of the Zemindars would be glad of professional aid in the improvement of their estates, and the Honourable Court have expressly directed that such aid shall be given them; and also the irrigation works of the Government portions of these districts have been more neglected than in any other part of the Presidency, and require a large share of attention. Again, the roads in that division, both the main lines and the country or district roads, have shared in the general neglect, and are as bad as in any part of the Presidency; and lastly, they contain several seaports which require to be attended to and improved.

The wants of Ganjam and Vizagapatam.

535. In providing four District Engineers to manage the works in the Mysore country, we have been influenced partly by what we have learnt from Major Green, the Superintending Engineer, as to his want of assistance; but chiefly by a consideration of the extent of the territory, and of the quantity of work to be done, and of that actually done, though without the advantage of adequate professional assistance. The Madras establishment has hitherto furnished the Engineer officers for that territory, as well as those for the administration of its affairs in every department; although the country, as well as all officers employed in it, is removed from all control or interference by the Government of the Presidency of which it naturally forms a part. The District Engineers will in like manner, it is presumed, be under the Indian Government, while the present arrangement continues, and not under the Government or the Board of Works of their own Presidency; but it is supposed that the Executive Engineer of Bangalore, and in all matters connected with military buildings, the Inspecting Engineer also, will be under the Board of Works. In the Saugor Division also there is a divided authority, but the partition is different from that in Mysore; we have already described its complicated character. The Superintending Engineer and the Executive Officers are under the Military Board of Madras in all parts of their duty; but the Military Board acts under the orders of the Madras Government as respects this division in military matters only; on all road works in those territories they correspond with the Government of Agra; while as respects the buildings in the Political Department, they communicate with the Government of India. Beyond giving a fourth Executive Officer, we have not provided for any increase of strength in the Engineer Department in that division, though the present establishment is obviously unequal to the general duties of a division of above 29,000 square miles, besides detached stations and roads; because we are uncertain how far that territory, which is not a part of this Presidency though occupied by Madras troops, falls within the scope of our duties.

The Mysore and Saugor Divisions.

536. To conclude our notice of the fixed and permanent establishment, it only remains to advert to the Executive Engineers to be appointed at the large stations. These will be 12 in number; there must be one for the Presidency Division, charged with all executive duties connected with the valuable and numerous public buildings, bridges, &c., at the Presidency itself, as well as at the neighbouring stations of St. Thomas' Mount, Poonamallee and Palaveram. The large military stations beyond the frontier will also require Executive Officers; they will be Hyderabad, including Bolarum and Jaulnah, at which latter place there will be a Warrant Officer of the Department, Kamptee, Bangalore, Cannanore, the Neilgherries, the Tenasserim Coast and Singapore; besides four Executive Officers for the several circles of the very extensive Saugor Division already noticed. Out of this number, there are already Superintending Engineers at Hyderabad and Kamptee, whose appointment is to be abolished, and the duties to be transferred

Executive Officers at military stations.

to the Executive Engineer. In the Straits Settlements there has always been a Superintending Engineer, till dispensed with lately, because an officer of lower allowances was desired, a want which will be met by our proposed arrangement. At Tennasserim there is an Executive Officer belonging to the Bengal army, though the whole of the force in the province is from Madras. At Bangalore it appears very necessary to have an Executive Officer for the duties of so large a station, so as to avoid taking up the time of the Inspecting Engineer of the division, or the District Engineer in whose limits the cantonment stands, with the detail of works in the station. At Cannanore the want of such an officer has long been felt, and in the absence of one, the whole time of the First Assistant to the Civil Engineer for many months was devoted to works at that station, being wholly withdrawn from the duties of the division at large. As to the Neilgherries, the new barracks now in building there will require more than one officer for the next four years, and an Executive Officer will certainly be required there permanently.

Officers for special projects.

537. But besides the officers filling permanent appointments, others will be required for special duties; that is, for investigating special projects, either of irrigation, of communication, or of other kinds, and for executive duties in connexion with them. As respects the former, the Board of Revenue in their letter to Government of the 30th July 1849 above referred to (Appendix H.), pointed out the necessity of having a number of officers in the department specially engaged in the investigation of great projects of works, and stated four as the number of officers sufficient for this purpose. We fully concur as to the necessity of officers for this object, and we will mention a few undertakings with which our very limited knowledge has made us acquainted, though in doing so we would not be understood as attempting to give a list of all the large undertakings for which openings exist; that is by no means our intention, as we are very far from having the necessary information:—

1st. The completion of the channels and other works in connexion with the Godavery anicut.

2d. The very extensive channels and works required in connexion with the Kistnah anicut. The laying out of all the channels, and the planning of the sluices, calingulahs and other works connected with these two great undertakings, altogether independently of the Executive, will call for a large amount of engineering skill. The want of both engineering skill and executive means has delayed and continues to delay the completion of the Godavery works, and so to postpone the increase of revenue certain to be derived from them; and the same causes are likely, under present circumstances, similarly to delay the Kistnah works, though the project long ago received the sanction of the Court of Directors, and has been commenced.

3d. The restoration of the anicut across the Cauvery at Nerinjiput in Salem district.

4th. The restoration of the Ponnair Tank and Channel in Trichinopoly District.

5th. The improvement and extension of irrigation from the Toombuddra River in Bellary District.

6th. Arrangements for turning to use the flood waters of all the large rivers of the Peninsula, including the Cauvery, which now flow almost entirely to waste. This, though here set down as one scheme, comprehends a large number of separate undertakings, each requiring careful examination of extensive tracts of country, but promising a vast and certain increase of wealth and revenue.

7th. The improvement of the principal rivers of the Peninsula, so as to render them navigable; more especially the Godavery, with its several branches, and the Kistnah. We have already adverted, at some length, to the vast benefits to be secured by opening the former river, and the smallness of the outlay by which that object may probably be effected.

8th. The laying out of canals along both the coasts of the Peninsula.

9th. The tracing of passes to form roads for connecting the interior country above the ghauts on both sides of the Peninsula, with the plain country at their foot, and with the coast.

10th. The laying out of main lines of road, where, as will often happen, the ordinary duties of the district prevent the District Engineers from giving sufficient

sufficient time to them. To make a road effectively and economically, a careful and skilful examination and survey of the ground must be made before the work is begun; and provision for this operation must be made.

11th. The sewerage of Madras and its suburbs; and in conjunction with that, the provision of a sufficient supply of good water for domestic use. Both these two subjects, so important to the health, and in a measure to the lives, of a population of 700,000 persons, have recently been indefinitely postponed by Government, after some inquiry, on the mere ground of expense. But in the present state of knowledge and of public feeling on such questions, it seems impossible that this postponement can be of very long duration.

12th. The improvement of the roadstead of Madras, by the construction of a breakwater outside the anchorage, and diminishing the existing inconvenience, expense and risk of the communication between the shore and the shipping, by means of a pier or jetty. There is reason to believe that both these enormous benefits to the commerce of this port and of the country, might be gained at a cost very small in comparison.

The Board of Revenue specified four as the number of officers constantly required for the examination of irrigation projects only. Taking a wider view of the requirements of the country, and even making allowance for more spare time from a larger permanent establishment, we still think that nine officers will be a very small number for these duties. We propose to style them "Special Assistant District Engineers." Although their number is the same as that of the divisions, we do not at all intend that they shall be so distributed; our design is that they shall be employed wherever wanted, but generally under the immediate control of the Inspecting Engineer of the division in which they are working.

538. As to the employment for Executive Officers, their services will be required very extensively whenever the improvement of the irrigation works and communications is extensively entered upon. They will be largely required on all such works as those which we have just enumerated; and indeed wherever large projects of improvement are in course of execution. Nor then only, for it will be found necessary to appoint officers of this class permanently to the charge of portions of road, as well as to canals, after completion. Even at present, with so little work undertaken, and the unvarying cry from all quarters that there is not sufficient means of doing even that little efficiently, no fewer than 20 such officers are employed in the execution of works; and it may safely be assumed therefore that hereafter, not fewer than 30 such officers will be required. Thus the whole number of officers required for special and for executive duties connected with irrigation and the means of communication will be 39. Occasional Executive Officers.

539. We must here observe, however, that we are not of opinion that all these officers need be Engineers. In all positions where engineering skill and science are required, we would employ professional officers only; but where the duty is merely to carry into effect the plans of others, requiring not a knowledge of engineering, but only or chiefly activity, ingenuity, resource, and the talent to call out the energies of men, and to direct the exertions of a body of labourers to advantage, there the requisite qualifications may successfully be looked for among the ranks of the unscientific corps of the army. In accordance with these views, we would confine all the permanent appointments in the Maramut Department, all the Inspecting Engineerings, and, as a general rule, all the special appointments for the examination of projects, to the professional corps; and it would generally be advisable that the Executive Engineer at the Presidency, as well as those at stations such as Tennasserim, Singapore, Hyderabad and Kamptec, where they are far removed from the controlling authority, should be Engineers. But as respects all other executive officers we think the appointments may beneficially be opened to all branches of the army; and thus, out of the whole number of officers that we reckon to be necessary in the department, probably 36 will be other than Engineers. All of them need not be Engineers.

540. It is proper that we should offer a few remarks with respect to the allowances which we have assigned to the several grades; omitting those connected with the new Board of Works, of which we have already spoken. To the Inspecting Engineers we propose to give, except in one instance, the same staff allowance that is now received by the Civil Engineers, with tentage, also at the same rate as at present, viz., Rs. 4 a day. The exception is the Presidency Division, Salaries proposed; the Inspecting Engineers. to

to which we propose to assign Rs. 1,000 staff salary without tentage. Including his allowance as Civil Architect, the Superintending Engineer of the Presidency Division receives at present a staff salary of Rs. 1,063. 10. 11.; the proposed Inspecting Engineer may be regarded as coming into his place, though his duties will be somewhat different, and somewhat more important. Comparing these functions with those of other appointments in the department, and considering the expenses of a Presidency residence, we consider Rs. 1,000 a suitable salary. The designation of Civil Architect may cease altogether.

The District
Engineers.

541. The District Engineers may be regarded as coming in the place of the First Assistant Civil Engineers, except that their duties will be of a far more extensive and important character; and with this further material difference, that as the number of appointments in the lower grades is much increased, without by any means a corresponding augmentation in those of the higher ranks, officers will be much longer in reaching the post of Inspecting Engineer, than even now in attaining that of Civil Engineer. And yet promotion to this latter rank is even now extremely long deferred; and only a few months ago there were two officers of above 20 years' standing holding the subordinate appointment of First Assistant. A consideration of this tardy rate of advancement led the Board of Revenue to recommend very strongly in both the papers already quoted (Appendices G. and H.), that the First Assistant Civil Engineers should receive additions to their salary after certain periods of service. In the second of those letters they recorded the following just remark: "There are at present 14 subalterns of Engineers of 23 down to 15 years' standing; and it appears to the Board contrary to sound principle that all the professional knowledge and experience of such officers, who according to the custom of the service can only be employed in professional duties, should be reckoned at no higher value than that of some of the youngest in the corps, merely because they have attained no higher military rank." The arrangement recommended by the Board was to give the First Assistant Civil Engineers an increase of Rs. 100 a month after 10 years in the service; and a further increase of Rs. 50 monthly in salary, and one rupee daily in tentage, after 15 years' service. They preferred the mode of giving the increase for length of service, to that of constituting grades in the district appointments, on the ground that the latter plan would involve frequent transfers of officers from one district to another; but they propose that the increase should be always contingent on the recommendation of the Board.

It is necessary that
their salary should
be graduated.

542. The differing circumstances stated at the commencement of the foregoing paragraph, will render an increase in the scale of allowances for officers of this class much more necessary under the new arrangement than at present; and we think the scale proposed by the Board of Revenue too low. Upon that scale a District Engineer's emoluments, in a month of 30 days, would be as follows:—

	Staff Salary.	Tentage.	TOTAL.
Of less than 10 years' service - - -	200	90	290
From 10 to 15 years - - - - -	300	90	390
Above 15 years - - - - -	350	120	470

An officer of Engineers under this Presidency does not attain his Captain's commission in less than from 22 to 24 years; neither can he expect the post of Inspecting Engineer in less than 25. A monthly income of Rs. 704. 14., including all items,* and out of which the necessary expenses of marching equipage will absorb

	Rs.	a.
• Regimental allowances as First Lieutenant - -	234	14
Staff pay as proposed by the Board of Revenue -	350	-
Tent allowance, at Rs. 4 a day - - - - -	120	-
Total	704	14

absorb fully the allowance granted for that purpose, seems too little after 20 or 22 years' service, for the officers of a corps to which special advantages are held out, and which is cut off on account of such supposed advantages from a participation in the civil and staff appointments open to the rest of the army; and too little, we may add, for the arduous and irksome life which such officers must lead in order to do their duty efficiently.

543. We differ from the Board also as to the mode which they propose, of granting the graduated increase of salary. The principle of giving such increase for length of service, even though conditionally on the favourable report of a superior, appears to us a bad one; it is the same of which we have already expressed our condemnation in the case of the Revenue Surveyors (*supra*, para. 41), after an examination of its results; and though its operation would not be exactly the same in the case now supposed, yet we cannot but think it bad here also. With reference to the Board's reason for objecting to a graduation by classes, we would observe that this system does not necessarily involve more transfers from district to district than any other system, for it is not necessary to attach particular classes to particular districts. Under any system such transfers must take place to some extent, for under any one, it would be necessary to have the most experienced and efficient men in the most important districts, and the juniors would as a general rule be posted to those of least importance. So also the most efficient and experienced men would be those selected for promotion, and thus an advance in salary might often accompany the transfer to another district; though the two events would be connected in time only, and not in the sequence of cause and effect. On the whole, the plan of classes appears to us to be decidedly the best, and the following is the scale which we propose:—

Three classes are therefore proposed

	Staff Salary.	Tentage per diem.	Total for a Month of 30 Days.
1st Class - - - - -	500	3	590
2d Class - - - - -	400	3	490
3d Class - - - - -	300	3	390

We recommend that particular classes shall not be attached permanently to particular districts, so that promotion will not necessarily involve a change of district; and we shall recommend presently, that the designation of these officers to particular districts shall be left to the Board of Works.

The emoluments which we propose for the Assistant District Engineers are the same exactly as those enjoyed by the 2d Assistant Civil Engineers now; and no remark on them is required.

544. We propose to arrange the Executive Officers also in classes, and on the following rates of allowances:—

The Executive Officers to be in four classes.

	Staff Salary.	Tentage per diem.	Total Payments of 30 Days.
1st Class - - - - -	600	-	600
2d do. - - - - -	400	3	490
3d do. - - - - -	250	3	340
4th do. - - - - -	150	2	210

In the permanent appointments we think it necessary to attach a particular class to each station; those of the occasional appointments will be determined in each case with reference to the magnitude of the work and the nature of the duties.

In the 1st class we propose only one appointment, viz., that of the Executive Engineer of the Presidency Division; the peculiar circumstances of this division already adverted to, seem to render a higher scale of allowances necessary here than up the country. In the 2d class there will be four appointments; viz., at Hyderabad, Nagpore, and two of those in the Saugor Division; in the 3d class seven appointments, viz., Bangalore, the Straits of Malacca, the Tennasserim Coast, Cannamore, the Neilgherry Hills, and two of those in the Saugor Division.

As to the occasional appointments, it is of course impossible to determine the numbers in each class; a large proportion may properly be of the 4th class, receiving only *Rs.* 150 staff salary. It may be assumed that of the 30 occasional Executive Officers, the number we propose to be usually engaged in executive duties, three may be of the 2d class, seven of the 3d, and 20 of the 4th. And as the emoluments of these last will be so low, it is the more desirable that as a general rule, appointments to the higher grades, even to most of those of a permanent character, should be filled by selections from these officers.

The Executive Engineer of the Presidency Division will require no tentage; in the other grade we propose that it shall be drawn under the limitations prescribed for the Maramut Engineers, at the rate of *Rs.* 3 a day for the 2d and 3d classes, and *Rs.* 2 a day for the fourth.

Promotion.
The Board to dis-
tribute and transfer
officers;

545. As to appointments and promotions among the officers of this establishment, it appears to us very expedient to take advantage of the knowledge which must necessarily be acquired by the Board of Works respecting the character and qualifications of the various officers employed, by bringing it to bear on the selection of officers for particular duties and for promotion. This principle is acted upon to a small extent, at present, the Board of Revenue being empowered to transfer the Assistant Civil Engineers from one division to another, as the exigencies of the public service may seem to render expedient; and the Government occasionally take the opinion of the Board in the appointment of the Civil Engineers. We think however that it ought to be carried further; and we beg to recommend that the duty of nominating District Engineers and Assistant Engineers to particular districts, as well as of nominating all the occasional Executive Officers to particular duties, should be reposed in the Chief Engineer and the Board of Works. We propose that the former shall lay before the Board a recommendation of an officer in every instance, with his reasons for the selection; and that the Board shall either make the nomination accordingly, or record their reasons for dissenting; and that in case of such difference the case shall be submitted for the orders of Government.

To recommend for
promotion;

546. Again, with respect to all promotions of officers from one class or grade to another, the final decision in every such case must rest with the Government; but we propose that the recommendation shall emanate from the Chief Engineer, and shall be sent up to Government, accompanied by the concurrence or dissent of the Board of Works. And the same rule appears proper in the case of the designation of the Inspecting Engineers, and of the permanent Executive Officers, to particular appointments.

And to be permitted
to recommend for
selection from the
line.

With regard to the selection of officers from other branches than the Engineers for employment on executive duties in the Public Works Department, that must be left as a general rule to the Government. But we beg to recommend that it should be fully recognised as the duty or the privilege both of the Chief Engineer and of the Board of Works, to submit to Government the name of any officer whom they may have reason to believe to be well qualified for those duties. To enable them to do this, we would further recommend that the Board should keep a record of the qualifications of officers desirous to enter the department. We would propose that any officer desiring it should be examined by officers nominated for the purpose by the Board, on subjects also specified by them, and that the report of the examining officers should be transmitted to the Board for their information and for record. We may add, that though it will be necessary to require in each candidate for such employment an acquaintance with the language of the locality, some knowledge of accounts, as well as a familiarity with some of the more elementary parts of engineering, yet that other qualities, not so readily ascertainable, are at least equally necessary in an officer engaged, as all the junior class of Executive Officers will be, in directing the exertions of large numbers of labourers; viz., laborious activity, readiness of resource, good temper and accessibility to all ranks.

We

We will only add here that we consider it very important that all officers in the department, whether Engineer or others, should take rank according to their position and standing in the department, and not according to their regimental or army rank. This is the practice in the Commissariat and other Departments, and it appears essential to the efficiency of the Public Works Department.

547. We must now offer a few remarks in explanation of our proposed establishment of European subordinates. In an earlier part of this Report (paras. 43, &c.) we have dwelt upon the excellent results obtained from the limited experiment already made, of the employment of European Overseers in the Maramut and Road Departments; and those results, and the qualities which the men have almost uniformly displayed, even under discouraging treatment, are such as to hold out the strongest inducement to the more extensive employment of this class of men, and in more important duties. We have already observed that men possessing attainments inferior to those of the Commissioned Officers, and, of course, on much lower salaries, may be largely made use of under the superintendence and direction of those officers, to perform duties which at present must either be performed by those officers themselves or be left undone. But at present no class of the natives of this country affords the materials for the formation of such a subordinate department; for men are not to be found possessing the activity, energy and fertility of resource on the one hand, and on the other, the straightforwardness and the superiority to intrigue and corrupt influence, which are not less required. It is absolutely necessary, therefore, that for many years to come the superior grades of the subordinate department should be almost exclusively European. The following is the establishment which we propose:—

European Subordinate Department.

RANK.	Class.	Number.		Allowances Monthly.					Allowances Annually.			
		In each Class.	In each Grade.	Pay.	Staff Pay.	House Rent.	Batta.	Compensation in lieu of Rations.	TOTAL.	For One of each Class.	For each Class.	
				Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	
Warrant:												
Sub-Engineers	{ 1st	10	-	250 - -	60 - -	121 12 -	- - -	431 12 -	5,181 - -	51,810 - -		
	{ 2d	30	-	150 - -	60 - -	91 5 -	- - -	301 5 -	3,615 12 -	1,08,472 8 -		
	{ 3d	40	80	50 - -	- - -	35 - -	91 5 -	176 5 -	2,115 12 -	84,630 - -		
Non-Commissioned:												
Overseers	{ 1st	30	-	50 - -	- - -	35 - -	60 14 -	145 14 -	1,750 8 -	52,515 - -		
	{ 2d	30	60	30 - -	- - -	30 - -	45 10 6	105 10 6	1,267 14 -	38,036 4 -		
Sub-Overseers	{ 1st	32	-	26 7 4	43 15 1	- - -	- - -	76 11 9	920 13 -	29,466 - -		
	{ 2d	32	64	26 7 4	20 - -	- - -	- - -	52 12 8	633 8 -	20,272 - -		
TOTAL Warrant and Non-Commissioned		-	-	204	182 14 8	463 15 1	220 - -	410 14 6	12 10 8	1,290 6 11	15,436 3 -	3,86,201 12 -

548. It will be seen that we propose to divide this branch of the department into two principal divisions; viz., Sub-engineers and Overseers; each of which will be arranged in several classes. The duty of the Overseers, as already remarked, will be much the same as those of the same class at present; viz., to superintend the execution of considerable works; those of the Sub-engineers will be to assist the Engineer officers in all branches of their duty, by relieving them from the more detailed and mechanical parts of it. Thus their work will be strictly of an engineering character, and we have given them a designation suitable to their duties. Our design is, however, that this partition of duties shall not be absolute; but that it shall be open to the District or Inspecting Engineer to employ these subordinates in whatever manner may appear the best for the public service. Thus, occasionally, a Sub-engineer may properly be set to superintend the construction of an important work, just as Assistant Civil Engineers, and sometimes even Civil Engineers themselves, are so employed now. And, again, an Overseer may sometimes be charged with the duty of inspecting work after execution, or in performing the preliminary operations necessary to the decision of some important project, whether a ghaut, a line of road, a canal, or other.

To be divided into two primary grades; Sub-Engineer and Overseer.

549. We are well aware that the number which we propose in this grade, as well as in that of Commissioned Officers, is much larger than in the existing establishments;—

A certain number of both grades will

be necessary for the ordinary duties of each division.

establishments; but we are persuaded that it is not at all larger than true economy requires. As with the Commissioned Officers, so also with the European subordinates, we propose that a certain number shall be permanently attached to each district for its ordinary duties, while others shall be maintained for more special works. The number of permanent appointments of each class, Sub-engineers and Overseers, has been fixed, after careful consideration of the wants of each district, with a view to the efficiency of the Maramut Department within it, comprising the following points: first, the careful selection of works for repair, and the judicious planning of repairs and preparation of estimates; second, the efficient execution of the more important works, whether of irrigation or communication, by the direct agency of the Overseers; third, an efficient control over the execution of the great majority of works which must still be left to native agents; fourth, the due inspection of work after execution, which is quite impracticable at present; fifth, the increased efficiency of all the works of irrigation, resulting from their being under the professional charge of a department numerically strong enough to attend generally to their improvement, which is now notoriously far from being the case; sixth, the improvement of the roads, by the operation of the same cause; seventh, the maintenance of the roads so improved.

And others must be provided for special works.

550. These ordinary duties will be found fully sufficient to occupy the fixed establishments proposed, so that none of its members could be withdrawn to other duty without loss; additional officers of this grade will, therefore, be necessary (as already said) for employment on those large special works, both of irrigation and communication, which we trust will hereafter be undertaken. To show the necessity for such a provision, it is only necessary to refer to the case of the Godavery improvements: these works have now been in hand five years; and in order to hasten them forward, officers, both commissioned and non-commissioned, have been largely withdrawn from other divisions (whence they were not taken without serious loss to Government), and all the ordinary duties, even of the 1st Division itself, have been almost totally neglected. By this very uneconomical means, and by entertaining several officers of the line as Assistant Civil Engineers, the number of officers of all grades on those works in March last, immediately before a large number were drafted away to the Kistnah anicut, was as follows: 14 Commissioned Officers, seven European Overseers, and five Revenue Surveyors; and yet, with this unusual assemblage of officers, enormous in comparison with the common means and with the state of other districts, and all directed by the untiring zeal and energy of the late Civil Engineer, Colonel A. Cotton, there has been very great loss of time (which in this case is truly money), for want both of officers and subordinates. Had there been a sufficient number of these, the greater part of the channels might have been already in operation; whereas, in fact, several of the main works, and almost all of the detailed works of distribution, still remain to be begun; and the loss of revenue from this delay cannot be estimated at less than 15 or 20 lacs. On this point we beg to refer to the several letters from Colonel Cotton (Appendices (C.), (D) and (F.), especially para. 10 of the last named. Looking at these facts, at the long postponement of the Kistnah anicut and works from the same cause, and their necessarily slow progress even now, from the want of officers, involving a certain loss of revenue to a very large amount, and at the other various large and important works which remain to be undertaken, and a few of which we have enumerated above, (para. 537,) we think the number of Sub-engineers and Overseers that we propose for special works, viz., 20 of each, is not at all more than the necessities of a sound policy require.

Any not required at any time on such undertakings may be very profitably employed in attending to the great channels and tanks.

551. And even if at any time the services of the full number should not be required for such employments, there will be other most important duty for them. We have already said that the custody and management of individual important works of irrigation, and the economical distribution of their water, is one of the most important duties to be performed by the Subordinate Department. In our proposed establishment, however, we have abstained from making any special provision for that duty, because we feel wholly at a loss to specify the number of officers that would be required for it; the increased number of officers of all grades in the department, indeed, will do a great deal for the more economical management of works, for their visits to each one will be much more frequent and more careful than they can be at present. But even this will fall far short of the special attention which they require, and which would so well repay its cost. We think

think it of the greatest importance that such special provision should be made; and we believe that as the value of efficient superintendence in all its parts comes to be practically felt, it will be made. But what we have here to observe is, that if any of those subordinates whom we have provided for special duty in connexion with the new works projected are at any time without employment on such duty (which, however, will rarely or never be the case), then their services may be most profitably employed in this way; viz., in the careful and detailed examination and management of existing individual works of magnitude.

552. The foregoing are the numbers provided for employment in the Civil Department, including, however, the greater part of the military buildings in the divisions within the frontier, but away from the Presidency. Besides these, 40 officers of the non-commissioned grades are required for the duties of the Presidency division, and of the various military divisions and stations.

A certain number of Overseers are required for military works.

We may observe here, though we shall have to mention it presently, that, following out the principle of relieving the superior classes of officers from works which can be as well done, under their superintendence, by inferior and cheaper classes, we propose to attach a certain number of native functionaries to each European subordinate.

Certain native subordinates are to be attached to each European.

It is proper to notice also in this place that we have not provided in our subordinate establishment, either European or Native, for the civil and general duties of the Mysore and Saugor Divisions, but for the military duties only. Our reasons for this omission are that those works are not conducted under the direction of the Madras Government, and also that we have not the means in either case of learning the amount of work to be done, or the wishes of the authorities controlling them. We have stated indeed the number of Engineer Officers required, in Mysore at least, that we might be able to form a judgment as to the whole requirements from that corps; but the number of the subordinates, both European and Native, can be enlarged from time to time as circumstances may require.

No subordinate establishment is proposed for the Mysore and Saugor territories.

553. The gradation of ranks and rates of pay which we propose for the European subordinates in this department, have been arranged with reference to the existing organization of the subordinate grades of the Ordnance Department; as well as to that of the Public Work Subordinate Department in Bengal, and to the sentiments expressed by the Military Board of Bengal in their letter to the Government of India, dated 28th October 1845, on the subject. The whole number that we propose is 204; of whom 80 are to be Sub-Engineers and of warrant rank, and 124 Non-Commissioned Overseers and Sub-Overseers. In the former grade there are three classes. In the first class the total pay and allowance amount to Rs. 431. 12. monthly; in this class there will be only 10 appointments. The second class is to contain 30 officers; the aggregate pay and allowance of each being Rs. 301. 5.; the third class to contain 40 officers, the total emoluments of each being Rs. 176. 5.

The organization of the European subordinate grades.

Of the Non-Commissioned Officers there are four classes; viz., two classes of Overseers, and two of Sub-Overseers, with emoluments varying from Rs. 145. 14. in the highest class, to Rs. 52. 12. 8. in the lowest. Their salaries are arranged under so many different names, in order to be in keeping with the practice in the Ordnance Department.

The pensions also of the Warrant and Non-Commissioned grades of the new establishment should be similar in amount to those of the corresponding grades of the Ordnance Department.

554. Admission into the lowest class of the Non-Commissioned grade will be given after the candidates shall have passed an examination, and produced certificates of sobriety and good conduct. They will rise to the rank of first class Overseer by seniority on condition of passing a certain fixed examination before each step. The Sub-Engineers, as already said, will require additional qualifications of a different kind from those which are sufficient to make a good Overseer. Promotion into that grade therefore will be from any one of the three Non-Commissioned grades, not at all by seniority, but by selection, and after the test of an examination suited to the duties of Sub-Engineer. So also the successive steps into the 2d and 1st class of Sub-Engineer shall be given by selection, and not by seniority; though, if the selections for the lowest class of that grade are properly made, it will rarely be necessary in practice to supersede men in the after promotions. It may be proper to require that every man before being made Sub-Engineer shall

Proposed course of promotion in these grades.

have been a certain time, perhaps three years, in the lower grade; and also that a certain time in the 3d and 2d class of Sub-Engineers shall be necessary to qualify for the class above it. In general the promotion will be much more tardy; and on the other hand, it may be proper to provide that in a very special case, it shall be competent to the Government to dispense with these restrictions, on the recommendation of the Chief Engineer and the Board of Works, and for reasons shown by them. Some more remarks on the subject of qualifications and promotion in this branch of the department will be found in the latter part of the following section.

It must be long before the establishment can be completed.

We may observe that the establishment which we propose cannot be completed for a long time, because it must require several years to produce the full number of men possessing the qualifications required in the higher grades. This of course is especially true of the highest class of all, and it is unlikely that that will be filled up for many years. But it will be expedient and wise to admit some individuals to those grades, even by some little relaxation of the requirements; in order to encourage the lower grades to exertion, by showing them that it is really the intention of the Government to complete the establishment as soon as properly qualified persons can be found.

What authorities to promote and recommend for promotion.

555. The whole of the men of the grades of which we are now treating will form one corps; their names will be borne on one list, and promotions must take place in the whole body, and not by divisions. We propose that promotions shall be made by the Board of Public Works on the recommendation of the Chief Engineer, and, in the case of Sub-Engineers, with the confirmation of the Government also, as those officers will receive "Warrants" from the Governor in Council. To enable the Chief Engineer to discharge his duty in this particular, he should receive periodical reports of the conduct and qualifications of every officer of these grades, which should be laid before the Board, with his recommendations for promotion. In the event of a difference of opinion between the Board and the Chief Engineer, the case to be submitted for the orders of Government.

We think that the same rule should apply to the appointments of individual officers of these grades to particular districts, or to special works, and to their transfers from one to another. Within the districts, their distribution should for the most part be left to the District Engineer, but subject to the control of the Inspecting Engineer and of the Board, when they shall see cause to interfere. As regards the selection of men for this branch of the department, we would give the same power to the Board of Public Works and to the Chief Engineer as in the case of the Commissioned Officers. We propose that men desirous to enter the Department should be examined under the orders of the Board, and that the reports of the examinations as well as of the conduct and character of such men should be sent to the Board; and that both the Board and the Chief Engineer should be entitled to recommend men to Government.

