The Hon. H. Sullivan
The Hon. T. J. Carmichael
Capt. Mc Leod
The Col. Hon. Sec.

P. Fr. C. No. 7781.

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All communications should be addressed to the Secretary.

No. 1126 L

GOVERNMENT OF INDIA.

PUBLIC WORKS DEPARTMENT.

GENERAL.

To

The Secretary to the Government of Madras,
Public Works Department.

Simla, 18th August 1883.

Sir,

In continuation of Resolution No. 1120 L dated 17th August, I am directed to forward for information a set of the correspondence and notes on the re-organisation of the Engineer Establishment quoted in the preamble of the Resolution.

I have the honor to be,
Sir,
Your most obdt. servant

G H Walker

offg Under Secy to the Govt of India

Document accompanying

Papers referred to above

Confidential

C. & W

Please two Copies can be sent Chief Engr & Indian: in Confidential Cover — in reply to their letter — adding that 10 Copies will follow on receipt

12.11.83

A.C.

Despatch Confidentially.

R.S.
13.11.83

Confidential

For Govt of Madras

Correspondence and Notes on the re-organisation of the Engineer Establishment of the P. W. Department, consequent on Secretary of State's Despatch No. 18 P. W., dated 22nd March 1883.

INDEX TO CORRESPONDENCE AND NOTES ON REORGANISATION OF THE ENGINEER ESTABLISHMENT.

I

Correspondence between the Government of India and Secretary of State on the reorganisation of the Engineer Establishment.

(1).—Despatch No. 50 P.W., dated 6th September 1881, from Secretary of State with enclosures, being memoranda by General Hannygton and General R. Strachey.

(2). Despatch No. 50 P.W., dated 16th December 1881, to Secretary of State with Appendices A and B.

(3). Despatch No. 8, dated 20th February 1882, to Secretary of State.

(4). Despatch No. 18, dated 22nd March 1883, from Secretary of State.

II.

Office-note with Appendices A, A. A., B., B. B., C. and explanations of the tables showing the probable effect of the orders on the rate of promotion.

III.

Further office note with Appendices D. and E. proposing measures for maintaining an uniform flow of promotion at what may be considered a fair rate for 33 years.

IV.

Note by Colonel W. S. Trevor, R. E., on the question of net Military pay of Royal-Engineers (paragraph 20 of Secretary of State's Despatch No. 18 of 1883 with 8 tables.)

V.

Note by Colonel W. S. Trevor, R. E., on the rate of promotion; proposals for accelerating the same, and for adopting an incremental in preference to the present graded scale, with tables P. Q. R. S. T.

VI.

Supplementary note by Colonel W. S. Trevor, R.E., on the proposed pay of Royal Engineers in the two first classes (Chief and Superintending Engineer) under the proposed incremental scale, also on the method of giving increments and officiating allowances under the proposed system.

VII.

Supplementary note by Colonel W. S. Trevor, R. E., on the method of adjusting the pay of officers when they are brought on to the incremental scale.

CORRESPONDENCE BETWEEN THE GOVERNMENT OF INDIA AND SECRETARY OF STATE ON THE REORGANIZATION OF THE ENGINEER ESTABLISHMENT, QUOTED IN THE PREAMBLE OF THE RESOLUTION CONVENING A COMMITTEE OF ENGINEERS TO CONSIDER THE QUESTION.

[No. 1.] No. 50 P. W., dated 8th September 1881.

From—The Secretary of State for India,

To—The Government of India.

Your letter in this Department, No. 97, dated the 2nd November, regarding the reorganization of the Engineering Branch of the Public Works Department, has been before me in Council, and the propositions contained in it have received my consideration.

2. The special measures taken in consequence of the reduction of Public Works expenditure in 1879 resulted in the retirement of 243 members of the Engineer establishment in various grades; but it is manifest, as was indeed to have been expected, that those measures alone did not suffice to place the establishment on a satisfactory basis, and that much careful consideration was still required in order to set it on such a footing as should secure present efficiency without excessive expense, and should, as far as possible, give security against the recurrence in the furure of those serious evils arising from the absence of a sufficient control over the strength of the establishments, which have led to such objectionable results in the past. Necessary elements of such arrangements would be, on the one hand that the members of the establishment should have such prospects of promotion as afford reasonable ground for contentment, and on the other a power of expansion and reduction according to the public need.

3. In regard to this last point, it is hardly needful to call your attention again to the more general use of the contract system. I am aware that many difficulties have retarded the extension of this system in the works of the Department, and specially apparent enhancement of rates. But if it be considered how much would have been saved to Government by freedom from the heavy charges incurred on account of establishments which have acquired claims upon them, it may well be doubted whether the earlier extension of the use of contract, even at considerable temporary excess of cost, would not have left us now in a much better economical position.

4. In regard to establishment required for the maintenance of Railways also, it is probable that, as pointed out in my Railway Despatch No. 64 of 28th April last, various Railways, when finished, may be grouped into systems which could either be brought under the management of existing agencies or might be handed over to new companies to be worked, and that thus the growth of Government establishments in proportion to extent of new construction may be kept down.

5. Further, it should be henceforth regarded as the fixed rule that the permanent Public Works Establishment in any province or branch of the Department should be regulated by the ascertained requirements of the service for the discharge of the duties which may certainly be reckoned upon as recurrent year by year, irrespective of any large new undertakings, provision for which should be made when necessary by the temporary employment of persons especially engaged for such periods, as in each case may appear desirable, and on the distinct understanding that at the end of such employment no claim will arise for pension or continued service under Government. The needful rules for the practical adoption of this system should receive the early consideration of your Excellency.

6. I notice that, in the 15th paragraph of your letter, your Excellency observes that you think you have ground for hoping that some augmentation of the sanctioned strength of the staff will be made, and that, with the close of the war and with returning financial prosperity, it may be possible, without an undue strain on your resources or credit, to lay out more money in the development of the country. On this point I would draw your Excellency's attention to the Despatches mentioned in the margin, in which it was pointed out that sudden retrenchment, followed in a few years by a great expansion of operations, was likely to prove wasteful; that a permanent reduction of Public Works expenditure was absolutely necessary: that such reductions of establishment were requisite as would admit of the reduced amount being laid out in an economical and advantageous manner, which would be impossible if the annual expenditure were soon enhanced; that at all events for some considerable time to come, it would not be prudent to increase the amount to be expended on Productive Works beyond the limit of 2,500,000*l.* a year; that the policy of maintaining a reduced staff of 900 on the *permanent* establishment, to be eventually brought down to 800, of whom a considerable number would be natives of India, had Lord Cranbrook's cordial concurrence, and that no permanent establishments should be kept up in excess of those for which your Government were reasonably

To Government of India, March 27th, 1879, No. 105 Financial, paragraph 6.
To ditto, Otober 23rd, 1879, No. 420 Financial, paragraph 5.
To ditto, November 13th, 1879, No. 444 Financial, paragraph 7.
To ditto, February 5th, 1880, No. 7 Public Works, paragraph 4.

certain of being able to provide full and constant employment. I must also observe that I should be especially loth to sanction an addition to the permanent strength of your staff, so soon after a large reduction had been made involving the compulsory retirement of many Engineers who were desirous of remaining in your service, a measure which was only authorized on the representations of the Government of India that it was necessary, and was proposed by that Government on the clear understanding that if hereafter the expenditure on Productive Public Works should be increased, the corresponding increase of establishment would be only of a temporary character.

7. I return now to the immediate subject of your letter under reply, which is the present condition and prospects of the existing fixed establishments. In illustration of the necessity for further action in improvement of promotion in the Department you point out that if no change is made in the constitution of the Establishment, and if no special measures are taken to afford relief, it is inevitable that the Engineers entering the Department in 1881, 1882 and 1883, will have to serve nearly 20 years before they can expect to become Executives of the lowest grade on a salary of Rs. 550 per mensem; whilst you urge that it is essential to the efficient and economical administration of the Department that no Officer of Royal Engineers or Civil Engineer of good education and attainments should be kept after the age of 32 or after a service of more than 8 or 10 years, in the position of Assistant.

8. Lord Cranbrook's Military letter No. 24 of 22nd January 1880, sanctioned a rule prescribing that Officers of Royal Engineers should thenceforth be called on to vacate their appointments on attaining the age of 55; and you now propose to apply the same rule to Civil Engineers.

9. You also propose such a modification of the proportionate lists of Assistant and Executive Engineers as shall alter the numerical ratio from four of Assistants to three Executives, to two Assistants to three Executives. And you would provide for the duties of the Assistant Engineers thus reduced in numbers by introducing a class of Engineers intermediate between the Engineer Establishment and that of upper subordinates; a class to be filled up exclusively in India and, as far as possible, from Natives trained in Civil Engineering Colleges.

10. You defer dealing with the adjustment of numbers or salaries in the different grades of Executive Engineer, and on the whole you do not put forward the present proposals as other than of a palliative and temporary kind. Indeed, you are aware that the scale authorized in your Resolution No. 1198-1211 E G of 4th June 1880 will not produce the result which you desire, even in the promotion of Assistants to the rank of Executive.

11. It seems to me, however, that it should be possible, as it is certainly desirable, to go further, and now to lay down the general lines at least of a scale of establishment which may be capable of permanant adoption. Before proceeding, however, I may say that I agree generally with your views quoted in the 12th paragraph of this letter as to the rate of promotion from the rank of Assistant to that of Executive, which should be regarded as essntial to the efficient and economical administration of the Department, and that I should look, without hope, to the working of a Department in which promotion continued to be retarded in the manner that you indicate as to be expected unless remedies be put in action. I also approve of the application of the 55 year limit of age to Civil Engineers; to this I am disposed to add compulsory retirement after 25 years of service of Officers who have not then attained the position of Superintending Engineers.

12. The introduction of a larger number of natives into the Department, under new conditions, is also quite in accordance with my view of what is desirable. But the mode in which your Government has proposed to effect this desirable measure does not, I confess, commend itself to me. It would appear to be a step backward rather than onward, and too like the creation of a new barrier to the rise of educated natives into higher branch of the Public Works service, a branch which is now at least partially open to them. And it seems to me that it would be on the whole preferable to apply to the admission of natives to this Department, regulations analogous to those which have been recently sanctioned for their admission into the General Administrative Civil Service, and with the application of the same rule of remuneration reduced by one-third below that given to European Officers.

13. Such a rule, if applied to all future nominations made in India, should throw the door more widely open to Natives, and eventually it should be held obligatory to fill defined minimum proportions of the executive and assistant grades with Natives. These should be in great part nominated from the various Indian Colleges, but partly also selected from able and tried subordinates of the Department. It may also be necessary, in order more completely to meet the reduction in the number of Assistants, that the upper subordinate establishment should be enlarged, and in that establishment also it would be desirable to open the door more widely to Native employment.

14. In framing a new scale of establishment for the Department, it will not suffice to rely upon any merely arbitrary, sudden or large measures of compulsory retirement, such as were lately resorted to, and I am satisfied that it is essential to strictly limit the number of admissions to the Department, whilst we provide for a fair flow of promotion by an adjustment of ranks, by a limitation of age in certain ranks (in such cases involving cumpulsory retirement), and by the encouragement of spontaneous retirement.

15. This brings me to the expression of my conviction, after repeated consideration of this subject, that the dfficulties attending the attainment of these conditions cannot be solved without some modification of the existing rules in regard to pension. The limitation of age in certain ranks is essential, and this limitation cannot be enforced without injustice, or at any rate without ruinous disparagement to the popularity of the service, and consequently to its efficiency, unless it be accompanied by material improvement in the inducement to retirement.

16. To assist in arriving at conclusions in regard to the adjustment of the grades of Executive and Assistant Engineers, in such a way as to afford promotion from grade to grade within reasonable periods, and without material enhancement of expense, I have obtained a note * on the actuarial view of the question from General Hannyngton of the Financial Department of this Office. But along this should be read, as essential accompaniments, two valuable memoranda† by Lieutenant-General Strachey one of which carries the necessary calculations to a further and more practical issue, and the other of which deals with the question of the grant of improved pensions to the Department.

* Dated 22nd May 1881.

† Dated 27th May and 18th June 1881.

17. In a matter like this, surrounded with difficulty and so nearly touching the necessities of your administration, I feel it impossible at this stage to lay down a specific scale, and I must again ask your consideration of the subject, hoping that in the communications now made you will find material aid in arriving at the determination of such a scale. I would add that I regard the general features of the schemes suggested in General Strachey's papers, as being at the outset well worthy of consideration and not erring on the score of excessive expense, and that the proportions of the grades which he has suggested seem to comply with the main requirements of the problem to be solved.

18. As to the question of pensions, which is from its nature more difficult to deal with, I am led by a consideration of the calculations in General Strachey's second paper to the conclusion that it would not be inconsistent with the requirements of needful economy to offer somewhat more favorable terms than those he has assumed, and that it would not add materially to the expense of the proposed arrangements if a maximum pension of Rs. 6,000 were granted to Public Works Officers after 30 years' service with an intermediate rate of Rs. 5,000 after 28 years, leaving the pensions after 20 and 25 years at Rs. 2,500 and Rs. 4,000 respectively. In all cases a suitable rule might be laid down to limit the pension so as not to exceed some proportion, such as one-half of the average emoluments of the pensioned officer; and there would be no objection to allow certain periods of furlough to be included in service for pension, for instance, two years' furlough in 20 years' service, three years in 25 years' service, and four years' furlough in 30 years' service. The further consideration of all such points of detail, I desire however, to leave to your Excellency's Government.

19. I have not overlooked the circumstance that a modification of the pension rules of the Public Works Department may possibly be found to involve the reconsideration of the pensions of some other branches of the service. But some change in this particular Department seems unavoidable, and as it appears to be possible in this case, so I believe it will be found possible in others to secure what is desired by a suitable readjustment of the proportion of grades, and the extension of the employment of Natives on lower salaries either with direct saving, or at all events without important increase of charge.

20. In connection with this subject I would request you to consider whether any and what encouragement could be given to a provident fund for the benefit of the officers of the Department, by which we could at least encourage frugality, and return to those who adhered to it, their savings with interest on retirement, or to their families on death. The formation of such a fund could only be usefully brought about with the consent of a considerable number of the officers of the Department, and it must be left quite optional to them whether they join it or not, though I should be disposed to consider it an essential rule, either that an officer once joining should continue a member during his whole service, or that, if he withdraws during the same, he should not be at liberty to rejoin.

21. The future recruitment of the Engineering Department must necessarily be regulated by the number which may ultimately be fixed upon for its aggregate strength. Supposing therefore, the numbers are 800, and the annual vacancies are 4 per cent., the appointments from this country, allowing for 25 per cent., being recruited in India, would average 24 per annum, of which six would be Royal Engineers and the rest Civil Engineers.

22. I would point out in conclusion that the object is to form a compact and well arranged staff of highly qualified officers, composed of a due proportion of Royal Engineers and Civil Engineers both European and Native, properly remunerated in reference to the duties they perform, and with fair hopes of advancement and of ultimate retirement on appropriate pensions, and when additional strength is required for carrying out an extended system of works, which it would be beyond the power of the Department to perform, to obtain it by the temporary engagement of persons specially qualified for the work required to be done.

23. Agreeably to the request contained in the last paragraph of your Despatch under reply, namely, that no more than 17 vacancies in the Indian Public Works Department shall be filled from England in 1884, I have decided that 13 of these appointments shall be offered for competition among the students quitting the Royal Indian Engineering College in that year, the remainder four being filled by cadets of the Royal Engineers from Woolwich.

Dated 2nd May 1881.

Memo—By General J. Hannyngton on the P. W. Department Reorganization.

In order to obtain a solution of the questions proposed, it is necessary, in the first instance, to select a proper Life Table, that is, a table that shall fairly represent the probabilities of life among the class employed in the Department.

It may be doubted whether such a table exists ; but, so far as I can judge, the table prepared by Mr. A. G. Finlaison (on the experience of the Bengal Uncovenanted Family Pension Fund) is the best fitted for the purpose in hand. This I shall accordingly use.

The following data are given in the reference paper :—

Numbers in the Department	800
Age of admission	22 years.
Age on retirement	55 „
The period of service in—	
First Class	5 „
Second „	8 „
Third and Fourth Classes	10 „

It is asked, " What should be the proportion per cent. of members in the several classes to ensure a steady flow of promotion by which the before-named length of service in each class should be secured ?"

The total number of officers in the Department being 800, and the average age of entry 22, the distribution as depending on life contingencies would be as follows :—

Years served.	Number serving.	Years served.	Number serving.
0	30	18	23
1	29	19	23
2	29	20	22
3	29	21	22
4	29	22	21
5	28	23	21
6	28	24	21
7	28	25	20
8	28	26	19
9	27	27	19
10	27	28	19
11	27	29	18
12	26	30	17
13	26	31	16
14	26	32	15
15	25	33	14
16	24		
17	24	Total ...	800

It cannot be supposed that in so small a number of officers the actual distribution would always agree with a fixed standard, and the variation might sometimes be considerable. Nevertheless, in the long run there would be a near agreement, and we are entitled to expect that out of 800 officers of ages between 22 and 55 inclusive, there would be in each year be 16 vacancies caused by death, and 14 by retirement, after 33 years' service. Consequently there would be 30 admissions yearly.

In the scale published by the Government of India, on the 9th June 1880, the following establishment, not including the Madras Presidency, is laid down :—

Chief Engineers	16	
Superintending Engineers	42	
Executive Engineers, 1st grade	86	
„ „ 2nd „	97	322
„ „ 3rd „	96	
„ „ 4th „	43	
Assistant „ 1st „	237	430
„ „ 2nd „ including apprentices	193	

And in the particulars regarding the Indian Public Works Department, a scale of salaries is given, from which it appears that there are in all 14 classes, having different amounts of salary.

The establishment of 800 officers would, with reference to years of service, be distributed as follows :—

Chief Engineers	over 30 years' service.
Superintending Engineers	
Executive „	„ 14 and under 30.
Assistant „ including apprentices	„ 0 „ 15.

Allowing for various casualties, by resignation, &c., it is probable that the term of service in the junior classes would be less than is here shewn, and it will be noticed that they are very much less than supposed in the reference paper.

With regard to promotion by seniority from class to class, it is necessary to bear in mind that earlier advancement in the junior grades must be followed by a block in the higher grades ; therefore, it should be no discouragement to the Assistants to know that promotion to the Executive grade cannot be promised or held out to any under 15 years' service.

Provision has been made against discontent by a gradual increase of allowances, and the general position of officers may be estimated as follows :—

Apprentices under 3 years' service	88	
Assistants „ 7 „ „	114	
„ „ 11 „ „	110	
„ „ 15 „ „	92	
		—404
Executive Engineers under 18 years' service	86	
„ „ „ 22 „ „	90	
„ „ „ 26 „ „	83	
„ „ „ 30 „ „	63	
		—322
Chief and Superintending	60	
		786

Applying the rates of salary as shown in Article 4 of the particulars, &c., the cost of the establishment as thus arranged would be :—

	No.	Salary.	Cost.
		Rs.	Rs.
Apprentices	88	1,200	1,05,600
Assistants, Class 3	114	3,000	3,42,000
„ „ 2	110	4,200	4,62,000
„ „ 1	92	5,400	4,96,800
Executives, „ 4	86	6,600	5,67,600
„ „ 3	90	7,800	7,02,000
„ „ 2	83	9,600	7,96,800
„ „ 1	63	11,400	7,18,200
	726	—	41,91,000

I have not classified the 60 officers available for the highest appointments. Such appointments will, I suppose, be usually made by selection, and will not fall within results drawn from a life table.

A question may arise whether promotion from class to class should depend on the completion of fixed periods of service, or on fixed numbers in each grade. I may say that the latter appears to me the preferable method. An establishment, as above given, would probably have a sufficient rate of promotion, and would not greatly deviate from the existing order.

Taking as a guide the comparative scale given on page 13 of Committee's Report, the following arrangements may be compared :—

	Class.	Existing.	Proposed by Committee.	This Report on a corresponding number.
Assistants	4	0	31	81
	3	53	150	105
	2	200	100	100
	1	128	100	84
		381	381	370
Executives	4	90		79
	3	69	No	83
	2	71	details.	76
	1	55		58
		285	285	296
Total		666	666	666

It has been already shown that the charge for 726 officers, classed as in the foregoing estimate, is not above that proposed by the Committee for 666 officers.

Memorandum on reorganization of Indian Public Works Department by LIEUTENANT-GENERAL R. STRACHEY,—dated 17th May 1881.

In order to arrive at an arrangement of grades which shall give reasonable promotion in the ordinary term of service, I shall assume that General Hannyngton's distribution of numbers in the whole body of officers employed may be accepted.

Applying this for convenience to an assumed total of 1,000, we shall have, for the several years of service, the following figures :—

Years.	No. in each.	Total from commencement.	Years.	No. in each.	Total from commencement.	Years.	No. in each.	Total from commencement.
0	37	37	11	34	423	22	26	751
1	36	73	12	33	456	23	26	777
2	36	109	13	33	489	24	26	803
3	36	145	14	32	521	25	25	828
4	36	181	15	31	552	26	24	852
5	35	216	16	30	582	27	24	876
6	35	251	17	30	612	28	24	900
7	35	286	18	29	641	29	23	923
8	35	321	19	29	670	30	21	944
9	34	355	20	28	698	31	20	964
10	34	389	21	27	725	32	19	983
						33	17	1,000

From this table it may be inferred that out of a total service of 1,000, the number of officers of ten years' service and less will be 389, of 20 years' and less 698, and so forth.

The Government of India's proposal to introduce a new class of "Clerks of Works" to be recruited from natives of India, to fill one-fourth of the future vacancies in the Department, would, in the end, of course, led to one-fourth of the total strength being of this class, *viz.*, in all 250 in 1,000. Their distribution in the several periods of service might be assumed to be similar to that of the main body, so that the totals for each term of service will be one-fourth of the numbers in the table. Consequently, with ten years' service and less there would be 97, with 20 years' service and less 175, and so on.

Passing next to the actual distribution of grades in the Department, we find that with a total of 810, there are 58 among Superintending and Chief Engineers, 322 among Executives and 430 among Assistants. Assuming that these proportions are those which experience has shown to be convenient if they can be maintained, we should have, for the ideal 1,000, the following numbers :—

	No.
Superintending and Chief Engineers	72
Executive	389
Assistants	539
Total ...	1,000

The appointments of Superintending Engineer and Chief Engineer are assumed to be distributed over the last ten years of service.

From this it would appear that if the grades in the Department were arranged in this proportion and advancement was wholly by seniority, the numbers would be distributed, in respect to length of service, as follows :—

	No.	Service.
Superintending and Chief	72	... 24 to 33 years.
Executive	398	... 15 to 33 „
Assistants	530	... 0 to 14 „

The Government of India desire that the European Officers shall pass from the grades of Assistant to that of Executive in eight or ten years, so that the above distribution would not comply with that condition.

If, however, the class of Clerk of Works, or any corresponding body of Native Assistants is grafted on to the Department, and if it be recognized that they shall not rise either nearly so rapidly, or in such great numbers to the superior grades as the European Officers, an assumption which, for present purposes, may quite properly be accepted, then an important help may be given to the economical promotion of the European Assistants.

The present proportion of Assistants to all superior grades is 530 to 470 in a total of 1,000. Let it be assumed that for the class of Natives, which as, before shown, may be taken at 250 in all, the proportions shall be 200 in the grades of Assistant and 50 in superior grades. This seems reasonable.

Then we shall have the following conditions established. The whole strength of European Officers being 750, there will be the following proportion of grades :—

	No.	Service.
Superintending and Chief ...	72 ...	24 to 33 years.
Executive	348 ...	11½ „ 33 „
Assistant	330 ...	0 „ 11½ „

Thus the required proportion would be nearly secured, but not entirely. If it be desired to give promotion to the Executive grades after 10 years' service, the number of Assistants among the Europeans must be reduced to 290, and the number of Executives increased to 388.

To ascertain how the distribution of classes should be arranged under the new conditions so as to bring the total cost to what it is now, we may proceed as follows :—

The present proportions on a strength of 1,000 will cost as follows, excluding the Superintending and Chief Engineers, the numbers and proportions of which it is not necessary to change :—

		Rs.	Rs.	
Executives, 1st class ...	106 ×	1,000 =	1,06,000	
„ 2nd „ ...	120 ×	800 =	96,000	
„ 3rd „ ...	119 ×	650 =	77,350	
„ 4th „ ...	53 ×	550 =	29,150	
Total ...			3,08,500	
Assistants, 1st grade ...	292 ×	450 =	1,31,400	Total
„ 2nd and below ...	238 ×	300 =	71,400	Rs. 5,11,300
Total ...			2,02,800	

Under the proposed arrangements we should first have to provide for 200 Native Assistants with salaries two-thirds of those allowed to the Europeans, namely, Rs. 300 and Rs. 200, respectively, for the two grades. If they came on the higher rate of pay after about ten years' service, there would be nearly 100 in each grade.

For the Executives it may be assumed that an average rate of Rs. 450 will suffice.
The cost will therefore be—

		Rs.	Rs.
Assistants	100 ×	200 =	20,000
	100 ×	300 =	30,000
Executives	50 ×	450 =	22,500
Total ...			72,500

There will therefore remain Rs. 4,38,800 for the European Officers of the Executive and Assistant grades.

On the hypothesis that the Assistants are promoted to Executive after 10 years' service, there will be, as before shown, 290. These might be divided into 160 at four years' service and less at Rs. 300, leaving 130 at Rs. 450.

		Rs.	Rs.
The cost will be	160 ×	300 =	48,000
	130 ×	450 =	58,500
Total ...			1,06,500

There is thus left for the 388 Executives, Rs.3,32,300. This would admit of the following distribution :—

	Rs.	Rs.
120 of 1st class ×	1,000 =	1,20,000
110 „ 2nd „ ×	800 =	88,000
100 „ 3rd „ ×	650 =	65,000
58 „ 4th „ ×	550 =	31,900
Total ...		3,04,900

This result is within the present charge, and does not differ greatly from the existing proportions.

But it is doubtful whether so expensive a scale is really necessary or proper. It will be seen that this arrangement absorbs the whole economy obtained by the employment of

Natives, and adds the amount to the salaries of the Europeans, who would obtain an average increase of pay from Rs. 550 monthly to Rs. 600.

Consequently the following distribution is suggested in preference :—

		Rs.	Rs.
1st grade	... ...	80 × 1,000	= 80,000 monthly cost.
2nd „	... ...	90 × 800	= 72,000
3rd „	... ...	100 × 650	= 65,000
4th „	... ...	118 × 550	= 64,900
	Total ...		2,81,900

This retains the average rate of pay nearly as at present, giving Rs. 560 instead of Rs. 550, while the total expense will only be Rs. 4,60,900 against Rs. 5,11,300, or give a saving of Rs. 50,400 monthly.

The above calculations are all based on the ideal strength of 1,000, from which the necessary proportions for any other total strength is readily obtained. The results reduced to the standard of the actual strength, 810, shown in the Government of India's Resolution, are as follows :—

Present.			Proposed.		
Grades.	Number.	Years' service.	Grades.	Number.	Years' service.
Assistant Engineer, 2nd grade ...	193 } 430	0 to 6½	European Assistant Engineer, 2nd grade. ...	130 } 235	0 to 5
1st „	237 }	6½ „ 15	1st „ ...	105 }	5 „ 10
Executive, 4th grade ...	43 }	15 „ 17½	Executive, 4th grade ...	96 }	10 „ 13½
„ 3rd „ ...	96 } 322	17½ „ 22	„ 3rd „ ...	80 }	13½ „ 17
„ 2nd „ ...	97 }	22 „ 27	„ 2nd „ ...	73 } 314	17 „ 22
„ 1st „ ...	86 }	27 „ 33	„ 1st „ ...	65 }	22 „ 28
Chief and Superintending...	58	— „ 33	Chief and Superintending	58	28 „ 33

Besides the above the Native grades would be as follows :—

Assistant Engineers, 2nd grade	...	...	...	81
„ „ 1st „	...	...	...	81
				— 162
Executive ...	...	...	...	41
			...	
		Total	...	203

The next point is how to accomplish the transition from the present to the future without undue extra expense.

The present cost of the Executive grades is as follows :—

		Rs.	Rs.
4th grade	... ...	... 43 at 550	... 23,650
3rd „	... ...	... 96 at 650	... 62,400
2nd „	... ...	... 97 at 800	... 77,600
1st „	... ...	... 86 at 1,000	... 86,000
	Total	...	2,49,650

The first step should doubtless be to increase the number of Executive from 322, its present number, to what it will be in the future with the addition of the Natives, namely, to 355. This will give 33 steps to the Assistants at once. It would increase the monthly cost to Rs. 2,57,900.

To get rid of the excess of Assistants, the following plan is suggested. The present total number is 430. When reduced by 33 as just proposed, the residue, 397, will be 162 in excess of the normal, 235 proposed.

But the proposed new normal number of European Assistants, 235, of not more than 10 years' service, supposes an additional number of Native Assistants, say 82, of the same length of service. But as these will not be forthcoming at first, it will suffice to reduce the Assistants to 315, which includes all up to the end of 10 years' service. This would involve a further reduction of 82 from the 397, and a corresponding addition to the Executive appointments, making them together 322 + 32 + 82 = 437 in all.

The following distribution would admit of the change with trifling extra cost :—

Assistants.

			Rs.
1st grade reduced from	... ...	237 to 122 × 450	= 51,750

Executives.

4th grade, increased from	... ...	43 to 157 × 550	= 86,350
3rd „ „ „	... ...	96 to 110 × 650	= 71,500
2nd „ decreased „	... ...	97 to 90 × 800	= 72,000
1st „ „ „	... ...	85 to 80 × 1,000	= 80,000
			3,09,850
Deduct saving on Assistants	... ...		51,750
Total			2,58,100
Original cost			2,49,650
Increase monthly			8,450

The change might be made by degrees by adding 20 or 30 Executives of the 4th grade year by year till the full number had been promoted.

The result would be that the several grades would have the following length of service :—

4th grade Executives	... ...	10 years to 16 years
3rd „ „	... ...	16 „ 21 „
2nd „ „	... ...	21 „ 25 „
1st „ „	... ...	25 „ 33 „

The proportions of the several grades of Europeans would subsequently have to be reduced to the normal scale as the Native Assistants and Executives were appointed. The total reduction would be 203, of which 123 would be in the Executive grades, and the rest among the Assistants.

The cost of an ultimate normal establishment of the total present strength, 810 would be—

Natives.

		Rs.	Rs.	Rs.
81 Assistants, 2nd grade	... ...	200	16,200	
81 „ 1st „	... ...	300	24,300	
41 Executives	... ...	450	18,450	
				58,950

Europeans.

130 Assistants, 2nd grade	... ...	300	39,000	
105 „ 1st „	... ...	450	47,250	
				86,250
96 Executives, 4th grade	... ...	550	52,800	
80 „ 3rd „	... ...	650	52,000	
73 „ 2nd „	... ...	800	58,400	
65 „ 1st „	... ...	1,000	65,000	
				2,28,200
	Total ...		...	3,73,400

The present cost as shown before is—

Executives	... ...	2,49,650

Assistants.

		Rs.	Rs.	
193 Assistants, 2nd grade	... ...	300 ...	57,900	
237 „ 1st „	... ...	450 ...	1,06,650	
				1,64,550
	Total ...		...	4,14,200

Statement showing the distribution of grades for a total strength of the Department of 810.

Years' service.	Europeans.	Natives.	Total.	Distribution of Europeans.		Distribution of Natives.	—	
							Residue of other grades.	Chief and Superintending
0	22	8	30	130, 2nd grade, 5 years.	235, Assistant.	81, Assistant, 2nd grade, 10 years.		
1	44	16	60					
2	66	24	90					
3	88	32	120					
4	110	40	150					
5	132	47	179					
6	153	54	207	105, 1st grade, 5 years.				
7	174	61	235					
8	195	68	263					
9	216	75	291					
10	233	82	315					
11	254	88	332	96, 4th grade, 5 years.				
12	275	94	369					
13	295	100	395					
14	315	106	421					
15	335	112	447					
16	354	118	472	80, 3rd grade, 4½ years.		81, Assistant, 1st grade, 14 years.		
17	372	124	496					
18	390	130	520					
19	407	136	536					
20	424	142	566	73, 2nd grade 4½ years.	314, Executive.			
21	441	147	588					
22	457	152	609					
23	473	157	630					
24	488	162	650					
25	503	167	670	65, 1st grade, 9 years.		41, Executive, 9 years.	487	1
26	518	172	690				500	3
27	532	177	709				512	6
28	546	182	728				528	10
29	558	187	745				531	15
30	571	191	762				537	21
31	584	195	779				543	28
32	596	199	795				546	38
33	607	203	810				548	48
							549	58
	A	B	A + B				A–C	C

Total emoluments in passing through the service, excluding Superintending and Chief Engineers.