Natives and East Indians admissible to these grades, on certain indispensable conditions.

556. We have already said that under the existing emergent want, in this department, of European straight-forwardness and energy, as well as of the example to be afforded by the display of such qualities, appointments to this corps of subordinates should be confined almost wholly to men of European birth and education. At first this should be so strictly; but eventually the appointments may be somewhat thrown open. Thus we would recommend that the grade of Sub-Engineer should be held to be attainable by a Superintendent of Maramut, having displayed in a pre-eminent degree those qualities of zeal, energy, and honesty, which it is only fair to say that some few of that class have already evinced, and on passing the required examination.

Again, we would propose that hereafter, though not immediately, for the reasons already stated, East Indians shall be admissible to the grade of Assistant Overseers, and then compete for promotion on equal terms with their European comrades. But as the main reason for entertaining this European Subordinate Department is to gain those most valuable qualities to which we have before adverted, it will be absolutely necessary to insist on proof of the same qualities in the East Indian candidates admitted; and still more to insist on them prior to promotion. We fully recognize the principle that character and qualification are to determine salary, and not caste or colour; but to carry it into practice fully and fairly, those qualities must be brought to the test which cannot be categorically ascertained by an examination, like the possession of a given quantity of mathematical knowledge or handicraft skill, we mean those qualities of integrity and energy, which distinguish

guish the European from the native of India, far more than any difference of natural talents. When placed in this competition we fully believe (as we have already said) that the character and capabilities of the East Indian will be developed, and individuals will be found or produced, able to stand on the same ground with the European. Certainly the way to this competition ought to be opened to the East Indian; but then he must be required to display those qualities which alone render the services of the European so valuable.

557. Before quitting this part of the subject, we must explain how we propose to dispose of the existing number of Revenue Surveyors. At present there are 27 of the different grades of that establishment. But one of the number is the manager in the office of the Secretary to the Board of Revenue in the Public Works Department; where the services of a man in that capacity cannot by any means be dispensed with, whatever designation he may receive. A second assists in the office, and is also the teacher of the Survey School. Thus there are only 25 officers engaged on the proper duties of a Revenue Surveyor as we have described them above (paras. 37, &c.). Some of these are valuable men, intelligent, experienced and industrious; while others are the reverse; all of them however have been brought into the service by certain prospects of pay and promotion held out to them, and those promises must not be broken. We recommend indeed that contemporaneously with the organization of the new Subordinate Department, the establishment of Revenue Surveyors should be abolished. But the officers of that class then in the service must be retained; either they must be continued on the present terms, or they may be transferred (with their own consent) to corresponding grades in the new establishment. In either case additional expense on their account will not be necessary. In the latter obviously not; nor in the former, for besides the fact that the new establishment cannot be completed for a number of years, a corresponding number of appointments in it may and should always be kept vacant, so long as any members of this extra establishment shall remain.

The existing East Indian Revenue Surveyors, how to be dealt with.

558. The following is our proposed establishment of Native subordinates:—

The native subordinates.

	Class.	Number in each Class.	Number in each Grade.	Monthly Pay.		Annual Pay.	
				For one of each Class.		For each Class.	
				Rs.	a. p.	Rs.	a. p.
Supts. of Maramut	1st.	10	-	120	- -	1,440	- -
	2d.	10	20	90	- -	1,080	- -
Deputy ditto	-	-	15	60	- -	720	- -
Foremen	1st.	65	-	40	- -	480	- -
	2d.	85	-	35	- -	420	- -
	3d.	101	251	30	- -	360	- -
Sub ditto	1st.	100	-	25	- -	300	- -
	2d.	100	-	20	- -	240	- -
	3d.	102	302	15	- -	180	- -
Surveyors	1st.	40	-	20	- -	240	- -
	2d.	45	-	15	- -	180	- -
	3d.	52	137	10	- -	120	- -
TOTAL	-	-	725	480	- -	5,760	- -
						2,85,560	- -

Having already dwelt at some length (paras. 78, &c.) on the defects both in character and number, of the existing Maistry class, it is not necessary to speak of them here at much length; but we will briefly explain the new establishment which we propose. The necessity of increasing the number of Maistries in the Public Works Department has been repeatedly brought before the Government, and the inconvenience and loss resulting from their present defective numbers and character are experimentally familiar to all officers concerned in executing or inspecting works, and have been admitted both by the Government and by the Court of Directors. So long ago as February 1842, Major Hugh C. Cotton, then Civil Engineer of the 5th Division, comprising the Tanjore and Trichinopoly districts, wrote a letter to the Board of Revenue (at the request of Lieutenant-Colonel Sim, the Chief Engineer), pointing out the defects of the existing establishments,

ishments, and proposing a new establishment on a larger scale, as well as a school for training Maistries.

Major H. C. Cotton's description of the Maistries.

559. This paper (which we give in Appendix I.) is well worth perusal. It is the production of an experienced officer, describing the deficiencies of the Maistry establishment as he had experimentally found them, and proposing those remedial measures which such actual experience suggested. Speaking of the qualifications of the Maistries he employs very similar language to that made use of by the Civil Engineers of the present day in describing the same class; and yet it must be remembered that he was writing of that division in which the Maistries were and still are better than anywhere else. Referring to a then recent order of Government directing that Civil Engineers should not undertake works till they had secured good superintendence, he writes as follows: "Were the Civil Engineer literally to fulfil the order, I am bold to say that scarcely a new work of importance in any of the divisions would ever be undertaken at all, unless the Civil Engineer confined himself to its superintendence, to the neglect of his other duties. No measures whatever are taken for the education of men for this very important and responsible line, and few indeed are found who have qualified themselves." "The situations are usually filled by men of the lowest grade of mind." "Without education, without natural talent (which would always find a better market in a thousand other trades or professions), without inducement to exert what talent or energy he may have, the Civil Engineer can never be justified under the present orders of Government in employing him to superintend works of any magnitude." Again he says, para. 5, "there is perhaps no expenditure in any department out of the public treasury, so badly economized as in the Department of Public Works, owing to the total inefficiency of the Maistries."

His scheme for organizing an efficient executive establishment.

560. With the view of remedying the defects of this class, Major Cotton recommended that their pay and their number should be augmented, and that youths should be systematically trained up for the duties. He considered it necessary that there should be a Maistry to every Talook, and a Superintendent of Maramut and a Deputy Superintendent to every district; also two Maistries under every Civil Engineer and one to every Assistant Civil Engineer and Revenue Surveyor; the total number of Maistries under this arrangement, including the Superintendents and Deputy Superintendents, would have been 349. The salaries which Major Cotton proposed were 100 rupees to the Superintendent, 60 to the Deputy, and from 35 to 14 rupees for the Talook Maistries; those of the Civil Engineers' Department to be paid somewhat higher.

The Board's proposal for the same object.

Major Cotton's letter was submitted to Government by the Board of Revenue with their own of the 15th February 1847 (Appendix H., paras. 63, &c.), when they stated their opinion that it was not necessary to go the whole length of his proposals, and submitted a scheme of an establishment numbering only 150 Maistries of all classes. We have no hesitation in declaring that this establishment was far too small for efficiency; and we are fully convinced that in thus limiting their demands the Board were actuated too much by a regard to the known indisposition of the Government to admit any enlargement of existing establishments. They deemed it hopeless to ask for a sufficient establishment, but they hoped by asking for little, to get that little. As it happens, this course did not succeed; the Board's application has not yet produced anything whatever, having only been referred backwards and forwards, as already said, between Madras, London and Simlah.

There are now still stronger reasons for improving the Maistries.

561. It is now nearly 11 years since Major Cotton's letter was written to the Board, and nearly six since it was laid before Government. The time that has thus elapsed has only served to show more clearly how truly economical it would have been to accept his whole scheme, how short-sighted is that policy which still keeps the Maistry class so inefficient; for it has afforded many examples of the saving effected, both of money and time (and time in this connexion means revenue), where energy, skill and honesty are brought to bear on the execution of work. Having the advantage of this experience, we must draw the requirements of true economy in this department on even a larger scale than Major Cotton did. It is true we have now European Overseers to superintend the more important works, and our scheme includes a larger number of them; but as the Board of Revenue truly observe in their letter already quoted (Appendix G., para. 65), the great mass of works must still remain dependent on the Maistries. Even as respects

respects the common duties of this class we are satisfied that a candid consideration of the few statistical details which we have already given of them (paras. 76 & 77), will vindicate the establishment that we propose; and if, as we trust, the time has now arrived when something effective is to be done for the formation of roads and the extension of irrigation, the improvement and enlargement of the Maistry class are absolutely essential. The course of instruction to be proposed in the succeeding section will, we trust, ensure the former object, and we will now notice the plan which we propose for the latter.

562. There are now 15 Superintendents of Maramut in the same number of districts, leaving five districts without that very useful class of officer. We fully agree in opinion with Major H. Cotton that a Superintendent is required in every district. There are also three Deputy Superintendents, or Head Maistries, as they are sometimes called, but it appears to us that the number of this class also ought to be enlarged, and we propose to entertain a Deputy Superintendent in each of those 15 districts where there is most work to be done.

Proposed number of Superintendents and Deputy Superintendents of Maramut.

As respects the Talook Maistries there are at present only 97 for the 256 Talooks. We fully agree with Major H. Cotton that there ought certainly to be one to each Talook. With the view of elevating the position of the Maistry, we also propose, as we have observed in another place, that the Maistries shall be borne on the establishment of the Collector's Office, not on that of any particular Talook, and shall be appointed to the charge of particular Talooks from time to time, as may be found expedient.

Proposed number of Maistries for the districts.

563. There is another change which will cost nothing, and which, though unimportant in itself, we recommend as tending greatly to increase the respectability of this class, and that is, to change the designation of the office. The term Maistry is used in common speech in connexion with building, to signify a head bricklayer or head carpenter; in a wider sense it is employed to designate a head gardener, head bearer, &c. All these characters are men living by bodily labour, receiving daily hire, of low caste, of no education, and often of low habits. The Maistries of the Public Works Department have usually been taken from the bricklayer class, and it must, unfortunately, be confessed that but few of them have done much to elevate the title. Bad as the pay and prospects have been in this line, we believe that the mere name has had not less effect, from the association of ideas, in deterring respectable and educated men from entering it. Again, the duties of the appointment having been almost totally changed since Maistries were first entertained (*see* above, para. 75, &c.), the name is now quite inapplicable. In organizing a new establishment, it seems highly expedient to discard the old and ill-esteemed name, and adopt one expressing the duties of the office, distinctive as regards other appointments in the department, and not associated with degradation. We have chosen that of "Foreman," as the most suitable that has occurred to us; and we propose that the higher three classes shall be styled Foremen, and the lower three Sub-Foremen. The duties of these two grades will generally be divided as indicated above in para. 87. For the Talooks and for the Engineer Officers men will chiefly be taken from the higher grade; those attached to Sub-Engineers and Overseers, and those employed exclusively in executive and mechanical duties, will for the most part be of the lower. The lowest class of all will usually be in immediate attendance on Overseers, as noticed in the next para.; and in the way of gaining instruction and experience from them.

The name of Maistry to be changed.

564. Besides the Maistries or Foremen of the Talooks, others must be attached to the various grades of European officers, just as European subordinates are appointed under Commissioned Officers, and for similar reasons. They will perform duties, which under the eye and the control of a superior, they can do as well he, and so will multiply the results of his labours; and they will also do sorts of work requiring an amount of exposure to the climate, to which, even from a regard to economy only, a European ought not to be subjected. Thus, when a European officer, of whatever grade, is executing a work, it will be proper that he should avoid the mid-day sun; and employ himself during that part of the day on his accounts; but his Maistries may be on the work all day, directing the operations, with as little injury as the labourers themselves; and the same with other sorts of work. A sufficient provision of inferior officers of every grade is true economy; and one great defect of the existing system is an unwise parsimony in this particular. To every Overseer allowed for the Maramut Department, for the main roads, and for

Others must be attached to the European officers and subordinates.

special works, we propose to allow one Foreman or Sub-Foreman, who will, in fact, be a subordinate Overseer under him, and will greatly enlarge his powers of superintendence. To all other European Officers we assign one Foreman, and also one "Surveyor," a class of which we shall speak presently. Of course this allotment will not be peremptory and invariable; the actual distribution of the Maistries will be modified from time to time according to circumstances. Thus, an officer or Sub-Engineer engaged on a large work, or in charge of a line of road, will require, and will be able efficiently to control, several native subordinates; and these may then be furnished to him by withdrawing them from other officers engaged on works requiring fewer of such assistants. The total number of Foremen required to supply the officers under the foregoing rule will be 251, as seen in Appendix (E E.). There are also 46 provided for military works at the various military stations; this is about the same number that are employed at present, as no material increase of number seems to be required there, but only the better education and training of the men, which will be effected by the school, and a more systematic organization. Thus the total proposed number of Foremen and Sub-Foremen for all purposes will be 553.

Proposed rates of salary.

565. We have already said, in remarking on the Maistry establishment in a former section, that their pay requires to be increased; and our proposed list provides what appears to us to be necessary. We propose to have two grades of Superintendent on *Rs.* 120 and *Rs.* 90 a month respectively; the Deputy Superintendents to be all in one class, at *Rs.* 60. The Maistries or Foremen to be in six classes, as already said, ranging from *Rs.* 40 a month down as low as *Rs.* 15.

The native subordinates to be entitled to pensions.

We of course suppose that the native members of the establishment will be entitled to pension under the general rules, as those of the existing establishments are. In the eye of a native the prospect of a pension is of great value, and will make up for much deficiency of present salary. Without such a prospect the scale of pay which we propose would certainly fail to raise this department to that position in relation to others, which we consider essential to its efficiency. We cannot but observe, that some relaxation in the existing rules regulating the grant of pensions appears expedient, especially in this department. At present absolute physical disability is required; and even after the pension is given, if a committee, assembling a year after, thinks the recipient has any more work in him, the pension is withdrawn. There is much difference also between sedentary employments, which require only eyesight and the power to sit up and use the hands, and those of which the duties can only be performed by men in the full possession of their physical and mental energies. But medical officers fail duly to discriminate between these classes, and in their fear of the subsequent committee, will hardly grant a certificate of incapacity at all. The consequence of this rigour is very hurtful to the public service; for men are consequently retained in the situations of Serishtadar, Tabsildar, Superintendent of Maramut, and Maistry, who are quite unfit for the active and laborious duties of those offices; as a consequence, the work is badly done, and both the Government and the people suffer.

In what authorities the promotion and appointment of these classes to be vested.

566. We think that promotion into the grades of Superintendent and Deputy Superintendent should be made by the Chief Engineer and the Board of Public Works, on the periodical reports and the recommendation of the Collectors and the Inspecting Engineers, in a manner similar to that already recommended for the European subordinate grades, and also that their appointments and transfers to particular districts should be made in the same manner. But we are of opinion that both the promotion and the distribution of the various classes of Foremen must be left in the hands of the local officers, as that of the Maistries is at present. This course appears to us to be necessary to the effective and vigorous working of the system, which would be hampered by too much centralization of power in this particular. We would propose, therefore, that the establishments of the several Collectors and District Engineers should be fixed to contain a certain number of each class. The distribution of those of the Engineer Department (except those immediately attached to the Inspecting Engineer), to vest in the District Engineer, subject to the general control of the Inspecting Engineer; their promotion to vest in him, subject to the special approval of his superior officer. Both the distribution and the promotion of those of the Collector's establishments, to vest in the Collector; who will generally, however, consult the Engineer Officers on such arrangements.

567. The next class in the establishment are the Surveyors. Our reasons for creating this new class are similar to those which lead us to enlarge the Maistry or Foreman class; officers engaged in surveying and levelling a tract of country, with the view to the tracing of a road or of a pass, or the planning of a channel or a tank, have much work to be done which can be done quite well under their superintendence, by men who can do nothing else, and who can perform with accuracy the mechanical part of the work, without any knowledge of principles. It is true economy, therefore, to employ such men, so as to save the time of the more highly paid officers. We propose that every Engineer Officer and every Sub-Engineer shall have one Surveyor attached to him. The Surveyors will go through a certain course in the school to fit them for their duty. There will be three classes, on Rs. 10, Rs. 15, and Rs. 20 respectively. After serving a few years in this grade, it will be open to the Surveyor, on the favourable recommendation of his superior officer, to re-enter the school, and go through the course and pass the examination necessary to qualify for a Foreman. The promotion of the Surveyors to be subject to the same rules as that of the Foreman. The Surveyors.

568. It does not appear necessary to say much on the subject of the office establishments. The details of the scheme will be found in the Tables already referred to, Appendices (D.D.) to (F.F.). The establishments assigned to the Presidency offices are precisely the same as now exist; not that we intend to signify that no change is needed: but, 1st, Because though the establishment of the Board of Revenue in the Public Works Department is now certainly too small, yet that of the Chief Engineer's Office seems to be larger than necessary; and, 2d, because until it is determined how the business is to be conducted, and what functions are to belong to the Board of Works and what to the local authorities and officers, it is impossible to say what strength will be required in the Board's office. We propose to increase the strength of the District Offices in this department, by giving a small establishment at the Collector's office, and a Gomastah or Accountant in each Talook. We are far from saying that this is sufficient; but it will be a material improvement on the present establishment, and with systematic management and an improved system of accounts, it may generally suffice to get through the duties. We also propose some addition to the strength of the office establishments of the Engineer Officers in the Provinces. The office establishments.

We will only add that we have assigned a Gomastah or Native Writer and Accountant to every Superintendent and Deputy Superintendent. We do this for the same reason already stated more than once with reference to the higher classes; viz., because to require those officers to copy their own papers, and calculate the whole of their own estimates, &c., is waste of their highly-paid time. Even at present this sort of assistance is given to them, we believe, in most districts in some way or other; and where it is not, we are persuaded that, for economy's sake, it ought to be. The pay assigned to these Gomastahs is very small, though sufficient; and the whole charge on this account will be trifling.

SECTION X.

On the proper Means of providing and training a succession of Officers for the Public Works Department, of all grades, Commissioned and Subordinate, European and Native.

569. We have next to consider the best means of providing and of educating and training the various classes of officers required to form an efficient establishment in this department. We will begin with the commissioned ranks. At present the country is entirely dependent for engineering skill on the small corps of Engineers which forms a part of the army. But a material increase of Engineers in the Maramut Department is absolutely necessary. And it becomes an important question whether it will be best to provide them by enlarging the existing corps: or whether, leaving that at its present strength, a separate body of Engineers should be constituted for civil duties, without military commissions or organization. The question is one to be decided on the joint consideration of efficiency and of cost. Whether the present Military Corps to be enlarged, or a Civil Corps formed.

570. As to cost: at first sight it might appear that a body of mere Engineers without any sinecure offices must necessarily be the cheapest. But, it is to be Their relative cost.

remembered that the expectation of the Colonel's commission and the off-reeknings, is virtually a part of the emoluments of every officer in the corps; and inasmuch as every man naturally takes a too favourable view of his own expectation of life and success, this prospect is worth more than the actual amount of a Colonel's allowances would be, if distributed as addition of salary among all the officers. Again, in a military corps, forming a member of a large army, and in a country where military rank is much thought of, the very holding of a commission, and even the military title, have no little value; and thus the place of salary is supplied *pro tanto* by the cheaper commodity, honour. On the other hand a new body of Civil Engineers would occupy no recognized *status* in society. Individuals would in time achieve a position for themselves; but others not so undeniably possessing personal claims, and not having the prestige arising from connexion with a highly honourable body, would sink, and find themselves in a painfully equivocal position. And unless the body generally were to be left in an inferior rank in society, their pecuniary emoluments must be increased to give them that consideration which the command of money confers. Further, the supposed Civil Corps must be provided no less than the military with absentee allowances on occasion of sickness, with furloughs, and with retiring pensions; and it does not appear that these could be fixed at lower amounts respectively than those enjoyed by the Engineer Officers.

Their relative efficiency.

571. Then as to efficiency: it is true that in a seniority service promotion is lost as a stimulus to exertion; but though the commissions in the Engineer Corps go exclusively by seniority, the appointments do not by any means in the same degree. Even in a non-military body, length of service must and always would be allowed some claim, quite as much as it need receive under the existing system; and indeed we cannot but think it a better working principle on the whole, and as a general rule, than that of selection.

Again, the members of a Civil Corps must be entertained and brought out to this country at an early age, and must be received permanently into the service; both because acquaintance with the languages and with the peculiar engineering works of India, can best be learned early in life, and also because no man having entered on a line of employment at home and established a connexion and character, would abandon his prospects and come out to India, without such large inducements as could not be held out generally. There would still, therefore, be the same chances as at present of some men turning out unfavourably.

Best to augment the present corps.

Looking at the whole question, the occasional mistakes in selection, or partiality of nomination, the high and increasing money value of engineering skill at the present time in England; and especially bearing in mind the high tone of honourable feeling which characterizes the officers of the Engineer Corps: we are decidedly of opinion that the best plan to effect the object in view, the cheapest and the most effectual, will be to extend the present system, rather than to adopt the alternative of entertaining a separate body of Civil Engineers.

Another alternative; selections from the line.

572. But it may be suggested by some that even admitting the necessity for an increased number of Engineers for civil duties, it is neither necessary to augment the present Engineer Corps nor to entertain a separate body of Civil Engineers; but that the additional strength required may be obtained by selection from the officers of the line. But we must emphatically record our protest against any such plan, as we are satisfied it could only end in failure and disappointment.

Such officers would have all their business to learn, and at the expense of the State.

Even supposing no officers to be so selected except such as had been at Addiscombe, very little could be thus obtained in the way of science. For even the mathematical requirements of the Infantry Cadets leaving that institution are generally very small; and as to engineering, the Engineer Cadets themselves hardly acquire so much as its rudiments till after they have left Addiscombe; and those for the Infantry cannot be supposed to have learnt anything of it all. Officers thus nominated, therefore, would still have everything to learn; in the course of years those possessing natural aptitude for the profession would no doubt acquire some skill, but in estimating the relative cost of the two systems, it must be remembered that during all this time they would have been receiving pay as Engineers, and also that such knowledge as they might ultimately gain would have been purchased by a succession of failures, the cost of which would have fallen on the Government and on the public.

And the requisite number could not be so procured.

But even supposing this objection, fatal as we deem it, to be overruled, there would be much difficulty in procuring officers with even a limited amount of fitness for

for the duty. This difficulty is experienced even in selecting for the comparatively simple and easy duty of superintending work. It is by no means every officer whose services would be worth his salary even in that capacity; and in point of fact, the drafts from the line for the ordinary staff appointments are so heavy, and there are so many regiments in which the proportion of officers permitted by the regulations are already on the staff, that frequently an individual officer selected as fit for the employment cannot be obtained.

A third consideration, an important one, though not strictly within the scope of our subject, is that the efficiency of the regiments of the line must suffer when their best officers (for the hypothesis must suppose the best, both as to intelligence, activity and steadiness), are thus systematically withdrawn to other duties. Such a plan would act prejudicially on the line.

573. In short here, as elsewhere, it will be found the best and the cheapest policy to employ scientifically educated men for scientific duties. This is even more necessary, indeed, in this country than in England, because there a large amount of science and skill is spread throughout all ranks of the community, which is almost wholly wanting in India. It has never been proposed to recruit the medical service by drafts from the officers of the line; and yet such a scheme appears hardly more unreasonable and opposed to common sense, than to depend on the same source for the formation of a body of Engineers. It is best to employ scientific men on scientific duties.

The foregoing remarks are not intended to apply to the employment of unscientific officers in executive duties, such as superintending the formation or the repair of a line of road or of a ghaut. In such situations their services have often been very valuable, when they have been carefully and judiciously selected for their special aptitude for the work. They are more particularly wanted where a work is so large as to involve the expenditure of larger sums than it would be right to entrust to a Warrant or Non-commissioned Officer. We have already observed, however, that it is by no means easy always to find fit men available; and the selections made have certainly not been happy in all instances. The foregoing remarks not intended to apply to executive duties.

574. Supposing it to be determined that the wants of the country for professional science and skill, shall be met by enlarging the Engineer Corps, the next point to be considered is what amount of augmentation is necessary for that object. We have already noticed most of the demands upon the Corps of Engineers, but must here offer a few remarks on the Sappers and Miners. This corps was formerly styled Pioneers, and was officered from the Infantry. In 1831, one of the two battalions of Pioneers was broken up, and the other was re-organized as a corps of Sappers, with a view to its being officered by Engineers. The Commandant and the Adjutant have accordingly been uniformly from that corps; but such has always been the paucity of Engineer Officers, and the urgent demand for them for other duties, that it has very rarely happened that there have been more than those two attached to the Sappers, except when on actual foreign service. This statement, however, is exclusive of the young officers of Engineers attached to the Sappers on first arriving in the country, for the purpose of going again through the course of instruction which they had already studied at Chatham, and to learn a native language. The Sappers and Miners.

575. The Commander-in-Chief has informed us, through the Adjutant-General, that he considers it necessary for the efficiency of the Sappers corps that it should always have present with it eight officers of Engineers; viz., a Commandant, an Adjutant, and an officer to command each of the six companies. Captain Rundall, who commands the corps, considers a still larger number of professional officers to be necessary; he says, "To secure the perfect efficiency of the corps of Sappers and Miners, in my opinion, there should be permanently with it at least two officers to every company, besides the Commanding Officer and Adjutant; that is, 14 Engineer Officers in all; and that it would still further contribute to the efficiency of the corps, if there were always at the depôt two juniors to supply the place of casualties, making 16 officers in all. The present system of officering from the line is but a choice of evils, and was only recommended and adopted as such, in the present dearth of Engineer Officers, in order to furnish the largest number possible to the Department of Public Works. It is not found to work so well, even as was expected." But though we quite agree with Captain Rundall that two officers with each company would be better than one, we are not prepared to recommend the addition of six more officers to the strength of the Engineer Corps for that purpose only; a great increase on other accounts is absolutely necessary, and we

may rest on the authority of the Commander-in-Chief that the corps would be effective in time of peace, if in addition to the Commandant and Adjutant, it had an Engineer Officer commanding each company, with a second junior officer from the line.

List of appointments requiring to be permanently filled by Engineer Officers.

576. The following then is a list of those appointments, which, as it appears to us, ought for the benefit of the public service to be held by the Engineer Officers only:—

Chief Engineer	-	-	-	1	Officers for Special Projects	-	9
Adjutant	-	-	-	1	Executive Engineers	-	5
Member of the Board of Public Works	-	-	-	2	Commandant of Sappers	-	1
Secretary to ditto	-	-	-	1	Adjutant of ditto	-	1
Inspecting Engineers	-	-	-	13	To command six companies of ditto	-	6
District Engineers	-	-	-	24	Principal of the Engineering College	-	1
Assistant District Engineers	-	-	-	20			
					Total	-	85

One-fourth of the Officers of Engineers are absent on sick certificate and furlough.

577. But in order to determine what ought to be the strength of the corps in order to furnish this number of officers present for duty, it is necessary to consider what proportion will generally be absent on furlough or on medical certificate. And the annexed table, based on information obtained from the Adjutant-General, shows the state of the Engineer corps in this particular on the 1st May of each of the last 16 years:—

YEARS.	1836.	1837.	1838.	1839.	1840.	1841.	1842.	1843.	1844.	1845.	1846.	1847.	1848.	1849.	1850.	1851.	TOTAL.	Average.
Present	34	33	33	30	26	26	26	28	30	34	38	41	41	39	43	48	550	—
Europe Sick Cert. Cape and Sea Sick Certificate.	5	8	9	10	8	6	5	4	5	5	5	6	6	4	3	3	92	—
Total Absent Sick	5	8	9	11	9	7	6	5	6	5	7	9	7	6	5	3	108	—
Europe on Furlough	3	4	4	4	4	4	5	2	3	4	3	1	2	3	5	5	56	—
Furlough in India	7	2	2	—	2	4	2	4	3	3	—	—	—	3	1	1	33	—
Total on Furlough	10	6	6	4	6	8	7	6	6	6	3	1	2	6	6	6	89	—
Total Absent	15	14	15	15	15	15	13	11	12	11	10	10	9	12	11	9	197	—
Fixed Establishment	40	40	40	40	40	40	40	40	40	46	46	46	46	46	46	46	682	—
Supernumerary 2d Lieutenants.	9	7	8	5	1	1	—	—	2	—	2	5	4	5	8	11	68	—
Waiting to complete.	—	—	—	—	—	—	1	1	—	1	—	—	—	—	—	—	3	—
Total on the Rolls	49	47	48	45	41	41	39	39	42	45	48	51	50	51	54	57	747	—
Per Centage of Absences on the whole Strength:																		
Europe Sick Cert. Cape and Sea Sick Certificate.	10.2	17.02	18.75	22.22	19.51	14.63	12.82	10.26	11.90	11.11	10.41	11.76	12.	7.84	5.56	5.26	—	13.32
Total Sick	10.2	17.02	18.75	24.44	21.95	17.07	15.38	12.82	14.28	11.11	14.57	17.64	14.	11.76	9.26	5.26	—	14.46
Furlough to Europe	6.12	8.51	8.33	8.89	9.75	9.75	12.82	5.13	7.14	8.89	6.25	1.96	4.	5.88	9.26	8.77	—	7.49
Furlough in India	14.28	4.26	4.17	—	4.88	9.75	5.13	10.25	7.14	4.44	—	—	—	5.88	1.85	1.75	—	4.42
Total Furlough	20.4	12.77	12.50	8.89	14.63	19.5	17.95	15.38	14.28	13.33	6.25	1.96	4.	11.76	11.11	10.52	—	11.91
Total Absent	30.6	29.79	31.25	33.33	36.58	36.82	33.33	28.2	28.56	24.42	20.82	19.6	18.	23.52	20.37	15.78	—	26.92

Thus it is seen that the average proportion of officers absent from duty is very nearly 27 per cent.; but of this per centage, 4.46 represents those absent on furlough in India, a term, which includes all leave for places in India given by the Government, or by the head of the army, whether on medical certificate or on private affairs. It comprises, therefore, some cases of absence of a temporary character,

character, such as do not need that the place of the absentee should be supplied; but these are not many, for it is a well-known fact that Engineer Officers, having always full occupation, rarely take leave on private affairs, and in their case the greater part of the leave under this head is certainly on medical certificate, and of such length as to require the appointment of a substitute. It may safely be assumed that fully one-half of it is of that description, and then the proportion of absentees to be provided for will amount to nearly 25 per cent.

578. And we must not omit to notice a peculiarity found in a considerable part of the period on which the per-centages are taken, and which unduly lowers the proportion of absentees; that circumstance is, that in eight out of the sixteen years in the table, the calculation is powerfully affected by the presence on the regimental rolls of a large number of Supernumerary Second Lieutenants, in some years amounting to nearly a fourth of the proper strength of the corps. This necessarily diminishes the proportion of absentees; because these supernumeraries swell the number on the roll, but they are not entitled to a furlough to England, and they contribute very little to the absences on medical certificate. This is observable in the earlier years of the period, in which the proportion of absentees is materially less than in those which follows; and still more in the latest years. In some of the very last, also, the number of absentees is even absolutely less than the average. The diminished number of furloughs to England may be partly owing to the increasing slowness of promotion, under which fewer officers have the pecuniary means of taking their furlough. But we are unable to assign a particular cause for the whole effect observed, and we believe it must be referred for the most part to that general law of variation and uncertainty, which is the very reason why it is necessary in all such inquiries as the present to draw conclusions from averages rather than from particular cases. It would obviously, therefore, be unsafe and deceptive to regard those few years as showing the normal condition of the corps.

The proportion would be larger except for the presence of many supernumerary 2d Lieutenants.

579. In endeavouring to form a judgment as to the proportion to be allowed for absence from duty, it may be useful to show here the actual state of the case in the other branches of the army; and we accordingly append a table prepared from a more detailed statement obtained from the Adjutant-General, showing the number of absentees on the several kinds of leave, from the various branches of the army, and their proportion to the whole strength. This table extends over the same 16 years as that for the Engineer Corps given above; but it gives only the total results, and not the details of each year:—

A table showing the numbers absent in all the several branches of the army.

On what Description of Leave.	Engineers.			Artillery.			Cavalry.			Infantry.			TOTAL.		
	Total Strength.	Absent.	Per Centage.	Total Strength.	Absent.	Per Centage.	Total Strength.	Absent.	Per Centage.	Total Strength.	Absent.	Per Centage.	Total Strength.	Absent.	Per Centage.
Europe Sick Certificate - -	747	92	12.32	2,265	256	11.30	2,492	278	11.16	19,586	2,075	10.60	25,090	2,701	10.77
Cape and Sick Certificate - -	747	16	2.14	2,265	16	0.71	2,492	19	0.76	19,586	212	1.08	25,090	263	1.05
Total out of India on Sick Certificate - - - - -	747	108	14.46	2,265	272	12.01	2,492	297	11.92	19,586	2,287	11.68	25,090	2,964	11.82
Furlough to Europe - - -	747	56	7.49	2,265	141	6.22	2,492	245	9.83	19,586	1,150	5.87	25,090	1,592	6.34
Furlough in India - - -	747	33	4.42	2,265	53	2.34	2,492	226	9.07	19,586	1,553	7.93	25,090	1,865	7.43
Total Furlough - - -	747	89	11.91	2,265	194	8.56	2,492	471	18.90	19,586	2,703	13.80	25,090	3,457	13.77
Total Absent - - -	747	197	26.37	2,265	466	20.57	2,492	769	30.82	19,586	4,990	25.48	25,090	6,421	25.59

580. This comparison shows that the proportion absent is largest in the Cavalry; that the Engineers come next, the Infantry third, and the Artillery last. But on looking more closely, it is seen that of the absentees from the Cavalry, 18.90 per cent. of the whole strength are on furlough to England or in India, and only 11.92 per cent. are absent from the country for the recovery of their health. In the Engineers, on the other hand, the great bulk of the absentees are such as have been driven from the country by temporary failure of health; no fewer than 14.46 per cent. of the whole strength are absent from this cause, while the absentees from other causes are only 11.91 per cent., and even this includes (as already explained) a considerable proportion, and much larger than in the

Facts exhibited by the table.

Cavalry, on Medical Certificate in India. The fact is, as respects private leave in India, that the Engineers and the Artillery being regularly occupied by their duties, rarely apply for it; while the Infantry, and still more the Cavalry, having much more leisure time, avail themselves of it more largely. As to the furlough to England, the Cavalry, from their superior emoluments, are able to take advantage of that privilege much more generally than the other branches of the army, especially than the Infantry.*

Another fact developed by the same Table deserves notice, viz., the large proportion of Engineer Officers absent from the country on medical certificate, compared with the other branches of the army. The proportion of those so absent in that corps is higher by one-fifth than in the Artillery or in the Cavalry, and higher than in the Infantry, by nearly one-fourth. And we must again repeat, that except for the presence of a very undue number of youthful officers, the proportion in the Engineers would be even higher than is here shown. This striking difference against the Engineer Corps appears clearly to be owing to the large amount of exposure to the evil influences of the climate (both solar and malarious) which is essential to the efficient performance of the duties of very many of the Engineer appointments, particularly of the whole of those in the Tank and Road Departments. This exposure is a necessary incident of the service; and it will be but little diminished by the augmentation of the corps, or even by the improved efficiency of the subordinates of the department.

Number of Engineer officers required.

581. Thus looking at the past experience of the Engineer Corps itself, we are led to the conclusion that nearly one-fourth of its whole number of officers will commonly be so absent from duty as to need to have their places filled up; and when we refer to that of the other branches of the army, we find it such as to confirm this conclusion. To obtain therefrom the proper strength of a corps of Engineers competent to furnish a given number of officers always present for duty, we must add to that number one-third of itself; and thus to supply 85 officers for duty, we require a corps of 112 officers.

Proposed organization for the corps.

It appears to us that this number may properly be organized in four battalions, each to be composed as follows, viz., one Colonel, one Lieut.-Colonel, one Major, eight Captains, 12 First Lieutenants and five Second Lieutenants, which would give a total of 112 officers. In the Infantry there are three officers of and above the rank of Field Officer to 21 below that rank, being one to seven; and there are six Captains to 15 Subalterns, or one to two and a half. The organization above proposed, gives a smaller proportion of officers of and above Field rank, being one to every 8½ below it; but in compensation, a somewhat larger proportion of Captains to Subalterns, viz., one to every 2½.

The number of officers specified only provides for absolutely necessary duties.

582. The number of officers which we propose is 66 more than the present fixed establishment, and 55 more than the actual number on the 1st May 1851, which included 11 Supernumerary Second Lieutenants. The increase is undoubtedly large, but we are satisfied it is not more than is actually required, and we feel it to be our duty not to shrink from stating the conclusion at which we have arrived. We beg to call attention to the fact, that in enumerating the officers required to be always present, we have mentioned only those wanted for duties strictly belonging to the Engineer Corps, viz., for the Sappers, and for the Public Works

* From the constitution of the service, almost all the Colonels of all branches of the army are constantly in Europe on unlimited furlough, and in order to compare the numbers absent on furlough in the usual and proper sense of the term, the Colonels ought to be omitted. The comparison will then stand as follows:—

	Engineers.	Artillery.	Cavalry.	Infantry.
Whole number absent on Furlough to Europe	56	141	245	1,150
Deduct Colonels	27	61	93	534
Remaining other Ranks	29	80	152	616
Total Number of Officers on the Rolls excluding Colonels	715	2,163	2,364	18,710
Per Centage on Furlough to England in the grades below Colonels	4.05	3.7	6.43	3.29

Works Department, strictly so called. We have allowed no officers for miscellaneous duties, which, however, will often form drafts, on the corps; none for the appointment of Mint Master, or Member of the Military Board; none for the Magnetical Observatories or other purely scientific researches; none for a Revenue Survey, though when that most important work is undertaken, as we trust it will be before long, it must be under the direction of at least one Officer of Engineers, besides Subordinates of the department; neither have we allowed any officers for employment under the Resident of Travancore, though it is understood that the Government are in a manner bound to supply such aid, and it is also much required; nor have we allowed any for district or executive duties in the very extensive Saugor and Nerbudda territories; and lastly, we have not made any allowance for those young officers who must be under instruction, and learning a vernacular language, at the head-quarters of the Sappers or elsewhere. With respect to the last item, we know that six or eight officers must always be so employed; and as to the rest, that calls will constantly be made on the corps for one or another of these duties; we are aware that the corps as proposed by us can only furnish officers for all these various demands by diminishing the number of Assistants to the District Engineers, or in other words, by shortening the valuable course of practical instruction which young officers will pass through before being put in charge of a district themselves; we feel that this will be an evil, but we prefer to encounter it rather than to lay ourselves open to the charge of including in our list any appointments not absolutely required, and not absolutely needing to be held by Engineers.

To the exclusion of many others for which Engineers will certainly be taken.

583. Again, we must observe also, that we have carefully excluded from our list of employments for the Engineer Corps all duties not requiring professional science and skill. In the immediate execution of large individual works of all kinds, and in the management of departments charged with executive duties, there will be many situations in the Public Works Department eminently demanding intelligence, probity, energy, and prompt resource; but except where such duties are peculiarly extensive, or where the professional superior is far distant, and except also the occasional employment of Assistant District Engineers in the immediate execution of works for their own better practical education, we have assigned the whole of such duties to unprofessional officers, by whom, we believe, if carefully selected and directed, they will be very efficiently discharged. But here the employment of such officers must stop; we are fully persuaded that it is true economy to confide professional duties solely to professionally educated men.

And of more executive duties.

584. We have arrived at the conclusion above stated as to the number of Engineer Officers necessary, from the sole and simple consideration of the wants of the public service. We would not add so much as a single officer to our list upon any mere consideration of establishments existing elsewhere. But it may be useful, nevertheless, to draw a comparison between the strength of the Engineer Corps at this Presidency and at the other Presidencies of Bengal and Bombay, in order to show that the increase which we advocate is not extravagant in the comparison.

The number in Bengal and Bombay.

Prior to 1824, the strength of the Engineer Corps of the three Presidencies had not been determined on any fixed principles; but in that year all three were re-organized. Each was to contain two battalions; but the organization was somewhat different in Bengal from what it was at Madras and Bombay, so as to give a total of 46 officers to the former Presidency, while each of the others had only 38. The wisdom of allotting the same strength to Madras and Bombay, and of making so little difference between these two and Bengal, when the requirements of the three cases differed very largely, is not apparent. It was soon found, however, that the number of Engineers allotted to Bengal was quite insufficient, and a third battalion was given to that Presidency in 1827, raising the total number of officers to 69. In 1829 a revision of this arrangement took place, and the strength of a battalion of Engineers for all the Presidencies was then fixed at 20 officers; and thus the Bengal Corps was reduced to 60, while those of Madras and Bombay were both raised to 40.

585. In 1839 a further enlargement of the corps took place in Bengal. In that year the Court of Directors sent out a despatch (20 March, No. 14) declaring that they had long been anxious that the whole of the operations connected with buildings, roads, canals and surveys should be exclusively under officers of Engineers; and pointing out that at that time, though all the officers of that corps (including 12 supernumeraries) were employed on professional duties, yet that such were the

Augmentations in Bengal.

- 1 Colonel.
- 1 Lieut.-Colonel.
- 2 Majors.
- 6 Captains.
- 2 1st Lieutenants.
- 7 2d Lieutenants.

- 1 Colonel.
- 1 Lieut.-Colonel.
- 1 Major.
- 5 Captains.
- 0 1st Lieutenants.
- 5 2d Lieutenants.

Changes at Madras.

exigencies of the service, that 26 officers not Engineers, were also employed on the same duties. Deeming this an unsatisfactory state of affairs, the Honourable Court proceeded in the same despatch to direct that the strength of each battalion of Engineers in Bengal should consist of 29 officers, as noted in the margin, by which the whole strength of the corps would be raised from 60 officers to 87. And the Court expressed a hope that, by a careful attention to the mode of employing this number, the Government would shortly be relieved from the necessity of confiding duties of a professional nature to officers not specially educated for that branch of the service. The corps continued on this organization till 1844, when a further change was made. The Honourable Court had become dissatisfied with the arrangement of 1839, because it broke in on the system established in 1823, of giving to all branches of the service equal proportions of Field Officers and Captains. They resolved accordingly (despatch 3 July, No. 5) that the Corps of Engineers in Bengal should consist of four instead of three battalions, each to contain 23 officers, as shown in the margin; and thus the total strength became 92.

586. In the same year a change was made in the organization of the Madras Engineers. Since 1829 that regiment had consisted of two battalions of 20 officers each; but in 1844 (despatch 27 November, No. 68) the organization then recently introduced in Bengal was ordered to be adopted at Madras also, and thus six subaltern officers were added. The Court at the same time declared their intention to add four more officers to the corps at an early period, and to determine when doing so, in what ranks the addition should be made. It does not appear how this intention could have been carried into effect, without a direct violation of the principle so lately enunciated in the case of Bengal; and in point of fact, the promise was never redeemed; no addition has been made to the Madras Engineers from that day to the present, except by the objectionable expedient of sending out every year a large number of supernumerary Second Lieutenants.

We may here observe, that we are aware that in the scheme given above in para. 581, for giving the required augmentation of the Engineer Corps, we have departed from that principle of uniformity which, as it appears from the despatch, constituted the principal reason for giving the Bengal Corps a fourth battalion in 1844. It appears to us that such rules, however good in themselves when applied with discretion and moderation, become an evil when pushed to the extreme, and allowed to operate as a bar to useful measures. On this consideration we have arranged the strength which we consider necessary, in four battalions, so constituted as to compensate by a larger number of Captains, for a smaller proportion of Field Officers and Colonels. If, however, the existing organization is to be rigidly adhered to, the number of battalions may be increased to five of the present strength; the total number of officers would thus be 115, and the number always fit for duty 86, a number certainly not too large for the demands of the public service.

Proportion of the Engineers to the rest of the army, under all the Presidencies.

587. As a branch of the army, the Engineer Corps may properly be compared with the other branches; and this comparison is the more appropriate as a test of the work which it has to do in some important departments of its duty, because the buildings required for an army are, in proportion to its strength, and because the army bears some proportion to the extent of the territory and to the scale of the other establishments; and, therefore, this comparison affords some criterion as to the number and value of civil buildings, and the extent of the communications of the country.

The Comparison of the Three Presidencies in this respect is shown in the annexed Table.

	Battalions of Engineers.	Other Branches :				Number of the Battalions of other Branches to one of Engineers.
		Battalions of Artillery.	Battalions of Infantry.	Regiments of Cavalry.	TOTAL.	
Bengal	4	12	78	10	100	25
Madras	2	7	56	8	71	35½
Bombay	2	5	33	3	41	20½
	8	24	167	21	219	27

11 24 167 21 219 Thus

Thus it is seen, that in the Bombay army the battalions of Engineers are to the battalions of the other branches of the service as one to 20½; in the Bengal army as one to 25, while in the Madras army they are only as one to 35½. Or to state the same facts in other terms, the Engineer battalions at Bombay are 4.65 per cent. of the number of battalions in the whole army, Engineers included; in Bengal they are 3.84 per cent.; while at Madras they are no more than 2.74 per cent.

588. But this is not the only point of comparison. In Bengal, almost the whole of the land revenue is permanently settled; and throughout the whole Presidency, both Bengal Proper and the North West Provinces, there are scarcely any Government works of irrigation; and in the Bombay territories the works of that description are still more few and insignificant. Whereas, in Madras, as before explained, by far the greater part of the land is held on annual and Ryotwar settlements; irrigation is very general, and the charge of repairing the irrigation works has been assumed by the Government, together with the annual contributions levied by ancient custom for that special object: and in proportion as that duty is well or ill performed, the amount of revenue collected varies very materially. Thus, whereas, under the other Presidencies, the operations of the Engineers are chiefly confined to the large military stations and to the main lines of road, they extend in this Presidency to the works of irrigation, scattered about in almost every village of the country. And the same cause, viz., the existence of the works of irrigation, works demanding a principal share of the attention of the Engineer Corps, also raises the expenditure requiring their control and management, much above what it would be without such works. This peculiar circumstance of this Presidency, viz., the existence and the nature of the Government irrigation works, is alone fully sufficient to show that Madras requires, in fact, a larger proportion of Engineer Officers than the other Presidencies; whereas it has, in fact, a much smaller proportion.

The irrigation works of this Presidency require a large number of Engineer Officers.

589. Compared with the other departments of the army, the increase which we advocate as absolutely required by the public service at this Presidency, would only raise the proportion here to what it is already at Bombay; while it would give Madras a somewhat higher proportion than is now possessed by Bengal. But compared with the work to be done, which after all is the only proper point of comparison, the establishment at Madras, even after such augmentation, would still be far below what it is at either of the other two Presidencies; for besides the large quantity of very important work in connexion with the irrigation, which is almost wholly wanting at both the other Presidencies, the extent of roads required in Bengal is very far below what it is here (compared respectively with the extent and population of the two countries), because, both in the Lower and even in the Upper Provinces, the rivers are the great highways. The reasons why, with the much larger amount of work to be done, we ask for this comparatively limited number of Engineers, are two; viz., first, that with an efficient subordinate establishment, such as we propose, a given number of Engineer Officers will be able to accomplish a vast deal more than they could without such assistance; and, second, we propose, as already said, that all merely executive functions shall be discharged by officers to be selected from the line.

Comparison with the other Presidencies.

590. In making this comparison with the other Presidencies we are far from saying that the existing number of officers in Bengal especially, is sufficient for the multifarious and important duties devolving on it in those very extensive territories. With that question we have no concern, we have only to consider the wants of this Presidency; and having done so with the utmost care, and having rigidly excluded all appointments not requiring professional skill, we cannot rate the requirements of the public service at a smaller number than that which we have stated. And we feel confident that no man acquainted with the circumstances of the country, or candidly considering the facts as we have stated them, will maintain that we ask for more than is necessary. For what is it after all that we propose? Every District Engineer will have charge on an average of a territory of 7,000 square miles, which is equal to the whole of North and South Wales; and this extensive charge will comprise thousands of works, contributing each in its degree to the revenue of the Government and to the wealth of the people, and requiring each in its degree the care and management of the Engineer Department; in each district also thousands of miles of road are to be traced and made, or

Even with the proposed augmentation the number of Engineers will be very small.

improved and kept in repair; and each one also contains Government buildings, civil and military, to a very great value. The Inspecting Engineers again will have charge of a tract of country of more than double this extent; viz., on an average above 16,000 square miles, and their tours on duty will not be confined to simply travelling along the high road to visit the chief stations, like the Inspecting Engineers in Bengal, but they will have to travel from time to time into every remote corner of their extensive divisions, in the investigation of projects of improvement and the inspection of work done. To these two grades of officers we may add eight of the Assistant District Engineers, being, probably, fully as many as will in general, under our proposed arrangements, be of sufficient standing and experience to be of real use. And thus we have 37 Engineer officers as the whole number actually engaged in the custody and management of all the numberless works of this extensive and populous country; viz., all the works of irrigation, and the roads and canals, besides the Government buildings, being one such officer to every 3,900 square miles of country, and to every 600,000 of its 22,000,000 of inhabitants. And the exertions of this very small number are expected to be sufficient to maintain the revenue derived from irrigation, to develop the resources of the country by pointing the way to the improvement of those works and of the internal communications, and to eradicate fraud and peculation from the very extensive native executive department.

And it would be more reasonable to condemn that number as insufficient than as extravagant.

591. When the actual facts as thus stated are duly weighed; when the small number of professional officers that we propose is compared with the huge extent of the territory, the enormous number of works to be attended to, and the vast importance of the interests at stake, we are convinced that instead of deeming the proposed establishment extravagant, every candid person will feel that it is far below what is required, and that it is hopeless to expect such large results from such limited means. We are persuaded that this view would be far more just than its opposite; and while we fully believe that with the aid of an efficient subordinate establishment much may be accomplished by the amount of professional agency which we seek for, we are yet convinced that in the course of 10 or 15 years after that augmentation shall have been given, when the value of an effective department shall have been practically demonstrated, and the importance of improving and maintaining both the works of irrigation and the means of internal communication shall be more fully recognized, it will be urgently felt that the number of officers is still much too confined, and that a further material increase is required, simply as a matter of economy.

Proposed order of raising the additional strength.

592. We have said that the wants of this Presidency in Engineer Officers cannot be met by a smaller augmentation than would be equivalent to two strong battalions, besides a corresponding increase to the present two battalions; and we think the facts which we have stated fully support that statement. But it may be doubtful how far it would be wise or expedient to give the whole of that increase immediately. To do this by the usual means would add a large number of very young officers to the corps, who for some years to come would necessarily be without the experience which is required to form a valuable Engineer Officer. The Madras Engineers have been so extensively superseded in both Bengal and Bombay that probably no assistance whatever could be obtained from either of those corps in forming an additional battalion here, but even without such extraneous help the standing of the officers generally is such, and the number of supernumeraries is so large, that the corps might be at once completed to three battalions of the full strength above proposed, without any inconvenience. The proper strength of the regiment at present is 46 officers, but the actual strength, with nine supernumeraries, is 55. The whole number necessary to form three battalions on the scale proposed is 84, and 29 additional officers would thus be needed to complete the present establishment to that strength; being not a larger proportion of quite young officers than must generally be found on the occasion of such an augmentation. As respects the remaining battalion it occurs to us that the best plan will be to raise it gradually in the course of the six years next after the first battalion is given; adding one-sixth of the strength in each grade every year, as nearly as it can be arranged. The subjoined scheme might answer for this purpose.

	First Year.	Second Year.	Third Year.	Fourth Year.	Fifth Year.	Sixth Year.	TOTAL.
Colonel - - -	-	-	-	-	-	1	1
Lieutenant-Colonel - -	-	-	-	-	1	-	1
Major - - -	-	-	-	1	-	-	1
Captains - - -	1	2	2	1	1	1	8
First Lieutenant - -	2	2	2	2	2	2	12
Second Lieutenant - -	1	1	1	1	1	-	5
TOTAL - -	4	5	5	5	5	4	28

Thus the augmentation would be spread over several years, and the inconvenience of a large number of very young and inexperienced officers, and of too rapid promotion, would be avoided.

593. Before quitting this subject we cannot but briefly notice a practice to which we have already adverted; viz., that of increasing the numbers of the Engineer Corps by sending out a large number of supernumeraries in the grade of Second Lieutenant. The return for the 1st May 1851, shows 11 officers of that description; at the present moment there are nine, and the number appears to range from eight to 12. This practice seems to have been in vogue 18 or 20 years ago (see the Table above in para. 577), but to have been afterwards abandoned until recently taken up again. It appears to have been adopted now in consequence of the pressing requisitions sent home by the Madras Government for an increase in the number of professional officers. But it is a mode of meeting that want not only unfair in the extreme of the Cadets so sent out, but certain to be ultimately injurious to the efficiency of the corps, and through that to the interests of the Government, from the feeling of disappointment and disgust with the service, to which it must give rise.

Supernumerary
2d Lieutenants of
Engineers.

594. A Cadet at Addiscombe is excited to use all his exertions to obtain a commission in the Engineers, by representations of the great superiority of a young officer's prospects in that corps over those of a brother officer in the Artillery, or in the Line; but no sooner does the successful competitor arrive at Madras, than the illusion is dispelled. He finds himself posted as tenth or twelfth supernumerary, with the prospect of from five to six years' service in that grade, before he is even brought on the strength of the regiment. Nor are his ulterior prospects of promotion less dismal; in the highly favoured Cavalry there are six Captains to twelve Subalterns, or one to two; in the Infantry there are six Captains to fifteen Subalterns, or one to two and a half; in the Artillery there are five Captains to fifteen Subalterns, or one to three; and nominally the same proportion exists in the Engineers, but in point of fact there are five Captains in the latter corps to twenty Subalterns, or only one to four. Thus the young officer's chance of promotion to Captain in the Engineers is one half worse than in the Cavalry, three-eighths worse than in the Infantry, and one-third worse than in the Artillery; and not only this, but half his time as Subaltern is passed in the inferior grade of Second Lieutenant, while only one-third of it is so in the other branches.

The prospects held
out at Addiscombe
are falsified.

In reply to a remonstrance from some Madras Engineer Officers some years ago, complaining of slow promotion, the Court of Directors justly observed that they could not recognize, as ground of complaint, circumstances which depended on the contingencies of the service. But that plea ceases to be valid when the supersession is not an accidental circumstance, but is the consequence of the Court's own acts, in unduly increasing the junior ranks of a regiment in breach of their own established regulations.

595. We have only a few remarks to offer as to the education and the training of the Commissioned Officers of the department.

To begin with the Addiscombe education, we believe that the whole management of the Cadets at that Institution is excellent. The most talented masters are secured by high salaries, the military discipline is beneficial to the pupils, the

The Addiscombe
system of instruc-
tions good.

subjects of study are so well varied throughout the day, that the greatest number of hours are occupied without injury to the health of the boys. And, altogether, no better use could probably be made of their first two years. At the end of each term, so many of the senior boys as the wants of the three Presidencies render necessary, are appointed to the Engineers; and as they have won their way to that position step by step through the Academy, by fair examination, nothing could be more honest than the selection. There is, however, one fault in the test by these examinations, which we will bring to notice, though we do not feel ourselves able to suggest a remedy. The selection, as it is now made, is by the amount of rudimental knowledge possessed by the candidates, and not so much as might be by their talent or capacity; whereas, the main points, at so early an age especially, to be determined in the Engineer recruit are, his aptness to acquire knowledge, and his power of applying it to the duties of his profession.

But the selections for the Engineers defective in one particular.

596. It may be thought that the amount of mathematical and other acquirements possessed by each Cadet after his course of study is completed, is the best criterion of his capacity for learning, but such is by no means the case. The preparatory schools which now almost entirely supply the Engineer Corps with the recruits, drill their boys in the exact line they have to walk through Addiscombe, (the path that leads to an Engineer Commission), which gives them so great an advantage over those who are untrained in that particular line, that the two years spent in the Academy does not give time enough for talent to win its proper place; and the consequence is, that the well-crammed pupil leads the class, and is appointed to the Engineers whether he has any turn or not for the profession. There can be no doubt that the longer the youths remain together in the school, the better chance each will have of proving his ability, and probably the defect which we are speaking of, could only be corrected by a longer stay at Addiscombe; but it is possible that something might be done by bringing more fully to the test the power the candidates possess of turning to account the knowledge they have acquired. This, however, we must leave for the consideration of those practically skilled in education.

A longer course of Civil Engineering is necessary.

597. After leaving Addiscombe, one year or 15 months is spent at Chatham in the study of Military Engineering, with a very flimsy course of Architecture and Civil Engineering. Here we would recommend a most decided change, limiting the military course to six months, and giving a year-and-a-half, or two years, to practical instruction under a Civil Engineer, engaged on some important work; and we may here observe, that so far back as 1838, the importance of this was so strongly felt, that the Government resolved (on the 20th March of that year,) to recommend to the Honourable Court of Directors to make Civil Engineering in future the primary object in the education of their Engineer Cadets. In the medical service, the young officers who have given their minds to the study of their profession in Europe, bring out practical knowledge, which could hardly be learnt from books, and each year something of modern improvement is thus brought to India. The same will be the case in the Engineer Corps if our recommendation on this point is followed. The military course might very well be condensed, and the more time that is allowed for the study of Civil Engineering in all its branches, the better; no course of study could be more improving, and the very fact of the Engineer Cadet remaining in Europe till he is old enough to know the real value of all he sees, will of itself be of great importance to the corps which he is to join in India. As a stimulus to those under this course of instruction, we would suggest that their relative position and standing in the Engineer Corps should be determined, not as at present by the Addiscombe examination, but by an examination after the close of their civil engineering studies.

The course of instruction in India.

598. On the arrival of the young officers at Madras, they are sent to the headquarters of the Sapper Corps in Coorg, where they go through a course of plan-drawing and estimate making, in the forms in use in India. They teach and practise with the Native and European Sappers some of the military engineering learnt in England, and have the advantage of a Moonshee in either Hindoostanee or Tamil. They remain at Mercara till they have passed an examination in some one Native language, after which they usually receive the appointment of Assistant to a Civil Engineer.

Its defects.

This most important year in the young officer's life does not appear to us very satisfactorily employed, although they do pass it at present under the orders of a

most zealous and efficient Commandant. We consider a period of service under Military discipline in India as wholesome and advisable for young officers; and there ought also to be an advantage in their remaining under military orders while studying the language; but still, the results of the present system are not in all respects good. Its great faults seem to be, that while attached to the Sappers, the young officers are not engaged in any great work of interest, and that the mess consists of very young officers; and the natural result may be traced in a decided distaste for the Civil branch of the department on leaving Mercara, and a consequent want of interest in their work.

599. To correct these defects, we would recommend that the head-quarters of the Sappers should be always stationed at one of the most important works under execution, in whatever part of the country that might happen to be. In such a situation, as at Roorkee in North India, the study of Engineering would be carried on to the greatest advantage, both to officers and men; the practical being intimately combined with the theoretical, so as to illustrate it, and give it an interest and relieve it of its dryness, by showing its use in actual work. Again, even if there should be no older officers of Engineers attending the mess, still officers of all ages from the corps would be engaged on the work, and would form a society in which the juniors could not but learn, as nearly all do later in their lives, that there is the highest interest to be found in Civil Engineering. We would relax nothing of the military discipline, would make the study of a native language of still more importance than it is at present; would give to the European and Native Sappers all the benefit of the Military and Civil Engineering knowledge brought out by the young officers; and would let all see it applied as far as possible to the work under execution. It has always been remarked, that men who showed little or no taste at first for the laborious duties of the department, have learnt to take a pleasure in their work, on such great undertakings as the Coleroon or Godavery anicuts, where they have found their seniors making the furtherance of the works their sole object, and the progress of each day the boast of all engaged. Every Civil Engineer would be glad to get assistants from such a school as that; there being this difference between young men so trained and those now sent out after the usual course at Mercara, that one is a useful assistant immediately, and the other not till he has acquired some practical acquaintance, both with the novel species of works which are to engage him, and with the people with whom he is to be in constant intercourse. On joining a division at present, if an officer has come direct from the Sappers Corps, he has still much to learn, and all the department being overworked with most unedifying routine duty, it is long before he has gained the information necessary for an independent charge of duty requiring Engineer's skill. He will not learn probably in years, what he would acquire in six months if employed to assist in the execution of some extensive work.

The means of correcting them.

600. We would also recommend that portions of the Sappers employed on public works, whether the head-quarters or detached companies, should, while so employed, be placed entirely at the disposal of the Government, as is the case with officers holding appointments in the Public Works Department. Under such an arrangement they would be under the general control of the Board of Works, which must be the proper authority to decide where and how their services could be most beneficially applied. In this case the charge to the Public Works Department would be the working money, and other expenses not purely military. The Sappers Officers of the party, or some of them, might be appointed Assistants to the Engineer Officer of the work or of the Division, or Executive Officers under him; and this would add to their emoluments, and give them a feeling of interest in the work. On the Sappers themselves, we think the effect of this change of arrangement could not fail to be beneficial. Their practical teaching would go on as at present, with this great advantage, that they would feel themselves to be labouring for a real object. Instead of doing work and then undoing it, first throwing up entrenchments and field works and then destroying them, an occupation peculiarly dull and uninteresting, they would see the utility of their labours, and would consequently work with increased zeal and energy. To the State also there would be a gain; for the immediate results of the men's labour would be valuable instead of entirely useless; and, lastly, the spread of handicraft skill among the labouring classes generally from working with the Sappers, would be a great public benefit.

Parties of Sappers employed on public works, to be under the Board of Public Works.

Acquisition of a native language important.

601. Much stress should be laid on the necessity of acquiring a native language. And as the corps of Sappers is entirely composed of men who speak Tamil or Telooogo, and one or the other of those tongues is the language of 18 out of the 20 districts of this Presidency, while Hindoostanee is but the language of a few persons thinly scattered, it would be better to teach the two former almost exclusively.* It is no doubt agreeable in moving from one part of India to another to be able, by a knowledge of Hindoostanee, to make oneself intelligible to some one at every considerable station or town; but to a Civil Engineer on duty, who should be in the habit of familiar communication with the most common Ryots, Hindoostanee in South India is almost wholly useless. Many of the servants of the district Cutcheries can use it generally, and so can most of the Peons, and all the Sepoys in the public bungalows; and officers familiar with that language are too apt to rest content with a direct communication with those classes only, and to use interpreters in their much more important intercourse with the people of the country. Under these circumstances we would recommend that every young officer should be obliged to acquire a good knowledge of either Tamil or Telooogo while with the Sappers; and we would have that study made of more importance than all others in the course of instruction there, which does not appear to be the case at present, as very few young officers are now able to speak any native language tolerably when they quit Mercara. On joining a division, a slight acquaintance with the language of the district is required before the allowance of First Assistant can be drawn. This is a beneficial rule; but as there is very little time for study, if the officer appointed is to do the duty of an Assistant, choice should be made for each division as far as possible from those who have already learnt the language of it whilst with the Sappers, and with a view to that, the numbers taught each language should have reference to the probable demand for Engineers in the northern and southern districts.