Proposed.			*Present.*		
	Rs.	Rs.		Rs.	Rs.
5 years ×	300 =	1,500	6 years ×	300 =	1,800
5 „ ×	450 =	2,250	8½ „ ×	450 =	3,625
5 „ ×	550 =	2,750	2½ „ ×	550 =	1,375
4½ „ ×	658 =	2,925	4½ „ ×	650 =	2,925
4½ „ ×	800 =	3,600	5 „ ×	800 =	4,000
9 „ ×	1,000 =	9,000	6½ „ ×	1,000 =	6,500
	12 ×	22,025		12 ×	20,225
		Rs. 2,64,300			Rs. 2,42,700

Memorandum showing probable results of a system of graduated pensions and Compulsory Retirements on the suggested scheme of Public Works Establishments.

1. The following scheme is prepared on the supposition that a department of 1,000 officers consists of 750 Europeans and 250 Natives.

2. The Europeans enter at the age of 22, and are compulsorily retired at the age of 55 or after 33 years' service.

3. There will be 72 officers in the position of Superintending and Chief Engineers who, it is assumed, will have from 26 to 32 years' service.

4. All officers who do not become Superintending Engineers after 25 years' service will be compulsorily retired.

5. Pensions will be given at the following rates :—

		Rs.
After 20 years' service	... ...	2,500
„ 23 „	... ...	3,500
„ 25 „	... ...	4,000
„ 29 „	... ...	5,000
„ 33 „	... ...	6,000

It is further assumed that *one* officer retires on pension in each year after the 20th till the 25th, and in the 26th year *four* will be retired under paragraph 4. Also, that *one* officer retires in the 29th year, *one* in the 31st, *one* in the 33rd, and the remaining *five* after the 33rd year.

The number of persons entering will be 30 yearly, the number of 10 years' service and less will be 326, and the number of 25 years' service and less will be 678, leaving 72 above 25 years' service.

Years' service.	No. in each.	Total.
2nd Grade Assistant.		
0	30	30
1	30	60
2	30	90
3	30	120
4	30	150
1st Grade Assistant.		
5	30	180
6	30	210
7	29	239
8	29	268
9	29	297
10	29	326
4th Grade Executive Engineers.		
11	28	354
12	28	382
13	27	409
14	27	436
3rd Grade Executive Engineers.		
15	26	462
16	25	487
17	25	512
18	24	536

Years' service.	No. in each.	Total.	—
2nd Grade Executive Engineers.			
19	24	560	
20	23	583	
21	22	605	1 retired on pension, Rs. 2,500.
1st Grade Executive Engineers.			
22	20	625	1 „ „ „ 2,500
23	19	644	1 „ „ „ 3,500
24	18	662	1 „ „ „ 3,500
25	16	678	1 „ „ „ 3,500
Superintending and Chief Engineers.			
26	12	690	4 „ „ „ 4,000
27	11	701	
28	11	712	
29	10	722	1 „ „ „ 5,000
30	9	731	
31	7	738	1 „ „ „ 5,000
32	7	745	
33	5	750	1 „ „ „ 5,000
			5 „ „ „ 6,000

Allowing, as before, 200 Native Assistants, the number of Europeans of 10 years and less, 326 will suit well for the Assistants. Taking 330 in round numbers, the total would be the same as the proportion, namely, 530. There would accordingly be left 348 Europeans for the Executive grades, which might be distributed as follows :—

4th grade	...	...	...	108	...	to 14 years' service.
3rd „	...	...	...	90	...	to 18 „
2nd „	...	...	...	80	...	to 21 „
1st „	...	...	...	70	...	to 25 „

The Assistants might be graded,—

1st grade	...	...	...	150	...	6 to 10 years' service.
2nd „	...	...	...	180	...	0 to 5 „

The monthly cost of the effective staff would be, excluding, as before, the Superintending and Chief Engineers, as follows :—

	Rs.		Rs.		Rs.		Rs.		Rs.
Assistants,—				Executives,—					
	180	×	300 = 54,000		108	×	550 =		59,400
	150	×	450 = 67,500		90	×	650 =		58,500
					80	×	800 =		64,000
			1,21,500		70	×	1,000 =		70,000
				Executive total					... 2,51,900
				Assistant „					... 1,21,500
									3,73,400

Under the original arrangement without the retirements, the cost was :—

		Rs.	
Executives	... ...	... 2,81,900	
Assistants	... ...	... 1,06,500	
Total		... 3,88,400	monthly.

To make a proper comparison of the final results the pensions must be included. Under the original plan there would have been 17 officers retired at the end of 33 years' service, on an average pension, say, of Rs. 4,500, the capitalized value of which would have been, say, Rs. 48,700, giving a yearly total of Rs. 8,27,900.

The new plan will be as follows :—

		Rs.		Rs.		Rs.
2	pensions at	2,500	at	32,500	=	65,000
3	„	3,500	at	44,500	=	1,33,500
4	„	4,000	at	49,700	=	1,98,800
3	„	5,000	at	59,000	=	1,77,000
5	„	6,000	at	65,000	=	3,25,000
			Total		...	8,99,300

The annual cost of the effective establishments would be,—

	Rs.		Rs.	
12 ×	3,88,400	=	46,60,800	on the original plan.
Pensions		...	8,27,900	
Total		...	54,88,700	

On the new plan the effective staff would cost yearly,—

	Rs.		Rs.
12 ×	3,73,400	=	44,80,800
Pensions		...	8,99,300
Total		...	53,80,100

There would, therefore, be an apparent saving of about Rs. 1,00,000 yearly by the new arrangement.

It should be explained, however, that the calculations do not profess to be made with great precision, and can only be regarded as fair approximations to the truth on the hypotheses assumed. The result, however, may be accepted as showing that the new scheme would not be likely to be more costly than the old one.

It may also be added that the figures must not be looked on as showing the actual charge that would be incurred, because so considerable a proportion of the Public Works Establishments consists of Royal Engineer officers whose pensions, &c., are regulated on different principles from those of the Civil Engineers. For purposes of comparison, however, the calculations are likely to be useful and fairly trustworthy.

18th June 1881.

R. STRACHEY.

NOTE.—Value of pensions, approximate.

Age on retirement.	Annuity.	Value, interest at 4 per cent.
	Rs.	Rs.
43 years ...	2,500	32,467
45 „ ...	3,500	44,502
47 „ ...	4,000	49,688
51 „ ...	5,000	58,815
55 „ ...	6,000	64,884

[No. 2.]

No. 50P.W., dated 16th December 1881.

From—The Government of India,

To—The Secretary of State for India.

We have the honor to acknowledge your Lordship's Despatch No. 50, dated 8th September, regarding the reorganization of the Engineering Establishment of the Public Works Department.

2. Our proposal to create a class of clerks of works intermediate between the Engineer and Upper Subordinate classes does not commend itself to your Lordship's judgment, and instead it is proposed for our consideration that a proper flow of promotion in the Engineer Establishment should be obtained, without an undue increase of expense, (1) by limiting the number of admissions, (2) by re-adjustment of ranks, (3) by a limitation of age in certain ranks, and (4) by the encouragement of spontaneous retirement. In order to apply satisfactorily the last two means your Lordship proposes a revision of the pension rules and the institution of a Provident Fund. These latter measures were not absent from our thoughts in the consideration of the reorganization of the Engineer Establishment, which resulted in our Despatch No. 97, dated 2nd November 1880, but we did not think that their introduction into the discussion of the organization of one Department was justified by the scope of our instructions. We now cordially accept your Lordship's suggestions and proceed to consider the best way of giving them practical effect.

3. The total number of Engineers sanctioned before the reduction of 1879 was 1,015. The reduced establishments sanctioned by us early in 1880 aggregated 879. The revision just completed after a year's experience of the reduced staff has resulted in a total sanction of 954 (see Appendix A). By effecting the reorganization of the Military Works Branch in the manner detailed in our Military Despatch No. 345, dated 21th September 1881, a reduction of 127 Engineers must be made in this number. The resulting number sanctioned will then be 827. The salaries of this number of officers, divided into grades on the present system and on present rates of pay, would amount to Rs. 5,16,000 per mensem. But we have carefully considered the future of the Railway Branch, and have come to the conclusion that, by having recourse to the contract system more largely than heretofore, and by a more general construction of such works by private enterprise, the number of officers may gradually be reduced from 213 to 147 within the next few years. If our hope of attracting private enterprise largely to the construction of Railways should be disappointed, we should still have a sufficient number of supervising officers who, when necessary, would be supplemented by temporary employés engaged for the job, so far as our wants exceeded the number of supernumeraries which reduction in the sanction scale would cause. By the time these supernumeraries become absorbed, there will, we anticipate, be a larger field in India for the selection of temporary men. This reduction in the Railway Branch would bring the sanctioned number of Engineers down to 761.

4. Taking, then, 761 as the normal strength of our Engineering staff, we propose to divide them into grades in each list as shown in the centre columns in Appendix A. The proportion of grades and classes which will prevail under that classification will be as follows :—

Chief Engineers	2·234	7·884
Superintending Engineers	5·650	
Executive Engineers, 1st grade	12·352	61·235
Executive Engineers, 2nd grade	14·192	
Executive Engineers, 3rd grade	16·426	
Executive Engineers, 4th grade	18·265	
Assistant Engineers, 1st grade	15·112	30·881
Assistant Engineers, 2nd grade	15·769	

The number of Chief and Superintending Engineers has been determined according to actual present requirements. The proportion of Executive to Assistant Engineers has been fixed at 2 : 1; and the Executive Engineers have been divided into four grades, the numbers in which, beginning at the highest, are in the aggregate multiples of 6, 7, 8 and 9, respectively; half the Assistants have been placed in the 1st grade of that class. For the present, however, owing to the presence of supernumeraries, the ratio of Executives to Assistants would be 3 : 2.

5. The cost of the whole Establishment of 761 Engineers so distributed would be about Rs. 5,18,000 per mensem, or about the sum shown above to be the cost of 827 Engineers, distributed according to the system now in force.

6. The number of Executive Engineers on the scale proposed is increased by 32 per cent. of their present strength, while that of Assistant Engineers will eventually be decreased by 50 per cent. Counting in, however, the number of supernumeraries, the reduction of Assistants in the first instance will be only 32 per cent. of the present stength of that class. The number of Executive Divisions would not be at once increased proportionately to the increase in the number of Executive Engineers. If a large disproportion between the number of Executive Engineers and the number of Executive Divisions were likely to be a permanence, it would be a serious drawback to the proposal; but there is no doubt that as railways are developed, and

the prosperity of the country increases, there will be a very large demand for additional works, necessitating a corresponding increase in the working power of the Department by the creation of new Divisions. When in the course of time, and by the growth of work, the spare Executive Engineers are absorbed and the effective strength of the department increased by the employment of temporary Assistants, it would be necessary, in order to secure proper supervision, to vary the above proportions somewhat by increasing the number of the Chief and Superintending Engineers. The ultimate proportions might be—

Chief Engineers	3 per cent.
Superintending Engineers	7 „
Executive Engineers	60 „
Assistant Engineers	30 „

We should desire to work within these proportions as a maximum without reference to your Lordship.

7. At the average rate of promotion which we anticipate with the proportion of ranks now proposed, an officer should attain the several departmental grades at the ages given below, assuming that he enters the service as a 2nd grade Assistant Engineer at the age of 22 :—

Assistant Engineer, 1st grade, at the age of	25
Executive Engineer, 4th grade	29
„ „ 3rd „	34
„ „ 2nd „	39
„ „ 1st „	44

As selections for the higher classes of Superintending Engineers will be made as a rule from the Executive Engineers, 1st grade, every officer might fairly calculate on about one-third of his total service being spent in a rank above that of 2nd grade Executive Engineer, assuming the total service to be 33 years; and of those who rise by selection above the rank of Executive Engineer, the average service as Superintending and Chief Engineer would probably be about 8 years, or one-fourth of the total service.

8. The present strength of the Engineer Establishment is 963, of which the removal of Military Works Branch to the control of the Military Department will take away 127. The balance is 836, which is 75 in excess of the proposed normal strength of 761. These supernumeraries must be gradually absorbed, and meanwhile they will, to the extent to which they exist, render the employment of temporary officers unnecessary. The annual number of vacancies in a strength of 761 officers may be put down at 30. We propose, until the supernumeraries are absorbed, to leave, as at present, one-fourth of these unfilled, and to retain one-fourth of the remainder for the Indian Colleges. This will give—

Unfilled vacancies	7
Indian Colleges	6
From England	17
	30

The whole of the supernumeraries would by this arrangement be absorbed in the course of about nine years.

The strength of Royal Engineers, including the Military Works Branch now in the Public Works Department, is 228, or approximately 25 per cent. of the total. This will be reduced to 100 by the transfer of 127 to the Military Department. We propose to fix 100 as the number of Royal Engineers to be retained in the Public Works Department. This arrangement, taking 4 per cent. as the number of casualties from ordinary causes, would divide the appointments from England as follows :—

Royal Engineers	4
From Cooper's Hill	13

The number of Royal Engineers will be affected by reversions of officers to the Imperial Establishment after a tour of service. This, however, need not affect the number from Cooper's Hill. On the subject of the supply of Royal Engineers for service generally in India, we are about to address your Lordship in the Military Department.

9. As to spontaneous retirement we are prepared to put Civil Engineers on the same footing as members of the Covenanted Civil Service, that is, to permit retirement after 25 years' service, of which 21 years must be active service.

10. We have frequently felt the inconvenience of being obliged under existing rules to retain in a subordinate position officers who have grown old without exhibiting qualities that would justify their promotion, and we gladly avail ourselves of your Lordship's permission to propose rules for the compulsory retirement of such officers. We conceive that these would be suitably expressed as follows, *viz.*, that an officer should retire—

if not at	30	years of	age an	Assistant Engineer,	1st grade.
„	35	„	„	Executive „	4th „
„	40	„	„	„ „	3rd „
„	45	„	„	„ „	2nd „
„	50	„	„	„ „	1st „

The existing rule of the Civil Pension Code, Section 106, Rule 6, to apply to all higher ranks. The above, as will be seen by a comparison with the figures in paragraph 7, would

require the retirement of officers who are about a full grade behind the average rate of promotion. The proposed rules should not work with undue hardship, and they would leave ample margin for reformation in an officer not absolutely incompetent.

11. We now proceed to consider the changes, we think should be made in the pension rules in favor of Civil Engineers. The rates of pension suggested by your Lordship after certain periods of service are—

After	20	years,	Rs. 2,500	per annum,
„	25	„	„ 4,000	„
„	28	„	„ 5,000	„
„	30	„	„ 6,000	„

subject in all cases to a maximum of half average salary. We do not understand that it is your Lordship's desire that these terms of service and rates of pension should be regarded as limiting the conditions of retirement to the exclusion of all intermediate terms and rates. For our part, we should much prefer to accept them as indications of the rates appropriate at the several stages of service specified, in a graduated scale of pensions adapted to every period of service. This is specially desirable under a system of compulsory retirements, in order that an officer may not have to retire when just in view of a very substantial increase to his pension.

12. It may be observed that, under existing rules, the maximum pension, after, 25 years' service, is Rs. 5,000 per annum, and that under the above rates this maximum is not attained till after 28 years' service. On the other hand, a higher pension of Rs. 6,000 per annum is allowed by the new rates after 30 year's service. In regard to the latter rate we have not had a sufficiently long experience in the Public Works Department to determine by observation how many men are likely to survive to obtain it, but in an exposed service it is probable that the number would be less than that arrived at by calculation on existing data. Taken alone then, we should have hesitated to adopt the new rates as suitable, or acceptable to the officers concerned. But with the addition of a Provident Fund on the lines laid down below, this difficulty would disappear.

13. Taking, then, the rates named by your Lordship as fixed points in a scale of pensions, we would propose to complete it as follows :—

	Rs. per annum.
10 years' service	1,000
11 „ „	1,060
12 „ „	1,140
13 „ „	1,240
14 „ „	1,360
15 „ „	1,500
16 „ „	1,660
17 „ „	1,840
18 „ „	2,040
19 „ „	2,260
20 „ „	2,500
21 „ „	2,760
22 „ „	3,040
23 „ „	3,340
24 „ „	3,660
25 „ „	4,000
26 „ „	4,360
27 „ „	4,740
28 „ „	5,140
29 „ „	5,560
30 „ „	6,000

For a shorter service than 10 years a gratuity should be given as at present, subject to a maximum of Rs. 6,000.

14. We are prepared, as suggested by your Lordship, to permit all Civil Engineers to reckon as qualifying service the following periods of furlough :—

2	years'	furlough	in 20	years'	service,
3	„	„	25	„	„
4	„	„	30	„	„

subject to one condition, *viz.*, that the furlough must be taken out of India. This is intended to meet the case of natives and persons born and educated in India, for whom the indulgence is not called for, unless it also involves the benefit to the State which would be derived from enlarged experience and new ideas.

15. We desire to calculate all pensions on the basis of allowing one-sixtieth of average salary for each completed year of service, including the furlough specified in the proceding paragraph, and subject to the rates laid down in paragraph 13 as maxima.

16. Our proposals in regard to the Provident Fund are to reduce the present receipts of all Executive and Assistant Engineers by Rs. 50 per mensem, and of all officers of higher rank by Rs. 100 per mensem, and then to credit each officer, of whatever rank, with Rs. 100 per mensem in the shape of deferred pay claimable, with interest, only on the termination of service. The sums thus credited would be allowed to accumulate at the rate of 2 per cent. half-yearly, compound interest, until each transaction should be closed by the death or retirement of the officer concerned. On retirement each officer would receive the accumulated sum at his credit, or in case of his death before retirement, his estate would receive it. As this

sum consists of deferred pay already earned, and interest thereon, it should also be given to officers dismissed for misconduct, less any claim Government might have against the officer at the time of dismissal.

17. Your Lordship will perceive that practically this arrangement involves an addition of Rs. 50 per mensem to each officer below the rank of Superintending Engineer, this increase being accompanied by a corresponding deduction from the present rate of pay, which, together with the addition, would be credited to the officer's account in the books of the Provident Fund. Officers who have been selected for the posts of Superintending and Chief Engineers should, we think, pay the full amount of the contribution to the fund from their present salaries, which are high enough to enable them to do so without inconvenience.

18. If an officer from the date of his joining, at the age of 22, is thus credited with Rs. 100 per mensem, it is calculated that he would on an average have the following sums at his credit after each of the periods of service specified below, (1) on the supposition that payments to the fund cease during furlough, and (2) that they are continued—

	Rs.		Rs.
After 10 years' service (1 year furlough)	13,250,	or including additions during furlough,	14,750
„ 15 „ (1 „)	23,000,	„ „ „	24,625
„ 20 „ (2 „)	33,000,	„ „ „	36,664
„ 25 „ (3 „)	45,000,	„ „ „	51,340
„ 30 „ (4 „)	60,000,	„ „ „	69,230
„ 33 „ (4 „)	71,400,	„ „ „	81,790

19. The contribution of Government to the fund being Rs. 50 per mensem for each Executive and Assistant Engineer, the aggregate would be, for a staff of 761 officers of all ranks, Rs. 35,000 per mensem. But as we do not propose that officers of Royal Engineers should receive any contribution from Government, and as we may estimate that 90 of the 100 will be in the ranks of Executive and Assistant Engineers, that sum may be reduced by Rs. 4,500 per mensem. We may say, therefore, that the Government contribution will be about Rs. 30,000 per mensem. This, as being deferred pay, should be a charge against the current Public Works grant.

20. The effect of the contributions by Government to the fund is given in detail in the note which forms Appendix B to this Despatch. It will be observed that the Government aid to officers who do not advance beyond the 1st grade of Executives is considerably greater than to those whose career does not stop there. This is as it should be, for the inefficient officers having been weeded out grade by grade, the 1st grade Executives may be assumed to good and efficient officers, but lacking the qualifications for Superintending Engineer, or only the opportunity for advancement.

21. We have said that we do not propose supplementing the subscriptions of officers of Royal Engineers by an amount equal to their own contributions as in the case of Civil Engineers, because the pay of the former, owing to their net Military pay which they receive in addition to their Departmental pay, is on an average about Rs. 150 per mensem higher than the pay of Civil Engineers of corresponding rank. There would be no objection, however, to their contributing Rs. 50 or Rs. 100 per mensem to the fund. Such contributions would be optional, but once made, the amount contributed could not be withdrawn till the officer making them was removed from the Public Works Establishment by transfer, retirement, or death.

22. We would treat Military officers other than Royal Engineers in the same way.

23. If the scheme should meet with your Lordship's approval, the new scale of pay and pension, as well as contributions to the Provident Fund, should be made compulsory on all person entering the Engineer service after their introductoin. Officers already in the Department should have the option of electing for the new scale of pay, subject to the new conditions of pension and contribution to the Provident Fund, or for the present scale of pay and the present pension rules.

24. With the introduction of the new arrangements we propose to cancel the rule (P. W. Code, Chap. I, sec. i, paragraph 7) under which increments of Rs. 50 per mensem may be given to Executive Engineers, 1st grade, after 4 and 8 years' service in that grade, for all officers who elect for the new rules.

25. We are quite prepared to admit Natives into the Engineer Establishment as it is now proposed to be constituted, on $\frac{3}{4}$rds of the salaries drawn by those appointed in England, and to afford every encouragement to their entering. The matter is receiving our careful consideration, and we shall shortly address your Lordship regarding it.

26. In respect to the power to entertain Engineers temporarily, which we desire to have accorded to us, we have aleady addressed your Lordship in our Financial Despatch No. 269, dated 22nd October.

27. If the foregoing proposals should meet with your Lordship's approval, we propose to apply the principles so far as they are applicable, to the Accounts Branch of the Public Works Department, which is now chiefly recruited from the Engineer Establishment.

No. 1642G, dated 28th December 1881.

Copy forwarded to the Military Dopartment for information.

Enclosure to Despatch No. 50 Public Works.

APPENDIX A.

		Madras.	Bombay.	Bengal.	North-Western Provinces and Oudh.	Punjab.	Local Administration.	Railways.	Military Works.	Total.	Total, exclusive of Military Works.
Chief Engineers ...	Sanction of 1880.	2	2	2	2	2	2	5	1	18	17
	Proposed.	2	3	2	2	2	2	4		17	17
	Present sanction.	2	3	2	2	2	2	5	1	19	18
Superintending Engineers.	Sanction of 1880.	5	5	6	4	5	5	12	5	47	42
	Proposed.	7	4	6	6	6	6	11	6	49	43
	Present sanction.	7	4	6	5	5	5	11	6	49	43
Executive Engineers, i	Sanction of 1880.	7	10	10	12	10	12	25	7	93	86
	Proposed.	8	9	14	17	14	13	19	9	104	94
	Present sanction.	10	11	12	13	12	12	22	9	101	92
ii	Sanction of 1880.	8	11	11	12	12	13	29	8	105	97
	Proposed.	10	11	16	19	16	15	21	8	116	108
	Present sanction.	11	12	13	13	16	14	25	8	112	104
iii	Sanction of 1880.	7	10	11	13	12	13	29	8	103	95
	Proposed.	13	13	18	23	18	17	24	8	134	126
	Present sanction.	11	12	14	16	12	15	26	8	117	109
iv	Sanction of 1880.	4	6	4	6	5	6	13	3	47	44
	Proposed.	15	15	20	24	20	19	26	4	139	139
	Present sanction.	4	6	5	8	5	8	11	4	52	48
Total Executive Engineers.	Sanction of 1880.	26	37	36	44	39	44	96	26	348	322
	Proposed.	46	48	68	82	68	64	90	26	466	466
	Present sanction.	36	41	44	53	46	49	84	29	382	353
Assistant Engineers, i	Sanction of 1880.	20	27	27	33	27	32	71	20	257	237
	Proposed.	11	12	17	20	17	16	22	20	115	115
	Present sanction.	27	27	33	39	33	36	63	22	280	258
ii,&c.	Sanction of 1880.	16	22	21	26	26	25	58	15	209	194
	Proposed.	12	12	18	21	18	16	23	16	120	120
	Present sanction.	20	22	26	32	28	30	50	16	224	208
Total Assistant Engineers.	Sanction of 1880.	36	49	48	59	53	57	129	35	466	431
	Proposed.	23	24	35	41	35	32	45	35	235	235
	Present sanction.	47	49	59	71	61	66	113	38	504	466
Grand Total ...	Sanction of 1880.	69	63	92	109	99	108	242	67	879	812
	Proposed.	78*	79*	111	131	111*	104*	147	74†	954	761
	Present sanction.	92	97	111	131	114	122	213	74†	954	880

* Reduced on account of being relieved of the charge of Military Works.

† This number is the present sanctioned strength, but if the proposals made in our Military Despatch No. 345, dated 24th September 1881, be adopted, this number will become 127 as noted in paragraph 3 of the present Despatch.

Enclosure to Despatch No. 50 Public Works.

APPENDIX B.

NOTE.

The amount of Rs. 50 per mensem which it is proposed that Government shall contribute towards the Provident Fund for each officer, multiplying at compound interest at 2 per cent. half-yearly, would be as below at each period of service. The life annuity corresponding to the amount of the Government contribution, according to the Carlisle Table of Mortality, and interest at 5 per cent. is given opposite each period :—

Years of completed service.	Amount of Government contribution without furlough.	Equivalent of life annuity per annum.
	Rs.	Rs.
10	7,362	507
11	8,272	575
12	9,224	647
13	10,202	722
14	11,226	802
15	12,292	888
16	13,400	971
17	14,554	1,075
18	15,754	1,177
19	17,003	1,284
20	18,302	1,397
21	19,653	1,516
22	21,059	1,644
23	22,522	1,780
24	24,044	1,927
25	25,627	2,083
26	27,275	2,252
27	28,989	2,438
28	30,772	2,639
29	32,627	2,859
30	34,558	3,099
31	36,566	3,358
32	38,655	3,640
33	40,829	3,945

The figures in the 3rd column represent practically the additional pension which an officer not rising above the grade of Executive Engineer and taking no furlough would receive from Government under the Provident Fund scheme.

An officer who attained to the rank of Superintendening Engineer at the end of the 22nd year of his service would have a smaller addition to his pension after that date than his less fortunate brethren. His bonus and annuity would be as below,—assuming that he took no furlough :—

Years of completed service.	Amount of Government contribution.	Equivalent life annuity.	Difference less than former annuity.
	Rs.	Rs.	Rs.
23	21,840	1,726	54
24	22,722	1,820	107
25	23,646	1,922	161
26	24,612	2,032	220
27	25,599	2,153	285
28	26,628	2,284	355
29	27,699	2,428	431
30	28,833	2,586	513
31	29,988	2,754	604
32	31,206	2,939	701
33	32,466	3,137	808

[No. 3.]

No. 8, dated Fort William, 20th February 1882.

From—The Government of India, Public Works Department,

To—The Right Hon'ble the Marquis of Hartington.

WE have now the honor to forward copies of our Proceedings in fixing the final strength of the Engineer Establishment throughout India. The total and detailed results were reported to your Lordship in our Public Works Despatch No. 50, dated 16th December 1881. The present sanctioned strength, excluding the Military Works Branch now under the control of the Military Department, is—

Chief Engineers	...	...
Superintending Engineers	...	18
Executive	,, ...	43
Assistant	,, ...	353
		466
		880

2. By confining the regular establishment of the Railway Branch chiefly to the open lines, and entrusting construction work for the most part to contractors or to temporary or special Engineers, we shall in course of time, reduce that number to 761, as already reported in the above, quoted despatch, leaving each Local Government and Administration with the strength applied for and sanctioned by us, subject to certain deductions which would follow the adoption of the scheme for the control of Military Works submitted to your Lordship in our Military Despatch No. 345, dated 24th September 1881.

3. We have very carefully considered each case, and are satisfied that that strength is not as a whole more than sufficient to meet the present normal work of the Department or that of the early future. Any considerable expansion of work must be met by the employment of temporary Engineers, under the intructions conveyed in your Lordship's Public Works Despatch No. 2, dated 5th January 1882.

4. The only proposals regarding which we had much hesitation were those from Madras. It will be observed that, after much discussion, we finally accepted the proposals of that Government, being partly influenced thereto by our desire to avoid further friction, and to settle, once for all, a controversy which has been carried on intermittently ever since the Public Works Department was created. We have informed the Government of Madras that the strength now sanctioned by us must be regarded as absolutely final.

5. We trust that our proceedings will meet with your Lordship's approval.

[No. 4.]

No. 18, dated London, 22nd March 1883.

From—The Secretary of State for India,

To—The Government of India.

YOUR letter in this Department, No. 50, dated 16th December 1881, submitting in reply to my predecessor's Despatch, No. 50 of the 8th September 1881, a scheme for the reorganisation of the Engineering Branch of the Indian Public Works Department, together with your letter No. 8 of the 20th February 1882, describing the measures which were taken by your Excellency for arriving at the estimate for its future strength, has engaged the anxious attention of my predecessor, and has also received my consideration in Council. In the present Despatch, I propose to communicate the conclusions at which I have arrived. Should you see your way, as I trust may be the case, to accept these as a settlement of the various questions involved, I authorise you to take the necessary steps for carrying them into effect. But should you, on the other hand, after full consideration of what is said in this Despatch and of the whole of the circumstances of this difficult subject, especially in reference to its possible effect on the general finances of India, be desirous of introducing any modifications of what is here laid down, I shall be willing to receive your suggestions and to give them my best consideration.

2. The objects embraced in this reorganisation are the following :—

(*a*) The reduction of the numerical strength to such proportions as will suffice for the work to be done.

(*b*) The readjustment of the grades so as to make promotion more repaid.

(*c*) The offer of terms of retirement which will have the effect of accelerating promotion and providing members with a superannuation allowance justified by their service and age.

(*d*) The determination of the proportions in which establishment shall be recruited by Royal Engineer Officers, by Civil Engineers from England, and by Passed Students (chiefly Natives) from the Colleges in India.

3. Your Excellency has come to the conclusion that the Public Works Department, which now consists of 963 officers, may, by the separation of the Military Works Branch from the Public Works Department proper, and by a reduction of the number of officers employed on the Railway Branch, be gradually brought to a strength of about 760. This number of 760 I am prepared, on the data supplied by you, and on the assumption that the Military Works Branch will be separated (to which point further reference will be made), to regard as the total maximum strength of the General Branch of the Department in the future, accepting at the same time as necessary an excess for, probably, the next ten years, till the existing redundancy of officers has become gradually absorbed. This excess of numbers, while it lasts, and to the extent to which it from time to time exists, will render less necessary the employment of temporary officers; but I am glad to precieve that your Government agrees with the views I have already expressed as to the expediency of adopting this last means of supplementing the strength of the Department, if the occasion should arise.

4. You propose to effect the two main objects of the scheme, *viz.*, diminution of the strength to a maximum of 760, and the accleration of promotion, by (1) a reduction in annual recruitment, and (2) a readjustment in the proportion of Executive to Assistant Engineers. The present number of all grades on the establishment, exclusive of the Military Works Branch, is stated in the 3rd paragraph of your Despatch at 827, and you propose to absorb the excess

in the course of nine years, by leaving unfilled one fourth of the annual vacancies, which are estimated at about 30. The recruitment for this period will, therefore, be limited to 23 annually, of whom 6 will be appointed from Indian colleges and 17* from England. With this proposal I quite concur.

* 13 Cooper's Hill College.
4 Royal Engineer Officers.
17

5. The re-adjustment of numbers in the two classes of Executive and Assistant Engineers as suggested by you, apparently contemplates an immediate promotion of Assistants to Executives sufficient to bring about a ratio of Executives to Assistants of 2 to 1 in place of the present proportion of 3 to 4.

6. After a careful study, however, of the statements contained in your letter, coupled with the lists of the Public Works Establishments throughout India, I have been unable to accept the conclusion that the circumstances of the Department justify so serious an alteration in the proportion of numbers in these two classes as that proposed. As, moreover, it is obviously easier to move hereafter in the direction suggested by you than to recede from it, should the measure, as appears to me not improbable, prove inconvenient, I propose to limit, for the present at any rate, the alteration in the numbers of Executive and Assistant Engineers so as to make them equal.

7. In order to produce this proportion within a reasonable time, I am willing to sanction the promotion of the necessary number of Assistants to Executives within the present year and one or two years succeeding, in the manner which appears most advisable to your Government. At the same time the proportion of numbers among the several grades of Executive Engineers which is proposed by you, namely,—1st Grade, 8; 2nd Grade, 9; 3rd Grade, 10; 4th Grade, 12,—should be adopted as early as possible.