Duties of a Sub-engineer.

602. We now come to the classes below the rank of Commissioned Officers; and in treating of them, we will first make a few remarks so far as it may appear necessary, as to the qualifications required in the several grades, and then explain the mode of training for these classes, which appears to us to be the best.

The Sub-Engineers will take all the important duties of the present Revenue Surveyors, and will in reality be Assistants to the District Engineers. They will usually travel independently of their superior officers, and have to act for themselves even in cases of considerable importance. They will visit from time to time as many as possible of the public works, and report upon their actual condition in all particulars. They will also examine work executed, comparing it with the accounts furnished by the Executive; decide on the value of labour and materials; and remark on the efficiency of the work, as well as the results of former outlay. It will in like manner be their duty to estimate for repairs, to examine estimates made by the Revenue Department, to suggest improvements for the better security or extended utility of the public works, and to give instructions as to the manner of executing work and preparing materials, so that the greatest economy may be ensured in all that is done. In some cases they will take executive charge of works too extensive to be left to the management of one Overseer, or where more than one Overseer may be employed without a Commissioned Officer being present.

The qualifications he requires.

603. The Sub-Engineer will thus need the following qualifications. A character above suspicion; a practical knowledge of building, and an acquaintance with the principles of Engineering, with reference both to hydraulic works, especially those of this country, and to the construction of roads, canals, bridges, &c. He must be a good practical Surveyor, must have some considerable knowledge of mathematics, must understand arithmetic thoroughly, and be able, either by tables, or formulae, to determine superficial and cubical contents, as well as the pressure and velocity of water, under different circumstances. It will also be requisite, that a Sub-Engineer should have the power of communicating what he sees and does, in good clear English, and possess such a knowledge of the language of the district as shall enable him

* There are two other languages extending over considerable tracts, besides mere local dialects; they are Canarese and Malayalum. The former is spoken in the greater part of Canara, in a small part of Bellary, and in the Mysore country; Malayalum is the language of Malabar and of the Rajaship of Travancore and Cochin. These languages should be studied by a limited number; Malayalum is much like Tamil, and Canarese a good deal resembles Telooogo.

him to communicate with the people of the district, or at least to detect an error of interpretation. There can be no doubt that the class best able to supply this grade at present, is that from which our Overseers are now drawn. And we consider it most advisable, for reasons given elsewhere, that a considerable number of Europeans should be appointed to it as rapidly as possible.

604. The Overseers will have the same duties as are usually entrusted to the same class now. They will manage works under execution, teach the use of English tools, and aid the executive in introducing a better system of work and more perfect materials. The Sub-Engineers will for the most part be selected from this class; but it may be expected that many most excellent Overseers will never qualify themselves for the higher grade, in those studies which are not easily taken up late in life. A man of good character, who understands building, and commands the respect of those who work under him, will be an invaluable Overseer even if he has no other qualifications, and for the first few years we must be satisfied to place such men upon our list; but in organizing the department we do not think we need limit ourselves to so low a standard for the future, if the pay and promotion we recommend is guaranteed to those who take service in it. We have no doubt that either from Her Majesty's, or the East India Company's, Corps in India, or by enlistment in England, respectable young men may be procured who have learnt some useful trade, and had such an amount of education that after a year or a year-and-a-half devoted to the particular studies suited to the department, including the nature and management of our peculiar hydraulic works, and the acquisition of a native language, they will be fully qualified for the place of Overseer, with a fair prospect of rising to the rank of Sub-Engineer. In the present state of the country, when a better knowledge of the arts is so much needed, it would be well if all who were selected for the Public Works Department could be such as have been brought up to some art required in building; but high character and general intelligence are of even more importance, and we would not therefore restrict enlistment to artisans. A man of intelligence will gain in two seasons of actual work, sufficient practical knowledge of building to make him a most valuable aid to an Executive Officer, under whose orders he will, while usefully employed, complete his education as an Overseer.

Duties and qualifications of an Overseer.

605. The recruit for the Overseer Department may be either enlisted in England, or selected from European corps in this country; but there is a disadvantage attached to the present plan of taking them from the Sappers. It is found useful to retain the men on the strength of the army, so that in case of misconduct they may be remanded; a useful secondary punishment, short of the extreme penalty of dismissal. In the Sappers, however, as there are no European privates, a man goes back as a Non-Commissioned Officer; and the present advantages of the Overseer's appointment are so small, that some men actually wish to be thus remanded. A second evil is, that under this system the Non-Commissioned ranks of the Sappers are kept up far beyond their proper strength.

Recruits for this department how to be obtained.

With an establishment increased as we propose, it would probably be found impossible to obtain a sufficient supply of men from the regiments in India. We think also that much is to be gained by enlisting men in England, because by that means the department will gain by the advantage of the superior prospects which it can hold out, in comparison with what other branches of the service can offer, and men would freely enter for this department of a stamp to be met with very rarely in the ranks of a regiment. We would propose then that the advantages of the department should be made known at the depôts, and that men should be enlisted for it, but should be enrolled in the Artillery or the Infantry, and with the liability to be remanded to such corps as privates, in case of misconduct. At the same time we would by no means close the door against soldiers of the regiments in India, but would advocate the cordial admission of all such as came up to the required standard. There is one advantage attaching to this class, viz., that their characters are generally well known. The men already in the Sappers Corps should also be admissible; the prospect of such employment was one of the conditions of their enlistment; and they are of the same class as those Overseers whose conduct has been so praiseworthy, and whose services so valuable.

606. The Writer in the Engineer's office should be capable of examining estimates and accounts, and writing English rapidly and well; he should read and write the language of one or both of the districts in the division, and be familiar with the

Engineer's writers.

terms and symbols used in surveying and plan-drawing. As he may frequently be of use in the examination of works, the more practical knowledge he has the better; and as he will have to do business on a somewhat equal footing with the Tahsildars, it will be essential that he should be a man of some standing in the service, and of that unquestionable respectability which enables a man in office to be independent of caste.

Estimate makers.

The officer in the Engineer's office heretofore styled "Maistry," has been in fact a calculator and maker of estimates; he has usually the estimate department in the office, examining those which come from the Collector, and entering abstracts of them in the books; and he has the checking of the bills sent in. His duties however are heterogeneous, for from the scantiness of the Civil Engineer's establishment, he has been required, in addition to the foregoing office duties, to accompany the Civil Engineer in his out of door inspections, and aid him in taking measurements for estimates or in measuring works executed; occasionally also, he is employed in surveying or taking levels. We propose to give every Engineer a Foreman, as already stated, who will take the latter portion of the Maistry's duties: for the former part we propose to give him an "Estimate maker." He will require a familiarity with English as well as with the language of the division, and he must be a good accountant and calculator, and thoroughly acquainted with the mode of making estimates and bills.

Draughtsmen.

607. The Draughtsmen will be employed solely in drawing fair plans and surveys. Hitherto this duty has usually been done by the Revenue Surveyors at a great unnecessary cost; not only from the high salary paid to that class, compared with what need be paid to the most expert Draughtsman, but also from the men engaged in drawing being kept constantly marching. It may be supposed how much labour and time is lost when unfinished drawings on large sheets of paper have to be packed up every day for travelling, and the work is to be done in the bad light of a tent, on tables never either firm or level. To correct this we would have all finished drawings made in an office kept at the head-quarter station, where the most may be made of time, labour and materials; while the Draughtsman, being relieved from the expense of travelling, would be well paid on half the salary that would be necessary for him if following the camp. Nothing but extreme accuracy and neatness being required in copying plans, many men who have not a talent for other studies, or strength for the Surveyor's duties in the field, may excel in it; and if we may judge from the beauty and minute correctness of detail, in the paintings of those who have been employed by the botanists and ornithologists in the country, no race of people would make better or cheaper Draughtsmen for the Engineer Department, than the natives of the South of India.

Surveyors.

608. The only other grade which we will here notice is that of the Surveyor. The mere operation of surveying is almost wholly mechanical, requiring little more than carefulness and patience; and it has been found by actual trial that native youths, carefully taught, will make more accurate surveys than are usually turned out by the Revenue Surveyors of the Civil Engineer's Department. And if copies are made of these surveys, by such Draughtsmen as we propose to employ on from Rs. 20 to 35 a month, the drawings will be more perfect than the generality of those that we have on our records now, and will cost only about a fourth of the price. For it has hitherto been the false economy of the Government in the Public Works Department, not only to grudge all suitable education, but by keeping establishments at too low an ebb, to employ the same man to copy a plan, who was paid on the supposition that he had skill enough to project the work.

The advantage of employing natives on the mechanical parts of surveying.

Other advantages will be gained by employing natives in surveying and levelling. Their better powers of communicating with the people will enable them to get fuller information regarding the nature of the country, the position of materials, and other important matters, and their work need not be confined to the cooler hours of the day, which is considered necessary with the East Indians employed at present. As the Surveyors will always be acting under the immediate instructions and check of either an Engineer Officer or a Sub-Engineer, their duties will be almost wholly mechanical, as already said. They will form the lowest grade of the Engineer Department, and in general will be very young men. Their course of education will be confined chiefly to the use of levelling and surveying instruments, plotting surveys and keeping field-books in English; but like all other classes of the subordinate department, they will be taught while at the school to work with their own hands on buildings under execution.

It does not seem necessary to say anything as to the classes of the establishment. Of the Superintendents of Maramut and the Foremen we have already spoken; the Accountants will need similar qualifications to the estimate makers. The Gomastahs are the class employed to keep the accounts of the department under the Collectors and Tahsildars, in the native languages; as to this part of the establishment and as to the expediency of retaining the use of the native languages in the accounts of the department, we shall speak in our Second Report. The other classes not noticed, either explain themselves or need no special remark.

609. Before going on to set forth our views as to the means to be adopted for training up men for the subordinate grades of the department, it seems proper that we should give some further account of the only school for the purpose in existence now; and explain our reasons for recommending its abolition, and the introduction of an entirely new system of instruction. The present Survey School.

The "Survey School" as it is called, is in the office of the Board of Revenue, under the control of the Secretary in the Department of Public Works. The only teacher is an Assistant Surveyor, who has, in addition to the school, some general supervision of the irrigation works in the Madras collectorate and of the Cochrane Canal, beside the care of the instruments in the Board's office, with all correspondence regarding them; and in short affords general assistance to the overworked establishment of the Public Works Department. The pupils are admitted on passing an easy examination in "Reading and Writing from dictation, Arithmetic, Elementary questions in Algebra and Geometry, and a colloquial knowledge of one of the Native Languages." They receive no pay while at school; their usual stay is two years, though some are considered qualified in less time. They are expected to find their own instruments; but brushes, colours and paper are supplied at the cost of Government. Their course of instruction is stated to comprehend arithmetic, logarithms, the use of instruments, mensuration, architecture, trigonometry, mechanics, algebra, geometry, plan drawing, the plotting of surveys, and estimate making; but it seems inevitable that their acquaintance with these numerous branches of study must be very superficial. During the second year, they are occasionally employed in copying plans for the office; and when their schoolmaster inspects the small works under his supervision, the pupils accompany him. They practise surveying in the neighbourhood, sometimes in company with their teacher and sometimes without him. The pupils are said to be so well-behaved, that no punishment is necessary beyond an additional hour in school, and that is seldom inflicted. There have usually been five boys under instruction, there are now seven, of ages varying from 17 to 21 years of age; four of them are of European parents, and three are East Indians. When these seven were admitted there were six more candidates, five of whom could not pass the prescribed examination; and the other was rejected because there was not room for him in that part of the office which is used as the schoolroom.

610. The cost of the school is very small: the Schoolmaster's allowance is Rs. 70 a month;* the boys find their own instruments, and as they are day scholars, the only other charge incurred is for their colours, paint brushes and paper, which is fully repaid by their work during their second year. The whole expense therefore is Rs. 70 a month, or Rs. 1,680 in two years; so that each of the seven boys will have cost about Rs. 240 when he leaves the school. But though the school is kept up on the cheapest possible system, or rather with the least possible expenditure, the result is not satisfactory even as to cost; for there is no doubt, that one Schoolmaster with no other employment, might give instruction to ten times the number. The teaching which it gives is very defective.

The defects of the school are easily stated. The schoolroom is so mixed up with the office of the Revenue Board, that it is a scene of confusion; and the schoolmaster has many other things to attend to; and the result is a desultory mode of study, the effects of which may be traced in the after-life of the Surveyors. The course of study fits the pupils for no one branch of their various duties; for
through

* There is some confusion about the Schoolmaster's pay. There are two Revenue Surveyors employed in the Board's Office, one as Manager, the other virtually as Assistant Manager. The former of these receives the Schoolmaster's allowance, to make up his pay to what is considered proper for him; the other has charge of the school. The pay of this latter is Rs. 176. 4.; but as so much of his time is otherwise taken up, it may still be truly said that the school costs only Rs. 70 a month.

though architecture and mechanics appear in the list of studies, nothing appreciable of either is possessed by those who join the Civil Engineer's Department. Hydraulics, or the peculiar management of our works of irrigation, or the means of determining the simplest questions as to the pressures or velocities of water under varying circumstances, are perfectly unknown to them, as are also the modes of determining the strength or necessary dimensions of materials. It is not required of them that they should be able to read any native language, and even in the use of instruments for surveying and levelling, that perfect accuracy which ought to be insisted on in beginners is not attended to. The pupil's habits are unbusiness-like, their work incorrect, and by the accounts given of them, with few exceptions, by the Civil Engineers, their inefficiency on joining their division is only equalled by their vanity.

And it is utterly unable to supply the numbers required.

611. Thus the system of the school, so to call it, is defective and vicious; and all that can be said of it is that it is much better than none at all. Though its practical results have been so slender, in the efficient qualifications of those whom it has educated, yet few as the Revenue Surveyors have been, and defective as have been their merits, so helpless and unprovided is the department, that it would certainly have been much worse off without them.

But a further evil in the school is the scantiness of the numbers that it can educate in any way. It cannot contain more than seven pupils; and that number in two years is altogether inadequate to the requirements of the department even in this single grade. And the notorious consequence is, that in repeated instances very undeserving men have been retained in the service as Surveyors, simply because if they had been dismissed as they deserved, none could be got to supply their place. And as regards any other class, this school can give no assistance whatever. But it is now necessary to provide for the education of the European subordinates of the department; and it is necessary also, as it has ever been though hitherto wholly neglected, to give instruction and training to the numerous class of Maistries or Foremen. Neither of these can be attempted by the present school. We are decidedly of opinion that it ought to be abolished; and that a new institution, based on more correct principles, and more commensurate in its extent with the requirements of the department and of the country, should be established without delay.

Special education and training must be provided for the department.

612. We proceed then to set forth the means which appear to us to be the best for securing the qualifications required in the various classes of subordinates of the Public Works Department. Very early in our inquiries we were brought to the conclusion that these could only be obtained by means to be specially provided by Government itself. Education, and more emphatically this species of education, is not at such a point in this country, that the Government need merely to fix a standard of qualification, and invite candidates to compete for admission into the service; it must itself provide all the training machinery. Nor is there any thing unusual or startling in the demand; the same thing is done already for the higher grades of the department, who have very much more command of the means of educating themselves independently than the lower; and in the Medical College at Madras, we have before our very eyes an example exactly in point, of an institution for training the subordinate grades.

It would be waste of time to recount all the various plans which occurred to us while debating the best mode of effecting the end in view. We will simply state that while the subject was before us, we had an opportunity of consulting the reports of the Civil Engineering College at Roorkee in North India; and we found there a system not indeed exactly adapted to our wants, but so nearly suitable, so appropriate in all its main features, that we had no difficulty in determining that we might well adopt it as a commencement, with a few minor changes, leaving it to time and experience to suggest further amendments.

The Roorkee College of Civil Engineering.

613. The origin and growth of the Roorkee College are delineated in the annual reports, and it may be useful here briefly to review them. In the North West Provinces, as under this Presidency, large sums are annually spent on public works, and increasingly of late years; and the want here felt, viz., that of an effective and well-trained subordinate agency, and which the working departments have here tried in vain for many years to force on the attention of the Government, was experienced in North India also, and the present Lieutenant-governor actively took up the subject. The first rudiments of the existing college are found in a letter

letter from the Secretary to the Lieutenant-governor, North-West Provinces, to the Military Board at Calcutta, dated Umballah, 17 January 1845, which declares the anxiety long entertained by his Honour, "to raise up a body of Native Civil Engineers," to aid the "officers in charge of canals in the operations of surveying and levelling, and laying out watercourses, as well as in the preparation of maps and plans and the formation of estimates." The first idea brought forward in this letter was to take two well-instructed mathematical pupils from the Government Colleges, and associate them with a number of unlettered but intelligent Lallahs (or Maistries as we might call them), under the control of an Engineer Officer, with the view that each of the two classes should impart to the other that sort of knowledge which it possessed, and of which that other was destitute. But even in that first letter, Mr. Thomason's views reached further, and he even then contemplated the training up of a subordinate engineering establishment, consisting of two parts; one, men having received a liberal and scientific education, to be called Assistant or Sub-assistant Surveyors, and to receive handsome salaries; the other, men of inferior education and acquirements, and to be paid on a much lower scale.

614. In pursuance of the first part of the plan, two young men from the Agra and Delhi Colleges were placed under the Superintendent of the Dooab Canal, each on a monthly salary of Rs. 50. But there that part of the scheme appears to have been dropped; for the Governor-general having in the following year (9 October 1845) authorized the institution of a class of officers to be called "Sub-assistant Executive Engineers," on a salary of Rs. 100 a month, besides travelling allowances, both youths passed the examination and were admitted into that grade, one immediately, the other after a further period of study, and no more appointments of the former kind were made.

Its early begin-
nings.

On its first institution the class of Sub-assistant Executive Engineer was restricted in number to four; but in the following year the limit was enlarged to 20. During the year 1846-47 eight candidates presented themselves for examination; of whom four passed as qualified theoretically, and were allowed to prosecute their further studies at Roorkee, under the director of the Ganges Canal, with the prospect of being passed, if they qualified themselves in the practical parts of their duty in six months.

In October 1847 the college at Roorkee was founded; the site having been selected in consequence of the extensive works then in progress there in connexion with the Ganges Canal. The institution of the college was proposed to the Government of India by the Lieutenant-governor of Agra, in a letter dated 23 September 1847; and it was immediately approved and agreed to by the Governor-general. An officer of Engineers was at once appointed Principal of the embryo college, and immediate measures were taken for the erection of suitable buildings. The first students joined the college on the 1st January 1848.

615. The college is formed into three departments; the first department is intended for candidates for the appointment of Sub-assistant Executive Engineers, who are all native youths from the various Government colleges. The preliminary qualifications necessary for passing into this class are high, comprising a familiar acquaintance with the English language, and a knowledge of geometry, algebra, mensuration, plane and spherical trigonometry, conic sections and mechanics. In this class eight stipendiary students are allowed, with salaries of Rs. 40 monthly.

The constitution of
the college and
the subjects of
study.
The 1st department.

The number of admissions to this class has been small; up to the end of the year 1849-50 (the last year for which we have the reports), the number of applications had been only 10, and the number admitted no more than four.

The subjects of study in this department are stated as follows in the report for 1849-50:

- I. Revision of certain branches of Mathematics.
- II. *Materials*—Strength of Materials, Stability of Structures.
- III. *Construction*—Masonry, Carpentry, Bridges, Foundations, Earthwork, Roads.
- IV. *Practical Hydraulics*—Rivers, Drainage and Irrigation Canals.
- V. *Motive Powers*—Machinery and Tools; Hydraulic Machines.
- VI. *Geodesy*—Surveying and Levelling; Practical Astronomy; Trigonometrical Surveying.
- VII. *Outline of Geology*—Physical Geography; Meteorology.

407—I.

113

Together

Together with the following, as appears from the Report of the preceding year; viz., Measurements and preparation of Estimates, and the method of keeping accounts and preparing abstracts.

The 2d department.

616. The second department of the college is for the training of European Overseers, the pupils being non-commissioned officers and soldiers. These men also are subjected, before admission, to an examination in reading, writing, arithmetic, elementary geometry, mensuration and simple plan drawing; a certificate of character from their commanding officer is also required. Their travelling charges to the college are paid; and while there they receive the same allowances as if with their own regiments. The time allowed for instruction at the college was at first limited to six months, but it has since been found necessary to extend the term. If ultimately approved, the men commence to receive the pay of an Assistant Overseer, and are either at once draughted off for the public service, or remain some time longer under instruction. The number allowed in this department was at first 10, it is now 15; it appears to be always complete. The studies of this department also are described in the Report for 1849-50; they are, plane geometry, mensuration, algebra and its application to geometry, plane trigonometry, the measurement of heights and distances, and the elements of mechanics. Their reading on practical subjects, it is added, may be detailed under the same heads as those of the first department; the subjects being taken up more briefly and treated more simply, to suit the more limited time and attainments of the students.

The students of both the first and second departments "are required to pay frequent visits to the works in progress in the vicinity, to make sketches and record their observations; and as a special exercise, to furnish written descriptions of particular works and processes." They are also instructed and constantly practised in surveying and levelling; and they are also instructed in architectural and topographical drawing, &c.—Report for 1848-49.

The 3d department.

617. The third department is for the instruction of native youths in surveying, levelling and plan drawing. The requisites for admission are a fair acquaintance with arithmetic, as far as the rule of proportion, and with vulgar and decimal fractions, and an ability to read and write Oordoo in the Persian character. Sixteen stipendiary students receiving each Rs. 5 monthly are allowed in this department. The instruction is communicated in the Oordoo language, and it comprises the following branches: Practical geometry, with its application in the field to surveying purposes, measurement with the chain and calculation of areas, surveying with the prismatic compass, protraction by bearings, theodolite surveying, protraction by traverses, and calculation of areas by the universal theorem; preparation of village field maps, and detailed area measurements as in the revenue surveys; levelling and construction of sections. They are also instructed in topographical drawing, and in copying, reducing and finishing maps and plans. (Report for 1849-50.) In short they are instructed in all that is calculated to make them skilful Surveyors, but in nothing else.

An institution of a similar kind is necessary here.

618. Having thus sketched the origin and growth of the Roorkee College as far as we have the means, and detailed its arrangement and course of instruction, we will now, having the advantage of the experience of that institution, set forth the plan which appears to us the best to meet the requirements of the public service at this Presidency. We will not stop to prove the necessity of such an institution here, for we are persuaded that no well-informed person, conversant with the nature of the case, will hesitate to admit it. Of the three great professional departments under the Government, the Medical service, the Engineers and the Artillery, due pains are taken in all, that the commissioned grades shall be properly instructed in England; as to the subordinate grades, the medical service is provided with an efficient school of instruction, which well vindicates in its results the attention and expense bestowed on its gradual improvement; the Artillery also, in the laboratory and workshop, possesses the means of giving valuable practical instruction to the men of the corps in their duties; in the Engineering Department alone the means of such instruction are almost wholly wanting. And yet the interests of Government are not a little involved in the skill and intelligence of this last department. It is invidious to make comparisons; every one of the three departments has its own peculiar value and claims to attention; but in a pecuniary point of view the injury sustained by Government during the last 40 years, from the ignorance and inefficiency of the subordinates of the Engineering Department, may fairly be pronounced

nounced incalculable. The college of Roorkee, however, at once saves the necessity of further remarks; the want was felt there, and it has been supplied: it is even greater here, and it must be supplied here too.

619. The following are the principal points on which some variation from the Roorkee system will be needed here. The first is, that we do not here require a class of natives corresponding to the first department of the Roorkee College. In the first place, there are no institutions under this Presidency capable of producing young men with qualifications nearly approaching to those required for admission to that department. The highest education given in any institution at this Presidency is at the Madras High School, and even there the scale does not rise so high; we may add that even in North India, with the numerous Government colleges, the number of qualified candidates is extremely small. Up to the close of the year 1849-50, a period of two years and-a-half, only 10 candidates had offered themselves, and no more than four had passed the test.

Some variations from the Roorkee system will be needed. First; a native "first department" would be out of place.

But, second, we have already stated our reasons for holding that for the present, at least, it is necessary that Europeans should constitute almost the whole of that grade which is to stand at the head of the subordinate department, with respect both to salary, influence and scientific attainments. This opinion is founded not merely on the fact just adverted to, that natives possessing the required attainments could not be met with, but upon the still more important consideration, that activity, energy, promptitude of resource, self-reliance in difficulty, and most of all probity, qualities fully as necessary to an effective discharge of duty, can be found most cheaply and most surely in Europeans, if not in them only. And on this point we may here observe, we find our opinion corroborated in part by Lieutenant MacLagan, the Principal of Roorkee College. In his Report for 1849-50, speaking of the first department, he says, "Personal energy, self-confidence, independence and decision, are of much importance to practical men in the department of engineering, qualifications which there are few opportunities of testing at this college. Their absence may be suspected. There is at all events observable the nearly allied disposition to receive confidently all that is read, without sufficiently examining its truth, and to be easily satisfied with any amount of information given, while resting contentedly ignorant of what is not specially taught."

We are convinced that so far as the exigencies of the public service are concerned, these will best be satisfied by confining the highest grade almost wholly to Europeans. If there is another end in view, viz., to encourage native youths to acquire knowledge, by holding out these good appointments as prizes, we will only say that, however good the object, it is an educational one, and the cost ought to be charged to the educational fund, and not to the Public Works Department. But we venture to advance the opinion that our scheme of admitting to the class a few really distinguished natives, distinguished not merely by academic honours, but by the actual display of energy, practical intelligence, and probity, and the placing them on equal terms with Europeans, and under the influence of their example, will be found not less calculated to develop in the native character all the higher moral qualities.

620. The second principal variation required here from the Roorkee system, is that the class of Sub-Engineers will need a higher standard of instruction than that provided there for the Europeans, who are to be only Overseers. The Sub-Engineers, as their name imports, and as we have already explained, are to be a subordinate class of Civil Engineers, using the term in its broad and not its mere local and official sense. They will therefore require instruction in all branches of Civil Engineering, and the candidates for this grade, who as already said will be almost exclusively Europeans, should in our institution, take the place of what is called in the Roorkee College the first department.

Second; our "first department" should consist of candidates for Sub-Engineerships.

Our Overseers will require the same qualifications as those of Upper India, and they will properly occupy the class of studies prescribed for the second department at Roorkee.

As to the third department, some change will be necessary in the course of instruction, to adapt it to the training of our foremen. The students in that department are trained up, as we have already observed, solely with a view to their becoming expert Surveyors; and we gather from the reports, that in point of fact their future employment is likely to be chiefly in that line. Under this Presidency the case is different, the duties devolving on a Maistry or Foreman, as we have described them (paras. 76 and 77), demand an acquaintance with surveying,

Third; the studies of the 3d department will need some modification.

levelling, plan drawing, &c., but they require something more besides. A Foreman must be in his degree an Engineer; he will have to manage works, to design and estimate their repair, and to execute work. He will therefore require instruction, and especially practical instruction, in the use of tools, the strength of materials, in the various species of construction, and in the incidents and treatment of hydraulic works. The course of instruction prescribed to the third department at Roorkee will very well suit our class of Surveyors; but the Foreman will require all the foregoing in addition. The studies of the Foreman should embrace the same subjects as those of the Overseer; but a lower standard of attainment will be fixed as the minimum. The instruction may also be given in a more popular form. It will properly be one of the early duties of the Principal of the college to compile or procure to be compiled a class-book or books of instruction with special reference to the hydraulic works of this country. No such work exists at present, or any means of acquiring information of that kind, other than the tedious one of the personal observation and experience of each individual officer.*

Besides these classes, we have already stated our opinion that the Accountants and Estimate-makers of the Public Works Department ought to receive some regular instruction in their duties. For the latter it is obviously necessary; and the very defective and irregular system now prevailing in the accounts of the department show that the Accountants require it likewise; and lastly, the Draughtsmen of the department, who under the new system are to be confined to the mere duty of fair copying plans, will also need to be instructed in the art.

Proposed classification of the students at the College.

621. The following then will be the divisions of the college best suited to our requirements, and we will adopt the term "Department" used at Roorkee.

First department for candidates for the rank of Sub-Engineer, being almost wholly Europeans who have passed through the grade of Overseer. The instruction to be very similar to that of the first department at Roorkee; having the same object, viz., to make Engineers.

Second department for training men for the rank of Sub-Overseer. The course of study to be very similar to that of the second department at Roorkee, which has the same object.

Third department for the training of Foremen and Surveyors; perhaps it may be expedient to have two divisions in this department, one for Foremen, and the other for Sub-Foremen and Surveyors. The latter division will also comprise the students for the grades of Accountant, Estimate-maker and Draughtsman.

Terms of admission and studies for the 2d department;

622. We must add a few remarks to explain our views as to the general arrangements of the college. We will begin with the European classes; that is, the first and second department; and for convenience we will take the latter first.

The members of the second department should be admitted on the same terms as at Roorkee, to be received from any European corps serving under this Presidency, whether Queen's or Company's, if the necessary arrangements can be made with the authorities of the former service, or specially enlisted in England in the mode suggested in an earlier part of this section, or similarly enlisted in this country, if fit candidates should present themselves. The preliminary examination to be held as far as practicable at the station where the applicant may happen to be. The course of instruction may be the same as that of the second department at Roorkee, with the addition of accounts and estimate-making; its duration should be in general at least one year, but longer time to be allowed when it may appear expedient. As at Roorkee, the travelling charges of the men to the college should be paid; and they should receive while there the same pay and allowances as with a regiment.

In the grades of Overseer and Sub-Overseer there are four classes. The general rule for promotion from one to another should be by seniority; but before promotion from the grade of Sub-Overseer to that of Overseer, a man should be required to show by examination that he had not forgotten, at least, what he had once known. Certificate of good conduct should also be required on every occasion of promotion.

623. Candidates

* Just as we are closing this Report a comprehensive and useful manual by Lieutenant Ford of the Engineers has issued from the press, which ought to be mentioned as forming an exception to the concluding statement in the text.

623. Candidates for the rank of Sub-Engineer should be receivable from any of the four classes of Overseers, with certain limitations as to a minimum length of service; and a limited number from among the Superintendents at Maramut. Being admitted they will constitute the first department of the college. The terms of admission should be to pass a preliminary examination, the subjects for which might be adopted at first from those laid down for the first department at Roorkee. Testimonials of character should also be required from both classes of candidates. The scale of subsistence money allowed for this department must be liberal; for candidates from the grade of Overseers it should not be less than Rs. 60 a month, which would be very much below what they would have left, in order to enter this department; for Sub-Overseers, Rs. 40 a month may suffice. The course of instruction should extend to a full year, or longer if necessary. We shall presently state the numbers required in every one of the departments, in order to supply the demands of the service.

Terms of admission and subsistence for the first department.

624. We must here observe that we consider a period of service as Overseer very necessary to Sub-Engineers, excepting those who have served as Maramut Superintendents, for the sake of the valuable practical experience so obtained; but we consider it equally important that the selection for the Sub-Engineer grade shall be not at all by seniority, but entirely on personal qualifications displayed, after a certain fixed period of service, in the Overseer grade. A large proportion of the latter class will be men very useful and valuable in that sphere of duty, as energetic, laborious and trustworthy Overseers; but who from the want of early mental discipline or of natural aptitude, could never become intelligent Engineers. For all that class the gradations of rank and pay in the grade of Overseers provide sufficiently well. They will usually be men who, if they had not entered the Public Works Department, would have been raised by steady conduct to the grade of Staff Serjeant; and the scale of allowance to Overseers holds out to them better prospects of advancement than they would otherwise have enjoyed, in return for the more arduous, irksome and responsible duties to which they are so called. The additional rank of Sub-Engineer is therefore not required as an object of ambition to this class; it is a different grade, with different duties; and those duties are important, and the best men obtainable must be got for their performance. There are not a few young men of respectable birth and education and good principle, to whom, in the absence of a better provision, a Sub-Engineer's appointment would be an object of ambition, and who from family connexion with India or other causes would be favourably disposed to the service. Such young men, after a short course of instruction at the college, and after a few years of practical work and discipline in the grade of Overseer, will be valuable additions to the department. And we believe that with the prospect open of promotion by good conduct to the rank of Sub-Engineer, the entering in that of Overseer will not be regarded as irksome or degrading.

The selection of the Sub-Engineers must be by merit and not by seniority.

625. We propose that the third department shall consist of two divisions. The second or lower division will be formed of native youths under instruction not only for the grades of Sub-Foreman and Surveyors, but also for Accountants and Estimate-makers, and for Draughtsmen; students will be admitted after passing an entrance examination, similar to that prescribed for the third department at Roorkee. The test will consist of a good knowledge either of Tamil or Telooگو (or for a certain limited proportion, Canarese or Malayalum), to read and write; a fair knowledge of English, speaking, reading and writing; and a fair acquaintance with common arithmetic, the rules of proportion, and vulgar and decimal fractions. It appears to us desirable that all these classes should begin their studies together, and that all should learn something of every subject taught; the Foreman and Surveyors will need some knowledge of accounts and of plan drawing; and some knowledge of the practical work of the department will be useful to the Estimate-makers and the Draughtsmen. But all classes will not need an equal degree of proficiency in each branch of study; and after a short term, the several classes may be separated.

The 3d department; the lower division of it.

We have already said that some knowledge necessary to the Sub-Foreman will not be required in the class of Surveyors, and we may add that the class which we term Surveyors are intended to be only assistants working under the immediate eye of a superior, and therefore will not by any means require the degree of proficiency contemplated at Roorkee for the third department there; they will in fact need little more than to be able to perform mere mechanical operations with rapidity and exactness. After a time those who evince the greatest dexterity in the use of surveying instruments and in the other operations of surveying, including

the ability to plot a survey accurately, though without any pretence to neatness or finish, should be draughted off, with their own full concurrence, to enter on the duties of Surveyor. This division may perhaps take place at the end of six months, or a year, or it may be permitted at any time during the course of a half-year. So also those for the grades of Accountants, Estimate-makers and Draughtsmen, will be told off in due time. The remaining part of the class will continue their studies; and after completing their course and passing the prescribed examination, will be declared fit for the post of Sub-Foreman.

The upper division. 626. We further propose, that both Sub-Foremen and Surveyors (and the other classes also, when they shall desire it, and display the necessary aptitude), after a certain time passed in those grades respectively, for which a minimum may be fixed by rule, shall be permitted, on obtaining a certificate of good conduct from their superior officer, to re-enter the third department of the college in the upper division, as candidates for the grade of Foremen. We suppose, that generally a year will suffice to qualify as Sub-Foremen, and a year more as Foremen; and that a second course of a year or a year and a half, will enable a Surveyor also to pass the examination as a Foreman.

The subsistence money to students in this department need not be much; Rs. 5 monthly will probably be found sufficient in the second division, and Rs. 10 in the first, the members of which will have abandoned better salaries in order to come there. In case of students coming from a distance it will be expedient to make an allowance for travelling expenses; for it is undesirable that the students should be drawn exclusively from any one particular locality, and without such a provision, the selection would be in a great degree limited to the near neighbourhood of the college.

We may here observe, that it is by no means our intention that a course of instruction at the college should be made an essential condition in the case of Writers, Accountants and Estimate-makers, or even Draughtsmen. For some grades of servants the necessary qualifications will be obtainable nowhere except at the college; and even with these classes the instruction to be got there will be so valuable as a means of obtaining advancement, that we believe it will be much resorted to by such. But as the qualifications needed in these latter classes are less special and peculiar than in the others, we think it will be sufficient that they shall obtain a certificate of qualification for their respective duties, from the Engineer authorities of their own division.

The English language should be the only medium of instruction.

627. We consider it of great importance that the public works should be made an English Department: that the accounts should generally, at least, be kept in English, and should be in the simple English form, instead of the complicated native system now in use,* and that correspondence and reports should be in great part in English also. And with this view, we are of opinion that the English language should be the sole medium used at the college for conveying instruction. Nor would this be by any means a novelty; for all those native Maistries and Superintendents of Marimut who have hitherto acquired any European knowledge in connexion with their duties, have obtained it from their European superiors of the Civil Engineer or Road Department, or at least in frequent communication with them; thus that knowledge is associated in their minds, and in the native mind generally, with the English language. And we believe it will be found that a sufficient number of candidates will be found possessing the necessary stock of acquaintance with English; rather, we should say we believe that at present, at least, all the candidates coming forward to enter this line, whether a knowledge of English is made a condition or not, will be young men already taught in English.

We consider it important, with reference to their after duties in the service, that the students should be familiarized with English; and we think it not less essential for another cause, viz., that without that the native student will not be able fully to benefit by the instruction obtainable at the college. That instruction should go at once from the European teacher to the mind of the pupil; but, the former will not be competent to teach or lecture in Tamil or Telooogo; he will be selected as a proficient in some one or more of the studies of the institution, not as a linguist, and the students must be capable of understanding him in his own tongue.

Some general suggestions.

628. It should be a standing rule that Overseers as well as Maramut Superintendents pursuing their studies at the college for admission to the grade of Sub-Engineers,

* We shall speak more in detail on this point in our Second Report.

Engineers, should be considered supernumerary and non-effective in the grade to which they belong, and that their places should be supplied by promotions to complete the establishment. And the same should be the rule in the case of Sub-Foremen and Surveyors studying for promotion to Foreman.

In speaking of the tests proper for the examination, it must not be forgotten, that as regards both those before admission into the college, and those before passing out of it into the public service, it will be necessary and expedient to lower the standards at first, and raise them gradually. If too high a standard for admission is rigidly insisted on at first, the college will be without pupils, and unless the conditions of getting through are somewhat lower at first than they may properly be made after a few years, the public service will be without members; and for some time the whole object of the institution will be sacrificed. As the value of the opportunities to which the studies at the college open a way becomes better known, there will be no difficulty in raising the standard of acquirement in all the grades.

We would recommend half-yearly examinations, at which the progress of all students would be ascertained and prizes awarded to the most deserving; and at which those passing the required examination should be declared competent to be appointed to the grades for which they have been training.

It will be necessary to provide the means of giving the European portions of the students some acquaintance with a native language. A critical knowledge will not be at all required; but some ability to read it, a grammatical knowledge of its structure, and a familiar use of it colloquially, will be essential to enable either the Sub-Engineer or the Overseer to perform his duty. We have already said that Tamil and Teloo-goo are the two languages most generally useful; Canarese and Malayalum should also be studied by a limited number.

629. But the handicraft arts connected with construction being at so very low a point in this country, it is of the very greatest importance that the men produced for the department by the Engineering College, should have real practical skill, and not merely theoretical knowledge; and without the means of imparting such practical skill, that institution would fail of half its proper effect. This state of things could hardly be realized probably in England, where the skill in question is to be had in abundance in the labour market. But in this country the great want experienced by officers engaged in the execution of a work of magnitude, is of that class of men who in England might be called "Foremen;" men who have been bred to particular handicraft trades, and have worked with their own hands, but who having more intelligence and education than their fellows, have come to be placed over a party of workmen or a portion of a work. It is most essential, therefore, that this practical handicraft skill should be communicated to the pupils of the school, and yet it is not easy to determine precisely the best way of effecting it. We will make a few suggestions, but our object is less to speak of the means of effecting the object, which do not fall within our province, than to insist on the essential importance of the thing itself. One main defect in the existing Revenue Surveyors is the want of this practical skill; and we are most anxious that it should be guarded against for the future.

The necessity that the college should give real practical skill as well as theoretical knowledge.

630. The following are the means which occur to us for carrying out the idea:

Some suggestions as to the means of communicating it.

1st. The pupils should take an active part in the erection of all the buildings for the accommodation of the school. In the earlier buildings the ordinary classes of workmen might be employed also, to prevent delay; but afterwards, when the more necessary buildings had been completed, the whole construction of the remainder might be effected by the very hands of the students.

2d. It seems desirable that the mechanical arts and operations connected with building, such as brickmaking, the mixing of mortar, and carpenters' and smith's work, should be constantly carried on upon the school premises. The materials prepared might be turned to good account, especially if the school is established at the Presidency.

3d. The pupils should be much upon Government works going on in the neighbourhood, of all the various kinds, as far as possible; including not merely bridges and buildings, but irrigating tanks and channels, and the several species of works belonging to them. Parties of the students might sometimes be vested with the actual execution of certain works with their own hands, under the direction of the Local Engineer. Here again the Presidency would hold out great advantages from the number and variety of public works always in progress, compared with other localities.

4th. Besides what is learnt in this way actually at the college, it may be expedient that when pupils pass out of the institution they shall go for a limited term to complete their course by working with their own hands on some great work in execution; or in some cases pupils might be sent out during their connexion with the college, to be employed in this way on some work in progress, and then return to complete their course; or, again, the officer in executive charge of such a work, might be empowered to take a limited number of apprentices, or pupils, to labour in actual handicraft employments in the various departments of the work, and afterwards to enter the Engineering College, and go through the regular course. Employment of this kind would be especially valuable on those works where there might be, as there is at the Godavery anicut, an English workshop for making and repairing machinery, &c.

We must repeat that we only offer the foregoing as suggestions; those to whom it may be entrusted to carry out our general propositions, and especially those concerned in the management of the college, will be in a better position to determine the precise measures. We are only anxious to point out strongly the necessity of this branch of instruction. The school teaching is absolutely essential to the efficiency of the department, but practical teaching is so also, and must by no means be overlooked.

General management of the college.

631. In concluding our notice of the general structure and arrangement of the projected college, we have but a few more particulars to notice. We propose, that like the institution at Roorkee it shall be under the management of a Principal, to be a Commissioned Officer of Engineers, and who shall have the assistance of a Head Master and other Masters; and with other aid to which we shall advert presently. We further propose that the Chief Engineer shall be visitor, with the duty of bringing to the notice of Government all measures likely to increase the efficiency and usefulness of the institution.

A library and model room to be formed.

One important object should be to form a good professional and general library at the college, for the use of the students; and after leaving that institution and entering the public service, every practicable facility should be afforded them of obtaining books, and so keeping up their knowledge. One great advantage of enabling the men thus to pursue their studies by themselves and improve their talents, will be that of shortening the time that they will need to be kept from active employment at the college to qualify for an examination for promotion; a still greater advantage will be that a habit of reading, and the possession in that habit of a source of rational amusement, is the best preservative against those pernicious habits into which a European is liable to fall in this country when cut off, as many of the Public Works Department must often be, from social companionship. This important object of supplying the men (and natives as well as Europeans) with books, might be effected, partly by a system of circulation under certain (but liberal) rules as to the care of books, and partly by selling books on cheap terms to those desirous of possessing them.

Another important point in the general arrangement is liberality in the supply of instruments; there should always be a large stock on hand; and both the students at the college and the members of the service should be encouraged to make free use of them. The rules respecting them should not be so rigid as to deter from their use, for there is no doubt that in the end the great loser by such restriction is the Government itself.

Another important object will be to form a good model room, containing models of machinery, of celebrated structures, of all kinds, in all parts of the world, and of all the forms of the various parts of the structures incident to irrigation works in this and other countries. A collection of good models will be a most valuable aid in communicating knowledge; of course it must be very imperfect at first, but every opportunity should be taken to improve it.

The Presidency will be the best position for the school.

632. It is a point of no little moment to determine the best locality for the college. We have no station such as Roorkee, where extensive works are likely to be always in course of execution for many years to come; even the works in connexion with the anicuts of the Godavery and the Kistnah will be completed in a few years, and the remote position of both works would be a serious objection to either as the site of the school. After careful consideration, we have come to the conclusion that the college cannot be placed anywhere so well as at the Presidency. There are some objections to it, indeed, the chief of which is that in so large a place it may be difficult to exercise due control over the conduct of the pupils.

pupils. But this is modified by the consideration that not a few of the number will be not youths, but grown-up men, and men of steady character. And further, we would not have the institution in or very near Black Town, or other of the large aggregations of population within the Madras limits, but still within the Presidency district. Another objection is the danger that too many of the students should be youths belonging to the Presidency, a class who will not be the best, perhaps, for the real work of the department; but this tendency may easily be guarded against, and the allowance of subsistence and travelling money to the students, will alone do much to remove obstacles in the way of youths coming from the interior.

633. On the other hand, there are advantages at the Presidency not to be met with elsewhere. The first which we will mention is found in the great number and variety of public works always in course of execution at Madras. The annual expenditure under the Military Board, in the Presidency division, is about Rs. 1,40,000, about half of which is on new works and half on repairs; besides which, there will be work to the tanks of the Madras Collectorate; and the repairs of the Cochrane Canal, recently ordered to be extended and improved, and always hereafter, it is to be hoped, to be kept in good order. Then, again, the project lately brought forward of forming a reservoir above St. Thomas' Mount, and bringing the water to cleanse Madras, with a navigable canal and locks in connexion with it, will supply a great variety of interesting works for the practical instruction of the students; and lastly, another class of works will be supplied whenever the improvement of the port of Madras is undertaken, whether by means of a pier or of a breakwater or both. We do not here mention the works connected with the railway, because it seems likely that they will not be undertaken on the part of Government; but even without them, it is at once seen that the Presidency offers advantages in the way of real practical and experimental instruction, with which no station in the interior can compete.

Great number and variety of Government works always going on at Madras, a means of practical teaching.

634. There is a second consideration not less important. In an educational institution embracing so many branches of study, it would not be well that the burden of instruction fell on any one man, however able. Left to the Principal only, with the sole aid of masters who must be men of inferior attainments, it is much to be feared that the college would disappoint expectation. But at the Presidency there would be means of supplying this want. Here there are always a number of scientifically educated men, Engineer Officers and others, capable of guiding the studies of the classes at the college in many of the branches of instruction; and as they all have substantive appointments, a small remuneration would be sufficient to secure their services in this way. And we think it would be much for the advantage of the school that men of that stamp should be engaged in delivering lectures there, in a mode similar to that already established at the Medical College.

The services of lecturers may be obtained at Madras, to aid in giving instruction.

The foregoing are the principal considerations which lead us to regard the Presidency as the best locality for the college. And to these we may add that Madras is a very central point as regards the Northern and Southern Provinces, and also that it is situated where the Tamil and Teloo-goo languages meet. And independently of the more direct advantages of this plan, we cannot but think that no little would be gained indirectly, from having the institution and the students within the influence of a large and active place, rather than in a remote and solitary station, with little intercourse with any classes out of their own immediate circle.

635. We will now close this sketch of the proposed college with a statement of the number of students required to be permanently under tuition, in order to keep up our proposed establishments, and a computation of the yearly cost of the institution.

Number of students necessary in each of the departments.

The general rate of casualties of all kinds among Europeans serving in this country is reckoned at one-tenth annually. "An account of Roorkee, with a scheme for its enlargement," printed last year by the Government of the North-Western Provinces, states the casualties among the Overseers up to that time to be at the rate of 11 per cent. a year, but anticipates a slight reduction of this rate as dismissals become less frequent. We take 10 per cent. as the rate for which we must provide; and the total annual number of casualties will therefore be 20. The calculation of the number required to be under instruction in order to meet a given demand, is however complicated by the circumstances that there are to be two grades of appointments, for each of which a separate course of instruction is provided; and that some men who enter the lower grade will not rise to the higher.

We think it may fairly be assumed, however, that of the 20 to be supplied every year, eight will be two years at the college, and 12 one year. This will give 28 as the number needed to be always under tuition.

For the native part of the establishment the average length of service may be taken at 15 years. The annual number of casualties among the Superintendents, Foremen and Surveyors, will thus be 48; but here also the calculation is complicated in a similar way, by the different grades requiring different periods at the college. We may suppose, however, that of the whole number of men to be supplied annually, 28 will be one year at the college, and 20, two years; and thus the numbers in training for these grades should be kept up to 68. The total number of Engineer Writers, Accountants, Estimate-makers, and Draughtsmen, on the establishment will be 369, and the annual casualties among them will be 24; supposing that half the numbers in these grades attend the school for a year, the number required to be always under preparation will be 12.

The foregoing number would provide for the casualties in the service; but it will be necessary to add a few more both to the second department and to the second division of the third department, to meet those cases in which individuals will leave the college from any cause, before completing their course, and so not come on the establishment at all. To meet this want, we would add five to the second department and 12 to the lower division of the third department. The number of students required in the various departments will thus be as follows:—

First Department, 8 students, at 1 year each	-	-	-	8
Second - ditto 25 - ditto	-	-	-	25
				<u>33</u>
Third Department	{	First Division, 20, at one year	-	20
	{	Second ditto 72 - ditto	-	72
				<u>92</u>
				<u>125</u>
		TOTAL	-	-

These we state as the probable numbers; but we cannot pretend to accuracy in such a calculation, and it is very likely that the estimate may be found to need revision.

Probable cost of the institution.

636. The following may be taken as an estimate of the cost of the college: in framing it we have had regard to the actual scale of salaries at Roorkee:—

Tutorage and Establishment.

	Monthly.
Staff salary of the Principal	Rs. 700
Salaries of Lecturers or Professors	600
Ditto of the Head Master	350
Ditto Two Masters	500
Ditto Two Moonshees as teachers of the native languages	150
Establishment, about	400
	<u>2,700</u>
TOTAL	-

Subsistence of Scholars.

First Department 8, at 50 rupees (average)	-	-	400
Second ditto - 25*	-	-	"
Third - ditto - 20, at 10 ditto	-	-	200
72, at 5 ditto	-	-	360
			<u>960</u>
Grand TOTAL	-	-	125
			<u>3,660 a Month.</u>

To

* The students in the Second Department will receive the same allowances as if with their regiments; and thus their attendance at the college will entail no increase of charge. We have, therefore, followed the Roorkee precedent, and omitted the subsistence of that class from our estimate.

To this must be added the annual expenses for the gradual formation of a library and model room; the necessary and contingent expenses of an educational establishment, including the books and instruments used in tuition; and lastly, the cost of the buildings used for the college, which may be computed in the form of a per-centage on the capital outlay, to cover interest and repairs.

637. The whole may probably amount to from Rs. 50,000 to Rs. 60,000 a year; and in justification of the demand, we confidently believe that we need only point to the circumstances of the case. Rs. 60,000 would be only 4 per cent. on the annual cost of the Public Works Establishment, the value and efficiency of which would be enormously increased by this trifling additional expenditure. Beyond doubt the annual saving of direct outlay, through the economical and efficient performance of work, secured by a well trained body of officers, will exceed many fold the cost of the institution: indeed without efficient training the establishment would be only a source of loss and mischief. Again, compared with the expenditure to be directed by the department, the cost of the college assumes a still more insignificant aspect. We may take the whole actual outlay at fully 48 lacs annually (*see* para. 481), including here, in the expenditure to be controlled, that for the improvement of the ports; upon that total amount the annual cost of the college will be only $1\frac{1}{4}$ per cent.

It would be insignificant compared with its value.

We will only add, that we do not offer this outline of a college as a complete or perfect scheme, but only as a rough plan to be improved upon. Every year has suggested, and continues to suggest, amendment at Roorkee; and the Medical College at Madras, though of much longer existence, still continues progressively to receive improvements. In like manner the projected Engineering College can only attain its full measure of usefulness by degrees. It is certain that such an institution is eminently and emphatically necessary; and the first thing to be done is to establish it on a sound basis, and with all the advantages which present knowledge suggests. If this is done, and the college is connected with a suitable agency for bringing further improvements required to the notice of Government, with the force which attaches to the opinions of persons of rank and character, and if the institution be so fortunate as to obtain from the Government the same liberal and enlightened patronage enjoyed by the fellow institution at Roorkee, then it cannot fail to become vastly and progressively beneficial.

This plan of a college is only offered as an outline.

SECTION XI.

Recapitulation, and Concluding General Remarks.

638. In this concluding Section it is our purpose briefly to recapitulate what we have said in the foregoing parts of this Report, and then to close with a few general observations on each of the principal subjects which have engaged our attention.

The scope of this section.

The first Section simply recites our appointment, and announces the plan of our Report; and agreeably to that plan, the succeeding three Sections are devoted to an endeavour to set forth the present condition of the Department of Public Works, under its three chief divisions of the Maramut Department, the Road Department, and the Engineering Department of the Military Board.

639. In the second Section we sketched out the past history and present condition of the Department of Public Works under the Board of Revenue, but with particular reference to the works of irrigation. We first traced the gradual changes from the time when the first English Collectors, in assuming charge of the provinces transferred to British administration, received at the same time numberless irrigation works on which the revenues of those provinces were very intimately dependent; and showed how, as the value of these works, the necessity of attending to their maintenance, and the ruinous consequences of neglecting them, became gradually impressed upon the ruling powers, the department for the care of these valuable works expanded by little and little; and we described its present extent and distribution. We next described the various classes of works of irrigation, both tanks and channels, and added some information respecting the total number

The second section; sketch of the system of irrigation: Paras. 6 to 16.

of such works, which by the best data obtainable we found to be as many as 43,000, in only 14 out of the 20 districts. The revenue yielded by the whole we found to be about 150 lacs yearly, and their capital cost about 1,500 lacs.

The Public Works
Department of the
Board of Revenue:
Paras. 17 to 25.

640. We next proceeded to speak of the agency by which all these valuable works are taken care of, and first of the Board of Revenue, in its Department of Public Works, the controlling authority. We gave some statistical facts to show the quantity of business in the Board's office; and, after observing that the Board does not seem justly obnoxious to some charges which have been brought against it, we stated our opinion, notwithstanding, that it has failed in the most important part of the duty of a controlling authority; viz., in not exercising a general intelligent control over all parts of the country, the state of its works, and its wants. The cause of this failure we declared to be the physical impossibility of a Board, burdened with heavy duties in connexion with the management and collection of the revenue of a vast country, to give sufficient attention also to the extensive department of Maramut. And, after showing how the labours of the Board in this department had steadily increased for a number of years, and pointing out that it must inevitably increase much more, and ought to do so, we declared our conviction that the Board of Revenue was and must be unequal to the additional task of controlling a department of such magnitude, and that a new and a different authority must be constituted for the purpose.

The agency under
the Board: Paras.
26 to 58.

641. We next came to detail the system of carrying on work in the provinces under the Board of Revenue in this department. We explained that at present estimates are for the most part made by the Civil Engineer's Department, but that almost all are executed by the Tahsildars or subordinate Revenue Officers, under the order of the Collectors; and that after execution, as many of the works are inspected by the Civil Engineers and his subordinates as they can find time to visit. And we pointed out that the Commissioned Officers of that department are still very far too few for the due performance of the duties required of them.

We then spoke of the subordinate agents of the Civil Engineer Department; viz., the East Indian Revenue Surveyors, and the new class of European Overseers, and described their qualifications respectively. We quoted the high testimony given by many of the Civil Engineers respecting the conduct and services of the latter, and mentioned, also, the reasons which they have for being dissatisfied with the treatment they have received from the Government. We advocated more liberal treatment of this class, on grounds both of policy and of justice; and stated our opinion that the only remedy for the defects of the class of East Indian Surveyors would be to throw them into competition with men of European birth.

We next came to the actual execution of work: we described the various classes of officers concerned in it, the chief of which are the Tahsildar or head Revenue Officer of a Talook, who makes arrangements and disbursements, and in whose office the accounts are kept; and the Maistry, whose duty it is to show how the work should be done; and we described the method and the routine by which the work is carried on.

Defects and remedies:
Paras. 59 to
74.

642. Having finished that review of the structure and working of the department, we proceeded to notice some of the most prominent defects in its operation; viz., great dilatoriness in executing work, and untruthfulness in the accounts rendered of it, and suggested means to remedy both. We also adverted to "data tables," or official lists of prices of labour and materials, which need much revision, and noticed the subject of compulsory labour on public works. We saw reason to believe that compulsion in obtaining labour is practised in most districts; and we stated what appeared to us to be the reason why the authorized rates of payment do not secure voluntary labour, and the remedies proper for the evil; those remedies being, fair measurement of work, full and prompt payment of the rate nominally allowed, and the increased employment of European Overseers, to ensure those measures of justice. We also adverted to the subject of retrenchment of the workpeople by the Civil Engineers in their inspection of work, which is very frequently a source of hardship, and proposed some limitations on this arbitrary checking of charges.

The Maistries:
Paras. 75 to 90.

643. We then gave a somewhat detailed notice of the "Maistries" of the department, describing their duties and their defective qualifications, with the reasons

reasons for their general inefficiency. We also stated the means by which this class was to be improved; viz., by providing proper instruction, of which hitherto they have been almost wholly destitute; by placing them in a position more independent and responsible, and less under the authority of the Tahsildars; by increasing their salaries; and, lastly, by augmenting their number. We referred to the system of taking apprentices for instruction as Maistries, introduced by the late Captain Best, when Superintendent of Roads, and of which the results in his own department, under his careful and able superintendence, had been very successful; and recommended that the same plan should be extended, as a temporary measure only, pending the establishment of a larger training institution, such as can alone really satisfy the requirements of the department in this essential particular.

In concluding the section, we recorded our sentiments on certain rules recently propounded by Government for the regulation of the Maramut Department, and objected to by the Board of Revenue, and which had been sent to us for our consideration. We examined the rules (five in number) in detail, and stated our opinion that they were severally impracticable, unnecessary, or pernicious, and that their whole tendency was to stop improvement; and we, therefore, earnestly deprecated their enforcement.

The new rules proposed by Government: Paras. 91 to 106.

644. Before closing this recapitulation of the second section of this report, we beg to call attention to the suggestions which that section contains for changes in parts of the department under the Board of Revenue. The greater part of those suggestions are such as we believe may be carried into effect by the authority of this Government, and they are offered with the view of their being so acted upon immediately. In subsequent parts of the report other and larger reforms are proposed; but their introduction into actual use must be a work of some little time; those to which we are now referring are proposed as intermediate, and are intended to be brought into operation, if it should so please the Government, without any delay. We allude particularly to the suggestions in para. 50, as to the mode of employing European Overseers; to those respecting the accounts of works executed (para. 64); the payment of full and just hire, and paying it promptly (paras. 68 and 69); regarding the retrenchments against the work-people (para. 73); and in particular to the recommendations as to the temporary means to be taken for the training of Maistries in para. 82, and those for improving their position and responsibility, in paras. 84 and 85.

Suggestions for immediate adoption.

645. The scope of the third Section was to give an outline of the past condition of the roads of the country; it contains, therefore such information on the subject as we could collect, together with a rather full review of the history and the operation of the "Road Department."

The third Section.

We first alluded to the entire absence of anything that could be called made roads when the country first came into our possession, and spoke also of the very rude means of carriage then alone available, and of the very defective attempts at water communication; and we observed that the larger number of carts now in the country, though no doubt due in part to the increased security of property, must still be taken to prove, in some degree, the better condition of the roads; but that very little indeed has been done to aid or improve the water carriage, whether by sea or river.

The early state of the roads: Paras. 107 to 111.

646. We then went on to relate the operations of the British Government on the roads; from which it appeared that for many years they gave them no attention at all; and that when they did, much want of judgment was displayed, combined with very confined views. We noticed the report on the roads by the Board of Revenue in 1813, which represented their condition as bad in the extreme, but stated that the cost of any serious attempt to improve them was too heavy to be incurred; and the reply of the Court of Directors, in 1817, concurring in that view, but ordering that the surplus receipts at the Government ferries should be given up for the improvement of the roads; and we observed that this order has never been acted on down to the present time.

Their treatment by the British Government: Paras. 112 to 120.

We then noticed the operations of the Pioneers in making roads on the great lines, which, from the want of directing skill, and of any care to maintain the roads made, were both very extravagant and entirely barren of permanent results; until, in 1831, we found the Government, vexed at the enormous outlay, and not

seeing the means of obtaining a better return, resolving to abandon all attempt at any general improvement of the roads.

The Salem roads:
Para. 121.

647. After noticing the amendment effected in some of the principal roads of the Salem district, by the exertions of Mr. Orr, the Principal Collector, and its good effect, though partially defeated by the absence of any general plan, we came to the report on the internal communications, by Captain A. Cotton, in 1836. In that report, Captain Cotton proposed a general system of communications, to be composed partly of canals, and partly of cattle railroads. The scheme was not taken up, however, by the Government; and a small experimental length of railroad, to bring road metal to Madras, turned out a failure, from various causes. We then adverted to two important lines of road opened some years later; viz., the Sumpajee Ghaut and the Western Trunk Road, evidence of the increasing attention devoted to the subject; and then came to the formation of the Road Department in 1845, designed for the construction and maintenance of the great trunk lines.

The Red Hill railroad: Paras. 122 and 123.

The Road Department: Paras. 125, &c.

648. The formation of the Road Department and the allotment of four lacs of rupees annually for the roads placed under it, was an additional proof of the more enlightened views now prevailing on the subject of the communications, and of the earnest desire of the Marquis of Tweeddale, then at the head of the Government, to effect something decided for their improvement. But after carefully examining the working of the department, we have been compelled to declare our conviction that the means selected for administering the fund were not judicious, and that the department has been a failure, from defects inherent in its constitution.

The duties required of it.

One Engineer Officer, with two unprofessional Assistants, was placed in immediate charge of 1,300 miles (afterwards enlarged to 2,300 miles), of what was called road, but of which in fact a very small part deserved the name in any sense, and the greater portion was simply lines where roads were to be, and much of it across very difficult country. The whole work of surveying these lines, tracing out the roads, framing estimates, executing the work, keeping the accounts, inspecting the work done, reporting upon it, and sending in the bills for sanction, was laid upon the Superintendent of Roads, aided in the executive duties by his two unprofessional Assistants. The furthest points of the roads under his charge were nearly a thousand miles apart; viz., from the frontier of Cuttack to Pomany, on the western coast; and this in a country where, from the condition of the roads, travelling with an office cannot exceed 10 miles a day. Yet it was expected that all the multifarious operations above enumerated, all of them essential to the formation of a road, could be carried on over this enormous extent of country, under the Superintendent's own personal direction; and, as if to hamper him in every possible way, the efficient subordinate establishment of Overseers and Maistries which he applied for, was refused him.

Its treatment by the Government: Paras. 136 to 142.