8. Before passing from this part of the subject, I would draw your attention to the necessity which will occur, in consequence of the diminished recruitment, for so regulating the promotion of Assistant Engineers to fill vacancies in the class of Executive Engineer as to retain the due proportion in each class as nearly as is compatible with a fair flow of promotion. This may be done by refraining, after the next two years, and until the Department is reduced to its normal strength, from filling up a certain proportion of the vacancies among Executive Engineers, the extent and precise manner of doing so being settled by your Government. In the event of the number of Executive Engineers being in excess of the number of Executive Divisions which it is necessary to maintain, it may be expedient to revert to a plan similar to that which existed from 1861 to 1864 of employing Officers of the rank of 4th Grade Executives as Special Assistants without Executive charge on works of exceptional importance.

9. With reference to para. 24 of your letter, it appears to me that the present rule, under which an increment of Rs. 50 per mensem, after 4 years' service in the grade of Executive Engineer, 1st Grade, and a further increment of equal amount after a service of 8 years in the same grade, is calculated to mitigate the hardship of possible slow promotion in individual cases, and I am, therefore, unwilling to assent to the cancelment of the rule in question, unless there are stronger reasons for its abolition than I am aware of at present.

10. With reference to the proposal in para. 6 of your letter to fix the proportion of numbers in the Chief and Superintending Engineer classes at 3 and 7 per cent. respectively, I observe that these proportions are not suggested by you in reference to actual present requirements, but to the possible future needs of the Department. It appears to me unnecessary to lay down any arbitrary proportion of numbers in these two classes. Such appointments should only be made as called for by the requirements of the Service. I would leave, therefore, the numbers in the ranks of Chief and Superintending Engineers to be regulated according to the demands of the Service as determined by your Government, subject, as usual, to the necessary sanction for any increase being obtained from the Secretary of State in Council.

11. The next proposal to which I will advert is the scale suggested by you (as marginally quoted†) for compulsory retirement of members of the Department who have not reached certain grades in the Department at certain ages. The necessity for introducing some general rule enforcing the retirement of officers in certain circumstances was alluded to in Lord Hartington's Public Works Despatch, No. 50 of 1881, and your attention was invited to the subject. But your present proposals go beyond what was intended in the matter, and I am of opinion that a stringent application of such a scale of enforced retirement as that which you have suggested might lead to hardship in the case of individuals, with resulting inconvenience to Government, which would outweigh any advantages to be derived from its adoption. I am not disposed, therefore, to move in this matter of compulsory retirement further than has been already indicated by me, namely, to couple with the existing regulation, which requires retirement from the public service at the age of 55, a further rule authorising your Government to call on an officer of the Public Works Department to retire who has not at the age of 50 attained the rank of Superintending Engineer, the power being reserved to your Government, in the one case as well as in the other, to retain the services of such an officer on special grounds.

† An officer should retire—
If not at 30 years of age Assistant Engineer, 1st Grade.
If not at 35 years of age Executive Engineer, 4th Grade.
If not at 40 years of age Executive Engineer, 3rd Grade.
If not at 45 years of age Executive Engineer, 2nd Grade.
If not at 50 years of age Executive Engineer, 1st Grade.

12. The next two points to be dealt with are the proposals for the improvement of the pension scale for retired officers of the Public Works Department, and for the institution of a Provident Fund.

13. I will first consider the scale of gratuities and pensions and the periods of furlough which you recommend should count for pension. These proposals are embodied in the 11th to 14th paragraphs of your letter, and are confined to the Civil Engineers in the Department, no interference with the rules which apply to Military Officers being intended. In connection with the scale of pensions proposed by your Excellency is a plan for establishing a provident fund to which considerable contributions would be made by Government, and proportionate benefits conferred on the subscribers. For the reasons which are explained hereafter, I am uuable to adopt your recommendations in this matter, but I am prepared to approve of a higher scale of pensions than that proposed by you in the 13th paragraph of your letter, applicable to periods between the 10th and 30th year of service, 20 years of service being necessary to entitle an officer to retire without a medical certificate.

The following is the scale which I should be willing to sanction :—

No. of years service.	Pension per annum. Rs.	
10	1,000	On medical certificate.
11	1,400	
12	1,800	
13	2,200	
14	2,600	
15 to 19	3,000	
20 to 24	4,000	Without medical certificate.
25 and upwards	5,000	

In some possible and exceptional case the old rules of invalid pension may be more acceptable than those now sanctioned, and it should, therefore, be notified that all now in the Department should, at the time of retirement, be allowed an option between old and new rules.

14. With reference to this scale of pensions, I observe that your Excellency writes, in para. 12 of your letter, as if a pension of Rs. 5,000 per annum, after 25 years' service, was obtainable by right, whereas no pension is now claimable up to that limit of service, or, indeed, until 30 years' service have been complted except on medical certificate. By the new rules, however, an officer, after 20 years' service, will be permitted to retire on the pension he may be entitled to by length of service, irrespective of medical certificate, a relaxation of existing rules which constitutes of course a considerable benefit to the body of the Service. In addition to this, I am prepared to offer further advantages in respect to the pensions of the members the of Department who have served in the high and responsible positions of Chief Engineer and Superintending Engineer, these officers being in my estimation entitled to special consideration. I accordingly propose to authorize the grant to any officer who may have served three years as a Chief Engineer, or who may have been graded as such, an extra pension of Rs. 2,000 per annum, irrespective of his total period of service in addition to the pension which he would receive under the scale now proposed by your Government. An extra pension of Rs. 1,000 per annum may be granted in like manner to any officer who may have served three years as a Superintending Engineer. These extra pensions will, however, be only granted at your discretion as rewards of approved services.

15. The new scale of pensions, with these additions, will in future be applicable to all the European Civil Engineers of the superior engineering branch of the Public Works Department.

16. As regards the time spent on furlough, which is to count as qualifying for pension, I sanction the proposals made in the 14th para. of your letter, subject, however, to a reservation which will be found later in paragraph 19. I would, in addition to your proposals, retain the existing rule which gives "five years of leave during 35 years of service" in order to meet special cases which may occur.

17. The institution of a provident fund for members of the Department was suggested to you by the Despatch marginally noted,* in these words "I would request you to consider "whether any, and what, encouragement could be given to a provident fund for the benefit "of officers of the Department, by which we could at least encourage frugality, and return "to those who adhered to it their savings with interest on retirement or to their families "on death."

* No. 50, dated 8th September 1881.

18. In pursuance of this suggestion, your Government has submitted a scheme which involves, besides deductions from the pay of officers in the Department, substantial aid from Government to all officers in the grades of Executive and Assistant Engineers. There are, however, in my opinion, many objections to a direct contribution by the State to a provident fund in addition to the grant of pensions, and, moreover, such large deductions from the salaries of junior officers as you have suggested appear to me to be out of proportion to their means. I am unable to assent to the institution of the fund on any other basis than that of encouraging members of the Department to save a certain proportion of their

salaries by allowing interest on their contributions. Subscription to such a fund should be open to all Civil Engineers now in the Department, or hereafter entering it. The contribution might properly be fixed at 5 per cent. on salaries, with voluntary contributions by members of a further 5 per cent., compound interest at 4 per cent. on such payments being annually credited by Government to each officer. The sum which will thus gradually accumulate to the credit of an officer will be his absolute property, to be handed over to him unconditionally on quitting the service, or, in the event of his death before retirement, to his legal representatives. When it is ascertained to what extent officers now in the Department look on the institution of such a fund as an advantage, and avail themselves of it, it will be more easy than at present to judge whether it should be made obligatory on all Civil Engineers hereafter entering the service to subscribe thereto. Meanwhile, I am not prepared to make subscription obligatory.

19. I have to add, with regard to the length of qualifying service for pensions (referred to in para. 14 of your letter) that, while I accept your proposals) it must be understood that, in accordance with the general principle established on this point, the permission to reckon certain portions of furlough as service will apply only to those members of the Department to whom the more favourable leave rules are applicable.

20. Although not alluded to in your letter, the question of the pay of the Royal Engineer members of the Department is one which it is desirable now to consider. The opinion has already been expressed by my predecessors that the position in the Department of the Military and the Civil Engineers should, as far as possible, be assimilated, and the time has, in my opinion, arrived when the distinctions which now exist in their emoluments should be removed. I desire, therefore, that in future the salary of the Royal Engineer Officers admitted to the Department shall not be supplemented by military pay proper, but shall consist only of the salary of the grade or office in which they may be serving. I do not propose that any deductions shall be made from the present allowances of those who are in the Department, but on their promotion the new rule should be applied to them, provided they do not by promotion suffer any diminution in their total present emoluments.

21. Another point remaining for consideration is that of the relative proportions of Royal and Civil Engineers in the Department. The whole number of Royal Engineers is now 228, but should the separation of the Military Works Branch be determined on, a transfer of 127 will take place, leaving 10 on the general Public Works staff. You propose to maintain the number at 100, and to fix the proportion of Royal Engineers at 15 per cent. of the whole. On this question I reserve my opinion until I have come to a decision on the proposals for the separation of the Military Works from the Public Works Department of your Government made in your Military Letter, No. 341, of the 21st September 1881.

22. You inform me in para. 25 of your Despatch, that you are "prepared to admit "Natives into the Engineer. Establishment on two-thirds of the salaries drawn by those appoint-"ed from England, and to afford every encouragement to their entering." This I entirely approve, and I wish you to consider how far it may be possible to adopt a scale of pensions for Natives of India, corresponding to those now sanctioned by this Despatch, at two-thirds of the rates for Europeans.

23. To ensure any larger introduction of the Native element into the Department the provision of efficient means of instruction and practical training in different parts of India will be essential; and as this is a matter which has formed the subject of former correspondence, I need say no more on this occasion.

24. With respect to the remark made in para. 26 of your letter, I have to refer you to my predecessor's Despatch, No. 2, Public Works Department, dated the 5th January 1882, regarding the discretion left to your Government to make engagements with Civil Engineers for short terms of service on particular works.

25. The request contained in the last paragraph of your letter for sanction to the application of the principles of the foregoing scheme to the superior officers of the Accounts 25th April last, which will be replied to separately. So far, however, as any of the officers of this branch have been recruited from the Engineer Branch, it will doubtless be proper to extend to them the advantages they would have received had their transfer not taken place.

26. Apart from the questions of promotion, pay, and pensions, there are other points connected with the Civil Engineering section of the Department which I consider it desirable to refer to. I have been made aware there is among the Civil Engineers an impression that they do not receive their due share of the appointments in the Secretariats, or in the department of Railway control. I do not know how far there is real ground for complaint on this score. Nor do I desire to interfere with the discretion which is exercised by the authorities in India in the selection of individuals for certain offices. I will only express my confidence that the choice of fit persons will be made with perfect impartiality, and that no grounds will be allowed to exist for such apprehensions as those which have been expressed. I am not aware of any reason why competent Civil Engineers of the Department should not hold the office of Consulting Engineer for Railways, or have equal opportunities to qualify for that position with officers of the Royal Engineers.

27. Another point on which I find that strong feelings are entertained by the Civil Engineering Members of the Department is in respect to their designation as Uncovenanted Servants. Under the special rules regarding their pay, pensions, and furloughs which have now been provided for them, they will no longer come under the general Uncovenanted Service Rules, and a special chapter will have to be introduced in the Pension Code to meet their case The term is, therefore, no longer applicable to them, and should be dropped in India as it will be here in all official notifications.

Govt. Central Branch Press, Simla.—No. 176 P. W. D.—17-8-83.—50.

II.

The effect of the orders of Despatch No. 18 P. W. on scales of establishment and rate of promotion actuarially considered.

Paragraphs 3—8 of the Despatch.

The ultimate scale to which sanction is given in these orders is 888.* But this ultimate scale depends on a reduction of 66 in the Railway Branch; and the ultimate distribution of the total number of 888 involves a transfer of 53 from several of the Provincial lists to the Military Works list.

* Public Works Department proper ... 761
Military Works 127

For the present we may consider that our provisional scale is 954 on one list, and that the distribution between the classes is—

Chief Engineers	19
Superintending Engineers ...	52
Executive and Assistant Engineers	883
	954

Our present actual numbers are 1,004,† of whom 40 are lent out of the Department, so that our working number is 964. In the present discussion, however, I shall deal with the number 1,004, which represents the aggregate of men in the substantive grades. In Despatch No. 51 of 1881, to which the present despatch is a reply, it is stated that the actual number was 963. The increase is due to the annual recruitments being at present in excess of the retirements and casualties, owing to the former being abnormally small. This is caused by the crowding which has occurred in certain ages in the centre of the actuarial scale; but the irregularity will correct itself in due time.

† Omitting two Local Fund Engineers in the North-Western Provinces.

2. Under the orders now received, the number of Executive and Assistant Engineers is to be equally divided, and the Executive grades are to be distributed in the ratio of 8, 9, 10, 12. If we distribute the provisional sanction of 954, which, as I have said, we must consider our present standard under the orders, it will compare with the scale on which we have hitherto been working as follows:—

	Present.		*Revised.*	
	No.	Scale.	No.	Scale.
Chief Engineer ...	19	19	19	19
Superintending Engineer ...	49	68	52	71
Executive Engineer, 1st grade ...	101	169	91	162
„ 2nd „ ...	112	281	102	264
„ 3rd „ ...	117	398	113	377
„ 4th „ ...	52	450	136	513
Assistant Engineer ...	504	954	441	954

The adoption of such a scale, although it would give relief to the Assistant class, would block promotion in the first and second class of Executive Engineers.

The orders seem to allow the Government of India discretion in adapting the new scale to existing circumstances, so as gradually to work round to it; and the necessary course of action for the present would seem to be to accept the proportion of 1: 1 between Executives and Assistants, but to base the proportionate distribution of the Executive grades by starting with 101 in the first grade. On this basis the distribution of our present establishment of 932 Executives and Assistants, after carrying out the three steps to the Superintending Engineer class, would be somewhat as follows :—

Executive Engineer, 1st grade	...	101
„ 2nd „	...	113
„ 3th „	...	125
„ 4th „	...	127*
		466
Assistant Engineers	...	466

* This is on the supposition that all the steps possible to 4th grade were carried out; but in practice this would not be done.

In this scale the Assistants are equal in number to the Executives; the 1st, 2nd and 3rd grades are in the ratio of 8, 9, 10; and the number in the 4th grade is the balance of the total number of Executives.

What we now have to do is to examine the general effect of adopting this scale on the rate of promotion. It will be found, as we go on, that the question of rate of promotion in the Executive grades may be neglected as comparatively unimportant, and that the whole question turns on the effect on promotion of adopting the ratio of 1: 1 adopted for the Executive and Assistant class.

3. For the purposes of this enquiry it is useless to take ideal figures, that is, to discuss the circumstances of an establishment of 1,000 officers supposed to be arranged in ranks by ages, with a certain number periodically going out and a certain number periodically coming in to maintain the given number. We shall not have an establishment of this kind for the next 25 years.

4. The first table appended to this memorandum (Appendix A) shows the ages in the several classes and grades as they now are; and an inspection of this shows that beyond a very limited extent, age and length of service is not a measure of promotion, under present conditions. The only clearly marked division is that between Assistants and Executives at about the age of 33 years, or, allowing for service to commence at 22 years of age, after a service of 10 or 11 years.

We may, however, without respect to grade distribution, estimate actuarially the number of Engineers of each age for a number of years on the known data, which are as follows :—

(*a*) Arrangements have been made for an annual present recruitment of 23 (see paragraph 4 of despatch). This does not allow for recruits for the present Military Works establishment of 74, the recruitment of which is in fact managed separately; but for purposes of this enquiry, 3 may be added for this establishment.

(*b*) On reaching the age of 55 all are compulsorily retired.

The second table (Appendix B) shows the numbers in each age up to the year 1907 actuarially worked out on the above basis, and shows that at the sanctioned rate of recruitment the establishment will go on slightly increasing up to 1889, and will then begin decreasing until the ultimate number of 888 is reached in 1897, when the scale of recruits will have to be increased to prevent the establishment from being depleted.

5. Next, we may approximately calculate the rate of promotion from the Assistant to the Executive class in the following manner. The third table (Appendix C) shows for each year up to 1900 the numbers under each age as taken from the second table distributed between the Executives and Assistants in one column and the Chief and Superintending Engineers in another.* The totals of Executives and Assistants are given in two columns for the purpose of showing the rate of promotion from class to class and grade to grade—the one on the supposition that all are retired at the age of 55 only; the other that men who reach the age of 50 without becoming Superintending Engineers (see paragraph 11 of despatch) are compulsorily retired.

* In framing this table the men who are likely to recruit the Chief and Superintending Engineer classes for the next 11 years were taken. After that the recruits for these classes had to be taken at hazard from the Upper Executive grades. The table is on this basis as nearly accurate as it can be made.

Supposing that the establishment were the typical one of the actuary, that is, that the measure of age were the measure of service, and that all the men being equally good were arranged in grades by age and length of service, we could by means of this table exactly measure the rate of promotion, knowing the scale or number in each class.

At the present time reference to Table A will show, as already observed, that any such calculation can but be approximate; but as time goes on, and as the numbers in each age by means of regular recruitment of young men of a good class fall into

the places they should naturally hold, the actual approximates to the typical establishment, and the calculation becomes nearer the truth. For the present, as I have said, we may apply the law of the typical table approximately to the Assistant class, and may estimate what the rate of promotion will be on adopting the prescribed ratio of 1 : 1 between the Executive and Assistant classes for each year. It will not do, however, to apply to each year the mere number of Assistant Engineers as a gauge of the rate. Owing to the mixture of various ages in the classes we must regulate the gauge a little.

Table A shows that with our present establishment of 1,004, working on a scale of 3 Executives to 4 Assistants, we have 542 men of 33 years and under, of whom 50 are Executives. Thus there are 492 Assistants of about the age of 32 and of 10 years' service. There are also 50 men besides over the standard age which make up the present number of 540 Assistants. Now, by inspection of the nominal lists we know that the men of 1873, or of between 9 and 10 years' service, who have been tolerably fortunate, have been promoted. And by similar inspection we know that if we were to promote the deserving men of 10 years' service and more who have not been promoted, but whom under the new distribution of 1 : 1 we can promote to the Executive class, we should have promoted all the men of 10 years' service and more who are ever likely to be promoted, that is, who are not bad bargains. We should then have some 500 Assistant Engineers, of whom 95 per cent. would be of the age of 32 and of 10 years' service and 5 per cent. of whom would be bad bargains. We have thus arrived at two conclusions :—

First.—The present rate of promotion, after adjusting the scales in the ratio of 1 : 1, is about 10 years' service or 32 years of age.

Secondly.—We may assume that out of the total number of Assistants for any year, 5 per cent. are bad bargains and above the standard age and length of service, so that to measure the number of years of service in the class for the good men we may assume 95 per cent. of the total number of Assistants.

To illustrate this, we may apply the rule to the year 1884. The number of Assistants to be adopted for that and subsequent years, taking the new ratio of 1 : 1, may be taken as 500, and the measure, reducing this by 5 per cent., will be

475. This measure includes the men of between 32 and 33 years of age, or of about 10 years' service.

Supposing, now, that we maintain the proportion of 1 : 1 year by year, the number of years' service in the Assistant class for each year as obtained from Appendix C is shewn below :—

	Total number of Assistants.	Measure allowing for bad bargains.	Number of years.
1884 ...	470	447	9½
1885 ...	470	447	10
1886 ...	470	447	10½
1887 ...	470	447	11½
1888 ...	470	447	12
1889 ...	470	447	12
1890 ...	470	447	13
1891 ...	470	447	13½
1892 ...	470	447	14
1893 ...	470	447	14½
1894 ...	470	447	15
1895 ...	456	430	15½
1896 ...	449	427	16
1897 ...	443	420	16
1898 ...	433	410	16½
1899 ...	433	410	16½
1900 ...	424	403	16

This shows that, as time goes on, the length of service in the Assistant class must gradually increase if the prescribed ratio of 1 : 1 be adopted. The reason of the gradual extension is, that at present the numbers in the earlier years of service are large, ranging from 43 in the 3rd year to 65 in the 8th, 53 in the 9th, 50 in the 10th year; and as these get lower down the scale, and the years of smaller recruitment fill up the Assistant class, the rate of promotion is retarded.

The 50 years' rule, it is hardly necessary to state, has no effect on the rate of promotion in the Assistant class.

6. Under these circumstances, it seems necessary to point out that instead of adopting the fixed ratio of 1 : 1, we must, while the establishment is adjusting itself to the ideal condition, adopt a sliding scale, and that we must ultimately adopt a different fixed ratio to that now ordered, if we are to give a reasonable rate of promotion for the Assistant class. If we adopt 10 years as a suitable period for service in the Assistant class—this being about the present period, and I think

the very utmost that can be adopted with due regard to the interests of the service—and if we measure the necessary scale on this basis by means of Appendix C, we get the following scale of Assistant and Executives :—

Years.	Standard.	Full number of Assistants.	Number of Executives.
1884 ...	480	505	437
1885 ...	447	470	478
1886 ...	385	405	539
1887 ...	384	404	542
1888 ...	357	376	576
1889 ...	301	344	611
1890 ...	306	322	630
1891 ...	283	298	651
1892 ...	268	282	653
1893 ...	267	281	655
1894 ...	270	284	640
1895 ...	270	284	629
1896 ...	270	284	614
1897 ...	270	284	603
1898 ...	270	284	583
1899 ...	270	284	580
1900 ...	270	284	564

The above table shows that, in order to give promotion after 10 years of service, the ratio has to be gradually increased until, when the age-ranks in the Assistant class become normal, the ratio of two Executives to one Assistant is established; and this is the ratio that it would seem necessary to adopt ultimately. This result is in striking accordance with that which was worked out in 1881, when Despatch No. 50 to the Secretary of State was framed.

7. Assuming that the sliding scale of the preceding paragraph for the Assistant and Executive classes ending ultimately in a proportion of 2 : 1 will be adopted, we may work out approximately the rate of promotion in the Executive grades.

The ultimate scale, as observed in paragraph 1, will be 888, of whom 71 will be Superintending and Chief Engineers. Thus the ultimate proportion on the basis of 2 : 1 will be 272 Assistants and 545 Executives, and the numbers in the Executive grades, divided in the proportion of 8, 9, 10, 12, will be—

		No.	Scale.
Ex. Engineers,	1st grade ...	112	122
„	2nd „ ...	126	238
„	3rd „ ...	140	378
„	4th „ ...	167	545

as compared with the scale we propose to adopt for the present (see paragraph 2), *viz.* :—

		No.	Scale.
Executive,	1st	101	101
„	2nd	113	214
„	3rd	125	339
„	4th	*	

* This number is uncertain, and would depend on the number of men deserving promotion who have completed 10 years' service.

On the proportion of 2 : 1 being accepted we should propose to level gradually up from this scale to the higher one, which represents the scale of the ultimate establishment. The following statement shows the scale and the number of years in each Executive grade on the above supposition under both the 55 and 50 years' rule of retirement. The period shown in the 1st grade is of course for those only who are not promoted to the Superintending and Chief Engineer class :—

			1st	2nd	3rd	4th	Assistant.
84	No. in each grade ...	55 years' rule ...	101	113	125	98	505
		50 „ ...	...	...	...	88	...
	Service „ ...	55 years' rule ...	11½	4	4½	3	10
		50 „ ...	7	4	4	3	10
85	No. in each grade ...	55 years' rule ...	102	114	126	136	470
		50 „ ...	...	...	...	112	...
	Service „ ...	55 years' rule ...	10½	4	4½	4	10
		50 „ ...	6½	4	4	3½	10
86	No. in each grade ...	55 years' rule ...	103	115	127	194	405
		50 „ ...	...	...	...	182	...
	Service „ ...	55 years' rule ...	10½	4½	4	4	10
		50 „ ...	6½	4	4	3½	10
87	No. in each grade ...	55 years' rule ...	104	116	128	194	404
		50 „ ...	...	...	...	1 1	...
	Service „ ...	55 years' rule ...	10	4½	4½	4	10
		50 „ ...	6	4	4½	3½	10
88	No. in each grade ...	55 years' rule ...	105	117	129	225	376
		50 „ ...	...	...	...	206	...
	Service „ ...	55 years' rule ...	9½	4½	4½	4½	10
		50 „ ...	5½	4	4½	4	10
89	No. in each grade ...	55 years' rule ...	106	118	130	257	344
		50 „ ...	...	...	...	233	...
	Service „ ...	55 years' rule ...	9½	4½	4	5	10
		50 „ ...	5½	4	4	4½	10
90	No. in each grade ...	55 years' rule ...	107	119	131	273	322
		50 „ ...	...	...	...	244	...
	Service „ ...	55 years' rule ...	9½	4	3½	6	10
		50 „ ...	4½	4	4	5½	10

			1st	2nd	3rd	4th	Assistant.
91	No. in each grade	55 years' rule	108	120	132	291	298
		50 „	...	...	...	251	...
	Service „	55 years' rule	8	4½	4	6½	10
		50 „	4½	4½	3½	5½	10
92	No. in each grade	55 years' rule	109	121	133	290	282
		50 „	...	...	...	248	...
	Service „	55 years' rule	8½	4	4	7	10
		50 „	4½	4½	3½	6	10
93	No. in each grade	55 years' rule	110	122	132	289	281
		50 „	...	...	...	237	...
	Service „	55 years' rule	7½	5	3	7½	10
		50 „	5	4	3	6	10
94	No. in each grade	55 years' rule	111	123	135	271	284
		50 „	...	...	...	223	...
	Service „	55 years' rule	7½	4½	3½	7½	10
		50 „	4½	4	4	5½	10
95	No. in each grade	55 years' rule	112	124	136	257	284
		50 „	...	...	...	203	...
	Service „	55 years' rule	7½	4½	3½	7½	10
		50 „	4½	3½	4	6	10
96	No. in each grade	55 years' rule	112	125	137	240	284
		50 „	...	...	...	177	...
	Service „	55 years' rule	7½	4	3½	8	10
		50 „	5	3	3½	6½	10
97	No. in each grade	55 years' rule	112	126	138	237	284
		50 „	...	...	...	166	...
	Service „	55 years' rule	7	4	3½	8½	10
		50 „	4½	3½	3½	6½	10
98	No. in each grade	55 years' rule	112	126	139	206	284
		50 „	...	...	...	166	...
	Service „	55 years' rule	7½	3½	3½	8½	10
		50 „	4½	3	3½	7	10
99	No. in each grade	55 years' rule	112	126	140	202	284
		50 „	...	...	...	166	...
	Service „	55 years' rule	7	3½	3½	9	10
		50 „	3	3	4	7½	10
1,900	No. in each grade	55 years' rule	112	126	140	186	284
		50 „	...	...	...	166	...
	Service „	55 years' rule	6½	3½	4	9	10
		50 „	3	3	4	8	10

Appendix AA.

Table classifying the various grades of the Engineer Establishment according to length of service showing Royal and Civil Engineers separately.

	Years of Service. 0		1		2		3		4		5		6		7		8		9		10		11		12		13		14		15		16		17		18		19		20		21		22		23		24		25		26		27		28		29		30		31		32		33		Total.
	C. E.	R. E.	C. E.	R. E.	C. E.	R. E.	C. E.	R. E.	C. E.	R. E.	C. E.	R. E.	C. E.	R. E.	C. E.	R. E.	C. E.	R. E.	C. E.	R. E.	C. E.	R. E.	C. E.	R. E.	C. E.	R. E.	C. E.	R. E.	C. E.	R. E.	C. E.	R. E.	C. E.	R. E.	C. E.	R. E.	C. E.	R. E.	C. E.	R. E.	C. E.	R. E.	C. E.	R. E.	C. E.	R. E.	C. E.	R. E.	C. E.	R. E.	C. E.	R. E.	C. E.	R. E.	C. E.	R. E.	C. E.	R. E.	C. E.	R. E.	C. E.	R. E.	
Chief Engineers, class I ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	...	1	...	7
Chief Engineers, class II ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	1	...	...	...	...	2	...	1	..	...	...	6
Chief Engineers, class III ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	1	...	1	1	1	...	...	...	1	...	...	...	...	...	...	...	..	6
Superintending Engineers, class I ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	1	...	4	...	4	...	2	...	2	...	3	...	...	...	1	...	...	...	...	...	...	18
Superintending Engineers, class II ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	...	...	...	1	...	...	...	...	...	...	...	3	...	...	...	1	2	2	...	2	1	...	2	...	1	...	...	...	...	...	...	...	...	...	17
Superintending Engineers, class III ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	1	1	1	1	1	2	1	2	1	...	1	...	...	...	...	1	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	15
Executive Engineers, 1st grade ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	1	...	1	1	2	2	5	4	11	...	4	1	5	1	4	4	3	7	10	4	2	2	1	8	5	1	2	4	2	4	1	...	...	1	1	...	1	...	...	...	1	...	...	...	...	107
Executive Engineers, 2nd grade ...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	2	1	1	4	5	2	8	2	6	3	32	2	14	3	7	1	2	...	2	5	1	1	...	2	2	...	2	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	112
Executive Engineers, 3rd grade ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	2	2	1	2	9	7	14	5	19	3	19	1	10	..	14	...	8	...	1	...	...	...	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	120
Executive Engineers, 4th grade ...	...	...	...	1	...	...	...	1	...	...	1	...	...	2	1	6	2	7	...	12	...	6	1	5	1	3	...	5	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	55
Assistant Engineers, 1st grade ...	...	...	...	...	4	1	3	1	1	8	1	20	3	35	5	41	8	44	7	41	3	15	6	12	1	7	...	2	...	3	...	2	...	1	...	1	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	278
Assistant Engineers, 2nd grade ...	20	2	21	12	45	4	44	1	36	1	29	1	12	...	14	...	9	...	2	...	5	...	...	...	3	...	1	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	263
Total ...	20	2	21	17	46	7	45	2	45	3	49	5	47	5	58	9	61	11	52	5	43	14	34	11	41	7	35	5	31	7	63	2	27	4	16	2	7	5	8	13	13	6	6	6	4	10	9	5	5	9	4	10	2	7	1	6	1	4	1	2	...	3	1	3	...	1	...	...	1,004
Other Military officers ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	1	...	4	...	1	...	...	...	1	...	2	...	2	...	1	...	2	...	1	...	3	...	...	...	2	...	1	...	...	...	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

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N.B.—Service before the age of 22 is excluded as in Appendix B.B.

Appendix A

	22 years and under.	23 years.	24 years.	25 years.	26 years.	27 years.	28 years.	29 years.	30 years.	31 years.	32 years.	33 years.	34 years.	35 years.	36 years.	37 years.	38 years.	39 years.	40 years.	41 years.	42 years.	43 years.	44 years.	45 years.	46 years.	47 years.	48 years.	49 years.	50 years.	51 years.	52 years.	53 years.	54 years.	55 years.	Total.
A. E., 2nd ...	22	27	42	48	36	33	13	12	12	4	4	1	3	1	3	1	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	263
A. E., 1st ...	...	...	1	1	8	23	40	30	50	40	30	14	9	7	4	5	1	4	2	3	1	1	1	...	...	1	1	...	1	...	..	...	...	...	278
E. E., 4th ...	...	...	...	...	1	...	...	2	2	8	7	7	8	2	3	3	3	3	...	3	...	1	2	...	...	...	...	...	...	...	...	...	...	...	55
E. E., 3rd ...	...	...	...	...	...	...	...	1	1	1	9	12	17	24	7	10	13	6	4	2	3	6	1	2	...	...	1	...	...	...	...	...	...	...	120
E. E., 2nd ...	...	...	...	...	...	...	...	...	...	...	...	...	2	10	4	15	18	18	1	13	8	7	2	5	4	...	1	2	2	...	...	...	...	...	112
E. E., 1st ...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	2	1	6	5	6	11	13	8	13	13	10	6	1	3	1	1	2	3	1	...	107
S. E., 3rd ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	2	3	3	1	1	...	2	1	...	...	...	...	...	...	15
S. E., 2nd ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	3	1	1	4	3	1	1	1	...	1	...	...	...	17
S. E., 1st ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	5	5	2	2	3	...	...	1	...	...	18
C. E., 3rd ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	2	2	...	1	...	...	...	...	6
C. E., 2nd ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	1	1	...	...	2	...	1	...	6
C. E., 1st ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	1	2	2	1	7
Total ...	22	27	43	49	45	56	53	45	65	53	50	34	39	45	23	35	41	38	13	34	27	29	23	24	24	15	12	12	8	3	6	6	4	1	1,004
C. Es. ...	20	20	38	48	43	49	49	40	58	49	41	24	30	40	20	30	30	30	6	15	16	16	10	19	10	5	3	5	4	1	2	3	2	1	...
R. Es. ...	2	7	5	1	2	7	4	5	7	4	9	10	9	3	2	5	7	8	3	17	8	11	13	4	11	10	7	7	4	2	4	3	2	...	...
Other Military ...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	1	...	4	...	4	2	3	2	...	1	3	...	2	...	...	...	...	...	...	...	...

Appendix B

Actuarial Table showing the Engineer Establishment of the Public Works Department arranged by ages for 34 years, on the hypothesis that each man retires as he attains the age of 55 years and that 26 recruits (including 3 for Military Works Branch) enter annually.

Years of service.	Age in 1883.	No. of each age in 1883.	No. of each age in 1884.	No. of each age in 1885.	No. of each age in 1886.	No. of each age in 1887.	No. of each age in 1888.	No. of each age in 1889.	No. of each age in 1890.	No. of each age in 1891.	No. of each age in 1892.	No. of each age in 1893.	No. of each age in 1894.	No. of each age in 1895.	No. of each age in 1896.	No. of each age in 1897.	No. of each age in 1898.	No. of each age in 1899.	No. of each age in 1900.	No. of each age in 1901.	No. of each age in 1902.	No. of each age in 1903.	No. of each age in 1904.	No. of each age in 1905.	No. of each age in 1906.	No. of each age in 1907.	No. of each age in 1908.	No. of each age in 1909.	No. of each age in 1910.	No. of each age in 1911.	No. of each age in 1912.	No. of each age in 1913.	No. of each age in 1914.	No. of each age in 1915.	No. of each age in 1916.	No. of each age in 1917.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37
0	22	22	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26
1	23	27	22	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25
2	24	43	27	21	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25
3	25	49	42	27	21	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25
4	26	45	49	41	27	21	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25
5	27	56	44	48	40	26	21	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25
6	28	53	56	44	48	40	26	21	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
7	29	45	53	56	44	47	40	26	20	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
8	30	65	44	52	55	43	47	39	26	20	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
9	31	53	64	44	51	55	43	47	39	25	20	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
10	32	50	53	63	43	51	54	43	46	39	25	20	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23
11	33	34	49	53	62	43	50	53	42	46	38	25	19	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23
12	34	39	33	48	52	61	42	50	53	42	45	38	24	19	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23
13	35	45	38	33	47	51	60	42	50	52	41	44	37	24	19	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22
14	36	23	45	37	32	46	50	59	41	49	52	40	44	36	23	19	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22
15	37	35	22	44	36	31	45	49	58	40	48	51	38	43	34	23	18	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22
16	38	41	34	21	44	36	31	44	48	57	39	47	50	37	43	33	22	18	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21
17	39	38	41	33	21	42	35	30	43	47	56	38	46	48	36	42	32	22	18	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21
18	40	13	37	40	32	20	41	34	29	42	46	55	37	45	47	35	41	31	21	16	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21
19	41	34	13	37	39	32	20	40	34	28	41	45	54	37	44	46	34	40	30	21	16	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
20	42	27	34	13	36	38	31	19	39	33	28	40	44	53	36	43	45	34	39	30	20	16	19	19	19	19	19	19	19	19	19	19	19	19	19	19
21	43	29	26	33	12	36	37	31	19	39	33	27	39	43	52	35	42	44	33	38	29	19	16	19	19	19	19	19	19	19	19	19	19	19	19	19
22	44	23	28	26	32	12	35	36	30	18	37	32	26	38	42	51	34	41	43	32	37	28	19	15	18	18	18	18	18	18	18	18	18	18	18	18
23	45	24	23	27	25	32	12	34	35	30	18	36	32	26	37	41	50	34	41	42	32	36	28	18	15	18	18	18	18	18	18	18	18	18	18	18
24	46	24	23	23	26	24	31	11	34	34	29	18	35	31	25	36	40	49	33	41	42	32	36	28	18	14	18	18	18	18	18	18	18	18	18	18
25	47	15	23	22	22	26	24	30	11	33	33	29	17	34	30	24	35	39	48	32	40	41	31	34	27	17	14	17	17	17	17	17	17	17	17	17
26	48	12	14	22	21	21	25	23	28	11	32	32	28	16	32	29	24	34	38	47	31	38	40	31	33	26	16	13	17	17	17	17	17	17	17	17
27	49	12	12	14	21	20	21	25	23	28	10	31	31	28	16	32	29	24	33	37	46	31	37	38	31	33	20	16	13	16	16	16	16	16	16	16
28	50	8	12	12	14	21	20	21	25	22	27	10	31	30	28	16	31	28	23	32	36	45	30	36	38	30	32	25	16	13	16	16	16	16	16	16
29	51	3	7	12	11	13	20	19	20	24	22	26	10	30	29	27	15	30	27	22	31	35	43	29	35	37	29	31	24	16	12	15	15	15	15	15
30	52	6	3	7	11	10	13	19	18	19	23	21	26	9	29	28	26	14	29	26	20	30	34	42	28	34	35	28	30	23	15	12	15	15	15	15
31	53	6	6	3	6	10	9	12	18	17	18	22	20	25	9	28	26	25	13	28	24	19	28	32	39	26	31	33	26	20	22	14	11	14	14	14
32	54	4	6	6	3	6	9	9	11	17	16	17	21	19	24	8	26	25	24	12	26	22	18	27	30	37	24	28	30	25	27	21	13	10	13	13
33	55	1	4	6	5	2	5	9	8	10	16	16	16	20	18	24	8	25	23	23	11	25	21	17	26	28	34	23	25	27	24	25	20	12	9	12
...	...	1,004	1,013	1,019	1,015	1,017	1,023	1,026	1,023	1,020	1,016	1,007	993	984	969	958	938	835	919	903	886	882	864	852	841	821	798	771	755	740	723	710	697	689	689	692

N.B.—Column 3 shows the numbers of each age in the year 1883. The succeeding columns show below the thick line the numbers deduced for each age according to General Hannyngton's Life Table from the numbers in column 3 for 34 years, that is, until the present Establishment has been worked off, and above the thick line the recruits entering each year, with numbers similarly deduced year by year—thus each vertical column represents the numbers of each age for each year named, and the total represents the total establishment in each year. The figures followed diagonally shew the numbers surviving from year to year.

Appendix BB.

Table classifying the present Engineer Establishment according to age and length of service.

Ages.	Years of Service.																																	Total.
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	
22 years ...	22																																		22
23 „ ...	...	27																																	27
24 „ ...	...	5	38																																43
25 „ ...	...	...	9	40																															49
26 „ ...	...	...	2	4	39																														45
27 „ ...	...	...	1	3	6	46																													56
28 „ ...	...	2	1	...	1	3	46																												53
29 „ ...	...	...	1	...	...	...	4	40																											45
30 „ ...	...	...	...	...	1	...	2	22	40																										65
31 „ ...	...	2	1	...	...	1	...	4	14	31																									53
32 „ ...	...	1	...	...	...	1	...	...	9	18	21																								50
33 „ ...	...	...	...	...	...	...	...	1	3	4	7	19																							34
34 „ ...	...	...	...	...	...	2	...	...	1	2	10	2	22																						39
35 „ ...	...	...	...	...	...	...	...	...	1	1	6	5	5	27																					45
36 „ ...	...	...	...	...	...	...	...	...	...	...	1	...	7	2	13																				23
37 „ ...	...	...	...	...	...	...	...	...	...	...	1	2	2	3	6	21																			35
38 „ ...	...	...	...	...	...	...	...	...	1	...	3	6	1	2	4	5	19																		41
39 „ ...	...	...	...	...	...	...	...	...	...	...	...	2	3	3	4	8	7	11																	38
40 „ ...	...	...	...	...	...	...	...	...	...	...	...	3	1	...	...	1	1	2	5																13
41 „ ...	...	1	...	...	...	1	...	...	2	...	1	1	3	1	1	6	...	...	2	15															34
42 „ ...	...	...	...	...	...	1	...	...	...	...	1	2	1	...	1	5	...	...	1	...	15														27
43 „ ...	...	...	...	...	...	...	...	...	1	...	1	1	1	1	2	6	1	...	1	4	1	9													29
44 „ ...	...	...	...	...	...	...	...	...	...	...	2	1	...	...	1	2	...	1	1	1	1	1	12												23
45 „ ...	...	...	...	...	...	...	...	...	...	1	...	1	...	...	3	4	1	2	1	...	1	2	...	8											24
46 „ ...	...	...	...	...	...	..	...	...	...	...	...	...	...	...	1	2	1	1	1	...	...	...	...	6	12										24
47 „ ...	...	...	...	...	...	...	...	...	...	...	1	...	...	1	...	...	...	...	...	...	...	...	...	...	1	12									15
48 „ ...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	1	1	...	...	...	...	...	...	...	...	1	8							12
49 „ ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	...	...	...	...	1	...	1	...	1	...	...	7							12
50 „ ...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	2	...	1	...	...	...	...	...	...	...	1	...	...	3						8
51 „ ...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2					3
52 „ ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	1	...	...	...	1	...	1	...	2				6
53 „ ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	1	1	3		6
54 „ ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	1		4
55 „ ...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Total ...	22	38	53	47	48	54	52	67	72	57	57	45	48	40	38	65	31	18	12	21	19	12	14	14	14	14	9	7	5	3	3	4	1	...	1,004

N.B.—Service before the age of 22 is excluded in all cases.

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Explanation of Appendix B.

In a typical table the years of service correspond with the age. That is, according to the datum of this table, recruits enter at the age of 22, and when they are 37 years of age will have served 15 years; when they are 55 years old will have served 33 years. The above explains the first two columns.

The red figures in the third column show the number of men now in the Department of each of the ages from 22 to 55 in column 2, and correspond with the totals taken horizontally in appendix A; that is, this column shows the men arranged by ages in the year 1883. Now, if we start with any of the red figures in column 3, and follow the figures diagonally, that is, parallel with the black line which cuts the table, we get the number of men who survive each year calculated according to tables of mortality until the survivors retire at 55. Thus, the red number 35, of men 37 years of age, we get a series as below following the table diagonally 35, 34, 33, 32, &c.; 23, that is, of 35, men 37 years old in 1883, there will be 34 survivors of 38 years old in 1884, 33 of 39 years in 1885, 32 of 40 in 1886, and so on until 1901, when there will be 23 survivors who retire at the age of 55. Every single diagonal line is worked out on this same principle. Above the black line, the 26 recruits of each year are similarly worked out,—18 of the 26 entering in 1884, serving in 1907.

The above explanation shows that each of the columns following the 3rd, shows for each year the number of men of each age from 22 to 55, who make up the establishment deduced according to life tables from the number of men now in the Department and those entering annually. The last horizontal line in the table shows the total of each column, that is, the total establishment of each year calculated according to the data of annual retirements and recruits, with the allowence for casualties given by the life tables.

Appendix C.

This is merely an expansion of Appendix B up to the year 1900. The first column, which is the age index, corresponds with column 2 of Appendix B. There are four columns to each year. The sum of the figures in the first and fourth column of each year corresponds with the figures for corresponding years in the several columns of Appendix B. The only difference is that there is a separate column for Chief and Superintending Engineers. In separating the figures, we start in the year 1883 with the actual men in the Chief and Superintending Engineer classes, and then up to the year 1894 fill the vacancies as they occur by the men who will probably be promoted. After that the recruits for the upper classes are taken at hazard, that is, as mere numbers from the upper executive grades. The two other columns, headed A and B in each year, are merely ready-reckoners for the rate of promotion. Each number in column A is the total of the aggregate of figures in the first column from the figure opposite the age 55 to the figure against which the total stands. Thus, 101 in column A of 1883 is the sum of the figures in the first column from 0 up to 23; that is, it is the sum total of men of the age of 43 and upwards. The top figure of the column is 932, which is the total of executive and assistant; and if this be added to the 72 in the 4th column of 1883, we get 1,004, the total of the column 1883 in Appendix B. The column is a ready-reckoner as follows. In the typical table of the actuary all the men enter at the same age, and all being equally good are promoted by seniority alone. Thus supposing there are 101 1st grade Executive Engineers, these will be the men longest in the service, and therefore the oldest. If we refer to the figures of 1883, we find that this includes men of 43 years of age and over, that is, of 21 years' service and more. If we look on to the year 1900 under column A we find that the 1st grade appointments will be absorbed by men of 49 years' and over; that is, will take 27 years' service to become a 1st grade Executive in the year 1900. Of course, as explained in the note, this is only true as the

actual approximates to the typical or ideal table, that is, as all men become ranged regularly by ages and length of service, so also if it be granted that all the youngest men are assistants—which as time goes on becomes actually true, allowing for a certain number of bad bargains who do not get promoted—we can always ascertain by this table the rate of promotion if we know the scale of assistants; or conversely if we want to give a certain rate of promotion, that is to promote men of a certain service, we can regulate our scale accordingly; *e. g.*, supposing our scale is 450 assistants and we want to know the rate of promotion this gives in 1890, we find by reference to column A of that year that 550 assistants (952—501) includes men down to 53 years of age, that is of 31 years' service. On the other hand, if we want men to be promoted out of the Assistant Engineer class after 8 years' service, that is, on completing the age of 30, we find by reference to the same column that 952 minus 731=221 is the scale we must adopt. Column B acts in exactly the same manner on the supposition that men, who are not in Superintending and Chief Engineer column retire at the age of 50; that is, column B sums up the figures in the first column for each year from the age of 50 instead of from the age of 55 years.

Ages.	1883.				1884.				1885.				1886.				1887.				1888.				1889.					
	Executives and Assistants.			Chief and Superintending Engineers. No. of each age.	Executives and Assistants.			Chief and Superintending Engineers. No. of each age.	Executives and Assistants.			Chief and Superintending Engineers. No. of each age.	Executives and Assistants.			Chief and Superintending Engineers. No. of each age.	Executives and Assistants.			Chief and Superintending Engineers. No. of each age.	Executives and Assistants.			Chief and Superintending Engineers. No. of each age.	Executives and Assistants.			Chief and Superintending Engineers. No. of each age.	Executives and Assis		
	No. of each age.	Total number.			No. of each age.	Total number.			No. of each age.	Total number.			No. of each age.	Total number.			No. of each age.	Total Number.			No. of each age.	Total number.			No. of each age.	Total. number.			No. of each age.	To
		A.	B.			A.	B.			A.	B.			A.	B.			A.	B.			A.	B.			A.	B.			A
22	22	932	925	...	26	942	932	...	26	948	934	...	26	944	932	...	26	946	933	...	26	952	933	...	26	955	931	...	26	9
23	27	910	903	...	22	916	906	...	25	922	908	...	25	918	906	...	25	920	907	...	25	926	907	...	25	929	905	...	25	9
24	43	883	876	...	27	894	884	...	21	897	883	...	25	893	881	...	25	895	882	...	25	901	882	...	25	904	880	...	25	9
25	49	840	833	...	42	867	857	...	27	876	862	...	21	868	856	...	25	870	857	...	25	876	857	...	25	879	855	...	25	8
26	45	791	784	...	49	825	815	...	41	849	835	...	27	847	835	...	21	845	832	...	25	851	832	...	25	854	830	...	25	8
27	56	746	739	...	44	776	766	...	48	808	794	...	40	820	808	...	26	824	811	...	21	826	807	...	25	829	805	...	25	8
28	53	690	683	...	56	732	722	...	44	760	746	...	48	780	768	...	40	798	785	...	26	805	786	...	21	804	780	...	24	8
29	45	637	630	...	53	676	666	...	56	716	702	...	44	732	720	...	47	758	745	...	40	779	760	...	26	783	759	...	20	7
30	65	592	585	...	44	623	613	...	52	660	646	...	55	688	676	...	43	711	698	...	47	739	720	...	39	757	733	...	26	7
31	53	527	520	...	64	579	569	...	44	608	594	...	51	633	621	...	55	668	655	...	43	692	673	...	47	718	694	...	39	7
32	50	474	467	...	53	515	505	...	63	564	550	...	43	582	570	...	51	613	600	...	54	649	630	...	43	671	647	...	46	6
33	34	424	417	...	49	462	452	...	53	501	487	...	62	539	527	...	43	562	549	...	50	595	576	...	53	628	604	...	42	6
34	39	390	383	...	33	413	403	...	48	448	434	...	52	477	465	...	61	519	506	...	42	545	526	...	50	575	551	...	53	6
35	45	351	344	...	38	380	370	...	33	400	386	...	47	425	413	...	51	458	445	...	60	503	484	...	42	525	501	...	50	5
36	23	306	299	...	45	342	332	...	37	367	353	...	32	378	366	...	46	407	394	...	50	443	424	...	59	483	459	...	41	5
37	35	283	276	...	22	297	287	...	44	330	316	...	36	346	334	...	31	361	348	...	45	393	374	...	49	424	400	...	58	4
38	41	248	241	...	34	275	265	...	21	286	272	...	44	310	298	...	36	330	317	...	31	348	329	...	44	375	351	...	48	4
39	37	207	200	1	41	241	231	...	33	265	251	...	21	266	254	...	42	294	281	...	35	317	298	...	30	331	307	...	43	3
40	13	170	163	...	36	200	190	1	40	232	218	...	32	245	233	...	20	252	239	...	41	282	263	...	34	301	277		29	3
41	32	157	150	2	13	164	154	...	36	192	178	1	39	213	201	...	32	232	219	...	20	241	222	...	40	267	243	...	34	2
42	24	125	118	3	32	151	141	2	13	156	142	...	35	174	162	1	38	200	187	...	31	221	202	...	19	227	203	...	39	2
43	23	101	94	6	23	119	109	3	31	143	129	2	12	139	127	...	35	162	149	1	37	190	171	...	31	208	184	...	19	2
44	19	78	71	4	22	96	86	6	23	112	98	3	30	127	115	2	12	127	114	...	34	153	134	1	36	177	153	...	30	1
45	20	59	52	4	19	74	64	4	21	89	75	6	22	97	85	3	30	115	102	2	12	119	100	...	33	141	117	1	35	1
46	13	39	32	11	19	55	45	4	18	68	54	5	19	75	63	7	21	85	72	3	29	107	88	2	11	108	84	...	33	1
47	6	26	19	9	12	36	26	11	17	50	36	5	17	56	44	5	18	64	51	8	21	78	59	3	28	97	73	2	11	
48	4	20	13	8	5	24	14	9	11	33	19	11	14	39	27	7	15	46	33	6	16	57	38	9	16	69	45	7	25	
49	5	16	9	7	4	19	9	8	4	22	8	10	10	25	13	11	8	31	18	12	15	41	22	6	16	53	29	9	13	
50	4	11	4	4	5	15	5	7	4	18	4	8	3	15	3	11	10	23	10	11	7	26	7	13	13	37	13	8	14	
51	1	7	...	2	3	10	...	4	5	14	...	7	3	12	...	8	3	13	...	10	9	19	...	11	6	24	...	13	12	
52	2	6	...	4	1	7	...	2	3	9	...	4	4	9	...	7	3	10	...	7	3	10	...	10	9	18	...	10	5	
53	3	4	...	3	2	6	...	4	1	6	...	2	3	5	...	3	4	7	...	6	2	7	...	7	3	9	...	9	8	
54	1	1	...	3	3	4	...	3	2	5	...	4	1	2	...	2	3	3	...	3	3	5	...	6	3	6	...	6	2	
55	0	0	...	1	1	1	...	3	3	3	...	3	1	1	...	4	0	0	...	2	2	2	...	3	3	3	...	6	2	

N.B.—Column A is framed on the hypothesis that all retire

APPENDIX C.

1890.			1891.				1892.				1893.				1894.			
Executives and Assistants.			Executives and Assistants.				Executives and Assistants.				Executives and Assistants.				Executives and Assistants.			
Total number.		Chief and Superintending Engineers. No. of each age.	No. of each age.	Total number.		Chief and Superintending Engineers. No. of each age.	No. of each age.	Total number.		Chief and Superintending Engineers. No. of each age.	No. of each age.	Total number.		Chief and Superintending Engineers. No. of each age.	No. of each age.	Total number.		Chief and Superintending Engineers. No. of each age.
A.	B.			A.	B.			A.	B.			A.	B.			A.	B.	
52	923	...	26	949	909	...	26	945	903	...	26	936	884	...	26	924	876	...
26	897	...	25	923	883	...	25	919	877	...	25	910	858	...	25	898	850	...
01	872	...	25	898	858	...	25	894	852	...	25	885	833	...	25	873	825	...
76	847	...	25	873	833	...	25	869	827	...	25	860	808	...	25	848	800	...
51	822	...	25	848	808	...	25	844	802	...	25	835	783	...	25	823	775	...
26	797	...	25	823	783	...	25	819	777	...	25	810	758	...	25	798	750	...
01	772	...	24	798	758	...	24	794	752	...	24	785	733	...	24	773	725	...
77	748	...	24	774	734	...	24	770	728	...	24	761	709	...	24	749	701	...
57	728	...	20	750	710	...	24	746	704	...	24	737	685	...	24	725	677	...
31	702	...	25	730	690	...	20	722	680	...	24	713	661	...	24	701	653	...
02	663	...	39	705	665	...	25	702	660	...	20	689	637	...	23	677	629	...
46	617	...	46	666	626	...	38	677	635	...	25	669	617	...	19	654	606	...
04	575	...	42	620	580	...	45	639	597	...	38	644	592	...	24	635	587	...
51	522	...	52	578	538	...	41	594	552	...	44	606	554	...	37	611	563	...
01	472	...	49	526	486	...	52	553	511	...	40	562	510	...	44	574	526	...
60	431		40	477	437		48	501	459	...	51	522	470	...	38	530	482	...
02	373	...	57	437	397		39	453	411	...	47	471	419	...	50	492	444	...
54	325	...	47	380	340		56	414	372	...	38	424	372	...	46	442	394	...
11	282	...	42	333	293	...	46	358	316	...	55	386	334	...	37	396	348	...
82	253	...	28	291	251	...	41	312	270	...	45	331	279	...	54	359	311	...
48	219	...	33	263	223	...	28	271	229	...	40	286	234	...	44	305	267	...
09	180	...	38	230	190	...	32	243	201	1	27	246	194	...	39	261	213	...
90	161	...	18	192	152	...	37	211	169	...	31	219	167	1	26	222	174	...
60	131	...	30	174	134	...	18	174	132	...	35	188	136	1	31	196	148	1
25	96	1	34	144	104	...	29	156	114	...	18	153	101	...	34	165	117	1
19	63	...	31	110	70	2	32	127	85	1	28	135	83	1	17	131	83	...
81	52	3	7	79	39	4	29	95	53	3	29	107	55	3	23	114	66	5
56	27	10	24	72	32	4	3	66	24	7	25	78	26	6	24	91	43	7
43	14	11	8	48	8	14	21	63	21	6	1	53	1	9	19	67	19	12
29	...	8	13	40	...	11	8	42	...	14	20	52	...	6	1	48	...	9
17	...	13	12	27	...	7	12	34	...	11	7	32	...	14	20	47	...	6
12	...	10	5	15	...	12	11	22	...	7	11	25	...	11	6	27	...	14
4	...	9	8	10	...	9	4	11	...	12	10	14	...	7	11	21	...	10
2	...	6	2	2	...	8	7	7	...	9	4	4	...	12	10	10	...	6

at the age of 55; column B as the hypothesis that those who are not promoted to the Superintending Engineer class retire at the age of 50.

1895.			1896.				1897.				1898.				1899.				1900.			
Executives and Assistants.			Executives and Assistants.				Executives and Assistants.				Executives and Assistants.				Executives and Assistants.				Executives and Assistants.			
No. of each age.	Total number.		Chief and Superintending Engineers. No. of each age.	No. of each age.	Total number.		Chief and Superintending Engineers. No. of each age.	No. of each age.	Total number.		Chief and Superintending Engineers. No. of each age.	No. of each age.	Total number.		Chief and Superintending Engineers. No. of each age.	No. of each age.	Total number.		Chief and Superintending Engineers. No. of each age.	No. of each age.	Total number.	
	A.	B.			A.	B.			A.	B.			A.	B.			A.	B.			A.	B.
26	913	859	...	26	898	835	...	26	887	816	...	26	867	810	...	26	864	795	...	26	848	784
25	887	833	...	25	872	809	...	25	861	790	...	25	841	784	...	25	838	769	...	25	822	758
25	862	808	...	25	847	784	...	25	836	765	...	25	816	759	...	25	813	744	...	25	797	733
25	837	783	...	25	822	759	...	25	811	740	...	25	791	734	...	25	788	719	...	25	772	708
25	812	758	...	25	797	734	...	25	786	715	...	25	766	709	...	25	763	694	...	25	747	683
25	787	733	...	25	772	709	...	25	761	690	...	25	741	684	...	25	738	669	...	25	722	658
24	762	708	...	24	747	684	...	24	736	665	...	25	716	659	...	24	713	644	...	24	697	633
24	738	684	...	24	723	660	...	24	712	641	...	24	692	635	...	24	689	620	...	24	673	609
24	714	660	...	24	699	636	...	24	688	617	...	24	668	611	...	24	665	596	...	24	649	585
24	690	636	...	24	675	612	...	24	664	593	...	24	644	587	...	24	641	572	...	24	625	561
23	666	612	...	23	651	588	...	23	640	569	...	23	620	563	...	23	617	548	...	23	601	537
23	643	589	...	23	628	565	...	23	617	546	...	23	597	540	...	23	594	525	...	23	578	514
19	620	566	...	23	605	542	...	23	594	523	...	23	574	517	...	23	571	502	...	23	555	491
24	601	547	...	19	582	519	...	22	571	500	...	22	551	494	...	22	548	479	...	22	532	468
36	577	523	...	23	563	500	...	19	549	478	...	22	529	472	...	22	526	457	...	22	510	446
43	541	487	...	34	540	477	...	23	530	459	...	18	507	450	...	22	504	435	...	22	488	424
37	498	444	...	43	506	443	...	33	507	436	...	22	489	432	...	18	482	413	...	21	466	2
48	461	407	...	36	463	400	...	42	474	403	...	32	467	410	...	22	464	395	...	18	445	381
45	413	359	...	47	427	364	...	35	432	361	...	41	435	378	...	31	442	373	...	21	427	363
37	368	314	...	44	380	317	...	46	397	326	...	34	394	337	...	40	411	342	...	30	406	342
53	331	277	...	36	336	273	...	43	351	280	...	45	360	303	...	34	371	302	...	39	376	312
43	278	224	...	52	300	237	...	35	308	237	...	42	315	258	...	44	337	268	...	33	337	273
38	235	181	...	42	248	185	...	51	273	202	...	34	273	216	...	41	293	224	...	43	304	240
26	197	143	...	37	206	143	...	41	222	151	...	50	239	182	...	34	252	183	...	41	261	197
30	171	117	1	25	169	106	...	36	181	110	...	40	189	132	...	49	218	149	...	32	220	156
31	141	87	3	27	144	81	3	21	145	74	3	35	149	92	...	39	169	100	...	46	188	124
14	110	56	2	26	117	54	6	23	124	53	6	19	114	57	5	31	130	61	...	36	142	78
21	96	42	7	11	91	28	5	23	101	30	9	20	95	38	9	16	99	30	7	30	106	42
21	75	21	9	17	80	17	11	7	78	7	9	18	75	18	13	14	83	14	14	12	76	12
18	54	...	12	26	63	...	9	16	71	...	11	7	57	...	8	17	69	...	13	13	64	...
1	36	...	8	17	43	...	12	19	55	...	9	15	50	...	11	7	52	...	7	16	51	...
19	35	...	6	2	26	...	7	16	36	...	12	18	35	...	8	14	45	...	11	6	35	...
6	16	...	13	18	24	...	6	2	20	...	6	15	17	...	11	17	31	...	8	13	29	...
10	10	...	10	6	6	...	12	18	18	...	6	2	2	...	6	14	14	...	11	16	16	...

Appendix D.

Referred to in note XXIII

Tables showing in detail how it is proposed to make promotions on the several lists of Engineer Establishment on the basis of age, and a certain length of service in each grade for the next 33 years, at the end of which time the present irregularity of age and service will be worked off, and a typical or normal establishment and scale will be established.

MILITARY WORKS.

Ages.	1883 EE 1	EE 2	EE 3	EE 4	AE 1	AE 2 & 3	Total.	1883 As reconstituted. EE 1	EE 2	EE 3	EE 4	AE 1	AE 2 & 3	Total.	EE 1	EE 2	EE 3
22 to 25	...	...	...	...	...	14	14	...	...	...	...	...	14	14	...	...	...
26 to 30	...	...	...	...	16	6	22	...	...	...	...	22	...	22	...	...	...
31 to 35	...	2	5	2	8	...	17	...	2	5	10	...	...	17	...	...	...
36 to 40	4	5	2	...	...	...	11	4	5	2	...	...	...	11	1	4	10
41 to 45	3	1	1	2	...	...	7	3	2	2	...	...	...	7	4	6	...
46 to 50	2	1	...	...	...	...	3	2	1	...	...	...	...	3	3	2	...
51 to 55	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	...	...
Total ...	9	9	8	4	24	20	74	9	10	9	10	22	14	74	10	12	10

STATE RAILWAYS.

Ages.	EE 1	EE 2	EE 3	EE 4	AE 1	AE 2 & 3	Total.	EE 1	EE 2	EE 3	EE 4	AE 1	AE 2 & 3	Total.	EE 1	EE 2	EE 3
22 to 25	...	...	...	...	...	18	18	...	...	...	...	1	17	18	...	...	...
26 to 30	...	...	...	1	37	34	72	...	...	...	1	71	...	72	...	...	...
31 to 35	...	1	14	4	24	2	45	...	1	14	28	2	...	45	...	...	4
36 to 40	3	14	10	5	1	...	33	3	14	15	1	...	...	33	...	13	26
41 to 45	14	9	3	1	2	...	29	14	12	1	2	...	...	29	12	16	1
46 to 50	5	1	...	...	1	...	7	6	...	...	1	...	...	7	15	6	2
51 to 55	1	...	...	...	...	...	1	1	...	...	...	...	...	1	3	...	1
Total ...	23	25	27	11	65	54	205	24	27	30	33	74	17	205	30	35	34

BENGAL.

Ages.	EE 1	EE 2	EE 3	EE 4	AE 1	AE 2 & 3	Total.	EE 1	EE 2	EE 3	EE 4	AE 1	AE 2 & 3	Total.	EE 1	EE 2	EE 3
22 to 25	...	...	...	...	...	15	15	...	...	...	...	...	15	15	...	...	...
26 to 30	...	...	...	...	11	16	27	...	...	...	...	27	...	27	...	...	...
31 to 35	...	5	6	3	12	4	30	...	5	6	15	4	...	30	...	...	...
36 to 40	7	5	3	2	6	1	24	7	5	5	6	1	...	24	2	7	14
41 to 45	5	4	5	1	1	...	16	5	9	1	1	...	...	16	8	8	3
46 to 50	2	1	...	...	1	...	4	3	...	...	1	...	...	4	6	4	2
51 to 55	1	...	...	...	...	...	1	1	...	...	...	...	...	1	1	...	1
Total ...	15	15	14	6	31	36	117	16	19	12	23	32	15	117	17	19	20

N.-W. PROVINCES AND OUDH.

Ages.	EE 1	EE 2	EE 3	EE 4	AE 1	AE 2 & 3	Total.	EE 1	EE 2	EE 3	EE 4	AE 1	AE 1&2	Total.	EE 1	EE 2	EE 3
22 to 25	...	...	...	..	...	19	19	...	...	...	...	1	18	19	...	...	...
26 to 30	...	...	1	...	18	11	30	...	...	1	...	29	...	30	...	...	...
31 to 35	...	2	9	5	16	2	34	...	2	9	21	2	...	34	...	...	3
36 to 40	2	11	5	...	4	1	23	2	11	5	4	1	...	23	1	8	20
41 to 45	8	2	1	1	1	...	13	9	2	1	1	...	...	13	9	7	4
46 to 50	1	...	...	...	...	...	1	...	...	..	...	...	...	...	5	2	1
51 to 55	1	...	...	...	...	...	1	1	...	...	...	...	...	1	...	...	...
Total ...	12	15	16	6	39	33	121	12	15	16	26	33	18	120	15	17	28

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1893 EE 4	AE 1	AE 2 & 3	Total.	1893 EE 1	EE 2	EE 3	EE 4	AE 1	AE 2 & 3	Total.	1898 EE 1	EE 2	EE 3	EE 4	AE 1	AE 2 & 3	Total.	Ages.
...	...	11	11	...	...	...	...	...	11	11	...	...	...	...	...	11	11	22 to 25
2	11	1	14	...	...	...	...	11	1	12	...	...	...	...	11	1	12	26 to 30
21	...	...	21	...	...	2	11	...	...	13	...	...	2	11	...	...	13	31 to 35
...	...	...	15	...	...	20	..	...	...	20	...	2	9	...	...	...	11	36 to 40
...	...	...	10	1	12	...	...	...	...	13	...	18	...	...	...	...	18	41 to 45
...	...	...	5	8	...	...	...	...	...	8	10	...	...	...	...	...	10	46 to 50
...	...	...	2	3	...	...	...	...	...	3	5	...	...	...	...	...	5	51 to 55
23	11	12	78	12	12	22	11	11	12	80	15	20	11	11	11	12	80	Total.