649. The fulfilment of such expectations was an impossibility, even in the hands of a man of such eminent talents, such untiring energy, and such rare physical stamina, as the first Superintendent. The Government soon became discontented with the working of the department, but their dissatisfaction was not directed to the proper points. It seems obvious, that with duties such as we have described them, the Superintendent's only chance of accomplishing his task, was by being continually on the march, yet this constant locomotion was found fault with. Again, the Government saw that little work was done, and that the executive agency was insufficient; but instead of giving more such assistance, they ordered that the Civil Engineers should aid the Road Department, though one reason of the formation of that department was, that those officers had no time to attend to the roads; and at last they reduced the Superintendent himself nearly to the position of an Executive Officer. By this last order the department was changed into a small executive establishment, in charge of 300 miles of road; and of course the salary of the Superintendent is disproportioned to such subordinate duties, having been fixed on a scale deemed adequate to secure talent to control the whole main roads of the country.

Result of our inquiries as to its working: Paras. 143 to 153.

650. After a careful examination of the operations of the department we arrived at the following results:

We found that the work done by the department had been performed with eminent efficiency and economy, under an excellent system established by Captain Best;

Best; but that the amount done was very small compared with what ought to have been accomplished in the time. Out of 24 lacs of rupees, the amount of the grant of four lacs annually for the six years, 1846 to 1851, only 13 lacs had been spent; and even of that small amount, no less than five lacs had been expended under the superintendence of the Civil Engineers, on works projected and planned by themselves and not by the Road Department, leaving only eight lacs, or one-third of the full amount, really spent by that department. And the cause of this short coming was plainly seen to be the utter inadequacy of a department so constituted, and so feeble in numbers to the work required of it.

We found also, that of the great works undertaken, though all of them highly useful, many, especially of the large bridges, were determined on, not because they were the most important, for they were not so by any means, but because they had already been projected and planned by the Civil Engineers, who were also prepared to undertake their execution. So that they thus presented the means of spending money immediately, without waiting for previous examinations, surveys, and estimates; and were also provided with that superintendence which the department itself could not have supplied.

We found that, out of the whole expenditure, nearly eight and a half lacs of rupees was still unadjusted; the cause being that the Superintendent had not been able to find time to go and inspect the work, though some of it had been completed and paid for several years before. Finally, we found that serious errors had been made in selecting the "Trunk Line;" some being included in the list which have not and are never likely to have much traffic, while some lines of first rate commercial importance were omitted. This error seems directly due to the faulty structure of the Road Department. In forming that department, the Government put aside altogether the ordinary intermediate authority, and placed the Superintendent in direct communication with itself. The selection of the roads to be in the first class, required careful consideration as well as local inquiry; the Superintendent, under the heavy pressure of his vast and heterogeneous duties, could find no time for such investigations, and it appears to be foreign to the genius and beyond the reach of the Government, to take them up in the first instance.

651. In closing our remarks on the Road Department, we expressed the decided opinion, that the scheme of having a separate department for the roads is essentially erroneous in this country, because the country being everywhere covered with works of irrigation, which need the constant attention of Engineers, it must be much more economical to make one set of such officers attend to both classes of works. Up to the year 1838, there was one set of officers for buildings in the provinces, and another set for the works of irrigation; and the abolition of that arrangement by doubling the number of Civil Engineers, and giving to each the charge of the buildings as well as of the irrigation works in his division, has been universally allowed to be an improvement. The formation of a Road Department was a revival of the same false principle of distribution; and for this radical and essential fault, independently of the accidental defects of its constitution, we decidedly recommended its abolition as a separate agency.

Its abolition recommended:
Paras. 164. to 168.

652. The fourth Section is devoted to that branch of the Public Works Department which is immediately concerned with the military works and buildings; viz., that controlled by the Engineering Department of the Military Board. It contains, first, a sketch of that department, its history and its operations; and, second, a detail of those changes in its structure which appear to us expedient, exclusively of those general reforms in which it will share in common with the other branches of the department.

The fourth Section.

The section opens with an account of the Military Board, which was originally constituted in 1785 as an *ex officio* Board, composed of the heads of various Military Departments. It continued to be so (with some modifications in the composition) till 1839, when it was remodelled, to consist of the Chief Engineer and Commandant of Artillery, with two Stipendiary Members; a change which has conduced to the more rapid and effective dispatch of business. The various duties of the Board, and its mode of transacting business in general were then described, after which we passed on to the "Engineering Department," with which alone we are concerned.

The Military Board: Paras. 169, &c.

Its duties, and the agency at its command, in the Engineering department.

We described the nature and extent of the buildings and works under the Board's control in that department, the territorial divisions into which they are distributed, and the local agency at the command of the Board for the carrying out of their instructions; viz., Superintending Engineers at the Presidency and in the four divisions beyond the frontier, but only casual and uncertain assistance in the five Military Divisions, other than the Presidency Division, within the frontier.

Routine of making estimates, &c. Paras. 176, &c.

653. We then went on to speak of the mode of making estimates and obtaining sanction for work to be done, describing the extent of power reposed in the local Commanding Officers and in the Board respectively, as to authorizing repairs to buildings; as well as the various channels of applying for new works, improvements and alterations, all of which, before estimates can be made, require in this department, the previous approval of Government, to be obtained through the proper office.

And of executing works: Paras. 178 to 189.

We then described the mode of executing works. In the Saugor Division the Superintending Engineer is in the position of direction and supervision as regards three of the four circles or sub-divisions into which it is distributed, and has under him an Executive Officer in each; while in the fourth sub-division he is, incongruously, himself executive also. In all the other divisions where there is a Superintending Engineer he is exclusively an executive officer, with a small establishment, principally of natives, for the immediate superintendence of the work. In the divisions within the frontier, where there are no Superintending Engineers or other officers at the Board's disposal, the work is carried on under great disadvantages. The abolition of the Superintending Engineers within the frontier in 1838, and the increase in the number of Civil Engineers, was on the whole a very great gain. But means ought to have been taken at the same time to provide some regular agency to carry on the works under the Military Board in those divisions, and as this was not done, that work has ever since been performed with much difficulty and irregularity; the executive management being entrusted to officers wholly inexperienced in such duty, and being transferred from one to another, on the relief of corps or detachments. We gave one striking instance of the ill-working of the present system in this respect, in which a remedy was only obtained by a return to the evils sought to be removed by the change of 1838. The native subordinates of this branch of the department are described in similar terms to those in which we spoke of the Maistries' department. There are no European Overseers in any but the Saugor Division; and the conduct of those has been not less satisfactory than of those employed in the Civil Department already spoken of.

The roads in Military cantonments: Paras. 190 to 192.

In closing our sketch of the Military branch of the department, we referred to the roads in the cantonments, and suggested some alterations in the system of managing them, intended to remedy some practices which seem liable to abuse.

Changes proposed in the Military Department: Paras. 193 to 205.

654. The changes which we proposed in the Military Department, were directed chiefly to the removal of some anomalies and inconveniences resulting from the mixture of duties now laid on the Military Board and the Chief Engineer; viz., from those authorities being charged with local duties, inconsistent with their functions of general control, and incompatible with the effective performance of those duties. We stated all the detailed local duties required of the Board and of the Chief Engineer respectively, and stated the distribution of those duties which appeared to us to be the best, and recommended that in order to provide for the due discharge of those from which the Military Board and the Chief Engineer ought to be freed, the Superintending Engineer should be changed into an Inspecting Engineer, and his Assistant into an Executive Officer, with a sufficient staff of subordinates, including European Warrant or Non-commissioned Officers for the out-stations of the division.

As respects the structure of the department in the interior, we recommended that the Superintending Engineers of the Saugor and Mysore Divisions should be made Inspecting Engineers; the number of Executive Officers in the former to be completed to four, so as to relieve the Inspecting Engineer of all such duties; and in Mysore four District Engineers for the four revenue divisions to be appointed, with an Executive Officer for the extensive cantonment of Bangalore. We recommended that the Superintending Engineers of the Nagpore and Hyderabad Divisions should be abolished, and Executive Engineers substituted; the former to be placed

placed under the Inspecting Engineer of Saugor, and the latter under the Inspecting Engineer of the new second division, to comprise the two districts of Guntoor and Masulipatam. With regard to the stations within the frontier, we did not propose any change of the existing system, but we observed that there would be much improvement in its working, when the subordinate department should be made efficient, and the whole department stronger; and when the whole should be under one controlling head, as we intended to propose, instead of the present divided authority.

655. Having thus completed our review of the present condition of the Public Works Department in its three separate branches, we proceeded to the consideration of the best mode of remedying the defects which we had discovered in it; and we first addressed ourselves to the controlling authority. This occupied our fifth Section, in which we advocated the abolition of the three distinct controlling offices now existing, and the creation in their place of one Board, to have control over the department in all its parts.

The 5th Section :
a single new Board
proposed for all
Public Works :
Paras. 206 to 211.

We first, briefly re-stated the defects noticed in the working of the existing system; viz., first, the heavy and increasing work of the Public Works Department of the Board of Revenue, far beyond the powers of its members to deal with, occupied as they are with their revenue duties, and the great deficiency of the professional element in that Board; second, the anomalous position of the Superintendent of Roads, in nominal charge, both superintending and executive, of an enormous extent of roads, but without local assistance, and restricted in fact to a very small district; and third, the helplessness of the Military Board from the want of agents in the provinces. And we stated the advantages of unity of purpose and harmony of arrangements attaching to a single head. We stated our reasons for preferring a Board to a single officer, viz., the vast amount of work to be done, beyond the power of any one man, even though well assisted; the expediency of having more than one opinion on many of the questions that would occur; and the advantage of obtaining experience from all parts of the country, and all species of work, in a department embracing so extensive a range both of territory and of duties.

656. We then stated the constitution which seemed to us the best for the Board; viz., that it should consist of a Revenue Officer from the Civil Service, and two Engineer Officers, besides the Chief Engineer *ex officio*. And we detailed the salaries which seemed proper for the Members and for the Secretary, placing them at such sums as seemed necessary to ensure the power of selecting the fittest men, but no higher. And we enumerated some appointments which might be abolished if this new Board were constituted. We then briefly stated our opinion as to the powers to be vested in the Board, advocating considerable relaxation of the centralisation now prevailing, and the expediency of assigning power to the Board both to authorize works and to sanction bills in certain cases, taking for our rule in great measure the practice now existing in Bengal; and also urging the good policy of allowing some discretion in the authorizing of works, to the officers in the provinces. And we recommend that both the Board, and the local officers through the Board, should bring under the notice of Government by annual reports, their operations respectively under the discretionary powers so to be granted to them. After suggesting that accounts current should be kept both of irrigation works and of roads, but more particularly of the former, so that Government might be periodically reminded of their real value and importance, and preserved from always looking at the outlay only, we concluded the section with a few suggestions as to the course to be followed in transacting business within the Board, and between the Board and other authorities.

Proposed constitution and duties of the Board :
Paras 212 to 232.

657. Having thus arrived at conclusions respecting the best constitution for the Controlling Office at the Presidency, we next went on to the consideration of the provincial branches of the department; and in dealing with that part of the subject, we first examined the amount of work to be done in its two great divisions, irrigation and roads, and then discussed the fittest agency for doing it. The first part of this inquiry occupied the sixth and seventh Sections.

The 6th Section,

The object of the sixth Section was to present as correct a view as we could arrive at, of the present condition of the Government irrigation works throughout

The works of irrigation.

the country, and to exhibit proofs of the great importance of bestowing more attention on their maintenance and extension. In our endeavours to obtain an accurate idea of the present condition of the works, we much felt the inconvenience of that entire absence of statistical records respecting them, to which we have already adverted. Being destitute of such help, we used the best means that offered of attaining the knowledge aimed at.

Their neglected condition: Paras. 234 to 240.

658. We first took the amount of annual revenue immediately dependent on those works, being 150 lacs of rupees, and from their capital value thence deduced at a very low estimate to be at least 1,500 lacs of rupees, we inferred that the sum now devoted to their repair and preservation must be too small. And we found this inference confirmed, by the fact that in every district the tanks and channels now water less land than they did formerly, in consequence of having been allowed to fall into disrepair; and we arrived at the conclusion, that in the 12 chief irrigation districts only, there is land formerly irrigated and productive, but now waste for want of water, which if supplied with water would yield a revenue of 47½ lacs of rupees annually.

We also quoted the testimony of the Civil Engineers, being certainly the officers best qualified to give an opinion on the subject, as to the generally neglected state of the works of irrigation. Most of these officers spoke of them as having undergone material improvement in the course of the last 15 years, but as being still very far below their proper point of efficiency; and in the Northern Division, where the works have certainly been more entirely neglected than elsewhere, they are even stated to be worse now than they were 20 years ago.

Examples of the benefit of attending to the irrigation.

659. Such being found to be the general condition of the works, we next took the instances of those districts in which more has been done than elsewhere for the improvement of irrigation, and compared the revenue results with the expenditure. And we there found full proof that this course of improvement is highly profitable to the Government. The instances taken were Tinnevelly, two talooks of South Arcot, Tanjore, and Rajahmundry.

In Tinnevelly District: Para. 241.

In the first named district no works of magnitude had been undertaken, but attention had been steadily paid during a period of about 15 years, to the repair and improvement of the existing works, the influence of which on the revenue would naturally be less marked. Yet comparing the revenue from irrigated land during a period prior to the commencement of these operations with what it was during their course, we found that an outlay of three lacs and a quarter of rupees in the 15 years, had produced a return of nearly 20 lacs.

In South Arcot: Para. 245.

660. The case of the two Southern Talooks of South Arcot is more striking. These two talooks possessed of a very rich soil were formerly abundantly irrigated from the Coleroon river; but after the accession of the East India Company to the Government of the country, they shared in the general neglect of the works of irrigation. The fine channels which watered them were allowed to become choked with deposit; the revenue fell off from three lacs in the time of the Nabob, and two lacs during the earlier period of our rule, to one lac and a quarter; and the people were reduced to poverty and despondence. In 1856, the improvement of the irrigation was taken in hand; the channels were cleared out, and an anicut was erected across the river to fill them. The revenue and the prosperity of the people immediately revived. The revenue, which in such a case is an excellent criterion of the general welfare, rose till in 10 years it exceeded three lacs; and though it has fluctuated, under the operation of causes which we have noticed, and which are capable of easy removal, the average amount since the very year when the anicut was constructed, has been Rs. 2,37,146, whereas the average of the 11 years preceding the improvements was only Rs. 1,22,065. The total net gain in revenue in 14 years has been above 18 lacs, in return for an outlay of four and a half lacs; and the improvement is a permanent one, as only a very trifling yearly expenditure on repairs will be necessary to keep up the revenue at its present high standard.

In Tanjore: Para. 252.

661. Tanjore is a district which has for ages been largely irrigated from the Cauvery river. Even here too this very essential part of the revenue administration was neglected in the early times of the British Government, though not to the same extent as elsewhere; and here too we found that increased outlay on the works of irrigation, to the amount of nine lacs in 20 years, chiefly on repairs and minor improvements similar to those in Tinnevelly, had returned an increase of revenue

revenue to the amount of 26½ lacs, besides an addition of wealth to the Merasdars and occupiers of the soil, to the amount of about 79 lacs. In further illustration of the effects of irrigation on the prosperity of Tanjore, we quoted two striking passages from Colonel A. Cotton's report on the then proposed irrigation of Rajahmundry, in which he contrasted the state of the former province possessing irrigation, with that of the latter without it. Those extracts are well worth attention.

662. The last instance which we gave of the powerful influence of irrigation to augment alike the Government revenue, and the prosperity of the people, in other words to create wealth, was that of Rajahmundry. That district, with a part of Masulipatam, forms the delta of the Godavery river. It had long been possessed of partial irrigation; but the channels by which the water of the river was to be conveyed to the land, had been more entirely neglected under our Government than even the works in other parts of the country. And this cause, added to the decline of the trade in piece goods, of which formerly the district had a large share, had acted fatally on the prosperity of the province. Commerce was stagnant, the revenue was falling off, the population was decreasing by emigration to more favoured regions, and the people who remained were apathetic and hopeless.

In Rajahmundry :
Para. 270.

It was under such circumstances that Colonel (then Captain) A. Cotton brought forward in 1844 his proposal for an anicut across the Godavery, with a system of channels for distributing the water over the district; it was approved by the Honourable Court, and shortly put in course of execution. We have given in its proper place, a somewhat lengthened notice to this undertaking; we will here only briefly state the results. The works commenced early in 1847, and up to the present time about 13 lacs of rupees have been expended; the total ultimate cost is estimated at 24 lacs. Such was the combined effect of the circulation of capital, the employment for labour and the supply of water, that in every year since the works began the increased revenue above that collected previously, has exceeded the amount expended on the works; and at the end of the year 1850-51, the aggregate of such gain was 19½ lacs, while the expenditure was under 13 lacs; so that the Government were in fact never at all out of pocket by the works. And the change in the condition and demeanour of the people is stated to be not less gratifying; industry and cheerful activity having taken the place of the former apathy and despondence. And the future prospects of the undertaking are still more promising: looking to the extent of land capable of irrigation, it seems reasonable to expect that at a very moderate rate of assessment, the works will ultimately yield in revenue a net return of cent. per cent. upon their cost; while the wealth of the people will be enormously increased.

663. As an additional instance of the great importance of irrigation as it respects the revenue, we quoted Appendix (Z.), being a statement of all the expenditure by Government for a series of years in extending irrigation, together with the results. It appears that the whole outlay for the extension of irrigation, as distinguished from the repair and maintenance of existing works, during the 14 years included in that statement, was Rs. 5,41,116; and the total average net yearly gain in revenue, after deducting the cost of current repair, was no less than Rs. 3,76,737, being 69½ per cent. on the outlay. And this is not the return from selected successful works, but from the whole of those undertaken, including a very few which from particular causes gave no return. Looking at the very small amount of expenditure shown in that table, and comparing it with the vast number of works scattered all over the country, the creation of former dynasties, we could not avoid the reflection that if the present powers had always ruled in the country, it would now have been destitute of those valuable sources of wealth.

Results of all the
improvements un-
dertaken : Para.
271.

664. Having given these instances to show the great advantage of maintaining and extending irrigation, we offered a few remarks as to the loss sustained by the Government, as well as inflicted on the Ryot, when the works on which the revenue of the one and the very livelihood of the other, so much depend, are allowed to fall into decay. We then quoted in support of our views of the importance of irrigation, the recorded sentiments of two gentlemen who, both from their talents and their position, had peculiar facilities for judging on this question; viz., Mr. J. Sullivan and Mr. C. R. Cotton. And after a few reflections on the same general topic, we adverted to the immense value of irrigation in another aspect; viz., for the prevention of the destructive famines which prevail periodically in many parts

The ill effects of
neglecting the irri-
gation : Para. 276.

of the country, where advantage is not taken of those means of guarding against them so bountifully afforded by Providence.

Notice of the
famine in Guntoor :
Para. 288.

665. To enforce this lesson, we dwelt on the effects of the famine in Guntoor in 1832. We found reason to believe that of the population of that district, amounting to 512,000 immediately before the famine, no fewer than 200,000 perished by that visitation and the consequent disease: besides multitudes more who forsook their homes, and fled to other parts of the country; and that even yet the population of the district has not fully recovered itself. We calculated also that the direct loss of revenue to Government in consequence of the famine, has been very little less than 93 lacs of rupees; while the losses of the Zemindars and of the Ryots, even leaving out of calculation those of the trading and manufacturing classes, have amounted to 124 lacs; making a total of above two and a quarter millions sterling. And all this enormous amount of misery and loss would have been prevented, if the same pains had been taken to turn the Kistnah river to use in irrigation, as was ages ago bestowed upon the Cauvery by the native rulers of the country; and it may confidently be trusted that when the anicut now at last in course of construction on the former river shall be completed and in operation, such a tremendous calamity can never again occur, in that part of the country at least.

Objections answered:
Para. 295.

666. Having thus stated the case in favour of maintaining and extending irrigation, we noticed a few objections sometimes urged against that policy. The first is, that there is sufficient food in the country already, and that consequently the means of raising more are not wanted and would not be made use of. In reply, we observed, that the argument is entirely opposed to past experience, whether we look at the whole history of such a country as Tanjore, and compare it with Guntoor or Cuddapah; or whether we take the results of all the improvements on which we had remarked in the earlier part of the section. Another objection is, that there is not labour in the country to execute works, or to take advantage of them if completed. But we showed the futility of this by an appeal to actual facts; viz., the emigration constantly going on from a people singularly averse to leave home and family; and the abundance of labour always forthcoming for undertakings within the country, both public and private, whenever called for; and we pointed out that labour is certainly more abundant here than in England, where people are constantly crying out that the market is overstocked with it.

And lastly, referring to the objections that there is not sufficient agricultural stock, or a disposition to extend cultivation, we showed that both are imaginary.

An exceptional
case: Para. 303.

667. We then noticed one improvement of an irrigation work which has not yielded a direct profit to Government; viz., that of a channel in the Trichinopoly District, in connexion with the Upper Coleroon anicut; and pointed out that the object of this work was not at all to gain increase of revenue from the channel itself, but that it was a necessary part of the general plan for improving the watering of Tanjore, which has most abundantly succeeded. And we concluded the section with the suggestion of a few measures not immediately connected with irrigation, but such as our examination of the subject had forced upon our attention as calculated to promote powerfully, though indirectly, the prosperity of the country and of the revenue, through the means of irrigation works.

General sugges-
tions: Para. 312.

The seventh Sec-
tion.

668. The seventh Section was devoted to an examination of the present actual state of the roads throughout the country, and to the endeavour to show the urgent necessity that exists for some general and vigorous effort for their amendment. In the same section we also noticed the harbours of the coast, and the necessity for attending to them. In dealing with this subject, we had the advantage of means of information, of a kind which we have already adverted to as wholly wanting in the case of the irrigation works, viz., a series of periodical reports upon the condition of the roads. At the same time that the Road Department was formed, viz., at the beginning of 1846, the Government issued a judicious order, directing that every Collector should report annually on the state of the roads of his district; these reports, though in some respects defective, afford on the whole a useful body of statistical information. We have given an analysis of them, with such additional information as we could obtain from some reports of the Civil Engineers; with the view of showing, as well as our means enable us, the present condition of the roads in each district, and what the present system has done during the last six years, and is now doing, for their improvement. In that sketch we would particularly point to the account given of the roads in Ganjaru,

The Collectors'
reports on the
roads: Para. 325.

Rajahmundry,

Rajahmundry, Masulipatam, Nellore, Bellary, Cuddapah, Kurnool, and North and South Arcot, to show what the roads are; and to the notice of Canara, for evidence of the vast benefit obtainable by a judicious expenditure upon them.

669. From the detailed abstract of the Collectors' reports we next proceeded to present a general view of the state of the roads, as deduced from those reports. We found, that in the extensive provinces composing this Presidency, having a total area two and a half times that of England and Wales, and a population one-fourth more numerous, there is no more than about 3,400 miles of what in the returns is called "made road;" and that even of this small extent, a great part has never been made at all, being only tracks where the soil is of so firm a character as to bear a very light traffic in dry weather, without requiring much repair; and further, that another very large portion of the so called "made road" is very imperfectly provided with bridges, and is therefore still closed for a considerable part of the year. We found that nearly all the most important lines for commerce, being those connecting the Coast Districts with the interior, still remain entirely neglected; and that even of the great military lines, which have received a larger share of the attention of Government, there are but very few in good order; while the greater part are in an utter state of ruin, or more properly speaking, have no existence at all as roads, being unmade, unbridged, and intercepted by frequent swamps and ravines.

Condition of the roads of the country: Para. 377.

And if such is the condition of the main lines of the country, it is not surprising that the roads generally, those by which produce ought to reach those main lines, are far worse. In point of fact, whole Provinces are almost entirely destitute of roads, without the means of bringing their products to a market; and as a necessary consequence, industry and trade are stagnant throughout these extensive countries. As instances, we referred to the two districts of Bellary and Cuddapah, each of them more than one-fourth of the size of England, and containing together a population of nearly 3,000,000, and yet having no more than 31 miles of made road throughout their whole extent.

670. We went on to remark that the character of the Collectors' reports is not satisfactory, because not indicating generally an adequate conception of the importance of the subject; and that the tone of the orders of Government upon those reports, affords still less encouragement as to future progress. We observed that the general tenor of those orders indicates an indisposition to grapple with the question; and a disinclination to receive the real truth respecting the actual condition of the roads and the consequent evils, as plainly and faithfully stated by some Collectors. On the contrary, the Government overrate both their efforts and sacrifices for the improvement of the roads, which whether compared with the vastness of the object in view, or with the resources of the Government, are puny and insignificant; and also the results effected by those efforts, which though very sensibly and beneficially felt in a very few favoured localities, have left the vast bulk of the country wholly unaffected.

The Collectors' reports and the orders of Government: Para. 382.

671. Referring to the sentiment much dwelt upon throughout these orders, that the work of making roads is one to be performed by the people themselves, we argued that the people at large cannot be required to make the great trunk lines. And citing at some length the actual results obtained by this unpaid system in some districts appealed to by the Government as examples of what ought to be done in all, we showed that in those districts, especially in the one most insisted on, the circumstances were eminently favourable, compared with what would be found in other districts, and that nevertheless the results have been very small; and that so far from proving that the roads can be made by the people, they prove the very reverse, viz., that if such means be mainly relied on, the country can never possess anything like good roads.

The people cannot make the main roads: Para. 386.

We then adverted to the surplus ferry receipts as a resource for local improvements, and pointed out that although this fund was formally ordered by the Honourable Court 35 years ago, to be given up to such objects, the order has never been acted on, but the amount has invariably been swept into the General Treasury.

The Ferry Funds: Para. 392.

672. We next proceeded to consider the value of good roads: and after quoting a striking passage to illustrate their effect in promoting social improvement we went on to speak of their great and peculiar influence in this country in augmenting the revenue, which here depends so immediately on the demand for agricultural

Beneficial effects of road improvements on the Government revenue: Para. 395. Example in Canara: Para. 398.

tural produce and the extension of cultivation. As an instance in point, we took the District of Canara, where, during the last 16 years, a good deal has been done to open the interior of the country to the coast. We found, that while the whole outlay on these improvements has been only Rs. 5,25,000, the total increase in the land revenue during the same period above the average of a number of years before, has been Rs. 16,39,575, and in the revenue from the salt monopoly it has been Rs. 15,60,488, making a total of Rs. 32,00,063. And deducting even as much as one-half of this gain as possibly due to some other causes which have been in operation, we have a sum of 16 lacs of rupees clear gain in revenue in this short period, attributable we fully believe, and the Collector upholds us in the belief, to no other cause than the judicious expenditure of five and a quarter lacs in the improvement of the roads.

Contrast in Ganjam and Vizagapatam : Para. 403.

673. And in order to enforce the lesson to be learnt from this example in Canara, we took the two districts of Ganjam and Vizagapatam on the Eastern Coast, which very closely resemble Canara in geographical position, but differ from it in the entire absence of any considerable attempts to improve their roads, and especially to open passes into the interior. We there found, that instead of an increase of 50½ per cent. as in Canara, the salt monopoly shows an actual falling off of five per cent. during the same period. This decline is probably due to an increase in the Government monopoly price which was made during the interval; but that increase extended to Canara also, but was there counteracted by other influences.

The Western Trunk Road: Para. 404.

So also with the Western Trunk Road from Madras; we had not the means of ascertaining its effects on the land revenue of the districts through which it passes; but we found that the increase of revenue from the larger quantity of salt sold at Madras, in spite of the augmentation of price, and clearly traceable to the improvement in the road, has been far more than sufficient to pay for the whole cost of the road.

Sketch of a system of main roads: Para. 407.

674. We then sketched out a system of main lines of communication for the whole Presidency; to consist, first, of lines running inland, from the coast: second, of lines running along both coasts; and third, of roads connecting principal places in the interior. Of these three descriptions we computed that 7,700 miles would be required, of what are called first-class roads, besides the subsidiary lines, the mention of which we reserved for the following section.

Really good roads are required: Para. 413.

We concluded that part of the Section with a discussion upon the degree of perfection which should be aimed at in our roads; contending against the opinion brought forward by the late Superintendent of Roads, and adopted by the Government, that really good roads are not wanted in this country. We argued against that opinion, and stated both facts and calculations to show it to be erroneous; and which we think fully bear out the conclusion at which we arrived, that far from its being true that the common tracks slightly improved will suffice for this country, a very moderate amount of traffic is sufficient to pay for making a first-class road and for keeping it in perfect repair; and that it is truly wise and economical to make and maintain such roads.

The seaports of this Presidency need attention.

675. The latter part of the Section was devoted to a brief notice of the harbours of the coasts of this Presidency. We first described these harbours as being considerable in number, and formed generally by basins or backwaters within the mouths of rivers; and we lamented that having been almost wholly neglected, many of them have very much deteriorated within memory. We made individual mention of some of these ports, and stated what has been done for them where they have received any attention at all, and what further they require. We spoke of Coringa at the mouth of the Godavery, already a thriving commercial and ship-building port, and noticed its rapid increase since the irrigation works on the Godavery were commenced, and the certainty that it will be a place of great trade. But we mentioned how sadly its great advantages have been neglected, so that it is far less commodious now than it was 20 years ago, and all from mere neglect. In connexion with the Port of Coringa, we adverted briefly to the vast importance of opening the noble Godavery river on which it stands, to navigation. We quoted facts to show the enormous advantages which would thence result, both to commerce, and to the Government revenue, as well as to the great saving which would so be effected in moving troops and stores. We spoke also of Cochin, a port on the Western Coast, only second in importance to Coringa, and like it excellently situated, both for commerce and for shipbuilding, and already possessing extensive business of both

Coringa and the Godavery Navigation: Para. 427.

Cochin and other ports: Para. 430.

both kinds. And we noticed Masulipatam, Negapatam and other ports of minor importance, describing the wants of each, and mentioning what little has been done for them.

676. We adverted to the fact that though an increased rate of port dues was imposed a few years ago, of which the proceeds were to be devoted to the lighting and improvement of the harbours, and though the fund thus formed now amounts to nearly a lac and a half of rupees, yet the Government have again and again refused most trifling expenditures, for averting the progress of decay in several ports, or for effecting improvement. And we pointed out that even taking the narrowest possible view of the interest of the Government in this question, limiting it to the bare amount of the port dues received, yet in those dues there is an abundant fund for effecting all that is desired. Both at Coringa and at Negapatam the merchants and shipowners have declared their willingness that the port dues shall be doubled, provided only the proceeds are expended in improving the port; and funds abundantly sufficient for all that is necessary might be obtained without advancing a rupee of Government money, by adopting the course so universally and so beneficially followed in England in such cases, viz., that of raising money on the security of those dues. Much knowledge has been obtained within a comparatively recent period in England in the treatment of such cases, and some of the most important ports in Great Britain, Liverpool, Glasgow, Newcastle, &c., are fully as much indebted to the skilful application of human ingenuity as to natural advantages. It is earnestly to be desired that some little of the experience acquired on those works should be brought to bear on the harbours of India; a very trifling expenditure in that way would do much to relieve trade here from very serious impediments.

A special fund for improving the harbours exists: Para. 449.

After suggesting a few measures calculated to ensure due attention to the conservation and improvement of the ports, we concluded with a brief notice of the operations carried on for some years past for deepening and straightening the Paumbam Channel, and the consequent very material enlargement of the trade passing through it; a result gratifying both in itself, and for the evidence it affords of the readiness of the commerce of this country to spring up, whenever relieved from the depressing causes which so generally bear it down.

The Paumbam Channel: Para. 456.

677. Having thus investigated the amount of work to be done in the country, in both the species of improvement which we had been discussing, we came next to the consideration of the amount to be devoted to that object; and this occupied our eighth Section. After declaring that the expenditure, though materially enlarged of late years, still appears far too small, we went on to consider the proper sum to be set apart for the three following objects; the maintenance of the existing works of irrigation, the construction of new ones, and the formation and improvement of roads. We did not here speak of the harbours, because it is clear that the funds necessary for their improvement may be easily and naturally obtained, without even an advance of money on the part of Government.