EE 4	AE 1	AE 2 & 3	Total.	EE 1	EE 2	EE 3	EE 4	AE 1	AE 2 & 3	Total.	EE 1	EE 2	EE 3	EE 4	AE 1	AE 2 & 3	Total.	Ages.
...	...	21	21	...	...	...	...	...	21	21	...	...	...	...	...	21	21	22 to 25
2	24	1	27	...	...	...	2	22	1	25	...	...	...	2	22	1	25	26 to 30
64	...	...	68	...	...	4	22	...	...	26	...	...	4	20	...	...	24	31 to 35
2	...	...	41	...	4	59	...	...	...	63	...	3	20	...	...	...	23	36 to 40
...	...	...	29	10	24	2	...	...	...	36	4	52	...	...	...	...	56	41 to 45
...	...	...	23	19	3	...	...	...	...	22	25	2	...	...	...	...	27	46 to 50
...	...	...	4	9	5	...	...	...	...	14	12	...	...	...	...	...	12	51 to 55
68	24	22	213	38	36	65	24	22	22	207	41	57	24	22	22	22	188	Total.

EE 4	AE 1	AE 2 & 3	Total.	EE 1	EE 2	EE 3	EE 4	AE 1	AE 2 & 3	Total.	EE 1	EE 2	EE 3	EE 4	AE 1	AE 2 & 3	Total.	Ages.
...	...	16	16	...	...	...	...	...	16	16	...	...	...	...	...	16	16	22 to 25
1	18	2	21	...	...	...	1	17	2	20	...	...	...	1	17	2	20	26 to 30
26	...	...	26	...	...	2	18	...	...	20	...	...	3	16	...	...	19	31 to 35
4	...	...	27	...	3	21	...	...	...	24	...	2	16	...	...	...	18	36 to 40
3	...	...	22	7	13	4	...	...	...	24	3	18	...	...	...	...	21	41 to 45
...	...	...	12	7	4	3	...	...	...	14	14	4	...	...	...	...	18	46 to 50
...	...	...	2	7	2	...	...	...	...	9	4	3	...	...	...	...	7	51 to 55
34	18	18	126	21	22	30	19	17	18	127	21	27	19	17	17	18	119	Total.

EE 4	AE 1	AE 2 & 3	Total.	EE 1	EE 2	EE 3	EE 4	AE 1	AE 2 & 3	Total.	EE 1	EE 2	EE 3	EE 4	AE 1	AE 2 & 3	Total	Ages.
...	...	19	19	...	...	...	...	...	19	19	...	...	...	...	...	19	19	22 to 25
1	23	2	26	...	...	...	1	21	2	24	...	...	...	1	21	2	24	26 to 30
25	...	...	28	...	...	3	22	...	...	25	...	...	3	20	...	...	23	31 to 35
2	...	...	31	...	3	23	...	...	...	26	...	9	19	...	...	...	22	36 to 40
1	...	...	21	6	19	2	...	...	...	27	...	24	...	...	...	...	24	41 to 45
...	...	...	8	12	4	1	...	...	...	17	17	3	...	...	...	...	20	46 to 50
...	...	...	..	4	1	...	...	...	..	5	8	1	...	...	...	...	9	51 to 55
29	23	21	133	22	27	29	23	21	21	143	25	31	22	21	21	21	141	Total.

MILITARY WORKS.

Ages.	1903 E E 1	E E 2	E E 3	E E 4	A E 1	A E 2 & 3	Total.	1908 E E 1	E E 2	E E 3	E E 4	A E 1	A E 2 & 3	Total.	1913 E E 1	E E 2	E E 3	E E 4	A E 1	A E 2 & 3	Total.	1918 E E 1	E E 2	E E 3	E E 4	A E 1	A E 2 & 3	Total.	Ages.
22 to 25	...	...	...	...	...	11	11	...	...	...	...	...	11	11	...	...	...	...	...	11	11	...	...	...	...	...	11	11	22 to 25.
26 to 30	...	...	...	...	11	1	12	...	...	...	...	11	1	12	...	11	1	12	...	...	12	...	...	...	...	11	1	12	26 to 30.
31 to 35	...	...	2	11	...	...	13	...	...	2	11	...	...	13	11	...	...	13	...	...	13	...	...	2	11	...	...	13	31 to 35.
36 to 40	...	2	9	...	...	...	11	...	2	9	...	...	...	11	...	...	....	11	...	2	9	...	...	9	...	...	...	11	36 to 40.
41 to 45	1	9	...	...	...	...	10	1	9	...	...	...	...	10	...	...	...	10	1	9	...	...	1	9	...	...	...	10	41 to 45.
46 to 50	14	...	...	...	..	...	14	6	...	...	...	...	...	6	...	...	...	6	6	...	...	...	6	...	...	...	...	6	46 to 50.
51 to 55	7	...	...	...	...	...	7	11	...	...	...	...	...	11	...	...	...	5	4	...	...	...	5	...	...	...	...	4	51 to 55.
Total ...	22	11	11	11	11	12	78	18	11	11	11	11	12	74	11	11	12	68	11	11	12	67	12	11	11	11	11	12	Total.

STATE RAILWAYS.

Ages.	E E 1	E E 2	E E 3	E E 4	A E 1	A E 2 & 3	Total.	E E 1	E E 2	E E 3	E E 4	A E 1	A E 2 & 3	Total.	E E 4	A E 1	A E 2 & 3	Total.	E E 1	E E 2	E E 3	E E 4	A E 1	A E 2 & 3	Total.	Ages.
22 to 25	...	...	...	...	...	21	21	...	...	...	...	...	21	21	...	...	21	21	...	...	...	...	...	21	21	22 to 25.
26 to 30	...	...	...	2	22	1	25	...	...	...	2	22	1	25	2	22	1	25	...	...	...	2	22	1	25	26 to 30.
31 to 35	...	...	4	20	...	...	24	...	...	4	20	...	...	24	20	...	...	24	...	...	4	20	...	...	24	31 to 35.
36 to 40	...	3	18	...	...	...	21	...	3	18	...	...	...	21	...	...	...	21	...	3	18	...	...	...	21	36 to 40.
41 to 45	2	18	...	...	...	...	20	1	18	...	...	...	...	19	...	...	...	19	1	18	...	...	...	...	19	41 to 45.
46 to 50	42	2	...	...	...	...	44	11	...	...	...	...	...	11	...	...	...	11	11	...	...	...	...	...	11	46 to 50.
51 to 55	16	1	...	...	...	...	17	33	...	...	...	...	...	33	...	...	...	9	9	...	...	...	...	...	9	51 to 55.
Total ...	60	24	22	22	22	22	172	45	21	22	22	22	22	154	22	22	22	130	21	21	22	22	22	22	130	Total.

BENGAL.

Ages.	E E 1	E E 2	E E 3	E E 4	A E 1	A E 2 & 3	Total.	E E 1	E E 2	E E 3	E E 4	A E 1	A E 2 & 3	Total.	E E 4	A E 1	A E 2 & 3	Total.	E E 1	E E 2	E E 3	E E 4	A E 1	A E 2 & 3	Total.	Ages.
22 to 25	...	...	...	...	...	16	16	...	...	...	...	...	16	16	...	...	16	16	...	...	...	...	...	16	16	22 to 25.
26 to 30	...	...	...	1	17	2	20	...	...	...	1	17	2	20	1	17	2	20	...	...	...	1	17	2	20	26 to 30.
31 to 35	...	...	3	16	...	...	19	...	...	3	16	...	...	19	16	...	...	19	...	...	3	16	...	...	19	31 to 35.
36 to 40	...	3	14	...	...	...	17	...	3	14	...	...	...	17	...	...	...	17	...	3	14	...	...	...	17	36 to 40.
41 to 45	1	15	...	...	...	...	16	1	14	...	...	...	...	15	...	...	...	15	1	14	...	...	...	...	15	41 to 45.
46 to 50	16	1	...	...	...	...	17	9	...	...	...	...	...	9	...	...	...	9	9	...	...	...	...	...	9	46 to 50.
51 to 55	11	...	...	...	...	...	11	12	...	...	...	...	...	12	...	...	...	8	7	...	...	...	...	...	7	51 to 55.
Total ...	28	19	17	17	17	18	116	22	17	17	17	17	18	108	17	17	18	104	17	17	17	17	17	18	103	Total.

N.-W. PROVINCES AND OUDH.

Ages.	E E 1	E E 2	E E 3	E E 4	A E 1	A E 2 & 3	Total.	E E 1	E E 2	E E 3	E E 4	A E 1	A E 2 & 3	Total.	E E 4	A E 1	A E 2 & 3	Total.	E E 1	E E 2	E E 3	E E 4	A E 1	A E 2 & 3	Total.	Ages.
22 to 25	...	...	...	...	...	19	19	...	...	...	...	...	19	19	...	...	19	19	...	...	...	...	...	19	19	22 to 25.
26 to 30	...	...	...	1	21	2	24	...	...	...	1	21	2	24	1	21	2	24	...	...	...	1	21	2	24	26 to 30.
31 to 35	...	...	3	20	...	...	23	...	...	3	20	...	...	23	20	...	...	23	...	...	3	20	...	...	23	31 to 35.
36 to 40	...	4	17	...	...	...	21	...	4	17	...	...	...	21	...	...	...	21	...	4	17	...	...	...	21	36 to 40.
41 to 45	1	18	...	...	...	...	19	2	16	...	...	...	...	18	2	16	...	18	2	16	...	...	...	...	18	41 to 45.
46 to 50	17	2	...	...	...	...	19	10	...	...	...	...	...	10	11	...	...	11	11	...	...	...	...	...	11	46 to 50.
51 to 55	12	1	...	...	...	...	13	14	...	...	...	...	...	14	8	...	...	8	7	...	...	...	...	...	7	51 to 55.
Total ...	30	25	20	21	21	21	138	26	20	20	21	21	21	129	21	21	21	124	20	20	20	21	21	21	123	Total.

PUNJAB.

Ages	1883 EE 1	EE 2	EE 3	EE 4	AE 1	AE 2 & 3	Total.	1883 As reconstituted. EE 1	EE 2	EE 3	EE 4	AE 1	AE 2 & 3	Total.	EE 1	EE 2	EE 3	EE 4	1888. AE 1	AE 2 & 3	Total.	1893. EE 1	EE 2	EE 3	EE 4	AE 1	AE 2 & 3	Total.	1898. EE 1	EE 2	EE 3	EE 4	AE 1	AE 2 & 3	Total.	Ages.
22 to 25	...	...	...	...	1	20	21	...	...	...	...	1	20	21	...	...	...	...	...	17	17	...	...	...	...	...	17	17	...	...	...	...	...	17	17	22 to 25.
26 to 30	...	...	...	2	20	14	36	...	...	...	1	35	...	36	...	...	...	2	18	1	21	...	...	...	1	18	1	20	...	...	...	1	18	1	20	26 to 30.
31 to 35	1	1	15	4	11	1	33	1	1	15	15	1	...	33	...	...	...	33	...	...	34	...	...	2	18	...	...	20	...	...	2	17	...	...	19	31 to 35.
36 to 40	...	8	...	...	...	...	8	...	8	...	...	...	...	8	2	12	16	1	...	...	31	...	1	30	...	...	...	31	...	1	17	...	...	...	18	36 to 40.
41 to 45	4	3	...	...	1	...	8	4	3	...	1	...	...	8	5	2	...	...	...	...	7	12	13	2	...	...	...	27	1	25	1	...	...	...	27	41 to 45.
46 to 50	3	1	...	...	...	...	4	3	...	...	...	...	...	3	4	...	1	...	...	...	5	3	1	...	...	...	...	4	18	2	...	...	...	...	20	46 to 50.
51 to 55	3	...	...	...	...	...	3	3	...	...	...	...	...	3	2	...	...	...	...	...	2	2	1	...	...	...	...	3	3	...	...	...	...	...	3	51 to 55.
Total	11	13	15	6	33	35	113	11	12	15	17	37	20	112	13	14	18	36	18	18	117	17	16	34	19	18	18	122	22	28	20	18	18	18	124	Total.

LOCAL ADMINISTRATIONS.

Ages	EE 1	EE 2	EE 3	EE 4	AE 1	AE 2 & 3	Total.	EE 1	EE 2	EE 3	EE 4	AE 1	AE 2 & 3	Total.	EE 1	EE 2	EE 3	EE 4	AE 1	AE 2 & 3	Total.	EE 1	EE 2	EE 3	EE 4	AE 1	AE 2 & 3	Total.	EE 1	EE 2	EE 3	EE 4	AE 1	AE 2 & 3	Total.	Ages.
22 to 25	...	...	...	...	...	23	23	...	...	...	...	1	22	23	...	...	...	...	...	18	18	...	...	...	...	...	18	18	...	...	...	...	...	18	18	22 to 25.
26 to 30	...	...	1	2	19	14	36	...	...	1	2	33	...	36	...	...	...	2	19	1	22	...	...	...	2	19	1	22	...	...	...	2	19	1	22	26 to 30.
31 to 35	...	1	5	8	10	2	26	...	1	5	18	2	...	26	...	...	2	31	...	...	33	...	...	4	17	...	...	21	...	...	4	17	...	...	21	31 to 35.
36 to 40	3	6	6	2	2	1	20	2	6	8	2	1	...	19	...	6	16	2	...	...	24	...	2	28	...	...	...	30	...	4	15	...	...	...	19	36 to 40.
41 to 45	9	5	2	...	...	...	16	9	7	...	...	...	...	16	5	9	2	1	...	...	17	4	15	2	...	...	...	21	2	24	...	...	...	...	26	41 to 45.
46 to 50	...	2	1	...	...	...	3	2	1	...	...	...	...	3	10	3	...	...	...	...	13	9	3	1	...	...	...	13	13	2	...	...	...	...	15	46 to 50.
51 to 55	1	...	...	...	...	...	1	1	...	...	...	...	...	1	2	...	...	...	...	...	2	6	...	...	...	...	...	6	7	...	...	...	...	...	7	51 to 55.
Total	13	14	15	12	31	40	125	14	15	14	22	37	22	124	17	18	20	36	19	19	129	19	20	35	19	19	19	131	22	30	19	19	19	19	128	Total.

MADRAS.

Ages	EE 1	EE 2	EE 3	EE 4	AE 1	AE 2 & 3	Total.	EE 1	EE 2	EE 3	EE 4	AE 1	AE 2 & 3	Total.	EE 1	EE 2	EE 3	EE 4	AE 1	AE 2 & 3	Total.	EE 1	EE 2	EE 3	EE 4	AE 1	AE 2 & 3	Total.	EE 1	EE 2	EE 3	EE 4	AE 1	AE 2 & 3	Total.	Ages.
22 to 25	...	...	...	...	...	15	15	...	...	...	...	...	15	15	...	...	...	...	...	13	13	...	...	...	...	...	13	13	...	...	...	...	...	13	13	22 to 25.
26 to 30	...	...	...	...	13	6	19	...	...	...	...	19	...	19	...	...	...	2	14	1	17	...	...	...	1	14	1	16	...	...	...	1	14	1	16	26 to 30.
31 to 35	...	...	5	3	14	1	23	...	...	5	17	1	...	23	...	...	2	16	...	...	18	...	...	3	13	...	...	16	...	...	2	13	...	...	15	31 to 35.
36 to 40	...	5	4	...	1	...	10	...	5	4	1	...	...	10	...	5	14	2	...	...	21	...	1	16	...	...	...	17	...	3	12	...	...	...	15	36 to 40.
41 to 45	9	5	1	1	...	...	16	9	6	1	...	...	...	16	2	6	1	...	...	...	9	5	12	2	...	...	...	19	2	13	...	...	...	...	15	41 to 45.
46 to 50	3	1	...	...	...	...	4	4	...	...	...	...	...	4	10	2	...	...	...	...	12	5	2	...	...	...	...	7	12	2	...	...	...	...	14	46 to 50.
51 to 55	...	...	...	...	...	...	...	...	...	...	...	...	...	...	3	...	...	...	...	...	3	8	...	...	...	...	...	8	4	...	...	...	...	...	4	51 to 55.
Total	12	11	10	4	28	22	87	13	11	10	18	20	15	87	15	13	17	20	14	14	93	18	15	21	14	14	14	96	18	18	14	14	14	14	92	Total.

BOMBAY.

Ages	EE 1	EE 2	EE 3	EE 4	AE 1	AE 2 & 3	Total.	EE 1	EE 2	EE 3	EE 4	AE 1	AE 2 & 3	Total.	EE 1	EE 2	EE 3	EE 4	AE 1	AE 2 & 3	Total.	EE 1	EE 2	EE 3	EE 4	AE 1	AE 2 & 3	Total.	EE 1	EE 2	EE 3	EE 4	AE 1	AE 2 & 3	Total.	Ages.
22 to 25	...	...	...	...	1	15	16	...	...	...	...	1	15	16	...	...	...	...	...	14	14	...	...	...	...	...	14	14	...	...	...	...	...	14	14	22 to 25.
26 to 30	...	...	...	...	17	5	22	...	...	...	...	22	...	22	...	...	...	1	16	1	18	...	...	...	1	15	1	17	...	...	...	1	15	1	17	26 to 30.
31 to 35	...	...	4	3	5	1	13	...	...	4	8	1	...	13	...	...	4	17	...	...	21	...	...	2	15	...	...	17	...	...	2	14	...	...	16	31 to 35.
36 to 40	1	2	10	3	2	2	20	1	2	13	2	2	...	20	...	3	8	1	...	...	12	...	4	16	...	...	...	20	...	3	13	...	...	...	16	36 to 40.
41 to 45	6	6	1	...	1	...	14	6	7	...	1	...	...	14	2	10	4	2	...	...	18	3	7	1	...	...	...	11	4	14	...	...	...	...	18	41 to 45.
46 to 50	5	2	...	...	1	...	8	7	...	...	1	...	...	8	9	...	1	...	...	...	10	10	2	2	...	...	...	14	6	2	...	...	...	...	8	46 to 50.
51 to 55	...	...	...	...	...	...	...	...	...	...	...	...	...	...	4	...	1	...	...	...	5	3	1	...	...	...	...	4	7	1	...	...	...	...	8	51 to 55.
Total	12	10	15	6	27	23	93	14	9	17	12	26	15	93	15	13	18	21	16	15	98	16	14	21	16	15	15	97	17	20	15	15	15	15	97	Total.

PUNJAB.

Ages.	1903. EE 1	EE 2	EE 3	EE 4	AE 1	AE 2 & 3	Total.	1908. EE 1	EE 2	EE 3	EE 4	AE 1	AE 2 & 3	Total.	1913. EE 1	EE 2	EE 3
22 to 25 ...	...	...	...	...	...	17	17	...	...	...	...	...	17	17	...	...	...
26 to 30 ...	...	...	...	1	18	1	20	...	...	...	1	18	1	20	...	...	...
31 to 35 ...	...	...	2	17	...	...	19	...	...	2	17	...	...	19	...	...	2
36 to 40 ...	...	1	16	...	...	...	17	...	1	16	...	...	...	17	...	1	16
41 to 45 ...	...	16	...	...	...	...	16	...	16	...	...	...	...	16	1	15	...
46 to 50 ...	20	1	...	...	...	...	21	8	1	...	...	...	...	9	8	1	...
51 to 55 ...	10	2	...	...	...	...	12	14	2	...	...	...	...	16	8	...	...
Total ...	30	20	18	18	18	18	122	22	20	18	18	18	18	114	17	17	18

EE 4	AE 1	AE 2 & 3	Total.	1918. EE 1	EE 2	EE 3	EE 4	AE 1	AE 2 & 3	Total.	Ages.
...	...	17	17	...	...	...	...	...	17	17	22 to 25.
1	18	1	20	...	...	...	1	18	1	20	26 to 30.
17	...	...	19	...	...	2	17	...	...	19	31 to 35.
...	...	...	17	...	1	16	...	...	...	17	36 to 40.
...	...	...	16	...	16	...	...	...	...	16	41 to 45.
...	...	...	9	9	...	...	...	...	...	9	46 to 50.
...	...	...	8	8	...	...	...	...	...	8	51 to 55.
18	18	18	106	17	17	18	18	18	18	106	Total.

LOCAL ADMINISTRATIONS.

Ages.	EE 1	EE 2	EE 3	EE 4	AE 1	AE 2 & 3	Total.	EE 1	EE 2	EE 3	EE 4	AE 1	AE 2 & 3	Total.	EE 1	EE 2	EE 3
22 to 25 ...	...	...	...	...	...	18	18	...	...	...	...	...	18	18	...	...	...
26 to 30 ...	...	...	...	2	19	1	22	...	...	...	2	19	1	22	...	...	...
31 to 35 ...	...	...	4	17	...	...	21	...	...	4	17	...	...	21	...	...	4
36 to 40 ...	...	4	15	...	...	...	19	...	4	15	...	...	...	19	...	4	15
41 to 45 ...	3	14	...	...	...	...	17	2	15	...	...	...	...	17	2	15	...
46 to 50 ...	18	3	...	...	...	...	21	9	...	...	...	...	...	9	9	...	...
51 to 55 ...	9	...	...	...	...	...	9	16	...	...	...	...	...	16	8	...	...
Total ...	30	21	19	19	19	19	127	27	19	19	19	19	19	122	19	19	19

EE 4	AE 1	AE 2 & 3	Total.	EE 1	EE 2	EE 3	EE 4	AE 1	AE 2 & 3	Total.	Ages.
...	...	18	18	...	...	...	...	...	18	18	22 to 25.
2	19	1	22	...	...	...	2	19	1	22	26 to 30.
17	...	...	21	...	...	4	17	...	...	21	31 to 35.
...	...	...	19	...	4	15	...	...	...	19	36 to 40.
...	...	...	17	2	15	...	...	...	...	17	41 to 45.
...	...	...	9	9	...	...	...	...	...	9	46 to 50.
...	...	...	8	8	...	...	...	...	...	8	51 to 55.
19	19	19	114	19	19	19	19	19	19	114	Total.

MADRAS.

Ages.	EE 1	EE 2	EE 3	EE 4	AE 1	AE 2 & 3	Total.	EE 1	EE 2	EE 3	EE 4	AE 1	AE 2 & 3	Total.	EE 1	EE 2	EE 3
22 to 25 ...	...	...	...	...	...	13	13	...	...	...	...	...	13	13	...	...	...
26 to 30 ...	...	...	...	1	14	1	16	...	...	...	1	14	1	16	...	...	...
31 to 35 ...	...	...	2	13	...	...	15	...	...	2	13	...	...	15	...	...	2
36 to 40 ...	...	2	12	...	...	...	14	...	2	12	...	...	...	14	...	2	12
41 to 45 ...	2	12	...	...	...	...	14	...	12	...	...	...	...	12	...	12	...
46 to 50 ...	12	...	...	...	...	...	12	9	...	...	...	...	...	9	7	...	...
51 to 55 ...	9	...	...	...	...	...	9	9	...	...	...	...	...	9	8	...	...
Total ...	23	14	14	14	14	14	93	18	14	14	14	14	14	88	15	14	14

EE 4	AE 1	AE 2 & 3	Total.	EE 1	EE 2	EE 3	EE 4	AE 1	AE 2 & 3	Total.	Ages.
...	...	13	13	...	...	...	...	...	13	13	22 to 25.
1	14	1	16	...	...	...	1	14	1	16	26 to 30.
13	...	...	15	...	...	2	13	...	...	15	31 to 35.
...	...	...	14	...	2	12	...	...	...	14	36 to 40.
...	...	...	12	...	12	...	...	...	...	12	41 to 45.
...	...	...	7	7	...	...	...	...	...	7	46 to 50.
...	...	...	8	6	...	...	...	...	...	6	51 to 55.
14	14	14	85	13	14	14	14	14	14	83	Total.

BOMBAY.

Ages.	EE 1	EE 2	EE 3	EE 4	AE 1	AE 2 & 3	Total.	EE 1	EE 2	EE 3	EE 4	AE 1	AE 2 & 3	Total.	EE 1	EE 2	EE 3
22 to 25 ...	...	...	...	...	...	14	14	...	...	...	...	...	14	14	...	...	...
26 to 30 ...	...	...	...	1	15	1	17	...	...	...	1	15	1	17	...	...	...
31 to 35 ...	...	...	2	14	...	...	16	...	...	2	14	...	...	16	...	...	2
36 to 40 ...	...	2	13	...	...	...	15	...	2	13	...	...	...	15	...	2	13
41 to 45 ...	1	13	...	...	...	...	14	...	13	...	...	...	...	13	...	13	...
46 to 50 ...	15	...	...	...	...	...	15	9	...	...	...	...	...	9	8	...	...
51 to 55 ...	5	...	...	...	...	...	5	11	...	...	...	...	...	11	8	...	...
Total ...	21	15	15	15	15	15	96	20	15	15	15	15	15	95	16	15	15

EE 4	AE 1	AE 2 & 3	Total.	EE 1	EE 2	EE 3	EE 4	AE 1	AE 2 & 3	Total.	Ages.
...	...	14	14	...	...	...	...	...	14	14	22 to 25.
1	15	1	17	...	...	...	1	15	1	17	26 to 30.
14	...	...	16	...	...	2	14	...	...	16	31 to 35.
...	...	...	15	...	2	13	...	...	...	15	36 to 40.
...	...	...	13	...	13	...	...	...	...	13	41 to 45.
...	...	...	8	8	...	...	...	...	...	8	46 to 50.
...	...	...	8	7	...	...	...	...	...	7	51 to 55.
15	15	15	91	15	15	15	15	15	15	90	Total.

Govt. C. B. Press Simla, No. 122 P. W. D.—13-7-83.—56.

Appendix E.

Table shewing the sliding scale to be adopted for each list so as to give fair promotion on the basis of age up to the year 1918, when the whole of the present establishment consisting of men of irregular ages and periods of service will have disappeared and the establishment will be arranged on the typical basis of an actuarial scale.

	Military Works.							Railways.							Bengal.							North-Western Provinces and Oudh.						
	E. 1	E. 2	E. 3	E. 4	A.E. 1	A.E. 2	Total.	E. 1	E. 2	E. 3	E. 4	A.E. 1	A.E. 2	Total.	E. 1	E. 2	E. 3	E. 4	A.E. 1	A.E. 2	Total.	E. 1	E. 2	E. 3	E. 4	A.E. 1	A.E. 2	Total.
1883	**9**	**9**	**8**	**4**	**24**	**20**	**74**	**23**	**25**	**27**	**11**	**65**	**54**	**205**	**15**	**15**	**14**	**6**	**31**	**36**	**117**	**12**	**15**	**16**	**6**	**39**	**33**	**121**
1883	9	10	9	10	22	14	74	24	27	30	33	74	17	205	16	19	12	23	32	15	117	12	15	16	26	33	18	120
1888	10	12	10	23	11	12	78	30	35	34	68	24	22	213	17	19	20	34	18	18	126	15	17	28	29	23	21	133
1893	12	12	22	11	11	12	80	38	36	65	24	22	22	207	21	22	30	19	17	18	127	22	27	29	23	21	21	143
1898	15	20	11	11	11	12	80	41	57	24	22	22	22	188	21	27	19	17	17	18	119	25	31	22	21	21	21	141
1903	22	11	11	11	11	12	78	60	24	22	22	22	22	172	28	19	17	17	17	18	116	30	25	20	21	21	21	138
1908	18	11	11	11	11	12	74	45	21	22	22	22	22	154	22	17	17	17	17	18	108	26	20	20	21	21	21	129
1913	12	11	11	11	11	12	68	21	21	22	22	22	22	130	18	17	17	17	17	18	104	21	20	20	21	21	21	124
1918	11	11	11	11	11	12	67	21	21	22	22	22	22	130	17	17	17	17	17	18	103	20	20	20	21	21	21	123

	Punjab.							Local Administrations.							Madras.							Bombay.						
1883	**11**	**13**	**15**	**6**	**33**	**35**	**113**	**13**	**14**	**15**	**12**	**31**	**40**	**125**	**12**	**11**	**10**	**4**	**28**	**22**	**87**	**12**	**10**	**15**	**6**	**27**	**23**	**93**
1883	11	12	15	17	37	20	112	14	15	14	22	37	22	124	13	11	10	18	20	15	87	14	9	17	12	26	15	93
1888	13	14	18	36	18	18	117	17	18	20	36	19	19	129	15	13	17	20	14	14	93	15	13	18	21	16	15	98
1893	17	16	34	19	18	18	121	19	20	35	19	19	19	131	18	15	21	14	14	14	96	16	14	21	16	15	15	97
1898	22	28	20	18	18	18	124	22	30	19	19	19	19	128	18	18	14	14	14	14	92	17	20	15	15	15	15	97
1903	30	20	18	18	18	18	122	30	21	19	19	19	19	127	23	14	14	14	14	14	93	21	15	15	15	15	15	96
1908	22	20	18	18	18	18	114	27	19	19	19	19	19	122	18	14	14	14	14	14	88	20	15	15	15	15	15	95
1913	17	17	18	18	18	18	106	19	19	19	19	19	19	114	15	14	14	14	14	14	85	16	15	15	15	15	15	91
1918	17	17	18	18	18	18	106	19	19	19	19	19	19	114	13	14	14	14	14	14	83	15	15	15	15	15	15	90

N.B.—The spaces between black lines show how the wave of irregularity, now present in the establishment, is pushed through the several periods until it disappears, and this represents, the block of promotion overcome by the device of a sliding scale.

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III

EXPLANATORY NOTE TO APPENDICES D AND E OF THE REORGANISATION, PUBLIC WORKS DEPARTMENT, ENGINEER ESTABLISHMENT.

In the note and tables which accompany Appendices A, B and C of the reorganisation scheme, it was shown that the adoption of the scale sanctioned by the Secretary of State, in which the ratio of 1 : 1 is prescribed as the proportion of Executives to Assistants, would result in the gradual retardation of the rate of promotion to the Executive class, until about the year A.D. 1900, men would be serving 16 years in the Assistant class before promotion. It was further shown how by adopting a sliding scale year by year for the 2 classes, gradually ending with the proportion of 2 : 1, a rate of promotion corresponding to a service of 10 years in the Assistant class, would be obtained; but at the same time, adopting the scale for the Executive grades of 8, 9, 10, 12, it was shown that a retardation of promotion became gradually established in the 4th grade of Executives.

2. Subsequently a number of other scales were tried experimentally, and the rate of promotion in successive years tested by the tables of Appendix C. But in all cases it was found that for any scale the rate, although fairly good at the commencement, was gradually retarded in the lower grades. This might have been anticipated as the result of adopting any fixed scale when it is remembered that for the next 30 years an establishment composed of very unequal numbers in each *age* rank is gradully passing out at one end, while a reduced and regular number of recruits is coming in at the other. A few of the *age* ranks, where the numbers cluster thickly, soon make up a grade in the middle and near the far end, while it takes a great many ranks to form the aggregate number of a grade similarly proportioned at the tail end. The problem, therefore, is to adapt the scale to the circumstances, and by this means to clear out the unequal ranks with a fair flow of promotion, while gradually adopting a normal or fixed scale for the tail end as the new system of regular recruitment moulds it to the typical scale.

In working out this problem the first thing to settle was the ultimate scale. To determine this, the basis adopted as a fair

and reasonable one in the interests of Government and of the establishment was as follows* :—

That promotion to Assistant Engineer, 1st class, should take place after 3 years' service, that is, at the age of 25.

"	Executive	"	4th	"	"	8	"	"	"	30.
"	"	"	3rd	"	"	13	"	"	"	35.
"	"	"	2nd	"	"	18	"	"	"	40.
"	"	"	1st	"	"	23	"	"	"	45.

Given an establishment of 888, of whom 72 belong to the Superintending and Chief Engineer classes, maintained by an annual recruitment of 33 or 34, the above rate of promotion would be maintained according to the typical figures by the following fixed scale :—

Assistant Engineer	... 2nd/3rd	129
" "	... 1st	156
Executive Engineer	... 4th	150
" "	... 3rd	135
" "	... 2nd	120
" "	... 1st	126
		816

But to provide for divergencies between the typical and actual, and to allow of a few promotions in excess of the standard of age, it was thought well to distribute the total number into 6 equal grades of 136 each.

3. At first starting it was found from Table A of the first series of notes that the actual distribution of men by ages in the several grades was as follows :—

Establishment of 1883 as it stands before reconstruction.

	E E 1	E E 2	E E 3	E E 4	A E 1	A E 2	Total.
22 to 25 ...	...	...	...	...	2	139	141
26 to 30 ...	...	...	2	5	151	106	264
31 to 35 ...	1	12	63	32	100	13	221
36 to 40 ...	20	56	40	12	16	5	149
41 to 45 ...	58	35	14	6	6	...	119
46 to 50 ...	21	9	1	...	3	...	34
51 to 55 ...	7	...	...	...	...	...	7
Total ...	107	112	120	55	278	263	935

With the typical scale accurately established, that is to say, with the totals read vertically and horizontally corresponding with one another and with the numbers followed diagonally, it is obvious that the numbers now lying outside the diagonal

* The grounds for selecting this basis are fully explained in Colonel Trevors note.

squares in the above figure would be clustered into those squares. The diagram shows at once that adopting our proposed age basis of promotion there is a retardation at present in the Assistant Engineer class, a fact which has been established already.

4. To overcome this block it would be necessary to adjust the diagram as below, by adopting the scale shown in the horizontal total of that diagram.

Establishment of 1883 reconstructed.

	E E 1	E E 2	E E 3	E E 4	A E 1	A E 2	Total.
22 to 25 ...	...	...	...	...	5	136	141
26 to 30 ...	...	...	2	5	257	...	264
31 to 35 ...	1	12	63	132	13	...	221
36 to 40 ...	20	56	52	16	5	...	149
41 to 45 ...	58	40	6	6	...	...	119
46 to 50 ...	27	1	...	3	...	...	31
51 to 55 ...	7	...	...	...	...	...	7
Total ...	113	118	123	162	280	136	932*

* Three men are supposed to have been promoted to Superintending Engineer according to original proposals.

In this diagram the men who are lower than they should be by the age standard have been pushed one step forward, and the outlying numbers to the right of the diagonal are by this means reduced. Those to the left of it who are before their time cannot of course be touched, nor can their further promotion be with justice stopped. They must go on with the advantage they have already gained under an imperfect system. It will be observed from the diagram that the first step towards regularity has been already gained by the normal number being established in the lowest grade.

5. Now we may go on adjusting the establishment on the above principle and by a similar dragram for every period of 5 years. At the end of the first 5 years it will be observed that the establishment will be modified as follows :—

The figures of each line of the diagram will have moved one line down, those before shown against 26-30 having moved down to 31-35, and those shown against 51-55 having disappeared altogether under the superannuation rule. In the first line will appear the surviving recruits of 4 years, 129 in number; in the second line will appear the 134 men between the age of 26 and 30, whom Appendix C shows will survive in the year 1888 out of the 141

original men, *plus* the 32 recruits now in their 5th year of service; total 166. Similarly, in the 3rd line we shall get 249 survivors out of 264 who appear in the 2nd line of the diagram of 1883, in the 4th, 134 out of 149; in the 5th, 88 out of 119, (allowing for men who are promoted into the upper classes as well as casualties), and similarly 19 in the last line, remaining out of 31. These figures are, it will be observed, all obtained from Appendix C.

The new diagram will stand as below, the figures in the vertical total being first worked out in the manner just explained, and the promotions being made so as to push on the men who are backward into their proper places, while at the same time not stopping the promotion of members of the present establishment who are before their time. This is done by working the figures of 1883 into the next diagonal square for 1888.

The diagram for 1888 works out these as follows:—

DIAGRAM OF 1888.

	EE 1	EE 2	EE 3	EE 4	AE 1	AE 2	Total.
22 to 25 ...	...	...	...	...	...	129	129
25 to 30 ...	...	...	...	23	136	7	166
31 to 35 ...	...	2	5	242	...	...	249
36 to 40 ...	8	52	129	13	...	...	202
41 to 45 ...	45	68	16	5	...	...	134
46 to 50 ...	66	16	6	...	...	...	88
51 to 55 ...	16	...	3	...	...	...	19
Total ...	135	138	159	283	136	136	987

Here it will be observed that the process of regularising the scale has advanced another step, the normal number being established in the 2nd grade from the bottom; and the block which in the present establishment is in the first and second grade of Assistants, and which in the establishment as reconstructed is in the first grade, [illegible], having been transferred to the fourth grade of Executives.

6. The conclusion to be arrived at is, that in order to give a fair flow of promotion and to gradually work to the normal scale, the scale shown in the bottom line of the diagram for 1883 must gradually in the period of 5 years pass into the scale shown by the corresponding line of the diagram of 1888.

Diagrams for every period of 5 years may be similarly worked out, until in the year 1918, that is after 33 years, when the whole of the present establishment has been worked out and the typical scale obtained by regular annual recruitment has been realised, the diagram will stand as follows:—

DIAGRAM OF 1908.

	EE 1	EE 2	EE 3	EE 4	AE 1	AE 2	Total.
22 to 25 ...	...	...	...	...	...	129	129
26 to 30 ...	...	...	...	13	136	7	156
31 to 35 ...	...	...	27	123	...	...	150
36 to 40 ...	...	26	109	...	...	...	135
41 to 45 ...	10	110	...	...	...	...	120
46 to 50 ...	70	...	...	...	...	...	70
51 to 55 ...	56	...	...	...	...	...	56
Total ...	136	136	136	136	136	136	816

The vertical line, it will be observed, represents the actuarial numbers for an establishment of 816 ranged by ages as shown in paragraph 2, while the horizontal total gives the scale which we decided to adopt for the normal establishment, and the diagonal line shows that the irregularity has worked itself out.

7. The above explanation will show the system on which it is proposed gradually to regularise the establishment for the whole of India, but as there are a number of different lists, and as each list, although on the average resembling the others in its rate of promotion, has its own peculiar difficulties, it is necessary to apply the same system in detail to each list. This has been done in the series of tables denominated Appendix D.

The manner in which this series of tables has been worked out is as follows. The principle is exactly the same as that already explained in the case of the general table; the only difficulty has been to distribute the general figures properly to each list. For the whole establishment the ultimate figures which work out in 1918 are—

EE 1	EE 2	EE 3	EE 4	AE 1	AE 2	Total.
136	136	136	136	136	136	816

and similarly the corresponding figures for the several lists are as follows :—

	E E 1	E E 2	E E 3	E E 4	A E 1	A E 2	Total.
Military Works ...	11	11	11	11	11	12	67
Railways	21	21	22	22	22	22	130
Bengal	17	17	17	17	17	18	103
North-Western Provinces and Oudh.	20	20	20	21	21	21	123
Punjab	17	17	18	18	18	18	106
Local Administrations ...	19	19	19	19	19	19	114
Madras	13	14	14	14	14	14	83
Bombay	15	15	15	15	15	15	90

Again, the actuarial figures for each establishment corresponding to the totals in the vertical column of the ultimate establishments (for 1918) work out as below :—

	Military Works.	Railway.	Bengal.	North-Western Provinces and Oudh.	Punjab.	Local Administrations.	Madras.	Bombay.	Total
22 to 25 ...	11	21	16	19	17	18	13	14	129
25 to 30 ...	12	25	20	24	20	22	16	17	156
31 to 35 ...	13	24	19	23	19	21	15	16	150
36 to 40 ...	11	21	17	21	17	19	14	15	135
41 to 45 ...	10	19	15	18	16	17	12	13	120
45 to 50 ...	6	11	9	11	9	9	7	8	70
51 to 55 ...	4	9	7	7	8	8	6	7	56
Total	67	130	103	123	106	‖114	83	90	816

That is to say, in the final diagram for each establishment as worked out for 1918 the horizontal total will be as in the first of the above tables and the vertical total as in the second.

8. In the first instance it will be seen from the tables Appendix D that the present establishment on each list is reconstructed by promotion of the backward men, as was done above with the general establishment. Then the establishment as it will stand in 1888 for each list has to be worked out in the same manner as was done for the general list.

The only difficulty will be in allotting the distribution of the first two lines which consist partly of the recruits. The distribution of the 129 four-year recruits

* This distribution is as fair as it can be made ; the fact of the total for some establishments exceeding 4 and the annual number will be adjusted by increasing the number for one or two years on any particular list.

† 129
166
295

is worked out from the distribution of the 33 annual recruits as follows :—

1	Annual number. 2	For 4 years. * 3
Military Works ...	3	11
Railways ...	5	21
Bengal ...	4	16
North-Western Provinces.	5	19
Punjab ...	4	17
Local Administrations.	5	18
Madras ...	3	13
Bombay ...	4	14
Total ...	33	129

The third column in the above shows the entry that will be made as the first total of the vertical column for each list in each diagram of Appendix D. for the year 1888.

9. The distribution of the second total, 166 is worked out as follows. In the first place, the present establishment, owing to recruits not having been distributed on any proper principle, is abnormal and must be regularised. In 1888, as shown by the diagram of the general establishment (paragraph 5), the number of eight-year men, that is, the sum of men in the first 2 lines, is 295. The normal total for eight years, taking the typical establishment of 33 recruits, is 285.† The distribution of the 295 must be accommodated to the normal as follows :—

	Normal for eight years.	Corrected total for 1888.
Military Works ...	23	25
Railways	46	48
Bengal	36	37
North-Western Provinces and Oudh	43	45
Punjab	37	38
Local Administrations ...	40	40
Madras	29	30
Bombay	31	32
Total ...	285	295

We may work the distribution of the corrected total as above by adjusting the arrangement in the several lists of the 32 recruits in their eighth year of service as follows:—

1	Recruits of first 4 years. 2	Survivors of present Establishment. 3	Recruits in their 5th year. 4	Total. 5
Military Works ...	11	14	...	25
Railways ...	21	17	10	48
Bengal ...	16	14	7	37
North-Western Provinces and Oudh ...	19	18	8	45
Punjab ...	17	20	1	38
Local Administrations	18	22	...	40
Madras ...	13*	14	3	30
Bombay ...	14	15	3	32
Total ...	129	134	32	295

The sum of the 3rd and 4th columns, which aggregate 166, shows the distribution for the 2nd line of the 1888 diagram, and the distribution has been properly adjusted to the system. Practically the table shows that the first ~~total~~ batch of recruits, who will be in their 5th year in 1888, should be distributed as shown in column 4, while those of the ensuing years should be distributed as shown in column 2.

10. The rest of the figures for the several lists of 1888 and for the following years will be distributed proportionately to the figures of the general diagrams which are worked out for each successive period of 5 years, as already explained. The defect in the tables is that after the year 1893 the actual vacancies likely to be caused by promotion to the Superintending Engineer class have not been taken into account, but the vacancies have been distributed proportionately. There is no help for this in drawing out the tables, but it will be easily remedied by adjusting the scales of the several periods as they came into force, if the scheme is accepted.

11. What these tables are intended to illustrate is how the block caused by the present irregularity of the establishment may be gradually pushed through the grades.

This is more clearly illustrated by Appendix E, which is an abstract of the horizontal totals of each list in Appendix D. This table shews how the block by means of the sliding scale, which adjusts itself to circumstances, is pushed through successive grades in the several periods until the normal or typical scale is established.

12. The aggregate scale for each successive period of 5 years stands as below:—

	E E 1	E E 2	E E 3	E E 4	A E 1	A E 2	Total.
1883 as reconstructed ...	113	118	123	162	280	136	932
1888 ...	132	141	166	265	143	139	986
1893 ...	163	163	256	145	137	139	1,003
1898 ...	181	231	144	137	137	139	969
1903 ...	244	140	136	137	137	139	942
1908 ...	198	137	136	137	137	139	884
1913 ...	130	134	136	137	137	139	822
1918 ...	133	134	136	137	137	139	816

and the cost of the successive scales as compared with that of the present scale (Rs. 5,16,650) is as follows:—

monthly rates

	Rs.
1883	5,44,400
1888	6,04,850
1893	6,41,700
1898	6,36,000
1903	6,25,050
1908	5,71,750
1913	5,13,300
1918	5,07,600

10-7-83 G. H. D. W.

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Secretary of States Despatch No. 18, dated 22nd March 1883.

In paragraph 20 of the despatch the Secretary of State says:—

"The opinion has already been expressed by my predecessors that the position of the Military and the Civil Engineers should, as far as possible, be assimilated, and the time has, in my opinion, arrived when the distinctions which now exist in their emoluments should be removed. I desire, therefore, that in future the salary of the Royal Engineer officers admitted to the Department shall not be supplemented by military pay proper, but shall consist only of the salary of the grade or office in which they may be serving. I do not propose that any deductions shall be made from the present allowances of those who are now in the Department, but on their promotion the new rule should be applied to them provided they do not by promotion suffer any diminution in their total present emoluments."

This proposal should, I think, be carefully considered in two ways—first, by comparing the relative emoluments of Royal and Civil Engineers which it is desired to assimilate; and next, by examining whether the Government can with justice order a reduction of the scale of pay of Royal Engineers now in the Public Works Department.

First, if the term "emolument" used in the above extract is intended to include the values of the pensions and gratuities earned during the course of their service as well as the actual salaries drawn while serving, it will not, I think, be difficult to show that, if the scale of pensions which the Secretary of State is willing to grant to Civil Engineers be sanctioned, the much desired assimilation of their position to that of the Royal Engineers serving in the Public Works Department will have been practically effected, or at least so nearly so that the withdrawal of the net military pay of the latter, in addition to the grant of improved pensions to the former, would reverse their respective positions in respect to emolument.

There are at the present time, I believe, 322 officers of Royal Engineers on the Indian establishment. Of these, only 151 are serving in what may be called the Civil branches of the Public Works Department, which are also open to the Civil Engineers. Any comparison between the emoluments of the two bodies for identical service is therefore possible only in regard to this limited number.

I give on the margin an approximate statement showing how the officers of Royal Engineers now serving in India are employed, distinguishing those of the late Indian corps from the Imperial. It is not absolutely correct, I fear, but it is sufficiently near the mark for my present purpose.

It will be seen that of the number now in the Civil branch about half belong to the Imperial corps. Before ten years are over, the whole of the officers of the late Indian corps will probably have disappeared, and at the end of fourteen years there will certainly not be one left in the Department under the operation of the 55 years' superannuation rule alone.

In the Military Works Branch 62 out of a total of 74 belong to the Imperial corps, and, as in the case of the Civil branch, the few of the Indian corps still remaining must disappear in the course of the next 14 years, and probably much sooner. In the margin I have shown the probable maximum number of officers of the Indian corps that will be serving in the Department in all its branches, Civil, Military and Accounts, in future years until they vanish from the scene altogether. The table allows for deaths and compulsory retirements only; but as, under the new pension rules applicable to this body, a good many voluntary retirements may also be expected, the list will in all likelihood be cleared off at a much earlier date.

In common with the officers of the late Indian Artillery, the officers of the late Indian Engineers have had special pensions recently extended to them in order to induce early retirements and thereby give promotion on the Imperial lists.

These special pensions apply, however, only to 40 per cent. of the Royal Engineers now in the Department, and each year the number of those entitled to them will diminish until none are left. The officers of the Imperial list have a scale of pensions of their own laid down in the Warrant of the 25th June 1881. Their pensions in no way depend on departmental service, nor indeed do those of the Indian Engineers, but are granted for military service and constitute a military charge.

I am not at all sure that it is right, in making a comparison between the emoluments of civilians and military men employed on similar civil duties, to take the military pensions of the latter into account. But inasmuch as the comparison which has to be made relates to the future rather than the present equality in the

	Colonels.		Lt.-Cols.		Majors.		Captains.		Lieuts.	
	Indian	Indian	Imperial	Indian	Imperial	Imperial	Imperial	Imperial	Total.
P. W. D., Civil ...	7	34	...	35	21	31	23	151
" Military ...	...	4	...	8	1	17	44	74
" Accounts ...	...	...	...	6	2	2	1	11
Survey ...	1	2	...	8	5	3	...	19
Military ...	...	4	1	4	2	7	34	52
Miscellaneous ...	1	2	...	5	2	2	3	15
Total ...	9	46	1	66	33	62	105	322

Probable maximum number of Royal Engineer officers of the Indian lists that will be serving in all branches of the Public Works Department during the following years :—

1883	... 95	1891	... 39
1884	... 91	1892	... 29
1885	... 85	1893	... 21
1886	... 78	1894	... 14
1887	... 74	1895	... 8
1888	... 68	1896	... 5
1889	... 59	1897	... 2
1890	... 50	1898	... 0

status of the two bodies, it would be manifestly unfair if that comparison were made with the exceptional privileges enjoyed by a fast diminishing minority. If, then the pensions of the Royal Engineers are to be taken into account at all in calculating departmental emoluments, it is with those of the Imperial and not with those of the Indian officers that the comparison must be made.

Such a comparison I have made in the accompanying tables I to VII.

In the calculations by which the results given in these tables have been arrived at, I have assumed that the Royal Engineer on the average joins the Department at the age of 23, and the Civil Engineer at the age of 22. This is true according to our present experience, though there are doubtless occasional variations.

I have also assumed that they will both begin as Assistant Engineer, 2nd grade, and that, their respective abilities being presumably equal, their promotion will also be equal, each attaining to, and passing through, the successive grades of the Department in the same time. The Civil Engineer will thus always be a year younger for the same length of departmental service and standing than the Royal Engineer.

The rate of promotion I have adopted in the comparison is what may be expected according to General Hannyngton's table (sent with the Secretary of State's despatch No. 50, dated 8th September 1881), if the proportion of grades and classes approved by the Secretary of State in his present despatch be accepted; and if retirement at the age of 50 be compulsory for those who are not promoted to Superintending Engineer, and for all at the age of 55. The rate of departmental promotion is, however, not very material to the comparison, so long as the same rate is assumed for both classes of officers.

The scale of pensions for Civil Engineers is that laid down in paragraph 13 of this despatch. The pensions of the Royal Engineers have been taken from the Warrant of the 25th June 1881.

To allow of the values of the pensions being fairly compared throughout, I have commuted them at 4 per cent., on the Carlisle tables, for each year during which they are available. In assessing the

values of the pensions of the Royal Engineers for comparison with those of the Civil Engineers earned in the same time, I have made a proportionate deduction for the three years the former pass at home, or it may be partly in India, on military duty, before joining the Department. This period counts as pensionable service; but as it is not service in the Public Works Department, it would be as reasonable to reckon the proportion of the pension earned by that service as forming part of their subsequent departmental emoluments as it would be to reckon the amount of the pay drawn by them during the same antedepartmental period of service in enhancement of the salaries they receive after they join the department. As the latter must obviously be rejected, the former must also be excluded from the calculation, and it has accordingly been omitted by me.

To complete the comparison, I have calculated out the values of the expectancies of pay and pensions on first entering the Department for both classes. These expectancy values represent what would be the fair price to pay on joining the service, either at 22 or 23 years of age, for the pay and pensions receivable up to the date of retirement, with the chance of dying in the interval taken into account.

I have begun the comparison with the tenth year of service, as the pensions of the Civil Engineers do not commence till after that term of service, and the Royal Engineer becomes entitled to a gratuity, if retired, only one year earlier. Moreover, an officer of the Royal Engineers cannot well be considered to have elected for an Indian career until he has returned from the furlough which is usually taken at the close of the first term of foreign service, that is to say, until about ten years after he first joins the Department. A comparison of the earlier years could therefore have no practical bearing on the question, and is better left out of consideration.

There are two ways of comparing the emoluments of the service.

One is to add together all the sums which an officer would have received from the day of his joining to the day of his leaving the service, inclusive of the value of his pension, and to call that his total emolument for the period he served. This is the easiest way of dealing with the question, and to some doubtless it will commend itself as very reasonable as well

as practical. If there were no liability to death during the period of service to affect the relative values of the deferred payments, or if the comparison were limited strictly to those who lived to claim their pensions, this method would be as good as any other, and in some respects better, as it avoids the fallacy of reckoning up the values of small recurring payments at compound interest when there is no practical possibility of investing the money in such a way, and, indeed, very little probability of there being any savings to invest at all.

The other, and unquestionably the more correct, method is not only to reckon the actual receipts, but to assign to them their true relative values arising out of the differences of time at which they accrue, and the chances of death in the interval.

I have adopted both methods to prevent any misunderstanding.

The figures in columns Y and Z of Table V show how the emoluments of Royal and Civil Engineers, respectively, would compare, in the aggregate, up to the close of each year of service, by the first method, on the hypothesis that they then retired on the pension due.

It will be seen that up to the end of the sixteenth year of service the emoluments of the Civil Engineer are in excess, and that he has the further advantage of being the younger man by one year.

After the sixteenth year the emoluments of the Royal Engineer begin to exceed those of the Civil Engineer of the same length of service in the Department; but this excess does not on the average go beyond what a Civil Engineer of the same age would receive on retirement. Thus, if we take the case of a Civil Engineer retiring voluntarily after 20 years' service at the age of 42, the total emolument received by him from first to last would have been equivalent to £15,297. A Royal Engineer similarly retiring after 20 years' departmental service at the age of 43 would have received the equivalent of £15,852. If both were compulsorily retired at the age of 50 or 55, their respective emoluments would have amounted to £23,063 and £24,797, or £38,208 and £38,491; the difference between the first of these two pairs being the maximum in the table, and due to the fact that the Royal Engineer at that particular time becomes entitled to the highest rate of pension he

can obtain while still eligible for departmental employ.

Turning next to the comparison by values of expectancies, Table VI, it will be seen that, though the same general rule prevails as in the previous comparison, the differences are exaggerated.

The marginal table showing the ages and years of service at which the aggregate emoluments of each class most nearly coincide will show better than any amount of explanatory writing the extent to which the retention or withdrawal of the Royal Engineer's net military pay would affect the comparative status of the two classes.

So far then it is clear that, if the test of actual cash receipts in the shape of pay drawn during service and the equivalent of a pension on retirement be applied, the improved scale of pensions proposed for the Civil Engineers will practically produce the desired equality in the pecuniary status of the two classes.

But if, on the other hand, we apply the more exact actuarial test, it is equally clear that the position of the Civil Engineers, notwithstanding the improved pensions, will still be somewhat inferior to that of the Royal Engineer drawing net military pay in addition to his departmental salary, if we reckon the pension of the latter as constituting part of his departmental emolument. If, however, we eliminate the pension, as being a military and not a departmental charge, or reckoning in the pension, if the net military pay be withdrawn, their relative positions will be reversed.

To produce absolute equality, if the pensions of the Royal Engineers are to be considered as forming part of their civil emolument, and their net military pay be withdrawn, it will be necessary either to make a special allowance* to them in lieu of that pay, or leaving them in the enjoyment of that pay, to grant some compensating allowance† to the Civil Engineers.

If the Royal Engineers' pensions are, on the other hand, to be looked upon as a military charge, pure and simple, and not as forming part of their civil emolument, the addition of their net military pay to their departmental salaries is barely sufficient to produce the desired equality.‡

As the pensions of the Royal Engineers are already treated as a military charge, it would appear wrong to include them among the civil emoluments ; and if they be excluded, the grant of the pensions proposed by the Secretary of State to the

The gross emoluments of Royal and Civil Engineers most nearly coincide at the following ages and lengths of service under the different conditions of comparison :—

TABLE V.

With net military pay.					Without net military pay.				
Royal Engr.			Civil Engr.		Royal Engr.			Civil Engr.	
Age. Year.	Service. Year.		Age. Year.	Service. Year.	Age. Year.	Service. Year.		Age. Year.	Service. Year.
34	11	*a*	33	11	34	11	*a*	32	10
35	12	*a*	34	12	35	12	*a*	33	11
39	16	*a*	37	15	37	14	*a*	34	12
40	17	*a*	40	18	38	15	*a*	35	13
41	18	*a*	41	19	40	17	*a*	37	15
44	21	*a*	44	22	41	18	*a*	38	16
45	22	*a*	45	23	43	20	*a*	41	19
47	24	*a*	47	25	46	23	*a*	43	21
49	26	*a*	50	28	47	24	*b*	45	23
49	26	*b*	49	27	48	25	*b*	46	24
50	27	*b*	50	28	53	30	*b*	51	29
51	28	*b*	51	29	55	32	*b*	53	31
53	30	*b*	53	31	...	...		...	...
55	32	*b*	55	33	...	...		...	...

TABLE VI.

With net military pay.					Without net military pay.				
Royal Engr.			Civil Engr.		Royal Engr.			Civil Engr.	
Age. Year.	Service. Year.		Age. Year.	Service. Year.	Age. Year.	Service. Year.		Age. Year.	Service. Year.
34	11	*a*	33	11	35	12	*a*	33	11
35	12	*a*	34	12	37	14	*a*	34	12
36	13	*a*	35	13	38	15	*a*	35	13
39	16	*a*	38	16	40	17	*a*	37	15
42	19	*a*	42	20	43	20	*a*	41	19
43	20	*a*	45	23	46	23	*a*	42	20
45	22	*a*	47	25	47	24	*a*	44	22
46	23	*a*	49	27	49	26	*a*	46	24
47	24	*b*	49	27	48	25	*b*	46	24
48	25	*b*	50	28	51	28	*b*	49	27
50	27	*b*	53	31	55	32	*b*	53	31
52	29	*b*	54	32	...	...		...	...
53	30	*b*	55	33	...	...		...	...

* See Table IV, column K and foot note.

† See Table VII.

‡ See column M, Table IV.

Civil Engineers will be more than enough to put them on an equal footing with the Royal Engineers and to meet the wishes of His Lordship, with a margin in favor of the Civil Engineers.

But if this solution of the problem does not commend itself to Government, we must resort to one or other of the alternative courses I have suggested above—*viz.*, either to give the Royal Engineer some allowance in lieu of net military pay, or to grant some compensating allowance to the Civil Engineer.

In favor of the first alternative, all that can be said is that it would for a time be the least costly of the two.

Against it many and very strong arguments can be adduced, not the least cogent of which is that in the end it would probably turn out to be the most costly course that Government could well adopt.

In the first place, to reduce the allowances of the Royal Engineers in order simply to assimilate their emoluments to those of the Civil Engineers, would afford the latter no satisfaction, and their grievance, which is not that others get more pay, but that they themselves do not get enough, would be untouched.

If any civil members of the Department have seriously agitated for the reduction of the Royal Engineers' pay, it is not by any feelings of empty jealousy that they have been actuated.

They have felt that the resistance which the proposal to "level down" would infallibly provoke would be a powerful aid towards obtaining the "levelling up," which is the object they have really at heart. And it may be taken for granted that if the reduction is made, so far from appeasing the clamour of the Civil Engineers for an improved status, it will only serve to fan the flames of their agitation into a warmer blaze.

In the next place, there is the question of the justice of reducing the pay of the Royal Engineer, and the light in which those officers themselves are likely to view a measure so seriously affecting their interests.

It cannot, I fear, be doubted that, so far as the Royal Engineers now in the Department are concerned, it would be received with feelings of great bitterness as a sop thrown out by Government at their expense to obtain a passing relief from the disquietude caused by the appeals constantly being made on behalf of

the Civil Engineers for the redress of their grievances. And the bitterness will be none the less, because they are perfectly well aware that the sacrifice will be wholly ineffectual either for putting an end to the agitation or satisfying the Civil Engineers.

That the measure would be a hard one for the Royal Engineers, both individually and as a body, cannot, I think, be denied: as to the great majority of them it means a heavy prospective loss.

The officers now in the Department may with justice argue that they entered it on certain conditions, and on the faith that those conditions would be observed as far as the exigencies of the State permitted. The extract quoted on the margin from the Public Works Department Code of Regulations shows that they have been required on joining the Department to elect between two scales of pay—one consisting of the consolidated civil salary of their appointment in the Public Works Department with their military pay proper; the other of staff salary with the military pay and allowances of their regimental rank. The two scales are not equal, as will be seen from the table in the margin, and the old scale is limited to a maximum which is in excess of the new scale for all grades below Chief Engineer, 2nd Class. Military pay proper is allowed on the old scale in addition to the maximum, if that is reached.

The new scale was favorable to officers whose standing in the Department was high compared with their military rank; and the old scale was favorable to officers whose military rank was high compared with their standing in the Department. Some have elected one scale, some the other; and many instances have occurred in which officers have found the scale elected unfavorable to them, and have endeavoured to change it, but without success. When the rank of Major in the corps of Royal Engineers was re-established, it was decided (see Public Works Department Circular No. 49, dated 15th August 1876) to give officers an opportunity of re-election, and it was in many cases taken advantage of. But since then no change has been allowed. It is the fact that many officers who elected the new scale in the belief that their promotion in the Department would keep pace with their military promotion have found their hopes not realized. Their military promotion has gone ahead of the departmental, and they have lost pay by the scale they have elected. They look to

6. The officers of the first three of these establishments are divided into classes and grades as follows:—

Designations.	Salaries per mensem, exclusive of Travelling Allowance.		
	Present scales, Civil and Military.	Old scale for military officers.	
	Consolidated salary.	Staff salary.	Maximum to be drawn in Public Works Department.
Engineer Establishment.	Rs.	Rs.	Rs.
Chief Engineer, 1st Class	2,500	...	2,500
Chief Engineer, 2nd Class	2,000	1,200	2,000
Chief Engineer, 3rd Class	1,800	1,000	1,850
Superintending Engineer, 1st Class ...	1,600	800	1,800
Superintending Engineer, 2nd Class ...	1,350	750	1,575
Superintending Engineer, 3rd Class ...	1,100	700	1,350
Executive Engineer, 1st Grade ...	950	600	1,250
Executive Engineer, 2nd Grade ...	800	500	900
Executive Engineer, 3rd Grade ...	650	400	750
Executive Engineer, 4th Grade ...	550	300	600
Assistant Engineer, 1st Grade ...	450	250	500
Assistant Engineer, 2nd Grade ...	350	200	450
Assistant Engineer, 3rd Grade ...	250	...	...
Apprentices	100	...	...

N.B.—Royal Engineer officers have the option of drawing the consolidated salary with their military pay proper, or the old scale of staff salary with military pay and allowances of their rank. In the latter case, they will draw their military pay proper independently of the maximum. In the rank of Major they will draw their military pay and allowances of a Major of the Staff Corps, as laid down in G. G. O. Military Department No. 71, dated 19th January 1875. Royal Engineers appointed to the Department under the provisions of Chapter II (6) are allowed to defer their election till permanently graded, and will meanwhile draw the salary therein laid down, old or present scale, whichever may be most advantageous to them. Except in the case of officers so appointed, the election is to be made on first joining the Department.

their future departmental promotion to recover this loss; and if a summary reduction in the scale of pay is now ordered to take effect from the next promotion, and a serious proportion of the remuneration which formed the inducement to join and make their election is withdrawn, after they are irretrievably committed to a departmental career, it would be not only contrary to precedent and the usual practice of Government in like cases, but an act of undoubted hardship and very questionable justice.

That it would be an unusual course may be illustrated from the analogous case of the furlough rules. These have been changed from time to time, but when an officer has elected for a particular set—say, for example, those of 1868—Government has always left it optional with him to adhere to his choice or to take those of later introduction, despite any extra cost that his decision might involve.

What radical difference is there, it may well be asked, between the principle which governs the one procedure and the other?

If a great financial or political crisis were impending, which rendered a general reduction of expenditure imperative in the interests of the State, I have no doubt that the Royal Engineers would, in the spirit of loyalty which they have always shown, acquiesce, if not cheerfully, still without a murmur, in any reduction of their emoluments, or change in the conditions of their service, which the necessities of the situation demanded.

But it would hardly be reasonable to expect from them such superhuman virtue as not to grudge being mulcted of what, rightly or wrongly, they consider to be part of their legitimate wage under their special contract with Government, whether the sacrifice be demanded on the simple plea of allaying a jealousy, the sources of which the measure will not touch, or with the scarcely more promising object of assimilating the emoluments of two services, the fundamental conditions of which are essentially dissimilar. If such an equality be desirable in the opinion of Government, they will probably, and not without force, urge that it should be achieved at the expense of the State itself and not by cutting down the by no means too redundant pay of a body of its servants, against whose efficiency and zeal no charge can be, or ever has been, brought, and who by the usage of the service may reasonably claim to be exempt from any

arbitrary reduction of the emoluments which constituted their sole inducement to enter a Department which they cannot now leave, and which offers no other rewards to compensate for such loss.

If the pay of the Civil Engineers cannot be raised to the same level as that of the Royal Engineers on account of the cost, the levelling down can at least be carried out gradually, without injury to present incumbents, or anything resembling breach of faith with them, by leaving them to die out or retire in the ordinary course, and applying the reduction order prospectively to new appointments only.

This would certainly prevent all irritation being felt by the Royal Engineers already in the Department, and those who may join it hereafter under the new conditions would have no just cause of complaint, as they would do so knowing what was before them. That they would subsequently resign themselves contentedly to their relatively inferior status because they had accepted it in the first instance with their eyes open may, however, reasonably be doubted. We see that the Civil Engineers under precisely similar circumstances are dissatisfied, and there is no reason to believe that the Royal Engineers would be any better pleased, though they might, and probably would, submit in silence.

But whether the order be applied prospectively only, or be made to embrace present incumbents also, the effect will unquestionably be the same, as far as Royal Engineers taking future employment in the Public Works Department is concerned.

Even with the addition of the net military pay, there is little doubt that the emoluments which Royal Engineers now joining the Department can look forward to will not average so high as those of Staff Corps officers in regimental employ; while their pensions and prospects of attaining the higher prizes of the service as well as of gaining personal distinctions are incomparably worse.

And it has to be borne in mind that Royal Engineers, presumably because they are supposed to have a special and highly lucrative professional field all to themselves, are practically excluded from the many other careers, civil as well as military, which are freely open to their brother officers of the other arms. If, therefore, we are to compare emoluments at all, the comparison, to be just, should be a double one, the disadvantages the

Royal Engineers labour under from the restriction of their opportunities as military officers, owing to their relegation exclusively to the Public Works Department, being set off against any advantages they may be held to enjoy over their Civil comrades in that Department.