The Eighth Section.

As to the first of those three objects, the works generally being out of order, as already shown, they will need a somewhat larger expenditure for some years to come, until they shall all be gradually brought into good repair, than will be necessary afterwards. We propose that 15 lacs of rupees should be devoted annually to the object of efficiently repairing and maintaining the old works, being about double the amount laid out on that object now. The examples of Tinnevely and of Tanjore, detailed in the early part of Section 6, are abundantly sufficient to show how amply such increased expenditure will be repaid. As to the formation of new works of irrigation, considering the great extent of the field to be so occupied, but limiting our estimate of a year's work by a regard to the means likely to be available for directing expenditure, we proposed seven and a half lacs as the ordinary amount to be devoted to this object every year: making a total of 22 and a half lacs annual expenditure in maintaining and extending irrigation.

Proper amount of expenditure on irrigation: Para. 463.

678. In speaking of the maintenance of those works, however, we stopped to observe that it is a serious mistake to look upon the whole amount so spent as an outgoing from revenue. We showed that the Government had appropriated to themselves and included in the revenue settlement, a very large annual income, forming no proper part of the Government revenue at all; but consisting partly of payments contributed by the Ryots themselves for the maintenance of their tanks and channels, out of their own share of the produce; and partly of joint funds for

A special fund, not a part of the Government Revenue, set apart long ago for maintaining the irrigation works: Para. 464.

similar objects, formed by such contributions united to sums assigned by the Government out of its revenue, which latter even could no more be justly considered as still Government revenue, than the amount of a "grant in aid" awarded by the Council of Education, can still be regarded as a part of its disposable funds. We found that the Government having merged this separate fund in the general revenue, came entirely to forget its origin, and to look upon the cost of maintaining the works as a mere drain on the Treasury, forgetting alike the great profit to itself from the expenditure, and also the fact that in reality it was no expenditure at all from its own resources, but only from a fund held by it in trust for that particular object. We stated our opinion that this trust had not been adequately discharged, as proved by the generally neglected and inefficient state of the works. And we concluded with stating the three motives obliging the Government to a liberal expenditure; viz., 1st, that having assumed the "tank and channel fees" on the condition of maintaining the works they are bound so to maintain them: 2d, that independently of this direct obligation, there is a second virtual obligation, arising from the fact that a vast amount of capital has been invested in the land under the works on the faith of the engagement of Government to keep them in repair: and 3d, that such a course is most remunerative through increase of revenue.

Extent of roads required: Para. 467.

679. In estimating the sum to be assigned annually to the construction of roads, we first computed the extent of road required to form a system of intercommunication throughout the country, and the probable cost. We divided the roads into three classes; the first composed of the main commercial and military lines of the country; the second, of roads to connect towns and places of second-rate importance; and the third, of the village or cross-roads to connect the villages with towns, or with roads of the superior classes. We calculated that the first-class ought to comprise 7,760 miles; the second 20,000 miles; and the third, 150,000 miles. The two former we proposed to be constructed by the Government; the last by the people of the respective localities. We vindicated the justice of the length here stated, by a comparison of the length of communication of the different kinds actually existing in England, and by comparing the extent and density of population of the two countries; and we then proceeded to calculate the cost of constructing and of maintaining the roads of the first and second classes.

Their cost: Para. 470.

680. We estimated that the first-class roads would cost Rs. 3,500 a mile, but that 1,200 miles of the distance might be navigable canals along the coasts, to cost only Rs. 3,000 a mile, and for the 8,000 miles (in round numbers) the total cost would be 274 lacs. The second class we supposed would cost Rs. 2,500 a mile, being for 20,000 miles, 500 lacs: making a grand total of 774 lacs of rupees, or 7½ millions sterling, for the formation of a system of internal communications for the whole of this extensive territory. As to the cost of repairing and keeping up these roads, we estimated that after the whole are completed, which in the nature of things cannot be for very many years, the annual charge on that account will not be less than 80 lacs of rupees. After considering the question of tolls, and expressing our opinion that they might be gradually introduced, and that ultimately they might be made to supply a very large part of the whole cost of maintaining the roads, we stated our opinion that 20 lacs of rupees a year ought to be steadily devoted by Government to the great work of creating a system of communication, the amount to be increased largely, as the resources of the State shall grow under the influence of such measures of improvement, and as the means of spending money to advantage become augmented.

Their effect in saving the cost of carriage.

681. And in order to modify the astonishment which we foresaw would be excited by the mention of the large sums which we have named, we gave a small statement to illustrate the annual value of the roads contemplated, from which it appeared, that on a moderate estimate of the traffic to be borne on them, they would, after paying their own charges, effect a saving in the cost of transport, to the enormous amount of 960 lacs of rupees every year, besides vastly increasing trade as a necessary consequence, and rendering commercial interchanges profitable, which at present are totally impracticable. Thus, large as the cost of the roads appears, their actual use in every single year, strictly valued in money, exceeds their whole capital cost. And it cannot be too often repeated, that improvements in this country literally cost nothing; whether laid out on roads or on works of irrigation, money expended is returned almost immediately, and a permanent addition is made to the resources of the Government and of the country.

682. We

682. We next noticed the cart tax in the Salem District, imposed a few years ago for the repair of the roads, and the small produce of which is laid out on that object; and after detailing the history and incidents of the impost, we recommended that when the new system which we advocate is introduced, this tax should cease. The cart tax in Salem: Para. 475.

We then reverted to the subject of the village or cross-roads. We declared our opinion, that it would be no hardship on the 56,000 villages comprised in this Presidency, to oblige them to make and maintain 150,000 miles of cross-road for their own use and convenience; and that, in fact, no other means of completing the system of general communications could be found, the task being clearly beyond the powers of the Government. We stated our belief also, that the obligation would be cordially recognized and cheerfully fulfilled, provided the main lines, that is, the roads of the first and second classes are kept in good order; and provided also, the obligation is duly regulated and enforced by authority on all parties liable to it, so that the well-disposed shall not be left to do the work of the idle and evasive. The cross roads: Para. 479.

683. On the whole, we found that the total increase of expenditure thus proposed by us, on irrigation works, on roads and on establishments, amounted to 38 lacs a year; and we next proceeded to consider how this sum could best be provided. After a few remarks to show that the real surplus of revenue over expenditure at this Presidency is much larger than it is usually considered, we stated our opinion, that whatever that surplus might be, those improvements, so essential to the advancement of the country, ought not to be dependent on any such accidental circumstance, but that whatever amount it might be deemed wise to devote to those most important objects, should be considered equally essential parts of the year's expenditure, with the pay of the army or the interest of the debt, and should be provided for as scrupulously. And we urged accordingly, that when the year's revenue fell short of the required amount, the deficit should be made good by borrowing; this being a species of loan which cannot be regarded as at all a burden on the Exchequer, because not incurred for the sake of mere expenditure, but for investment in methods morally certain to return a profit manifold greater than the interest to be paid for the use of the capital. We observed that these loans need not be permanent, but that the first proceeds of the works to be constructed by their means, might be devoted to their repayment. We supported our recommendation by an appeal to the practice of private persons, who regard their credit as a portion of their capital, and use it as such; although it is not nearly so good or so stable as that of the Government of this country. Total expenditure proposed; how to be provided for: Para. 481.

481

In closing our remarks on the subject, we observed, that of the public improvements to be undertaken, the irrigation works and common roads would in general be most properly undertaken by the Government; but that on many lines, railways or navigable canals would return a very handsome profit, and that such works would properly be left to private enterprise; and we recorded a few remarks as to the way in which they should be undertaken, should be encouraged by the Government, and should be carried on. Railways and canals to be formed by private enterprise: Para. 480.

684. We concluded the section with a suggestion, that whatever amount might be determined as proper for the annual expenditure on public works, the whole ought to be at the unfettered disposal of the Local Government. We observed that a Board or Council of Bengal Officers sitting at Calcutta cannot exercise an intelligent judgment as to the local concerns and wants of the various Provinces under this Government, and that the intervention of such a body has, in fact, acted very injuriously to the interests of this Presidency. Admitting the necessity that the Supreme Government should be kept acquainted with the financial position of this part of the empire, we conceived that this necessity, as regards the public work expenditure, would be met by an annual prospective estimate of the expenditure in that department. And we recommended, that a standard for the usual expenditure having been fixed, an estimate of the probable actual expenditure in each of the two years then next to ensue, should be prepared annually by the Board of Works; that it should be laid by the Board before Government, and having been there approved, should be communicated to the Indian Government if within the amount of the fixed standard, as the expenditure to be provided for in the two years; but that, if in any year the estimate should exceed the fixed standard, then it should be sent home for the approval of the Honourable Court, and having been there approved and confirmed, should be communicated to the Supreme Government. The whole amount of the expenditure to be at the disposal of the Local Government: Para. 482.

The ninth Section.
Remarks on "Superintendence:"
Para. 495.

685. In the ninth Section we detailed the establishment, which, after careful consideration, we deemed it essential to maintain for the economical execution of the work, on the scale now prevailing or likely to prevail in the Public Works Department. Various circumstances had made it plain to us that much misconception existed as to the use and value of skilled establishments, and of what is called "Superintendence;" and much jealousy of any increase in that item of charge, founded on such misconception. We deemed it advisable, therefore, to open this section with a few remarks on the general subject of superintendence; designed to show its true character. We pointed out the five distinct functions included in the term, often unthinkingly, and showed that, to judge of the sufficiency or the excess of superintendence in any given case, as is so often done, by comparing the charge on that account, with that of the whole work, must be wholly fallacious in respect to every one of the five particulars; and that, as regards most of them, it would lead to an inference the very reverse of the truth. And we gave several reasons why both the quantity of oversight in the execution of work, and its money proportion to the cost of the work, ought to be larger in this country than in England, though in fact we believe it is not so large. We also adverted to the enormous losses sustained formerly through the great deficiency of superintendence, and the undoubted gain in efficiency through the measure of increase since obtained in that item. And we also pointed out the good effects that would result from a system of effective management of the works of irrigation, for the prevention of that wholesale waste of their water which now prevails; a species of "Superintendence," hitherto almost unknown under this Presidency.

The want of officers: Para. 511.

The proposed establishment.

The Commissioned Officers: Para. 525.

686. We then dwelt upon the duties of the Civil Engineers, in order to show how inadequate their number is to the due performance of those duties, and gave a number of instances exemplifying the very heavy loss to Government in consequence; and we then went on to state our proposed establishments. We need not here recount our propositions on that head. We will only observe that the general division of the establishment is into four branches, as at present; viz., Commissioned Officers, Warrant and Non-Commissioned Officers, the Native Executive Agents, and the office servants. We propose a material augmentation of the commissioned grades, but still larger of the lower grades; for it is undoubtedly one most wasteful defect of the present establishments, that from the deficient numbers of the inferior grades, officers of all ranks except the very lowest, are constantly and of necessity engaged in operations which men of greatly inferior qualifications and inferior cost would perform as well or better. Thus the Revenue Surveyors, and even the Assistant Civil Engineers, are obliged to copy their own plans for want of draughtsmen, and their own diaries and letters for want of writers; though five writers or draughtsmen might be procured for the pay of one Revenue Surveyor; and a Civil Engineer with ability to project and plan works for the improvement of whole talooks, is occupied in taking levels and surveys, for want of the aid of a few surveyors on one-eighth of his pay; and this grievous waste has hitherto been thought good economy.

The subordinate grades to be much increased: Paras. 584 and 585.

687. We have guarded against this evil by providing a much larger proportion than hitherto of the subordinate grades; yet still smaller than it will hereafter be in the power of the higher grades of officers to control and direct efficiently. The number of commissioned officers which we propose is absolutely necessary even now, with reference to the enormous extent of the divisions, and we have assigned the proportion of subordinates of all grades suited to the works now done or likely to be done; but hereafter, as the quantity of work increases, and so becomes more dense over a given area, it will be possible still more to increase the numbers of the subordinate grades and so the efficiency of the whole body, without a commensurate augmentation in the highest classes. Among the subordinates we propose a large increase of the European warrant and non-commissioned grades, and a considerable improvement in their emoluments; the excellent conduct maintained by the men of that class hitherto employed, under very discouraging treatment, fully justifies our anticipation of the most beneficial results from their larger employment, and on more important duties.

Salaries and promotion: Paras. 539, 554 and 555.

We also stated the salaries proposed for all the grades of officers to be employed; and we saw reason to advocate an increase in the case of many, though not in those of the highest ranks; and we also detailed the rules which seemed expedient for regulating the course of promotion in the department, and likewise with reference to the authorities to whom the duty of promoting or recommending for promotion

promotion should be entrusted, as well as that of selecting for particular appointments and duties.

688. The tenth Section discusses the best mode of providing and of training men for all the various grades of the Public Works Establishment. It begins with the commissioned officers. We first considered how the required number of professionally educated Engineers could be best obtained; and we arrived at the conclusion that the best course would be to enlarge the Military Engineer Corps. We believe no other system would supply the qualifications wanted, so efficiently and so cheaply; especially with reference to the high tone of honourable feeling established in the corps.

We next proceeded to consider the extent of the increase necessary to the Engineer Corps, in order to provide the number of officers contained in the proposed establishment. That number is 85, counting those appointments only which absolutely require professional acquirements, to the exclusion of nearly all the executive appointments, and taking no notice of many other duties which we enumerated, and for which demands will certainly be made on the Engineer body. Having carefully investigated the proportion of officers absent from duty for a series of years, as well in the Engineers as in the other branches of the army, we found that it would require a corps of 112 officers, to have 85 always available for duty. We recommended that this number should be organized in four battalions, of a composition which we specified; and that the present two battalions should be immediately increased to three battalions of that strength, but that the fourth battalion should be raised gradually in six years, so as to avoid the inconvenience of having too large a proportion of very young officers.

689. Comparing the proportion of Engineers to the rest of the army under this Presidency with what it is under the other Presidencies, we found that after the augmentation which we recommend, that proportion here would be only equal to what it is already in Bombay, while it would be somewhat higher than it is now in Bengal; and we pointed out that the simple fact of the existence of a vast system of Government irrigation works in this Presidency, requiring the constant attention of the Engineers, is sufficient to render a larger proportion necessary here. We expressed the opinion that though the number of Engineers that we propose may be thought large, yet that compared with the extent of territory and the amount of work, it would be thought fatally small in any other country; and that it will be thought so here in a few years.

690. We then briefly noticed the practice of augmenting the number of Engineer Officers available for duty, by keeping up a number of Supernumerary Second Lieutenants; and we expressed the earnest hope that it would be put a stop to, as injurious and unfair to those officers; and we then proceeded to advert to the mode of educating the Engineer Officers. We recommended that the period of residence at Chatham after leaving Addiscombe should be shortened; and that the Cadets should go through a good course of Civil Engineering, under a practical Civil Engineer, with an examination at its close. As to the course in India also, we recommended that the head-quarters of the Sappers should always be at some great work, so as to initiate the young officers early into a knowledge of the civil works of India; and we offered a few suggestions as to the employment of the Sappers on civil works.

691. We then went on to the subordinate ranks of the department. We first described briefly the qualifications required in those grades which seemed to need such notice, and then proceeded to speak of the best mode of supplying those qualifications; having previously however described the present "Survey School," and given our reasons for recommending its abolition, as inefficient and utterly incapable of effective improvement or enlargement.

We declared our decided conviction that the Government must form an institution for the training and education of the subordinates of this important department, akin to that already existing for those of the Medical Department; and we referred to the Engineering College at Roorkee as affording a model suitable in most respects to our wants. We reviewed the origin and progress of that institution, and its arrangements and course of instruction; and we pointed out a few particulars in which a modification of that system would be necessary, in order to adapt it to the requirements of this Presidency. We set forth the arrangement which we deem the most suitable for a college here, as respects the various classes

The tenth Section.

Number of Engineer Officers required: Para. 676

Comparison with the other Presidencies: Para. 595.

The training of Engineer Officers: Para. 595.

The subordinate grades of the department: Para. 602.

A training institution for them is necessary: Para. 612.

both European and Native, which our establishment will require; and we added some remarks as to the conditions to be required in the several grades, for admission and for passing out, as well as for promotion in the department.

Further suggestions respecting the college: Para. 627.

692. We then offered a few suggestions as to the general arrangements of the institution, in particular that the English language should be the only medium of instruction, and that the college should be provided with a good library and model room, for the use of the students; and we dwelt particularly on the essential importance of imparting to the students real practical constructive skill, as well as mere theoretical knowledge. We professed ourselves unable to pronounce as to the best means of effecting this important end, but we suggested a few methods of doing it.

It should be at the Presidency: Para. 632.

With regard to the most proper situation for the school, we stated our conviction that it certainly ought to be at Madras. Though open to some minor objections, which however may be obviated, the Presidency possesses advantages which no other place can show. In particular we noticed two; viz., the great number and variety of public works always in progress, for the practical training of the pupils, and which are likely hereafter to be still more numerous and various; and the number of scientific officers of different branches of the service, or not in the service, whose aid might be secured by small remuneration, to assist the principal of the college, by giving lectures on the various branches of study.

Number of pupils and cost: Para. 635.

We closed our notice of the college with a computation of the number of students required to be maintained, and an estimate of the yearly cost. We calculated that in order to supply vacancies, it would be necessary to have always 125 pupils at the college, of whom 33 would need to be Europeans and 92 Natives; and we estimated the whole charges of the institution, comprising salaries, subsistence of pupils, the expenses of tuition and of the library and model room, and the annual cost of the buildings (viz., interest and current repairs), at about Rs. 60,000 a year. A charge very insignificant, when compared with the utility of the institution, the numbers of the establishment to be trained, and the enormous value of the property and the interests to be dependent on the skill and care of that establishment.

CONCLUDING REMARKS.

Our recommendations are directed to three principal points.

693. HAVING thus briefly recapitulated the contents of our Report, we will conclude it with a few general remarks. Our chief recommendations may be comprised in a few words; they are addressed to three main objects; viz., 1st, the past neglect of even the existing works of irrigation, and the high expediency of repairing past omissions, and entering vigorously on the task of both restoring the old works to their highest point of efficiency, and of greatly extending irrigation by new works; 2d, the utter want of anything like good roads at present, and the absolute necessity of taking measures without delay to form a general system of internal communications; and 3d, as an essential means to both those objects, the necessity of very greatly enlarging and improving the Engineering Establishments, now in all its grades lamentably below the point of true economy, even for the present meagre scale of expenditure.

Irrigation works.

694. In supporting our opinions in favour of an increased expenditure on irrigation works and on roads, we urged facts to prove the value of both, even regarded simply as means of filling the Government exchequer. As to the former, we proved that the past expenditure by our Government has been decidedly too small, and that the revenue has undoubtedly declined in consequence; and we brought forward instances to show how the revenue has immediately rallied, conjointly with and as a consequence of the more thriving condition of the Ryots, wherever the restoration or formation of works of irrigation has been undertaken on a large scale. As to the roads, we carefully depicted, from the best information obtainable, their condition at present; not only of the cross or country roads, but even of the vast bulk of the most important lines. We showed how this state of the means of communication paralyzes commerce and enterprise, and so keeps down the revenue, by impoverishing its sources; and we gave instances to show how immediate and how powerful is the effect both on the land revenue and on that from the salt monopoly, where some little amount of attention is steadily paid to the improvement of the roads.

Roads.

695. As to establishments, we found that those now existing are utterly insufficient even to direct and control effectively the present expenditure, or duly to attend to the existing works, much more to attempt anything in the way of improvements, without still more neglecting ordinary duties. We found that this truth has been acknowledged for many years past, has been brought to the notice of Government and fully recognized there, and has been pressingly represented to the Supreme Government and to the Honourable Court, but that still nothing has been done to remedy it. We found also that, of late years at least, a serious and fatal misapprehension has pervaded the Government as to the wastefulness of that expenditure which is devoted to what is called "Superintendence," *i. e.*, to the providing of science and skill to plan works and to direct rude labour; and that a tendency prevails to look upon that work as the cheapest which is effected with the least possible amount of such aid. We combated that opinion, opposed as it is to the growing experience of European countries, where, every day, science is applied more and more to even the most homely branches of industry; and where, year by year, mere labour is more and more superseded by science and skill. And we proposed an establishment much larger indeed than the present one, but not greatly exceeding what has been constantly asked for, even for the present scale of operations, and necessary for that; but yet from the scattered distribution of the work to be attended to now, competent to do much more in the same geographical extent.

Establishments.

696. We will now, in conclusion, offer a few remarks on each of these three heads. And first of irrigation. There are two peculiar circumstances attaching to these provinces which must not be overlooked in considering this subject; of which one, an incident of the revenue system prevailing here, makes it especially the function of the Government to undertake such improvements; while the other, which is a natural circumstance, makes it so eminently remunerative to do so. In other parts of the empire, and in those parts which from their Metropolitan connexion represent the whole of India in the ideas of many persons, the revenue is fixed and invariable, either in perpetuity or for a term of years; and neither any improvement in the resources of an estate or village, nor any extension of cultivation, entitles Government to demand the smallest addition of revenue. Thus Government has put it out of its power to take an active part in promoting such improvements in those provinces, except by a special agreement in each case, and with each individual proprietor; but here the case is very different. Throughout by far the greater part of the Madras Presidency the Ryotwar field settlement prevails, under which every acre of land bears a certain assessment, which is paid in years when the land is cultivated, but not when it is not cultivated, and of which a part is even remitted in the case of irrigated land cultivated, when the water is insufficient to mature the crop. Here then any improvement or extension of irrigation immediately affects the revenue, almost by a natural process; for the former, *viz.*, the improvement of existing works, leads to the cultivation of land under those works, previously waste from want of water; and the latter leads to the conversion of wholly waste land, or land formerly cultivated only with dry crops, into irrigated land; upon which conversion the assessment is increased according to certain rules; and the gain to the Ryots being so great, he gladly avails himself of the water supplied, and cheerfully pays the increased demand. And as it is the immemorial custom of the country that the ruling power should thus provide water, and in return levy an increased tax on the land, and as it is so profitable to the Ryots, they every where desire it, and the arrangements follow almost naturally.

The Madras revenue system holds out peculiar inducements to the Government to promote irrigation.

697. And there is a second circumstance almost peculiar to the provinces of Madras, as compared with other parts of India, which enhances the value of irrigation here; a peculiarity not in the revenue system, but in the climate. In Northern India irrigation is valuable during the two or three dry months preceding the rains, to strengthen the crop or even as necessary to the preservation of some kinds; but the crops generally are not wholly dependent upon it, and very valuable kinds of produce are raised without it. Here, on the other hand, from the greater heat and aridity of the climate, and the longer duration of the dry season, the most valuable species of produce cannot be raised at all without constant artificial watering, and for the most part those species not so watered are very poor and scanty, while those enjoying irrigation are luxuriant and abundant. Hence it is that there is so great a difference between the value of a crop from irrigated and from unirrigated land; and that the Ryot is so anxious to obtain water, and

And the climate makes it eminently remunerative to do so.

willingly pays a largely increased assessment, because his profits are so much augmented by it.

A very wide field is open for such improvements.

698. And the field for this species of investment of capital by the Government is very far from being fully occupied; on the contrary, we may say that large as is the number of fine works bequeathed by former Governments, those of the very finest and most remunerative class have as yet hardly been commenced upon. We allude to works for turning to account the waters of the high floods of the rivers. In many rivers the waters of the low freshes are already turned to use to some extent, though even here there is still a vast deal to be done. But as respects the high floods scarcely an attempt has been made to preserve them for use; the Cauvery is more largely turned to irrigation than any other river of South India, and nearly the whole water of the low freshes is so used; but scarcely any part of the high floods. Almost the whole of it flows to waste in the sea; and it is the same with other rivers, the Godavery, the Kistnah, the Palar, the Pennar, and others of inferior magnitude. Here then is a vast field of improvement open: the water which now annually falls into the sea is sufficient to water many times the extent of land now irrigated. It should be stored in reservoirs to be constructed in favourable situations all over the country; reservoirs such as the tanks of Cauveripauk, Chumbrumbaukum, Cumbum, Veeranum and Cunnigherry, described in a former part of this Report, and even on a larger scale, and be drawn off as required. And not only will these works supply irrigation, they will also furnish extended lines of water carriage, ramifying over the whole country. Many years ago, the able Engineer, Colonel De Havilland, expressed the opinion that our efforts should not cease till the whole of the waters of the rivers of the Peninsula were turned to this use; but during the long period that has elapsed since that sentiment was uttered, scarcely anything has been done towards effecting the object proposed.

It is to be hoped that the liberal policy followed in North India will be imitated here.

699. And as it is shown that this species of enterprise is so profitable to the Government, and so productive of wealth and comfort to the people, such a means in short of advancing civilization, and as such numerous and splendid openings for such undertakings exist, we indulge the hope that now at length they will be entered upon. We see a liberal spirit of improvement acted on in the Punjaub, and 50 lacs allotted by a single stroke of the pen, for promoting the irrigation of that province; and we see large expenditures on similar objects under the Government of Agra: and yet we believe it to be certain that in neither of those territories will the returns, actual or expected, compare in amount with those which can be pointed to as the actual result of similar undertakings under this Presidency. We cannot believe that two such opposite courses of policy will be continued in different parts of one and the same empire; that while in one part of it a share of the resources of the State is wisely and liberally devoted to the promotion of the general wealth and the improvement of the revenue, the same enlightened policy will be ignored in another part, little if at all inferior in extent and population, and even more capable of making an abundant return for the outlay.

And the formation of roads is not less important.

700. And we cannot regard the formation of good roads as less important, or less essential to the prosperity and advancement of the country, than the extension of irrigation. The two species of improvement are intimately connected and should go hand in hand. Without the means of transport and of interchange, the most valuable products become a drug, and production is arrested; thus roads give value to produce, and large production gives a use and a value to roads. No advantages can make up for the want of the means of transport; at the present time good wheat is selling in the Berar valley at Rs. 5½ (11s.) the quarter, and the whole cost of freight and charges from the coast to London do not exceed 15s. a quarter. Yet in the absence of good roads and of all attempts to improve the noble Godavery for navigation, the cost of carriage from the place of production to the coast effectually keeps it out of the market. For at present the only means of exit for the produce of Berar is by carriage on pack oxen, either to Bombay, a journey of 60 days, or 400 miles to Meerzapoor on the Ganges, and then 500 miles down that river to Calcutta; whereas if the Godavery river, the natural outlet of that country, were opened to navigation, the cotton and other valuable produce it yields would reach the seaport of Coringa at its mouth, in 70 hours. On the other hand, a ton of salt which is sold at the Government stores on the coast for Rs. 27, costs Rs. 112 at Nagpore. We have already adverted (para. 433, &c.) to the enormous yearly loss in the carriage of the cotton of the

same

same country to the sea coast by land, instead of by the river; and have noticed what large supplies of that article of the best quality for the English market, would immediately flow out, if the navigation were opened.

701. At the present time, indeed, it may be said that not merely the advance of the country, but even its continued hold of its present position, depends on the formation of roads; for other countries, with the products of which those of this country must compete, are not equally stagnant. The two great staples of these provinces are cotton and sugar, which seem likely, if only the expense of carriage is lowered, to give employment and wealth to the population. The climate and soil are excellently adapted for both, and from the great abundance of cheap labour, and the vast extent of unoccupied land, they may be produced in any quantity, and at a price with which no other country could compete. But the fatal bar in both cases is the cost of transport. The competing countries are America in the case of cotton, and Cuba, Brazil and the West Indies in that of sugar: every one of these countries, even the most backward of them, possesses means of transport vastly superior to anything that we can show; all possess railways, and those in great part constructed by English capital. The money of England would speedily cover the face of this country also with the same aids to commerce and the growth of wealth, and with other enterprises; but though it is engaging in undertakings in almost every other part of the world, very little of it reaches India. We will not attempt to dive into the causes of this difference; but it is certain that if the interior of the country were more opened by means of good roads, to the access of European agents, one great deterring cause would be removed.

X
And they are necessary not merely to enable this country to advance, but to retain its present position.

702. At this very time the sugar trade of India is struggling for existence, and the result is uncertain. The recent improvements in the process of making sugar from beet-root are so reducing the price of the article in the great consuming countries of Europe, that the manufacturers from the cane are driven to exert all their ingenuity to cheapen their own processes. This country has enormous advantages in its cheap and abundant labour; but it seems doubtful whether these will not be overborne by its disadvantages in the high cost of carriage. We believe there is a large decrease in the export of sugar from the Madras ports in the present year, and this is chiefly in the raw sugars, on which the cost of transport bears the most heavily, and in which there is less loss from discontinuing operations, because little fixed capital is employed. In the case of refined sugar large capital is invested in the necessary machinery and buildings; and as it would be ruinous to sacrifice that, lower prices must be met if possible by extended operations, so as to do a larger quantity of business with the same plant and apparatus. But here too the want of roads intervenes. The letter in Appendix (P.) refers to such a case. In that letter Mr. Boothby speaks not only of the difficulties and losses to be encountered in sending down the manufactured sugar to the coast for shipment, from the want of a good road, and especially from the absence of bridges, but also of the difficulty and expense even in procuring the raw material for manufacture, from the entire absence of roads through the district. At such a critical time the refusal of the sum required for metalling and bridging the road from Berhampoor to Russelcondah, to which we have adverted above (para. 333), is very much to be regretted.

The sugar trade especially needs such relief at the present time.

703. We must again beg attention to the letter just referred to, which is well worth perusal as a narration of simple facts, bearing on the important subject now before us. It is there seen that if the factory were in full work, it would circulate annually in the district no less than seven lacs of rupees; and the powerful effect exercised on the revenue by such dispersion of capital, above remarked upon (para. 262) in the case of Rajahmundry, proves how important it is to the interests of the Government to encourage such operations. Yet Mr. Boothby states (para. 2), that hitherto he has been unable to spend more than a third of the sum above-mentioned, because the absence of roads made it impossible to procure the raw material. Looking at the actual results produced in Rajahmundry, as well as in Canara, it appears certain that not only the cost of perfecting the Russelcondah road, but any amount laid out judiciously in improving the roads of the district generally, would be replaced in a very few years, and would have the effect of permanently raising the revenue.

Particular instance of the loss from want of roads in this regard.

704. A recent writer on the trade of Liverpool thus expresses himself: "Who can venture to assign limits to the trade which India will possess with Great Britain, when

Present state of the roads.

when Bombay, Calcutta, Delhi and Agra, are connected with each other, and with Madras and all Southern India, by the magnificent railways which are already in progress?" To those on the scene spoken of this might be taken for the language of irony, as applied to Madras at least. Not a sod has yet been turned in the construction of a railway, nor is even the line to be taken determined on: and as to the existing communications of the country, they are in a condition worse than those of England in the time of Charles the Second. If any one will attempt to image to himself what the social state of England would be if her magnificent railways, canals, bridges and roads were annihilated, and her communications brought back to their condition two centuries ago, he will obtain some idea of the impediments now opposed to the prosperity and advancement of this country, and which the Government only can remove.

It is to be hoped that a period of improvement is now at hand.