The younger officers of the corps are fully alive to the disadvantages of departmental service, and even now show no particular alacrity in joining it, as witness the small number of subalterns in the Civil branches. In fact, Royal Engineers are under no compulsion to take civil departmental employ at all, and few seem inclined to volunteer except for temporary employment in some special branch to which they may happen to take a fancy, and from practical training in the duties of which they hope to make capital hereafter. In short, the remuneration is not sufficiently tempting, especially with the stagnation of promotion now prevailing, to induce officers to throw up their military career for Civil Engineering, pure and simple, which is what election for permanent departmental employment practically amounts to. The withdrawal of their net military pay by still further reducing the temptation, and, what is perhaps likely to strongly influence some, by severing the last link which binds them to the army will probably settle all doubts, and the ultimate exclusion of the Royal Engineers from all but the Military Works Branch may be looked upon as one certain result of the measure.

In the Military Works Branch, after it has been constituted on the purely military basis which is in contemplation, I presume that Royal Engineers coming to this country for their foreign tour will have to serve if required; but the number who can be so employed with advantage is limited. Probably less than a third of the whole strength which the military policy of the Government requires to be maintained permanently on the Indian establishment as a reserve for contingencies could be profitably so employed.

If professional civil employ is made so distasteful and unremunerative to the Royal Engineers of the future as to prevent their taking to it, the finances of the country will be burdened with the cost of about 150 officers of various ranks practically doing nothing under the guise of general military duty.

A comparison between the figures in columns V and Z, Table V, will show that

on an average the cost of employing 100 Royal Engineers, inclusive of their net military pay, on civil departmental duties would be about the same as that of 34 Civil Engineers under the proposed pension rules, if it is indispensable to maintain the Royal Engineers at their present strength as part of the military garrison of the country. Thus, within the limits of military necessity, every Royal Engineer in departmental employ costs the State about one-third what it would cost to replace him by a Civil Engineer.

And at the same time that there is this decided economy from the employment of Royal Engineers on Civil works, their is a military gain also from the professional experience they acquire in the course of such employment.

Again, the cost of a Royal Engineer doing military duty on Indian pay and pension earned during service is to that of a Civil Engineer, also inclusive of pension, nearly as 2 to 3. If then Government were in a position to dispense with 150 Royal Engineers from the military reserve of the country, they might, out of the saving so effected, substitute 100 Civil Engineers for them in the Department. But without such reduction in the military strength, only 50 Civil Engineers could be added to the Department in place of the 150 Royal Engineers withdrawn, keeping within present limits of cost.

The situation then is this. If the Royal Engineers are driven out of the civil branches of the Department by any ill-advised measure of reducing their pay, Government must be prepared to face the following difficulties. If neither the military reserve nor the civil establishment can consistently with efficiency be reduced, it will be necessary to increase the aggregate cost of its establishment by the pay and pensions of 100 additional Civil Engineers to replace the Royal Engineers withdrawn to military duty.

Or if it keeps within present limits of cost, Government must put up with the inconvenience of having its civil Public Works Department staff reduced by 100 engineers.

But if military necessities will allow of the 150 Royal Engineers withdrawn from the Public Works Department being dispensed with from the Indian establishment, either the strength of the Public Works Department staff must be reduced by 50 engineers to keep the cost within present limits, or the aggregate cost of its establishment must be increased by the amount of the pay and pension of the same number of Civil Engineers.

Thus, by taking what seems at first sight the most economical step towards compliance with a sentimental and persistent cry for equality, the Government will ultimately, and I think I may say inevitably, find itself in the awkward dilemma of having to choose between paying much higher for the same service or being content with a feebler service for the same cost.

If there is a grievance to be redressed, it should no doubt be redressed promptly and effectually in a manner becoming the dignity of a great Government. But to create another and a greater grievance as a set-off to the one already existing is scarcely the kind of redress that is expected, or that would be acceptable if offered.

But whether the Civil Engineers have at present any real and tangible grievance calling for immediate redress, and whether after the concession of the higher pensions they will still have a grievance, must to a great extent be matters of opinion. So far as a grievance is capable of assessment, it is possible to apply a pecuniary remedy; but when it is merely the outcome of a sentiment which has no more substantial basis than that every man is as good as his neighbour—and better, there is no finality to its claims. The more that is conceded to it the more it craves. It behoves Government, therefore, to be careful to distinguish between those claims which are reasonable and remediable and those which no liberality can satisfy.

As I have already pointed out in this note, the Civil Engineers of the Department will have been substantially placed on an equality with the Royal Engineers when the new scale of pensions is sanctioned. For the first half of their service they will be decidedly the better off of the two, but in the second half the Royal Engineers will have the advantage.

If the object is to *silence* the complaints of the Civil Engineers, not even putting them at a decided advantage all through their service will, I fear, be effectual; although that advantage be conceded not by reducing the emoluments of the Royal Engineers, but by increasing their own. There are other and higher standards of pay than that of the Royal Engineers which will be open for comparison and form a ground of complaint when that has been surpassed.

That they will never desist from agitating until they have succeeded in substantially improving their pecuniary position, and being at least as well remunerated as the Royal Engineers, I have no doubt

whatever; and that they will ultimately succeed may, I think, be safely assumed from what they have already achieved.

Under these circumstances the proper course for Government to pursue seems scarcely open to question. It is always better to give in to the inevitable with a good grace, making a merit of a necessity, than to yield grudgingly under pressure when resistance is no longer possible.

The cost of the concession which will place the Civil Engineers at the desired advantage is not so very high that Government could not afford to give it. An average addition of Rs. 7,500 per mensem to the pay of every hundred Civil Engineers on the establishment would effect the required assimilation.

And if this allowance be granted for length of service only, independently of departmental rank, increasing by regular increments with each year of completed service, the incidence of the charge on the revenues would not be so heavy at first.*

In table VII, I have shown how an allowance of Rs. 6 per mensem beginning with the second year of service and increasing by Rs. 6 per mensem with each succeeding year would affect the prospective value of the Civil Engineers' status. The relative values of the emoluments of the two bodies calculated for each year of service and for each year of age, with this allowance added to the pay of the Civil Engineer, is shown on the margin. Absolute equality at every stage is incompatible with the irregularity of the intervals between the times at which the pensions become due and the differences in the values of the pensions themselves. The assimilation is, however, practically complete.

To prevent any misunderstanding of my meaning in the foregoing observations, I wish to explain finally that I do not advocate any immediate increase of pay being given to the Civil Engineers, believing as I do that the enhanced pensions now proposed will virtually establish the desired equality besides substantially improving their pecuniary status. Thus, so far as their grievance has a money basis, a great step will have been made towards its redress, though it is scarcely to be expected that the concession, handsome and adequate though it be (*vide* Table VIII) will satisfy all the hopes raised by the conciliatory spirit in which the clamour raised on their behalf has hitherto been met, by the Home Government.

But if, in deference to a sentiment, the assimilation of emoluments is to be carried

* I calculate that the cost would be about Rs. 6,000 per mensem on the average for every hundred Civil Engineers if the allowance were granted this year, and the subsequent annual increase would, of course, be at the rate of Rs. 600 per mensem for the same strength. If instead of an allowance during service the compensation were paid as a gratuity on leaving it, or in the event of an officer's death to his heirs, the amount so payable in each case is given in column 3 of Table VII.

Table showing the relative values of the expectancies of the pay and pensions of Royal and Civil Engineers with the special incremental allowance added to the pay of the latter, compared first, according to length of departmental service; and, secondly, according to age at the time of retirement:—

Years of completed service on retirement.	Civil Engineers.		Royal Engineers.		Civil Engineers.	Age on retirement.
10	·9756	*a*	1·000	*a*	1·0621	32
11	1·0515	*a*	1·000	*a*	1·1328	33
12	1·0335	*a*	1·000	*a*	1·1560	34
13	1·0665	*a*	1·000	*a*	1·1373	35
14	1·0919	*a*	1·000	*a*	1·1598	36
15	1·0761	*a*	1·000	*a*	1·1714	37
16	1·0574	*a*	1·000	*a*	1·1114	38
17	·9874	*a*	1·000	*a*	1·0899	39
18	·9836	*a*	1·000	*a*	1·0212	40
19	·9760	*a*	1·000	*a*	1·0173	41
20	1·0027	*a*	1·000	*a*	1·0646	42
21	·9892	*a*	1·000	*a*	1·0273	43
22	·9827	*a*	1·000	*a*	1·0119	44
23	·9775	*a*	1·000	*a*	1·0092	45
24	·9532	*a*	1·000	*a*	1·0016	46
	·9535	*b*	1·000	*b*	1·0065	
25	·9821	*a*	1·000	*a*	1·0087	47
	·9825	*b*	1·000	*b*	1·0202	
26	·9756	*a*	1·000	*a*	1·0000	48
	·9766	*b*	1·000	*b*	1·0174	
27	·9528	*a*	1·000	*a*	·9903	49
	·9551	*b*	1·000	*b*	1·0087	
28	...	...	1·000	*a*	·9686	50
	·9530	*b*	1·000	*b*	·9883	
29	·9716	*b*	1·000	*b*	1·0083	51
30	·9684	*b*	1·000	*b*	1·0017	52
31	·9663	*b*	1·000	*b*	1·0044	53
32	·9784	*b*	1·000	*b*	1·0136	54
33	...		1·000	*b*	1·0072	55

to absolute theoretical equality, irrespective of any dissimilarity in the conditions of the two services, my object has been to show that both in justice and expediency this should be done by increasing the allowances of the Civil Engineers and not by reducing those of the Royal Engineers.

I have accepted as a foregone conclusion that the Government will in the long run have to yield to the organised importunity of the Civil Engineers, backed as it appears to be by the influence of the entire profession at home, and bring their emoluments up to the same level as those the Royal Engineers now enjoy. And I have endeavoured to show that no equality with any reduced scale of emoluments to which the Royal Engineers may be subjected will allay the discontent of the Civil Engineers or induce them to desist from agitating for the improvement of their status; also that any attempt to apply such a process of levelling down will, besides inflicting most undeserved wrong on a large body of its servants, not without a share of discredit to itself, launch Government into difficulties from which there will be no escape except by submitting to loss of efficiency in its services or a considerably enhanced expenditure.

If the sentiment which craves for equality of remuneration for so-called indentical services has any weight at all in the practical business of life, it applies to the Royal Engineers equally with the Civil Engineers, and the proposal of the Secretary of State, which would place the former at a decided disadvantage, appears to completely ignore this application. Even with their present rates of pension, the gross emoluments of the Civil Engineers will appreciably exceed those of the Royal Engineers (*vide* Table VIII) if the net Military pay of the latter be withdrawn, and if higher pensions be granted to the Civil Engineers simultaneously with a reduction of the pay of the Royal Engineers, the relative position of the former will obviously be still further improved.

If the sentimental principle is to be applied at all in the assimilation of emoluments it should at all events be applied consistently; and above all, I venture to think, that its application should not be allowed to override the rights of individuals or to conflict with the principles of common justice, which the proposal now before Government is in my opinion calculated to do.

There are other aspects of this question which I have not touched upon and which

it is not necessary for me to notice as they have been dealt with far more ably in the Military Department notes than they could have been by me. The notes of the two Departments are supplementary to each other and should be considered together as making up between them the complete case.

26-6-83 W. S. T.,

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I.

Pensionary prospects of a Civil Engineer joining the Public Works Department at the age of 22 under the conditions of Secretary of State's Despatch No. 18, dated 22nd March 1883.

Explanation of Table.

A.—Amount of pension, in rupees per annum, to which he would be entitled if he retired at the end of the number of years of completed service shown in the first column.

B.—Commuted value of the pension shown under column A if realised at the age shown in the last column, converted into pounds sterling at Rs. 12 = £1, and calculated according to the Carlisle Tables of Mortality with money at 4 per cent. per annum.

C.—The value at the age of 22 of the expectancy of a reversion to the amount shown in column B, at the end of the number of years shown in the first column, calculated according to the Carlisle Tables of Mortality with money at 4 per cent. per annum.

Year of completed service.	A.	B.	C.	Age.
	Rs.	£	£	
10	1,000	1379	858	32
11	1,400	1912	1132	33
12	1,800	2433	1370	34
13	2,200	2941	1576	35
14	2,600	3436	1753	36
15	3,000	3917	1902	37
16	3,000	3867	1785	38
17	3,000	3817	1676	39
18	3,000	3767	1571	40
19	3,000	3720	1472	41
20	4,000	4897	1838	42
21	4,000	4837	1720	43
22	4,000	4770	1607	44
23	4,000	4700	1501	45
24	4,000	4630	1400	46
25	5,000	5692	1631	47
26	5,000	5592	1518	48
27	5,000	5479	1410	49
28	5,000	5363	1309	50
29	6,000	6284	1455	51
30	6,000	6130	1345	52
31	6,000	5975	1242	53
32	7,000	6784	1334	54
33	7,000	6591	1225	55

N.B.—If the net Military pay of the Royal Engineers be withdrawn and their pensions be treated as a Military charge it will be necessary to grant them special gratuities on leaving the Department equal to the amounts shown in column B, in order to assimilate their departmental emoluments to those of the Civil Engineers.

II.

Pensionary prospects of an Officer of Royal Engineers joining the Public Works Department at the age of 23 after 3 years' Pensionable Military Service, under the terms of the Warrant of the 25th June 1881.

Explanation of Table.

D.—Gross amount of gratuity or commuted value of pension earned during service counting from date of 1st commission or age of 20 under the terms of the Warrant of the 25th June 1881.

E.—Amount of gratuity or commuted value of pension earned by service previous to entering the Department.

F.—Difference between amounts given in D and E or amount of gratuity or commuted value of pension earned during service in the Department.

G.—The value at the age of 23 of the expectancy of a reversion to the amount shown in column F, at the end of the number of years shown in the first column on the same line.

N.B.—The commuted values of pensions and of reversions are calculated according to the Carlisle Tables of Mortality with money at 4 per cent. per annum.

Years of completed departmental service.	D.	E.	F.	G.	Age.
	£	£	£	£	
10	1200	277	923	572	33
11	1200	257	943	556	34
12	1600	320	1280	719	35
13	1600	300	1300	695	36
14	1600	282	1318	671	37
15	2000	333	1667	807	38
16	2000	316	1684	769	39
17	(*a*) 3014	452	2562	1120	40
18	(*a*) 2976	425	2551	1058	41
19	(*a*) 2938	401	2537	997	42
20	(*b*) 3628	473	3155	1126	43
21	(*b*) 3577	447	3130	1105	44
22	(*b*) 3525	423	3102	1038	45
23	(*b*) 3473	401	3072	974	46
24	(*c*) 4098	455	3643	1093	47
25	(*c*) 4026	431	3595	1022	48
26	(*c*) 3945	408	3537	954	49
27	(*d*) 4698	470	4228	1081	50
28	(*d*) 4588	444	4144	1005	51
29	(*d*) 4475	420	4055	933	52
30	(*d*) 4362	396	3966	864	53
31	(*d*) 4245	375	3870	797	54
32	(*d*) 4125	353	3772	735	55

(*a*) Commuted value of a pension of £200 per annum for life at the age given in last column on same line.
(*b*) " " " £250 " " " " " "
(*c*) " " " £300 " " " " " "
(*d*) " " " £365 " " " " " "

III.

Value of the net Military pay of an officer of Royal Engineers joining the Public Works Department at the age of 23 and serving in it continuously without furlough, on the assumption that he serves 9 years as a Lieutenant, 8 years as a Captain, 6 years as a Major and 9 years as a Lieutenant-Colonel.

Explanation of Table.

H.—Shows the accumulated amount of net Military pay drawn up to the end of the year of completed departmental service given in the first column without interest.

			Rs.	
The pay of a	Lieutenant being	... ...	70	per mensem.
Do.	Captain	... ...	140	"
Do.	Major	... ...	182-6	"
Do.	Lieutenant-Colonel	... ...	243-5	"

and the rupee being converted into sterling at the rate, Rs. 12 = £1.

I.—Shows the amount of the net Military pay accumulated at compound interest at 4 per cent. per annum, on the assumption that it is invested at the end of each year, as received.

J.—Shows the value at the age of 23 of the expectancy of the reversion to an annual income of the amount of the net Military pay, calculated according to the Carlisle Tables of Mortality with money at 4 per cent. per annun.

Years of completed departmental service.	H.	I.	J.	Age.
	£	£	£	
10	770	910	588	33
11	910	1087	671	34
12	1050	1270	749	35
13	1190	1461	824	36
14	1330	1659	895	37
15	1470	1866	963	38
16	1610	2081	1028	39
17	1750	2304	1089	40
18	1932	2579	1165	41
19	2115	2864	1236	42
20	2297	3161	1304	43
21	2480	3470	1369	44
22	2663	3792	1430	45
23	2845	4126	1488	46
24	3088	4536	1561	47
25	3332	4960	1630	48
26	3575	5403	1696	49
27	3819	5862	1758	50
28	4062	6341	1817	51
29	4306	6838	1873	52
30	4549	7356	1926	53
31	4793	7892	1976	54
32	5036	8453	2024	55

IV.

Table showing the differences in the values of the pensions earned by Civil and Royal Engineers during departmental service, also the differences in the values of a Civil Engineer's pension and the net military pay drawn by a Royal Engineer of equal departmental service and the differences between the value of a Civil Engineer's pension and the corresponding combined values of a Royal Engineer's pension and net military pay.

Explanation of Table.

K.—Shows the difference in the amounts of gratuity or commuted value of pension earned by a Civil Engineer and a Royal Engineer during departmental service for every year of completed service over ten.

L.—Shows the difference between the value of a Civil Engineer's pension on retirement and the amount actually received by a Royal Engineer as net Military pay during a corresponding period of departmental service.

M.—Shows the difference between the value of a Civil Engineer's pension on retirement and the amount of a Royal Engineer's net Military pay for corresponding periods of service with compound interest at 4 per cent.

N.—Shows the differences between the values of the expectancies on joining the Department to the reversion of gratuities and pensions accruing after various terms of departmental service to Civil and Royal Engineers.

O.—Shows the differences between the values of the expectancies on joining the Department to the reversion of the pensions accruing to Civil Engineers and of the net Military pay drawn by Royal Engineers during corresponding periods.

P.—Shows the differences between the values of the sum of the expectancies on joining the Department to the reversion of the combined pension and net Military pay of Royal Engineers and the pensions only of Civil Engineers.

Q.—Shows the difference in the amounts of pension earned by a Royal Engineer during departmental service *plus* actual net Miltary pay drawn during that service, and the amount of a Civil Engineer's pension for the same length of service.

R.—Shows the same as Q, except that the amount of the net Military pay drawn is increased by compound interest at 4 per cent. per annum.

Years of completed departmental service.	K. (B—F.)	L. (B—H.)	M. (B—I.)	N. (C—G.)	O. (C—J.)	P. (G+J—C.)	Q. (F+H—B.)	R. (F+I—B.)
	£	£	£	£	£	£	£	£
10	456	609	469	286	270	—302	—314	—454
11	969	1002	825	576	462	—95	59	—118
12	1153	1383	1163	651	621	—98	103	—117
13	1641	1751	1480	881	752	57	451	180
14	2118	2106	1777	1,082	857	186	788	459
15	2250	2447	2051	1,095	939	132	780	384
16	2183	2257	1786	1,016	657	—12	573	102
17	1255	2067	1513	556	587	—533	—495	—1049
18	1216	1835	1188	513	407	—652	—716	—1363
19	1183	1605	856	475	236	—761	—932	—1681
20	1742	2600	1736	712	434	—592	—555	—1419
21	1707	2357	1367	615	351	—754	—773	—1763
22	1668	2107	978	569	177	—861	—995	—2124
23	1628	1855	574	527	13	—961	—1217	—2498
24	987	1542	94	307	—161	—1254	—2101	—3549
25	2097	2360	732	613	1	—1021	—1235	—2863
26	2055	2017	189	564	—178	—1132	—1520	—3348
27	1251	1660	—383	329	—348	—1429	—2568	—4611
28	1219	1301	—978	304	—508	—1513	—2843	—5122
29	2229	1978	—554	522	—418	—1351	—2077	—4609
30	2164	1581	—1226	481	—581	—1445	—2385	—5192
31	2105	1182	—1917	445	—734	—1531	—2688	—5787
32	3012	1748	—1669	599	—690	—1425	—2024	—5441

The minus sign shows that the difference is *in favor* of the Royal Engineers.

N.B.—If the pensions of the Royal Engineers be reckoned as part of their civil emoluments and their net Military pay be withdrawn and the Civil Engineers get the enhanced pensions it will be necessary to grant the former a special gratuity on leaving the Department equal to the amount shown in column K in order to equalise the gross civil emoluments of the two classes.

V.

Table comparing the amounts that would be received by a Civil Engineer and a Royal Engineer in the form of pay, allowances and commuted pension or gratuity, from date of entering the service to retirement at the end of the number of years of departmental service shown in the 1st column or the ages shown in the last two.

The amounts shown are the simple aggregates of the receipts without interest.

Explanation of table.

S.—Shows the amounts of the departmental salary up to the end of the year. Both Civil Engineers and Royal Engineers are assumed to serve 4 years on £350 per annum, 7 years on £450, 3 years on £550, 4 years on £650, 4 years on £800, and for those under (*a*) the remainder of their service up to the age of 50 at £950 per annum. Those under (*b*) are assumed to serve only 1 year on £950, 1 year on £1,350, 2 years on £1,600, 1 year on £1,800, 2 years on £2,000, and the remainder of their service up to the age of 55 on £2,500 per annum.

T.—Shows the amounts of the net Military pay of Royal Engineers added to the Departmental pay given in previous column.

U.—Shows the amount of Indian pay and allowances that would be drawn by an officer of Royal Engineers doing general Military duty without any staff salary during the same number of years.

V.—Shows the difference between the figures in columns S and U.

W.—Shows the difference between the figures in columns T and U.

X.—Shows the amount drawn as departmental pay up to the end of each year of completed service, with the commuted value of the pension earned by a Royal Engineer during the term of his Departmental service added.

Y.—Shows the same as X, with the addition of the amount of the net Military pay drawn up to the same date.

Z.—Shows the amount of the departmental salary drawn by a Civil Engineer up to the end of the number of years of completed service, with the addition of the commuted value of the pension due at the same date.

Years of completed departmental service.	S.		T. (S+H.)		U.	V. (S—U.)		W. (T—U.)		X. (S+F.)		Y. (T+F.)		Z. (S+B.)		Age of C. E.	Age of R. E.
	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£		
	a	*b*	*a*	*b*	*b*	*a*	*b*	*a*	*b*	*a*	*b*	*a*	*b*	*a*	*b*		
10	4100	...	4870	...	2825	1275	...	2045	...	5023	...	5793	...	5479	...	32	33
11	4550	...	5460	...	3259	1291	...	2201	...	5493	...	6403	...	6462	...	33	34
12	5100	...	6150	...	3693	1407	...	2457	...	6380	...	7430	...	7533	...	34	35
13	5650	...	6840	...	4126	1524	...	2714	...	6950	...	8140	...	8591	...	35	36
14	6200	...	7530	...	4560	1640	...	2970	...	7518	...	8848	...	9636	...	36	37
15	6850	...	8320	...	4994	1856	...	3326	...	8517	...	9987	...	10767	...	37	38
16	7500	...	9110	...	5427	2073	...	3683	...	9184	...	10794	...	11367	...	38	39
17	8150	...	9900	...	5861	2289	...	4039	...	10712	...	12462	...	11967	...	39	40
18	8800	...	10732	...	6502	2298	...	4230	...	11351	...	13283	...	12567	...	40	41
19	9600	...	11715	...	7143	2457	...	4572	...	12137	...	14252	...	13320	...	41	42
20	10400	...	12697	...	7783	2617	...	4914	...	13555	...	15852	...	15297	...	42	43
21	11200	...	13680	...	8424	2776	...	5256	...	14330	...	16810	...	16037	...	43	44
22	12000	...	14663	...	9065	2935	...	5598	...	15102	...	17765	...	16770	...	44	45
23	12950	...	15795	...	9706	3244	...	6089	...	16022	...	18867	...	17650	...	45	46
24	13900	14050	16988	17138	10738	3162	3312	6250	6400	17543	17693	20631	20781	18536	18680	46	47
25	14850	15400	18182	18732	11770	3080	3630	6412	6962	18445	18995	21777	22327	20542	21092	47	48
26	15800	17000	19375	20575	12803	2997	4197	6572	7772	19337	20537	22912	24112	21392	22592	48	49
27	16750	18600	20569	22419	13835	2915	4765	6734	8584	20978	22828	24797	26647	22229	24079	49	50
28	17700	20400	21762	24462	14867	...	5533	...	9595	...	24544	...	28606	23063	25763	50	51
29	...	22400	...	26706	15900	...	6500	...	10806	...	26455	...	30761	...	28684	51	52
30	...	24400	...	28949	16932	...	7468	...	12017	...	28366	...	32915	...	30530	52	53
31	...	26900	...	31693	17964	...	8936	...	13729	...	30770	...	35563	...	32875	53	54
32	...	29400	...	34436	18996	...	10404	...	15440	...	33172	...	38208	...	36184	54	55
33	...	31900	...	...	...	...	...	...	...	...	...	...	...	...	38491	55	...

N.B.—It will be observed that under columns Y and Z, the advantage up to the end of the 16th year is on the side of the Civil Engineers. After that year the total emoluments of the Royal Engineers are greater compared by years of service, but if compared by age on retirement, they are very nearly the same for both.

(*a*) Salaries of officers up to and inclusive of Executive Engineers, 1st grade.

(*b*) ,, ,, of higher rank than ,, ,, ,,

VI.

Table showing the Values on first entering the Department of the expectancies of the reversion to Departmental Pay, Pensions and Net Military Pay of Civil and Royal Engineers, the former being assumed to join at the age of 22, and the latter at the age of 23. The Civil Engineer having one year's start in point of age is supposed to keep this advantage throughout his service.

Age of retirement.	Value on entering the Department of the expectancy of Departmental pay, if the officers be retired at the age shown in the first column.				Value on entering the Department of the expectancy of Departmental pay and pension combined if the officer be retired at the age shown in the first column.				Value on entering the Department of the expectancy of Departmental pay, pension and net Military pay of a Royal Engineer if retired at the age shown in first column.		Difference between columns 3 and 4. All in favor of the Civil Engineers.		Difference between columns 3 and 5. The minus sign shows the difference in favor of Royal Engineers.		Years of completed Departmental service. Civil Engineer.	Years of completed Departmental service. Royal Engineer.
	Civil Engineers. 1.		Royal Engineers. 2.		Civil Engineers. 3.		Royal Engineers. 4.		5.		6.		7.			
	£ a	£ b	£ a	£ b	£ a	£ b	£ a	£ b	£ a	£ b	£ a	£ b	£ a	£ b		
33	3420	...	3148	...	4552	...	3720	...	4308	...	832	...	244	...	11	10
34	3730	...	3414	...	5100	...	3970	...	4641	...	1130	...	459	...	12	11
35	4024	...	3723	...	5600	...	4442	...	5191	...	1158	...	409	...	13	12
36	4305	...	4017	...	6058	...	4712	...	5536	...	1346	...	522	...	14	13
37	4581	...	4296	...	6483	...	4967	...	5862	...	1516	...	621	...	15	14
38	4881	...	4611	...	6666	...	5418	...	6381	...	1248	...	285	...	16	15
39	5166	...	4910	...	6842	...	5679	...	6707	...	1163	...	135	...	17	16
40	5478	...	5194	...	7049	...	6314	...	7403	...	735	...	−354	...	18	17
41	5794	...	5463	...	7266	...	6521	...	7686	...	745	...	−420	...	19	18
42	6095	...	5778	...	7933	...	6775	...	8011	...	1158	...	− 78	...	20	19
43	6379	...	6076	...	8099	...	7202	...	8506	...	897	...	−407	...	21	20
44	6649	...	6358	...	8256	...	7463	...	8832	...	793	...	−576	...	22	21
45	6952	...	6626	...	8453	...	7664	...	9094	...	789	...	−641	...	23	22
46	7239	7285	6927	...	8639	8685	7901	...	9389	...	738	784	−750	−704	24	23
47	7512	7672	7212	7257	9143	9303	8305	8350	9866	9911	838	955	−717	−608	25	24
48	7770	8107	7482	7641	9288	9625	8504	8663	10134	10293	784	962	−846	−668	26	25
49	8014	8519	7738	8073	9424	9929	8692	9027	10388	10723	732	902	−964	−794	27	26
50	8246	8958	7981	8482	9555	10267	9062	9563	10820	11321	493	704	−1265	−1054	28	27
51	...	9421	...	8919	...	10876	...	9924	...	11741	...	952	...	−865	29	28
52	...	9860	...	9379	...	11205	...	10312	...	12185	...	893	...	−980	30	29
53	...	10,380	...	9814	...	11622	...	10678	...	12604	...	944	...	−982	31	30
54	...	10,872	...	10329	...	12206	...	11126	...	13102	...	1080	...	−896	32	31
55	...	11,337	...	10815	...	12562	...	11550	...	13574	...	1012	...	−1012	33	32

Value of Civil Engineer's expectancy in column (1) at age of 32=£3153.

(a) Salaries of officers up to and inclusive of Executive Engineers, 1st grade.
(b) ,, ,, of higher rank than ,, ,, ,,

VII.

Table showing the different values of an annually increasing allowance granted for length of service to Civil Engineers with a view to equalising their emoluments to those of Royal Engineers serving in the Department. The allowance is supposed to commence at the beginning of the 2nd year of service at the rate of £6 per annum and to increase by additions of £6 yearly. That is, in the 2nd year of his service the officer draws Rs. 6 per mensem in addition to the pay of his departmental rank, the 3rd year he draws Rs. 12 per mensem, the 4th year Rs. 18, and so on. The result is shown in the last column, for comparison with the figures given in Column 5 of Table VI.

Year of service.	Amount of additional allowance during year. 1	Total amount of additional allowance actually drawn from beginning to end of year in 1st column. 2	Value of total amount drawn at 4 per cent. compound interest to end of year in 1st column. 3	Value of expectancy of additional allowance on entering the service if officer retires at end of year in 1st column. 4	Value of expectancies in last column added to the values of expectancies in column 3 of Table VI. 5		Age.
	£	£	£	£	£	£	
					(a)	(b)	
10	54	270	301	192	4203	...	32
11	60	330	373	228	4780	...	33
12	66	396	454	265	5365	...	34
13	72	468	544	304	5904	...	35
14	78	546	644	343	6401	...	36
15	84	630	754	384	6867	...	37
16	90	720	874	426	7092	...	38
17	96	816	1005	468	7310	...	39
18	102	918	1147	511	7560	...	40
12	108	1026	1301	553	7819	...	41
20	114	1140	1467	596	8529	...	42
21	120	1260	1645	639	8738	...	43
22	126	1386	1837	681	8937	...	44
23	132	1518	2043	723	9176	...	45
24	138	1656	2262	765	9404	9450	46
25	144	1800	2497	806	9949	10109	47
26	150	1950	2747	847	10135	10472	48
27	156	2106	3013	887	10311	10816	49
28	162	2268	3295	927	10482	11194	50
29	168	2436	3595	966	...	11842	51
30	174	2610	3913	1004	...	12209	52
31	180	2790	4249	1041	...	12663	53
32	186	2976	4605	1078	...	13284	54
33	192	3168	4981	1114	...	13676	55

VIII.

Table showing I. The amount of pension accruing to a Civil Engineer after each year of service over 10 under present rates. II. The commuted value of the present Civil Engineer's pension at 4 per cent, and Carlisle tables. III. The expectancy value of the present Civil Engineer's pension on joining the Department at the age of 22. IV. The increase in the commuted values of proposed over present Civil Engineer's pensions. V. The increase in the expectancy values of the proposed over the present Civil Engineer's pensions. VI. The difference in the commuted values of the present pensions of Royal and Civil Engineers. VII. The difference in the expectancy values of the present pensions of Royal and Civil Engineers referred to date of joining the Department at the ages of 23 and 22 respectively.