But we trust that now at last the commencement of a new era is at hand: the sanction of the project of an electric telegraphic communication throughout India encourages this hope. We cannot believe that with an electric telegraph established, the roads of the country will be left in their present condition. It seems incredible that things so incongruous should co-exist in the same country; that a message should be sent with the speed of light, while the ordinary mail travels five miles an hour, and that uncertainly; that the Government should be able to send an order a thousand miles in a second of time, while it could not march a regiment ten miles along a main road, without risk of its being stopped by an unbridged nullah; that a merchant at Madras should receive a reply in a few minutes; to a communication sent to Calcutta or Bombay, but should be unable to order down a cart load of sugar from Palmanair, with any certainty as to the time of its arrival, or even as to its safety. It is fair to conclude, that the same large and liberal conceptions which gave the one improvement will not long withhold the other.

The want of Engineer Officers.

705. And in order to the prosecution of both species of undertaking, works of irrigation as well as of communication, a large increase in the engineering establishments is absolutely necessary. Even now, with the present very meagre scale of work, operations are much hampered by the want of engineers. We have recently received a letter from Mr. Forbes, the Collector of Cuddapah, which places the inconvenience of the paucity of Engineer Officers in a striking point of view. We have mentioned how entirely the internal communications of that fine district have been neglected; within a short period several grants have been made for their amendment, but now these are actually inoperative from the want of officers to act upon them. Mr. Forbes enumerates no less than four works thus arrested. Two of these are for the improvement of portions of the road from Cuddapah to Madras, on estimates to the amount of Rs. 27,000; the two others are the tracing of passes through mountain ranges, one of them is across the Nullah Malay hills, spoken of above as so often applied for in vain by the authorities of the Kurnool district, the other is a pass from the Cuddapah district into that of Nellore. All these four important works in that much neglected district are now at a standstill from the mere want of officers to carry them on.

This partly the reason of the absence of improvements.

706. And we believe that to the same cause is partly owing the small extent of works undertaken throughout the country; for without Engineers, projects cannot be investigated, or the necessary preliminary surveys and inquiries made, nor can even the necessity of an improvement be made known, or the existence of the evil to be remedied. It seems probable that the striking contrast observable in the condition of the West and of the East Coast with regard to the means of access into the interior, is greatly due to the fact, that on the former there have been officers with leisure to attend to the roads, while on the latter there have not. In Canara and Malabar there are no works of irrigation, and the Engineers there have had time to give attention to the roads. In all the districts on the East Coast, on the contrary, except the two most northerly districts, the number of Engineers has always been far too small even for properly attending to the irrigation works; and in Ganjam and Vizagapatam, there has never been even one Engineer Officer till recently.

Remarks on the scale of establishment proposed.

707. We will now offer a few general remarks in reference to the scale of establishment which we have proposed above. We are well aware that the amount will at first sight be thought excessive. But we have not formed our opinions on this important part of our duty without long and anxious deliberation; and as we are conscious that our propositions far exceed anything heretofore contemplated or thought

thought of by the Government, we will now give some further reasons, in addition to the considerations above set forth, in vindication of our proposals.

And first we would earnestly call attention to the vast magnitude of the work to be accomplished; unless this is fully realized, the proposed establishment, seen by itself, must inevitably appear enormous. Let it be remembered then that the Madras Presidency contains above 138,000 square miles; besides the Mysore country, with an area of 28,000 square miles, which is also administered by officers of the Madras service, and which must be included in all arrangements for the future; the whole extent of country being thus 165,000 square miles. As to the population of this extensive territory: that of the Honourable Company's own provinces amounts, by the census completed last year, to 22,281,572 persons; and adding only 3,000,000 for Mysore, we have a total population of 25,000,000 and a quarter. The country then for whose improvement we have to provide is, within a trifle, three times as large as England and Wales, and contains a population considerably more than one-third larger.*

Extent of territory and amount of population.

708. And the work to be done in this vast territory and for this large population, is, first, though of insignificant account in comparison with the other two, to preserve the numerous Government buildings in all parts of the country, the aggregate value of which considerably exceeds a million and a half sterling, and to add to their number from time to time as may be required; second, to maintain and manage and keep in efficient repair the numberless works of irrigation, on which are dependent a revenue of Rs. 150,00,000 annually, and private income to the annual value of probably two millions and a quarter sterling; and not only to maintain the existing works, but to extend them, by taking advantage of the many openings for turning to beneficial account the volumes of water now annually wasted; and third, not simply to maintain, but to create a system of internal communications commensurate with the wants of 25,000,000 of people, and such as is absolutely necessary to enable them to advance in wealth and civilization; we may indeed say, to enable the products of this country to retain even their present dubious position among those of other countries of the globe.

The works to be done by means of the establishment.

What the state of the internal communications now is throughout the country, we have described already; and they have to be gradually brought up from this abject state into a condition more befitting the claims of the nation holding rule in this country, to civilization. And it must not be forgotten that under the centralizing system which has ever prevailed in India, and more emphatically in the Madras Presidency, the whole staff necessary for directing the execution of this great work must appear on the Government establishment. There are here no local or corporate bodies to divide the work with the supreme power. We have no turnpike trusts, no canal or railway companies. All must be done by the central power; who indeed in their capacity as sole landlord of almost the whole of the soil, stand in the position of that body which in every country not yet possessed of much commercial wealth, has the greatest interest in the formation of roads, and commands the largest funds for the purpose.

709. Such is the task to be performed; a great work undoubtedly, one which in its most important parts has been too long staved off, but respecting the importance of which, we trust, a juster appreciation prevails now in the places of power than at any former period. But, large as it is, there is too much vagueness in the idea when presented in this general view, and we will therefore endeavour to ascertain the value of the property and of the interests to be preserved and fostered, and to bring that into comparison with the cost of the establishment proposed for the purpose. As a preliminary, we must estimate the proportion of the whole cost of establishment due to each of the three branches of work above enumerated. And it will probably not be very far from the truth, if we assume one-eighth of the whole to be due to buildings, one-half to irrigation works, and three-eighths to roads. That is to say, the annual cost of the proposed establishment for buildings is Rs. 1,84,000; that for irrigation works is Rs. 7,35,000; and that for roads and other communications is Rs. 5,50,000.

Proportion of the cost of the proposed establishments to the value of the property to be cared for.

710. Now

* McCulloch's "Statistical Account," (3d Edition, Vol. I. p. 6), gives the area of England and Wales as 57,812 square miles; the population by the census of 1851 is 17,922,768, or a trifle under 18,000,000.

The Government
buildings.

710. Now as to the value of the property concerned; and first, that of the buildings. The dead stock account systematically kept by the Military Board, of all works under their control, affords the best information as to the value of those works, and we find it to amount to 112 lacs of rupees. As to other buildings, viz., those under the Board of Revenue in the Department of Public Works, we have not such accurate information, because the annual returns of those buildings do not show their money value. But in the Accountant-general's Office we have accounts of the actual cost of construction of all buildings, both in the Military and in the Civil Department; and it will give a near approximation to the truth, if we take for the present value of the civil buildings, a sum bearing the same proportion to their first cost, as the present value of the military buildings according to the dead stock accounts of the Military Board, bears to the first cost of those buildings. Now the first cost of the buildings under the Military Board (omitting the Saugor Division, of which the Military Board have not the accounts of the first cost,) amounted to 199 lacs, and the present computed value of the same buildings is 97 lacs; the first cost of the civil buildings was very nearly 102 lacs, and their present value, after allowing for depreciation at the same rate as for the military buildings, will be nearly 50 lacs. To these two sums must be added the value of civil and political buildings in Mysore, and at Hyderabad and Kamptoc, which are under the professional charge of the Superintending Engineers of those divisions respectively, but without the control of the authorities of their own Presidency. The value of these may be taken at fully 15 lacs, bringing up the whole value of the buildings to be professionally cared for to 167 lacs of rupees; upon which the proposed cost of the annual establishment is no more than $1\frac{1}{16}$ per cent.

The irrigation
works.

711. Next as to irrigation works. For these we have no specific valuation, but we can without difficulty arrive at one quite sufficiently correct for our purposes. The annual revenue derived to Government from irrigated land amounts to 135 lacs; besides Government revenue alienated to various classes in the form of enam or rent-free holdings, and which may be estimated at 15 lacs more. This makes a total of Rs. 150,00,000 of annual revenue dependent on the works of irrigation; and taking the proportion which we have already stated between the revenue and the gross produce, viz., taking the revenue as equivalent to two-fifths of the whole crop (which is certainly a full valuation), the total annual value of the whole gross produce of irrigated land will be 375 lacs of rupees, or 3¼ millions sterling.

Their value.

Again, to take the value of the works themselves; we have repeatedly stated that a vast amount of capital might now be invested in every district in the construction of works of irrigation which would yield a return of from 25 or 30 to 50 or 60 per cent. on the outlay; but all who are acquainted with the existing works formed by the Native Governments know that many of them yield a far smaller ratio of profit. The reasons for this difference are various; many of the works were placed in very badly selected positions, frequently from want of engineering skill and judgment in the projector; though sometimes in consequence of the limited extent of the dominions of the petty chief undertaking the work; and again from the want of constructive skill, the cost of the work was often far larger than it need have been. Another cause is, that the works now irrigate far less land than they once did, and than they might at comparatively small cost be made to do again; because the care and the preservation both of the works themselves and of their sources of supply, have been too much neglected by the British Government. On all these considerations, we think that 10 per cent. may be taken as the annual return in revenue yielded by the existing works, on their original cost; and on this basis, the value of the work is 1,500 lacs, or 15,000,000 sterling.

Per-centage of the
cost of establish-
ment.

712. We find then that the annual cost of the proposed establishments for the custody and maintenance of the irrigation works, being Rs. 7,35,000, is less than two per cent. on the annual income derived from them; and under one half per cent. upon their estimated capital value. It surely cannot be considered extravagant to propose so trifling a charge for the maintenance of these valuable works. But to state the case in this way only, by no means does justice to it; for our proposed establishment is drawn up with a view not only to the efficient maintenance of the existing works, but to that extension and improvement of them, and to that formation of new and most remunerating works, which in the earlier part

of

of this report we have urged as so desirable. Indeed it may safely be said that the establishment for irrigation works will not be at all a charge, but a source of gain; for the revenue obtained from the improvement effected both in the economical execution of work, and in the efficiency of the works themselves, will pay the whole cost of that establishment, besides a large per-centage of profit on the direct outlay.

713. With respect to the value of the property which will be under the charge of the Road Establishments, if we take the money value of the works of communication now existing, it will be found to be extremely small; simply because the vast importance of roads has been hitherto so lamentably overlooked by our Government. But we earnestly trust that the time has at last come, when their value is more justly appreciated; when the vast benefits which they have conferred on other countries is more generally recognized, and it is seen that the like advantages, similar advance in wealth and civilization, will follow their introduction in this country also; and our proposed establishment, therefore, is planned on a scale sufficient for the gradual formation of a system of good roads and canals on the main lines. In a former part of this Report (para. 470) we attempted to estimate the gain from such a system of communications as we advocate, when fully in operation; and we found it to amount to 960 lacs of rupees yearly, (clear of the cost of maintenance,) in the saving of the expense of conveyance. Comparing the amount of our proposed establishment for the roads with this yearly profit from the works to be effected by their means, we find that its whole yearly cost is less than $\frac{1}{2}$ per cent. upon such annual value. And in thus speaking of the value of cheap and rapid means of transport, we cannot but add our opinion that compared with this, even the maintenance and extension of irrigation is of secondary importance. Irrigation, like machinery, multiplies the produce of the soil and of labour, and provides a fund for the employment of labour on other objects besides the production of food, and so it tends to soften and humanize the character; but its influence can only be felt in a limited degree without good roads. While the latter, though they do not directly increase the produce of food or of commodities, yet give to industry and materials a higher exchangeable value, call out the peculiar resources of all localities, spread civilization and improvement into deserts, and by cheapening production, give all classes a larger command of food, as well as of all other commodities of necessity or convenience.

The road establishments compared with the gain from good roads.

714. Whether then we look at the extent and populousness of the country for which we are to provide, at the vast magnitude of the work to be done, or at the pecuniary value of the property concerned, the cost of the establishments which we now propose ceases to appear in any degree exorbitant. But perhaps this will appear more clearly if we show it in comparison with the charge for superintendence in other places. We must again express regret that we have not the means of comparing it with the corresponding cost in England; a country in which the minute division of labour, and the art of economizing it by employing its various species in the most judicious and profitable manner, has been carried further than in any other. The little which we do know of the modes of doing work there, satisfy us that actual experience has there led plain, practical, economical men to adopt, and to consider necessary a much larger proportion of what is called superintendence than we have provided for in our scheme; and this, notwithstanding the causes above enumerated (para. 500), which render more superintendence necessary in this country than in England, and which also make the money ratio of superintendence to work, larger here than there. But we have not the means of making the comparison, and we therefore turn to the experience of a country of which we know more, and which more resembles that with which we ourselves have to deal; we mean the Presidency of Bengal.

Cost of superintendence in England.

715. We were anxious to obtain a view of the whole expenditure in Public Works in Bengal for a series of years, and of the whole charge for establishments and superintendence, for the purpose of making the comparison for the whole Presidency; but we failed to obtain the necessary materials. But in support of our recommendation of increased superintendence on works in this Presidency, especially on those of irrigation, we are anxious to call attention to one fact of Bengal experience; viz., to the large amount of superintendence which has been accumulated on the irrigation canals in Upper India. These are works which have obtained a special share of the attention and care of the Governments of the N. W. Provinces and of India, on account of their great public utility; able officers have been carefully selected for their superintendence and management,

Comparison with Bengal.

The canals in North India.

ment, and means have steadily and consistently been adopted for securing efficiency in their management. Now we wish to attract special attention to the fact, that in the case of these works, respecting which the Supreme Government, the Agra Government, and the able Engineers in charge of them, have for so many years been willing and anxious to do what should best increase their efficiency, the measures adopted in order to obtain that end, have been precisely the same as those which the ablest Engineers here, as well as the Board of Revenue, have for so many years been endeavouring in vain to press on the attention of our Government in the case of the irrigation works of this Presidency; that is, a really efficient establishment has been constituted for them.

Cost of the establishment upon them.

716. On referring to the published documents respecting the Western Jumna Canal, and the Doab Canal, we find the following facts as respects the cost of superintendence upon them. The restoration of the ancient canals, now called the Western Jumna Canals, was commenced in 1820; but the work appears not to have been completed till about 1835. During the last 10 years preceding the time of Major Baker's General Report, viz., from 1837-38 to 1846-47, the average annual cost of maintaining the works, including both improvements and ordinary repairs, was Rs. 66,687. The average annual cost of the establishments of the canal during the same period was Rs. 60,306; but from this is to be deducted the cost of the establishment maintained for collecting the revenue of the canal, and that cost, as nearly as we can compute it, from the rather scanty details given by Major Baker, was 24,242, or about 84 per cent. on the collections. This amount being deducted from 60,306, the whole cost of the establishment, leaves Rs. 38,064 as the cost of that portion maintained exclusively for the conservation and repair of the canal and works; being 57 per cent. on the annual amount expended on the works. Again, to take the Doab Canal; on the average of the 10 years, 1835-36 to 1844-45 (the last 10 given in Colonel Cautley's Report), the yearly cost of improvements and ordinary repairs was Rs. 71,783, and that of the establishment was Rs. 33,640. It seems uncertain whether this latter includes the establishment for collecting the revenue of the canal: supposing that it is included, and that it equals 84 per cent. on the collection, as in the case of the Western Jumna Canal, it will amount to Rs. 6,980; and this sum, deducted from the whole cost of the establishment, will leave Rs. 26,660 as that of the portion employed solely in the care of the canal, being 37 per cent. on the amount expended on the works. But if, as seems probable, the cost of collecting the revenue is not included in the establishment, but is deducted from the gross receipts, then the cost of the establishment for the custody and maintenance of the canal, will be 47 per cent. on the annual amount of work.

Efficient establishments are needed here also.

717. Large as this proportion may appear, we are very far from intending to imply that it is larger than necessary; on the contrary, we quote these two instances in support of the opinion which we have already given (paras. 502 and 507) as to the necessity and the value of superintendence both in the custody of works so exposed to damage as channels and tanks, and also in managing the distribution of the water, and preventing its waste. We have already given our reasons for absolutely denying the doctrine that a comparison of the cost of superintendence with that expended in work affords any criterion whereby to judge of the sufficiency of the former, and in the present instance, we see no reason to doubt that the cost of efficient superintendence is more than repaid by the very saving in the amount required for repairs; not to speak of the additional and vastly greater benefit of preventing waste of water, and so obtaining a much larger extent of irrigation, a much larger profit to individuals, and a much larger revenue, from the same works and the same quantity of water. Nor does this truth apply to the larger works only; it is true in degree of all works of irrigation whether tanks or channels. Now the establishments which we propose for the maintenance of the irrigation works of this Presidency (including also a provision for their large extension) amounts indeed to 70 per cent. on the present very inadequate expenditure, but only to 324 per cent. on the larger scale of outlay that we advocate; while on the two canals on which we have now been remarking, the annual cost of Engineering Establishments is respectively 57 and 37 per cent. on the annual outlay.

Details of the establishment on the North India Canals.

718. But we will examine a little more closely (though as briefly as possible) the particulars of the conservative and executive establishments maintained on those two works, as compared with those existing for similar works in this Presidency. The Western Jumna Canal is 4744 miles in length. It is formed into nine

nine divisions, averaging 53 miles in length; and to each of these there is a European Overseer, with a native establishment of three Maistries, three Chupprassies, two Classics, and three Chokidars, in all 11 persons besides the Overseer. Over the whole there are a Superintendent and three Assistants (apparently all of them usually Commissioned Officers, though, as a special case, one was of warrant rank at the date of the report), with a large establishment of natives of various denominations and grades, to the number of 52, of whom two-thirds or 34 may be assigned to the management of the canal, and the remaining one-third to the collection of the revenue. Thus for the custody and maintenance of this canal, excluding the collection of its revenues (except that part of the time of the Superintendent, and perhaps of his three Assistants, which may be given to that object), there are four Commissioned Officers, nine Warrant or Non-commissioned Europeans, and 151 natives; in all 164 persons. Thus there are on this canal, one Commissioned Officer to every 119 miles, one Warrant or Non-commissioned Officer to every 53 miles, and one native to every three miles. Again, the Dooab Canal is 140 miles in length, with one branch apparently about 20 miles long; total 160 miles. It is divided into three parts, each superintended by a European officer. The Europeans on the canal are as follows: an Executive Engineer, an Assistant Engineer, two Overseers and two Assistant Overseers. Thus there are here, one Commissioned Officer to every 80 miles, and one Non-commissioned Officer to every 40 miles. But Colonel Cautley wrote in 1845 that this number of Non-commissioned Europeans was quite insufficient, and he strongly recommended that they should be increased from four to six. The number of the native servants employed on this canal is not stated.

719. Now let us compare the above with the state of some of the principal canals under the Madras Presidency. The Calingaroyen and the Tadapully Channels in Coimbatore, are respectively, 52 and 44 miles in length; the Wyacondan Channel in Trichinopoly is 30 miles long, and in Tanjore there are a number of canals of large size, being, in fact, almost rivers in dimensions. Again, there is the canal from the lower Coleroon anicut to Porto Novo, which, besides supplying irrigation to hundreds of thousands of acres, is capable, if well managed, of affording a very valuable line of water carriage, 35 miles in length; and there is the Cochrane Canal from Madras to Pulicat, which, in conjunction with the Pulicat Lake, forms a navigation 60 miles in length. Now, of all these canals and of the many other valuable and productive channels and tanks of large size, there is not one work, or even any one set of such works, which enjoys the peculiar care and attention of a European officer of any grade. The utmost amount of professional or skilled superintendence enjoyed by any of these important works consists of the hundredth or the five hundredth part of the time and attention of the Civil Engineer or his Assistant; who have also to attend to many thousands of other works, spread over an area of 16,000 or 20,000 square miles. Nor is there even any effective native agency in existence to supply this want of European superintendence. It is true that there are a few natives employed on each great work; but they are so few in number, they are so wretchedly paid, are so entirely removed from any real or efficient control, and in its absence are consequently so much in the selfish interests of influential Ryots, that it can hardly be said that they exercise any beneficial control over the works or the distribution of their water. Hence the strong contrast presented by the exact, orderly and systematic arrangements of the canals of Upper India, and the careful distribution of their water, with the loose, irregular, capricious management of our great channels, some villages drawing off and wasting a vast deal more water than they can use, while others receive far less than they require and are entitled to, and this without the possibility of effective redress.

720. And what makes this difference of treatment the more remarkable, is, that while the channels under this Presidency need effective superintendence and management not less than those in Upper India (a want common indeed to such works, in all parts of the world), they are far more capable of bearing the charge. For while the Western Jumna Canals yield a revenue of less than Rs. 600 a mile, and that of the Dooab Canal very little exceeds Rs. 700 a mile, the revenue from many of the Madras canals of irrigation exceeds Rs. 5,000 a mile; and in few or none of the larger class does it fall so low as Rs. 1,500 a mile; * and the
Cochrane

Comparison with the very deficient establishments under this Presidency.

The income from the Madras works per mile is very much greater than from those of North India.

* In order to show that we have good ground for this assertion, we append a short statement, showing the length, the total revenue, and the revenue per mile of some of the longest channels in the
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Cochrane Canal, though not a legitimate source of revenue at all, affords a net income of Rs. 30,000 a year, which would much more than provide efficient superintendence and repairs, but which, instead of being so laid out, is remorselessly swallowed up by the exchequer.

And therefore an efficient establishment would be a much lighter charge in their case.

Again, the cost of the establishment maintained on the canals in Upper India amounts to 13½ per cent. on the revenue, in those west of the Jumna, and to 26½ per cent. on that of the Dooab Canal. But we have already said (para. 509), that all the more considerable works under this Presidency might be placed under efficient special custody and management, at an outlay of from 2 to 3 per cent. on the revenue they produce respectively. Probably 2 per cent. would everywhere be sufficient for this object; and this added to 3½ per cent., being the general per-centage of our proposed establishment to the whole revenue from irrigation, would raise the whole apparent charge for superintendence on such works to 5½ per cent. on the present revenue, being very far below the proportion in the North India Canals. But we would by no means be understood to imply that the new charge would in reality be any addition at all to expenditure. On the contrary, we fully believe, and this is our chief ground for advocating it, that the cost of the additional establishment would be repaid many fold in the economising of water; for under the present absence of any systematic or effective control, a large proportion of the water brought at great expense into a channel, is let out again in wanton or wilful waste. The prevention of this waste would alone suffice in a vast number of instances, greatly to extend irrigation, and so secure crops now always precarious; but as it involves the increase of the ratio of the cost of establishments to that of work, it has hitherto been thought better to effect the same object by the far more costly means of bringing more water into the channel (to be similarly wasted in great part), or better still, not to attempt to effect it at all.

The income from the North India Canals as compared with their original cost.

721. Having had occasion thus to advert to the canals of Northern India we are unwilling to quit the subject without one remark on another particular connected with them, viz., the amount of revenue that they yield. These canals were originally undertaken for the purpose of irrigation only, as we learn expressly from the reports of Colonel Cantley and Major Baker. The advantages to be derived from making them available for traffic also, attracted attention subsequently; but as regards boat navigation, this object has never been attained, and appears to be unattainable without vast improvements in the canals; and the rafting of timber upon them has been carried on to a very limited extent, and seems to be diminishing. Thus we must look to irrigation alone for a return for the cost of these works.

Now, the first cost of restoring the Western Jumna Canals was about 15 lacs, omitting the cost of the small improvements made subsequently to 1835-36, and including a fair proportion of the cost of establishments down to that time. The average gross annual revenue from the canal from all sources for the 10 years above specified, is Rs. 2,82,740, and the net revenue, after deducting the average annual charges of collection, and repairs of the works for the same period (being 1,68,935), is only Rs. 1,13,805, or 7¼ per cent. on the original cost.

the southern districts; others inferior to smaller than these in point of length, yield a larger revenue per mile than any of them.

District.	Name of the Channel.	Length in Miles.	Total Revenue in Rupees.	Revenue to the Mile in Rupees.
Tanjore	Munniaur	47	187,133	4,000
	South Rajah Voykaul	33	128,458	3,878
	Oodumboyee	21	129,023	6,144
Trichinopoly	Wyscondan	30	162,772	5,426
	Iyen Voikaul	20	105,500	5,275
South Arcot	North Rajah Voikaul	27	73,120	2,830
	Yuddavaur	14½	71,602	4,939
Coimbatore	Calingaroyen	52	86,749	1,668
	Todupully	44	77,077	1,752
Tinnevely	Cannuden Channel	20	162,297	8,120
	Calagan ditto	21	60,978	2,903
	Mundoor, Upper Branch	21	131,671	6,270
	Pauliaur Channel	26	69,592	3,146

The first cost of restoring the Dooab Canal was Rs. 4,37,995, taking the original outlay only. During the 10 years taken for comparison in a former paragraph the average gross revenue was only Rs. 82,120; but as it increased considerably after the commencement of that period, we will take the last five years of it only. The average yearly collection during these five years was Rs. 99,849, and the annual establishments, repairs and improvements, amounted to Rs. 1,20,654, being materially in excess of the receipts. But we will consider all improvements as a part of the original cost, which will then amount to Rs. 8,81,851. The gross annual income during the last five years being, as already said, Rs. 99,849, the cost of establishments and of ordinary repairs is Rs. 69,471, leaving a net annual revenue of Rs. 30,378, which is less than 3½ per cent. on the capital invested in the works.

722. We learn from Major Colvin's Memoir on these canals, in the Appendix to Major Baker's Report, that in authorizing their construction the Government did not seek "to form a productive source of revenue," but that they looked for the reimbursement of the outlay to the general improvement of the country and its resources; and, therefore, though the direct return in one of these two cases is one-third less than the interest payable by Government on money borrowed, it cannot be said that the object of the works has not been attained. But we would ask, if the policy here indicated is wise and right in the north of India, why is it not equally so in the south? The new works of irrigation constructed in this Presidency have yielded 20, 30, 50, 80, and even more than 100 per cent. annual return in direct revenue (*see* Appendix Z.), and there are numberless openings for other works sure to return fully as much; and yet capital to turn to account these enormous advantages is withheld by the Government. Far from looking to the general improvement of the country, as in any degree an object in entering on such works, or as a justification of expenditure on them, a sure prospect of an exorbitant profit in direct revenue is made one indispensable condition of a grant. We do not ask the Government to spend money on works not likely fully to repay the interest of the capital in direct return, because numberless works remain to be executed, which would return vastly more. But we do seek to awaken them to the importance of taking advantage of those opportunities; and we do plead for the adoption of the liberal and enlightened policy of the north of India, so far as to regard the increase of wealth and comfort to the people, as in some degree an end to be consulted by the Government. On such principles the improvement of irrigation would be extensively undertaken, a moderate assessment would be imposed on the land benefited, and the increase of revenue thus obtained, would be devoted gradually to the reduction of the heavy taxation which now presses on industry and checks cultivation and improvement in so many parts of the country.

That from similar undertakings here is very much greater.

723. The various matters which were generally to engage our inquiries were enumerated in the order of Government of the 21st March 1851, and the memorandum from the Chief Secretary of the 22d idem, both of which will be found in Appendix (A.); and some other matters were from time to time sent down by Government for our consideration and report, in the several orders of the 10th and 24th April, 8th and 30th May, and 14th and 17th June, of the same year. In the foregoing Report we have gone over all the subjects thus placed before us, with the exception of those connected with the accounts and correspondence, and the employment of convicts on Public Works. As respects the former of these topics, the accounts and correspondence of the department will form the subject of a second Report, agreeably to the arrangement signified by us to the Government on the 12th May 1852, and approved by them; that Report is already in a state of forwardness, and we hope to be able to submit it at an early period. With regard to the employment of convicts on Public Works as a means of saving expenditure, we will here offer a few brief remarks.

Conclusion.

724. The practice of employing convicts in detached gangs under the Public Works Department, was abrogated under this Presidency in accordance with orders from the Indian Government, based on the fact that such employment of the same class in Bengal had been very unhealthy. That experience does not appear to have been supported by the results here; but taking a practical view of the matter, we are of opinion that the subject is of little importance as regards the economical execution of work, because the whole assistance that could be so obtained would be insignificant.

The employment of Convicts on Public Works.

The amount of such labour available is too small to be of importance.

The returns for the first half of the current year give the entire number of convicts under sentence of labour throughout the districts of this Presidency, as 5,705 in 24 Zillah gaols and 15 dependent gaols. Of this number 3,215 were employed on the public roads and streets; 781 were in hospital, attending on the sick, cooking, or clearing the gaol, &c.; 451 were employed inside the gaol, some on work that could not be dispensed with; and 1,258 were employed outside, on work other than the roads and streets, but some of it unavoidable. On the whole, judging from the actual number and distribution of the convicts, and remembering the rules which restrict the employment of certain classes of convicts to labour within the gaol, we think that no more than 2,000 at the most could be made permanently available for employment under the Public Works Department, without very much neglecting the station roads and streets. Now there seems good reason to believe that with the very short day's work of convicts, the incumbrance of their irons, and their habitual listless style of labouring, a given number of them do not do more work in a day, at the outside, than half the number of free labourers; and at this rate the labour of 1,800 convicts (10 per cent. of the 2,000 being deducted as in hospital, cooking, &c.) would be equal to that of 900 paid labourers. The value of the work of these latter at two annas a day for 300 days, would be Rs. 33,750; and this then would be the measure of all the aid that the Public Works Department could receive from convict labour in a year. But against this is to be set the extra cost of lodging and guarding convicts in temporary gaols, over and above what it would be in the permanent buildings, besides that of marching them long distances backwards and forwards to and from their own zillahs, for exchange, release, &c. All this would further reduce the net value of the work obtained, and it would become so trifling in comparison with the whole amount of work to be done in the Public Works Department, as not to deserve serious consideration.

Suggestions as to the management of convicts when employed on Public Works.

725. As respects that department, then, we regard the question of the employment of convict labour as one of no importance. And we cannot but think that it is one much more appertaining to the subject of prison discipline, and to be dealt with on other considerations than those with which the Public Works Department has to do. We will only offer two suggestions as to the mode of working convicts under that department if ever they should be so employed, as they may properly be occasionally, in the immediate vicinity of their own gaols.

Whenever it may be deemed expedient to give to any officer executing work the aid of convict labour, we are of opinion that the party ought, nevertheless, to remain under the charge of the judicial or magistrate department, and that the executive officer should have nothing to do with them beyond directing their labour. We also deem it of much importance, that in every such case the work done by the convicts should be accurately valued and paid for in cash by the executive officer, like any other work; the amount being received by the officer in charge of the gaol or party, and credited to Government in his accounts, under the proper head. It is usual at present in the annual statements, to show a value for the labour of the convicts; but the value so set down is merely nominal and fictitious, and is no true criterion of what has been done. In place of this we would have a real *bona fide* valuation, the work done by the convicts being appraised at the same rates as that done by free labour, and paid for in cash. There will be several advantages in this plan. It will ascertain accurately the real value of the convicts' labour; it will simplify the accounts of the work, and it will exhibit its real cost, instead of an arbitrary sum being deducted from the estimate or added to the bill, as the assumed value of convict labour. We cannot but think that if the assistance received from convict labour on public works had always been thus valued, and, in particular, if it had been customary to balance the value of work done by gangs stationed in temporary gaols against the extra cost of so employing them, it would not be deemed a matter of much moment whether they were permitted to be so worked or not.

(signed) J. D. Bourdillon.
F. C. Cotton, Major.
G. Baifour, Major.

Madras, 23 December 1852.