Length of service.		Age.	I. Rs.		II. £		III. £		IV. £		V. £		VI. £		VII. £	
C. E.	R.E.		(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)
10	9	32	1200	...	1655	...	1030	...	—276	...	—172	...	...	...	...	...
11	10	33	1320	...	1803	...	1067	...	109	...	65	...	880	...	495	...
12	11	34	1440	...	1946	...	1096	...	487	...	274	...	1003	...	540	...
13	12	35	1560	...	2085	...	1117	...	856	...	459	...	805	...	398	...
14	13	36	1680	...	2220	...	1133	...	1216	...	620	...	920	...	438	...
15	14	37	2000	...	2612	...	1268	...	1305	...	634	...	1294	...	597	...
16	15	38	2000	...	2578	...	1190	...	1289	...	595	...	911	...	383	...
17	16	39	2000	...	2545	...	1117	...	1272	...	559	...	861	...	348	...
18	17	40	2000	...	2511	...	1047	...	1256	...	524	...	—51	...	—73	...
19	18	41	2000	...	2480	...	981	...	1240	...	491	...	—71	...	—77	...
20	19	42	2000	...	2448	...	919	...	2449	...	919	...	—89	...	—78	...
21	20	43	2000	...	2419	...	860	...	2418	...	860	...	—736	...	—266	...
22	21	44	2000	...	2385	...	804	...	2385	...	803	...	—745	...	—301	...
23	22	45	2000	...	2350	...	750	...	2350	...	751	...	—752	...	—288	...
24	23	46	2000	4000	2315	4630	700	1400	2315	...	700	...	—757	1558	—274	426
25	24	47	4000	4000	4554	4554	1305	1305	1138	1138	326	326	911	911	212	212
26	25	48	4000	5000	4474	5592	1214	1518	1118	...	304	...	879	1997	192	496
27	26	49	4000	5000	4383	5479	1128	1410	1096	...	282	...	846	1942	174	456
28	27	50	4000	5000	4290	5363	1047	1309	1073	...	262	...	62	1135	—34	228
29	28	51	...	5000	...	5237	...	1213	...	1047	...	242	...	1093	...	208
30	29	52	...	5000	...	5108	...	1121	...	1022	...	224	...	1053	...	188
31	30	53	...	5000	...	4979	...	1030	...	996	...	212	...	1013	...	166
32	31	54	...	5000	...	4846	...	953	...	1938	...	381	...	976	...	156
33	32	55	...	5000	...	4708	...	875	...	1883	...	350	...	936	...	140

In columns IV and V the minus sign shows that the present pension is worth more than that proposed. In columns VI and VII the minus sign shows that the difference is in favor of the Royal Engineers.

N.B.—If the net Military pay of the Royal Engineers be withdrawn and the Civil Engineers do not get the improved pensions it will be necessary to grant the Royal Engineers special gratuities on leaving the department equal to the amounts shown in column VI in order to equalise their gross departmental emoluments to those of the Civil Engineers.

V

Secretary of State's Despatch No. 18, Public Works, dated 22nd March 1883.

The objects to be embraced in the reorganisation of the department are laid down by the Secretary of State to be the following :—

1. The reduction of the numerical strength to such proportions as will suffice for the work to be done.

2. The readjustment of the grades so as to make promotion more rapid.

3. The offer of terms of retirement which will have the effect of accelerating promotion and providing members with a superannuation allowance justified by their service and age.

4. The determination of the proportions in which the establishment shall be recruited by Royal Engineer officers, by Civil Engineers from England, and by passed students, chiefly natives, from the colleges in India.

First, as regards the reduction of strength to such proportions as will suffice for the work to be done.—

The Government of India in Despatch No. 50 of 16th December 1881, fixed the strength required at 761 officers for the Civil branches of the department, and 127 for the Military Works Branch, or a total of 888 Engineers, of whom 72 were to be in the ranks of Superintending and Chief Engineers. The Military Works branch was to be officered exclusively by Royal Engineers while the Civil branches were to comprise 100 officers of that corps.

Leaving the Military Works branch out of consideration for the present, as it is to be organised independently and on a military basis, I will confine my attention to the Civil branches.

The present sanctioned strength of the establishment for these is 880, divided as below—

Madras	92
Bombay	97
Bengal	111
North-Western Provinces and Oudh	131
Punjab	114
Local Administrations ...	122
Railways...	213
Total ...	880

The proposed establishment of 761 was divided as follows :—

Madras ...	... 78	14	Transferred to Military Works.
Bombay ...	... 79	18	„ „
Bengal ...	... 111		
North-Western Provinces and Oudh	... 131		
Punjab ...	... 111	3	„ „
Local Administrations	104	18	„ „
Railways ...	... 147	66	To be gradually absorbed.
Total	... 761	119	

Thus it will be seen that the effective reduction of strength in the entire establisment was limited to 66 officers, and this reduction was to be made in the Railway branch, under the belief that more general construction of Railways by private enterprise and a larger recourse to the contract system for State construction would allow of that branch being gradually reduced without any serious difficulty.

The experience of a year-and-a-half since the above conclusions were formed can scarcely be said to have justified the hopes on which they were based. Private enterprise has not come forward to the extent that was expected to relieve Government of the task of Railway construction; and the new policy by which the State is to make all those Railways which do not hold out sufficient prospects of earning remunerative dividends, to induce private capitalists to undertake them, leaves but little hope of our being able to reduce the strength of the Government Railway establishment within any measurable period.

On the other hand, in the interval since the Government of India Despatch No. 50 was written, the Local Self-government policy has been inaugurated, and there is reason to believe that under its provisions some reduction in the strength of the Public Works staff now employed in the construction and maintenance of most of the roads and buildings throughout the country, will be possible. It is, however, too early yet to say with any approach to confidence what that possible reduction may be, though I think it may safely be assumed that for a good many years at least all the staff set free by the transfer of such works to the charge of local committees will find ready employment on the various Railway and Irrigation projects which the State is virtually bound to undertake before long, in pursuance of its protective obligations.

While the future is so uncertain, it would not, in my opinion, be wise to lay down any fixed scale of establishment to serve as a sort of procrustean bed for the torment of future administrators.

The bane of the Department hitherto has been the uncertainty of the policy by which its efforts have been directed, coupled with the attempts at finality in its strength and organisation which have characterised all the changes to which it has been subjected in the course of the last 25 years.

Successive Administrations, and even the same Administrations at different times, have held widely divergent views as to the part the State should play in the development of the country by means of Public Works. At one time nothing has been too small for the State to undertake; and, again, at the next swing of the pendulum the State has determined to hold aloof from every thing not absolutely indispensable for its own administrative purposes. And at each change of policy it has been sought to stereotype the establishment to the immediate requirements of the phase of policy then in favour.

We are now again asked to fix a strength and organisation which shall do duty for all time.

We may certainly provide the Department with an organisation better adapted than the one it now possesses to the fluctuating policy by which its operations seem fated to be governed, but it would obviously be futile to attempt to fix a strength which shall never be either insufficient or excessive for the requirements of future years, unless the Government which fixes that strength can also bind the policy of its successors.

Whatever the future may bring forth, it is quite certain that we have at present none too many Engineers for our requirements; and it is also equally certain that whatever permanent strength may be adopted as the scale to be worked down to, about a generation must pass before that reduced scale can be attained, unless, indeed, resort is again had to the unpopular and costly expedient of compulsorily retiring all those who may be considered superfluous.

We have at present 1,004* Engineers altogether on the establishment, of whom, however, 40 are ineffective, their services being lent to Municipalities, Port Trusts,

* Inclusive of Military Works.

Native States, and Railway Companies. To bring this number down to 888 in the natural way by recruiting only to the extent * required to make good the average number of casualties to be expected in an establishment of that strength, will take over 30 years, if retirements be compulsory only at the age of 55. If recruiting be stopped entirely, the required reduction could be effected in 10 years, and by taking any less number than 34 annually, the process could be proportionately expedited. But there are obvious and very serious drawbacks to lowering the recruiting below the number required for the maintenance of the ultimate permanent strength of the establishment. Whatever that strength may hereafter be fixed at, the supply of recruits annually must bear the proportion of about 4 per cent. to it, or we shall only be creating fresh difficulties for the future in trying to evade those of the present.

* 34 annually according to General Hannyngton.

The determination of the future permanent strength of the Department is a question therefore which does not press urgently for the moment. We cannot reduce at once in view of the immediate demand for men, and we cannot say how long that demand will continue. Even the recruiting must, for the next few years, be carried on in accordance with the pledges given, and cannot be varied at will. The decision as to what is to be the standard of the future can, therefore, easily bear postponement, and I also venture to think that it would be better for many reasons to defer the consideration of this question for the present.

I will assume as a tentative arrangement that the ultimate strength to which the Department has to be worked down is 888 Engineers, of whom 228 will be Royal, and 660 Civil Engineers, and also that 128 of the Royal Engineers will be in the Military Works branch of the Military Department. To keep an establishment such as the above of 760 Engineers always up to its full strength, we shall require on the average from 30 to 31 recruits annually, of whom 4 will have to be Royal Engineers. As the Military Works will also have to be recruited for the same percentage of casualties, the total demand may be set down at 35 or 36 per annum, of whom 9 would be Royal Engineers.

Secondly, as regards the re-adjustment of the grades with the object of accelerating promotion.

The Department as now constituted comprises the following numbers in each grade and class.

			No.	Total.
Chief Engineer,	1st class,		7	
,, ,,	2nd ,,		6	
,, ,,	3rd ,,		6	19
Superintending Engineer,	1st class,		18	
,, ,,	2nd ,,		17	
,, ,,	3rd ,,		15	50
Executive Engineer,	1st grade,		107	
,, ,,	2nd ,,		112	
,, ,,	3rd ,,		120	
,, ,,	4th ,,		55	394
Assistant Engineer,	1st grade		278	
,, ,,	2nd and 3rd ,,		263	541
Grand total ...				1,004

The monthly pay of this establishment, assuming it to be composed entirely of Civil Engineers drawing the present sanctioned rates of pay, would be as below.—

			Rs.
19	Chief Engineers	...	40,300
50	Superintending Engineers	...	68,250
107	Executive Engineers, 1st grade,		1,01,650
112	,, ,, 2nd ,,		89,600
120	,, ,, 3rd ,,		78,000
55	,, ,, 4th ,,		30,250
278	Assistant Engineers, 1st grade		1,25,100
263	,, ,, 2nd ,,		92,050
	Total	...	6,25,200

In a typical establishment of the above strength and constitution, an establishment that is to say, which had grown up from the beginning by regular recruitment from below, combined with promotion by seniority,—the officers entering at the age of 22 and serving till they completed their 55th year, or died,—the average lengths of service and ages of the members to be found in each grade would compare with the actuals of the present establishment as shown below.—

	Typical Establishment.		*Present Establishment.*	
	Average age.	Average Deptl. service.	Average age.	Average Deptl. service.
Chief, Superintending, and Executive Engineers, 1st grade ...	50	28	45·5	21·5
Executive Engineers, 2nd grade ...	44	22	40·3	15·5
,, ,, 3rd ,, ...	41	19	36·8	12·8
,, ,, 4th ,, ...	38	16	34·9	10·3
Assistant Engineers, 1st ,, ...	33	11	31·3	7·9
,, ,, 2nd ,,	25	3	25·1	3·7
Whole Department ...	37·2	15·2	34	11·9

This comparison shows that, taken as a whole, the present members of the Department on the average are 3·2 years younger and have 3·3 years' less service than would be the case if the Department had grown up regularly. The officers serving in the ranks of Executive Engineers, 1st grade, and Superintending and Chief Engineers are 4·5 years younger and have 6·5 years' less service on the average than the standard shows, while in the lower ranks we have the following differences :—

	Younger. Years.	Less service. Years.
Executive Engineers, 2nd grade ...	3·7	6·5
„ „ 3rd „ ...	3·2	6·2
„ „ 4th „ ...	3·1	5·7
Assistant Engineers, 1st „ ...	1·7	3·1
„ 2nd and 3rd „ ...	—·1	—·7

Now, if the present gradation be maintained and retirement be compulsory at 55 only, it is obvious that the block of promotion in the Assistant grades must be greatly aggravated. In fact the present junior Assistant would not in all probability be promoted to Executive Engineer, 4th grade, till 1901, and at that period the average ages of the various grades would be about the following :—

	Average age.
Executive Engineer, 1st grade, and higher ranks ...	51·5
Executive Engineer, 2nd grade ...	47·5
Executive Engineer, 3rd grade ...	43·5
Executive Engineer, 4th grade ...	39·0
Assistant Engineer, 1st grade ...	33·0
„ 2nd and 3rd „ ...	25·0

But as the present gradation of ranks has been already condemned and is not to be maintained, it is not worth while following out the different phases of promotion that would occur under it, before the normal rate was established.

The Secretary of State's proposal for graduating the ranks is to make the Assistant Engineers equal in numbers to the Executive Engineers and to grade the latter in the proportion of 8, 9, 10 and 12, the first of these numbers representing the 1st grade in that class. We shall, under the strict application of this gradation, have the following numbers in each rank :—

Chief and Superintending Engineers ...	72
Executive Engineers, 1st grade ...	96
„ „ 2nd „ ...	108
„ „ 3rd „ ...	120
„ „ 4th „ ...	142
Assistant Engineers, 1st „ ...	233
„ „ 2nd and 3rd grade	233
Total ...	1,004

We should thus have 538 officers in the ranks above Assistant Engineer against the 463 of the present scale, which would allow of 75 1st grade Assistants being at once promoted to Executive Engineer, 4th grade, and 30 Assistant Engineers, 2nd grade, to the 1st grade of that class. So far then the adoption of the proposed scale would give immediate relief to the congestion now prevailing in the lowest grades. But this relief would be temporary only. The proportion of the numbers in the ranks above Executive Engineer, 4th grade, remains practically unaltered — or if any thing altered slightly for the worse — consequently, after the first relief the congestion will soon begin again, though its seat may be moved a grade higher. In fact as shown in appendix B to Mr. Walker's note, the junior Assistant Engineer now on the establishment would not in all probability get the step to Executive Engineer, 4th grade, till the year 1899 or 1900 — a prospect by no means encouraging or conducive to contentment.

In the year 1900, the average ages of the members serving in the different ranks would probably be as below.—

	Average age. Years.
Chief, Superintending, and Executive Engineer, 1st grade ...	51·8
Executive Engineer, 2nd grade ...	47·2
Executive Engineer, 3rd grade ...	44·4
Executive Engineer, 4th grade ...	40·5
Assistant Engineer, 1st grade ...	33·4
Assistant Engineer, 2nd and 3rd grade	25·5

So far then as securing a permanently more rapid flow of promotion is concerned, the foregoing figures prove pretty conclusively that the Secretary of State's scheme of gradation would be absolutely futile.

The ages and lengths of service of the present members of the Department serving in

the different grades are so hopelessly at variance with the symmetry and order of a typical standard,—*vide* table R,—that it is impossible to reduce them to anything like a common measure. If it is sought to establish a flow of promotion in the establishment as it stands, corresponding with some theoretical standard based on the typical scale, we must adopt a fluctuating gradation suited to the present special circumstances of the Department, by which the wave of discordance in its elements will be carried through the service until the present members disappear from the scene altogether.

Before, however, it is possible to engage usefully in the task of devising any scheme for securing a fair flow of promotion, it is necessary to settle two points, on the determination of which the entire issue depends.

The first of these is, what the future standard rate of promotion is to be; and the second is, which of the two standards *viz.*, that of age, or length of service, shall be adopted for assimilating the flow of promotion, under existing conditions to that under the theoretical conditions of a typical scale. We evidently cannot adopt both as they are absolutely irreconcilable with each other. And whichever we take, it will require some ingenuity to make it harmonize even distantly with the type.

The decision on the first point must be grounded in a great measure on the extent to which Government is prepared to go in the matter of additional cost. The more rapid the average promotion on a normal scale, the greater must be the proportion of numbers in the ascending scale of ranks. And if the higher ranks carry higher pay, without which promotion would have no meaning, the cost must increase in some direct ratio to the acceleration of promotion.

If, for example, it were desired to establish a rate of promotion which would permanently fix the average age of the officers of the rank of Executive Engineer 1st grade, *et supra*, at 45·5 years, which is what we have at present, it would be necessary to have 408 officers in those ranks instead of 176, the present strength; that is to say, all the officers now in the 2nd and 3rd grades of Executive Engineer would be in the 1st grade and drawing in the aggregate Rs 52,800 per mensem more than they now do. The 1st grade would also be reached on the average at the end of the 16th year of service, assuming the men to join at the age of 22.

19	Chief Engineers	...	40,300
53	Superintending Engineers	...	72,350
250	Executive Engineers, 1st grade	...	2,37,500
100	„ „ 2nd „	...	80,000
100	„ „ 3rd „	...	65,000
100	„ „ 4th „	...	55,000
100	Assistant Engineers 1st „	...	45,000
86	„ „ 2nd „	...	30,100
808			6,25,250

New scale.		Present scale.	
2×350 =	700	6×350 =	2,100
3×450 =	1,350	8×450 =	3,600
3×550 =	1,650	3×550 =	1,650
4×650 =	2,600	4×650 =	2,600
4×800 =	3,200	4×800 =	3,200
17×950 =	16,150	8×950 =	7,600
33×777·3	25,650	33×628·8=	20,750

If the remaining 600 were divided into 5 groups of 120 each, the time of service in each grade would be approximately as follows:—

	Years.
Assistant Engineer, 2nd grade, ...	2
„ „ 1st „ ...	3
Executive Engineer 4th „ ...	3
„ „ 3rd „ ...	4
„ „ 2nd „ ...	4

The additional cost involved in this distribution of the lower grades would be Rs. 88,600 per mensem. The aggregate cost of such an establishment would be just about 20 per cent. higher than that of the establishment as now constituted. But the cost of a strength of 808 Engineers of all ranks, as per margin, would be almost exactly the same as that of the present establishment of 1,004.

The average pay drawn by an officer who had served 33 years passing through all the grades in the regular average periods, but not rising above the rank of Executive Engineer, 1st grade, would, under this scale, be Rs. 777 per mensem as against Rs. 629 per mensem on the present scale. That is to say, he would throughout his service have drawn on the average about Rs. 148 per mensem more under the suggested scale, than under that which we actually have.

Now, though the rate of promotion which the scale thus outlined would provide is immensely in advance of what the junior members of the Department can now look forward to, it is practically no more than what the present seniors have enjoyed in the past, owing to the repeated augmentations which the department has received since its first formation.

They have floated, so to say, on or near the crest of the advancing wave, filling up the new posts in the higher ranks as they were created by the successive proportionate increases in the strength of the different grades due to the general expansion. Now that the tide has not only ceased to flow, but the ebb has set in, there must be a reaction in the opposite direction of general stagnation as a set-off to the previous abnormally rapid promotion, unless the flow is kept up by varying the proportions of the grades, always increasing the numbers in the higher to such strength as may be necessary to absorb those whose age or service in the Department may be held to give them a claim to a higher place than they could possibly obtain, under existing

conditions, with a fixed scale of gradation. The great majority of the officers now in the Department joined it while it was still in its expanding stage, with hopes of promotion based on the rate then prevailing. To these the stagnation which has followed upon the change in the policy of Government has been a cruel disappointment. The prospects of the service are no longer to them what they were, even though they are better off than those who joined after them and *á fortiori* than those who may yet join for many years to come. So long as the tradition of the palmy days of promotion endures, there will be discontent with any position which does not come up to the standard of that tradition. And we all know that traditions of the "good old days" are hard of dying.

Discontent with the conditions of service, when general, is in itself a source of inefficiency. Anything, therefore, which will tend to eradicate or to reduce it must be beneficial to the State, provided that the cost of the remedy applied is not disproportionate to the intensity of the evil to be cured.

If it were possible to look forward with confidence to being able to carry on the work of the Department, including Military Works, with a staff of about 800 Engineers, it would, in my opinion, be politic to adopt an ultimate scale, such as I have already sketched out, in which the promomotion would be maintained at very much the same rate as in the past. That scale would not however need to be adopted at once. The Department would still have to pass through a transition stage, lasting probably 30 years, until the numbers were brought down to the strength finally determined upon. In this interval the irregularities which have sprung out of the way in which the Department has grown will have disappeared, and the new order will approach as closely to the theoretical standard of regularity as the practical can ever be expected to approach the theoretical.

I do not, however, for my own part see how we can work down to so low a number as 800, nor do I think that the members now in the service can reasonably claim to have anything like so rapid a rate of promotion permanently secured to them as that which obtained in the growing stage of the Department, though, no doubt, the claim will be set up by many. It has to be remembered that in the early days when promotion was more rapid, the pay of the different grades was also less than it has since become, and

now that the pensions are also to be increased, some slackening in the rate of promotion may well be endured in consideration of the higher emoluments of the service.

After long and patient investigation of the subject, the conclusion I have arrived at is that, taking everything into account, an average rate of promotion which will carry an officer through the 2nd and 3rd grades of Assistant Engineers in 3 years, and through the four succeeding higher grades up to Executive Engineer, 1st grade, in 5 years each, will meet all reasonable claims. The average pay drawn by an officer who had served through the different grades at the above rate and retired at the age of 55 without rising above the rank of Executive Engineer, 1st grade, would be *Rs. 703 per mensem, or Rs. 74 per mensem more than the average would be on the present scale, and the same amount less than the average under a scale which would perpetuate the past rate of promotion. I therefore suggest the adoption of this mean between the acceleration of the past and the retardation of the present as the standard rate for the future.

* See Table Q.

The proportion of numbers in each grade which would secure this average rate of promotion would have to be something like the following.—

Executive Engineer, 1st grade	...	135
„ 2nd „	...	125
„ 3rd „	...	140
„ 4th „	...	155
Assistant Engineer, 1st „	...	160
„ 2nd & 3rd „	...	100
Total		815
Superintending and Chief Engineer	...	72
		887

But the purpose would be equally, if not better served, if the numbers were equal in each grade.

On this basis of ultimate numerical equality in all the grades from Assistant Engineer, 2nd grade, to Executive Engineer, 1st grade, and a flow of promotion during the transition stage which will correspond as closely as possible with that which it is desired to establish in the Department as finally constituted, the accompanying tables D have been worked out to show what the numbers in the different grades would have to be on each list to start with, and subsequently at the end of every five years from the present time, to keep the average rate of promotion in the intervening periods up to the standard of a mean between that of the

past and that which would probably prevail in the future if no remedial measures were applied.

If the scales of varying gradation given in these tables be adopted, the average ages of the members serving in each rank will not differ sensibly at any time from that of a standard scale graduated to afford the same average rate of promotion. With such small numbers, however, as the different lists are composed of, no uniform rate of promotion can be expected when that promotion depends mainly, if not entirely, on the rate of mortality. As has happened before, some lists will in time get far in advance of others, and the members of the more lucky lists will virtually, have the monopoly of all the prizes of the Department. The less fortunate officers could of course only blame their ill luck for their deprivation of the good things of the service, but their grievance would notwithstanding be none the less real, nor would their contentment be any the greater, because their misfortunes could only be ascribed to providence.

The present system of gradation is, moreover, a most embarrassing one in many other respects. It is practically impossible to transfer men from one list to another, without infringing on the vested interests of some one or other. Transfers are even now often necessary in the public interest, and they promise to become still more so, as local self-government developes. When promotion depends on the occurrence of vacancies in a limited list, and the steps go virtually by seniority, tempered occasionally by supersession for notorious inefficiency, the introduction of an officer from another list cannot fail to be looked upon by those junior to him in standing as a distinct violation of their rights. The more able such an officer may be the greater the resentment his importation into their ranks must cause, as the more certain it is that he will be a permanent stumbling block in the way of their promotion. It is thus impossible to strengthen one list in which men are required by transfers from another where they are redundant, without causing an amount of discontent and heartburning which is most detrimental to discipline. And it also not infrequently happens that it is impossible to make such transfers without being flagrantly unjust; the interests of the State have consequently to give way at times to the maintenance of the rights of individuals.

All these difficulties would vanish if we had a system of incremental salaries

dependent on length of approved service. Not only could we have a clear field for moving men from list to list and province to province as required, without trenching on the rights or disturbing the prospects of any one, but we should absolutely put down the claims of seniority in the selections for the higher posts of Superintending and Chief Engineer. Paradoxical as it may seem, the only effectual way to crush out such claims is to recognise them as conferring certain rights and no others. The right I would admit to the exclusion of all others is that of obtaining a fixed increase of salary at the end of each year of approved service, such increases to contiuue subject to certain maxima so long as the officer remains in the service, or at most to the age of 55 when retirement will be compulsory.

In Table Q I have shown how the present rates of pay on the scale of gradation recommended could be converted into an incremental scale such as I have suggested.

The idea is to divide the whole establishment simply into four classes. The two higher classes would correspond with the present Chief and Superintending Engineer, while the two lower would embrace the Executive and Assistant Engineer, though they would not exactly correspond to them.

Appointment to the 4th or lower class would be as at present from Cooper's Hill College and from passed students of the Indian Civil Engineering Colleges. An officer so appointed would join on a salary of Rs. 350 per mensem if 22 years of age, and obtain an increase of Rs. 20 per mensem after each year of completed and approved service, until at the end of the 15th year he attained to the maximum salary of the class, or Rs. 650 per mensem.

The utmost length of service in this class that should be allowed, in my opinion, is 20 years. Under the new pension rules which have been approved by the Secretary of State, an officer will be allowed to retire voluntarily from the service after he has completed that term of service, on a pension of Rs. 4,000 per annum.

In the case of men who are considered unfit after that time for promotion to the next higher class, such retirement should be compulsory.

It is of no use to keep on inefficient men after they have established their incapacity for higher charges beyond a doubt, as they must have done in the course of so long a period of probation as 20 years.

For exceptionally good service in the 4th class, I think Government should have the power of giving double increments occasionally, as in the case of dissatisfaction, it would have the power of suspending or stopping them altogether. The limit I should be inclined to fix for the grant of special increments in this class, is that the salary drawn at any time should never be greater than would have resulted from increments averaging Rs. 25 per mensem from the beginning of his service.

This would allow of a deserving officer attaining the highest rate of pay for the class at the end of the 12th year of his service, and of his being promoted into the class above at the end of the following year.

The rule I would recommend for promotion into the 3rd class, is that an officer considered fit for such promotion would receive it after he had drawn the highest rate of pay in the class below for one year. The rate of pay in the 3rd class would, according to my scheme, be Rs. 680, rising by Rs. 30 per mensem for each year of approved service until he retired at the age of 55 or was promoted to a still higher class. I would allow no special increments to be given in this class as the rewards of exceptional service. The reward which men of marked ability who had attained this rank should look forward to, is promotion to the next higher class. But the power to stop increments should be reserved in case of any officers incurring the displeasure of Government.

The promotions to the 2nd class should be made by selection from the whole body of officers in the 3rd class who had served 3 years in it, without any further reference to their standing or seniority in the Department.

Under these rules an officer who showed marked ability would become eligible for promotion to Superintending Engineer after 16 years' completed service counting from the age of 22, that is, when he was 38 years old. An officer who had shown great capacity during his service in the 4th class and been advanced in consequence to the 3rd class in the shortest time the rule allows, would probably be selected for promotion to the 2nd class soon after he had completed his qualifying three years in the 3rd class. But if he failed to keep his earlier reputation for exceptional ability while continuing to perform his duties satisfactorily, the maximum pay he would

receive would be Rs. 1,250 per mensem, and that would be only during the last year of his service.

I would fix no definite number of officers for either the 3rd or 4th class, but leave their respective proportions to be determined by the numbers qualified under the rule. On the average when the normal standard of a typical establishment was reached, the 4th class would comprise about 60 per cent. of the total strength.

Members of the 3rd class would, as a rule, hold the more important executive charges, and the majority of those in the 4th class would be Assistants, though many of the seniors in the class would always be in independent charge. I have refrained from designating these two classes by the terms Executive and Assistant Engineer, as, if the scheme be adopted, a good many of those now called Executive Engineers would fall into the 4th class, and if they reverted to the inferior title of Assistant Engineers, though it would involve no loss of emolument, there would certainly be a sentimental soreness which it is as well to avoid.

As regards the 1st and 2nd classes, it will be necessary to have a fixed number in each, though the number may vary from time to time according to the requirements of the service. Within the classes themselves, however, I am of opinion that the incremental rule should apply.

I think that in respect to the 2nd class the pay should begin with Rs. 1,100 per mensem, and rise by annual increments of Rs. 50 per mensem till the end of the officer's service. The maximum any one could attain to under this rate would be Rs. 1,950 per mensem in the last year of his service, supposing him to have entered the class at the end of his 16th year of service and to retire at the age of 55 without obtaining further promotion. There would be very few so circumstanced I think.

As regards the 1st or highest class, corresponding to the present Chief Engineer, I would recommend that their pay should begin at Rs. 1,800 per mensem and rise by annual increments of Rs. 100 per mensem to a maximum of Rs. 2,800. This class should be recruited by selection from the members of the 2nd class of not less than 6 years' service in that class. No one could therefore remain long enough to draw the maximum salary for more than one year. Under the scheme I have thus sketched out the most successful

officer would rise at the end of 13 years from date of joining, or from date of his attaining the age of 22 if he were below that age on joining, to the 3rd class. At the end of his 16th year of service he would be promoted to the 2nd class, and at the end of the 22nd year of his service to the 1st class, retiring after 33 years' service, reckoning from the age of 22.

The maximum aggregate pay he would have drawn at the time of retirement would be £41,280, or an average of Rs. 1,251 per mensem for the whole 33 years, *vide* margin.

	Aggregate. £	Average. Rs.
In 4th class ...	6,500 ...	500 per mensem.
„ 3rd „ ...	2,130 ...	710 „
„ 2nd „ ...	7,350 ...	1,225 „
„ 1st „ ...	25,309 ...	2,300 „
Total ...	41,280	1,251×33

Rs. 12 are reckoned as =£1

The aggregate pay and average salary of an officer who rose no higher than the 3rd class without any acceleration of increments would similarly be £23,640 and Rs. 716 per mensem. (see Table Q.)

The only other rules for the regulation of promotion that appear to me to be requisite are, (1) that no officer whose salary in his class had in the usual course increased to more than the minimum of the class above should be eligible for promotion out of his class; and (2) that the power of Local Governments to grant special increments in the 4th class should be limited to the amount of increments stopped or suspended, any excess requiring the sanction of the Government of India.

The general effect of the first of these restrictions would be that no one after the 30th year of his service, or above 52 years of age would get any further promotion, though in some cases when a man had distinguished himself in his early career, and afterwards failed to maintain his reputation, the stoppage of further promotion might occur two or three years earlier. The object is, of course, to prevent the highest classes being recruited by men past their prime, and too near the end of their service to take up new duties with any prospects of advantage to the State.

The second rule will tend to preserve a general average of cost and prevent the power of accelerating increments being abused.

The foregoing scheme is intended to apply to the Civil portion of the establishment. In regard to the Royal Engineer element of the Department, I think it will be advisable to adopt a different system. The conditions of service are in many respects so dissimilar that it is almost impossible with justice to either to place the two bodies of Civil and Military Engineers on an identical

footing in the matter of pay, though they may be both employed on the same work.

The Royal Engineers are essentially a military body with a military organisation and military aspirations, though, in India at least, when not required in the field, they are mostly employed on Civil Engineering duties. If we eliminate the officers of the Indian cadres who are already in a mionrity and will soon become extinct, the Royal Engineers come to this country, as they would go to any other station abroad, to work out their tour of foreign service, and they are not obliged to remain in it after the expiry of the term which the regulations lay down for such service. Some have elected for an Indian career, and will remain in the country until they retire from the service altogether, but the majority, and that an increasing one, undoubtedly prefer retaining their position and privileges as officers of Her Majesty's British service to the allurements of a civil career in the Public Works Department of India. While they are here, of course they are willing to take any employment that will add to their emoluments; and as practically the only employment open to them is in some branch of the Public Works Department, they join it to make the best of the time they have to serve abroad. Now, as I have already pointed out in a previous note, the inducements for Royal Engineers to serve in the Public Works Department are not such as to tempt them to give up permanently all the chances of preferment and distinction which a military career in their own corps offers; while at the same time it is of the greatest importance to the Government, both financially and on the grounds of superior efficiency, to have a strong strain of the military element in the Department permeating all its ranks.

The problem to be solved is how best to secure this result without creating needless jealousies between the two bodies of civilians and soldiers who have to work side by side, and on conditions which will harmonise as far as possible with the military organisation and *esprit de corps* of the latter.

The best solution which presents itself to me is the following, but its applicability depends on the adoption of the incremental system of salaries for Civil Engineers, which I have already advocated. Promotion in the corps of Royal Engineers is well known to go purely by seniority. This principle being the basis of the corps organisation, should also, I think, be recognised as the

characteristic feature of any collateral organisation, in which its officers may be required to serve by virtue of their belonging to the corps. The object of the Government should not, I venture to think, be to transmute their Military Engineers into Civil Engineers, to the detriment of their *esprit de corps* and the slackening of the bonds of military discipline which the subordination of miitary to civil official status in a wholesalle way is apt to produce. I do not for a moment contend that superior regimental rank should always override superior professional attainment in the selection of men for posts of special responsibility requiring exceptional administrative capacity, tact, or other qualities for the proper discharge of the duties connected therewith. Such posts carry with them a rank and dignity of their own which cannot be ignored, and which it is not difficult to appraise by a military standard, if need be.

Besides running counter to the military feeling of the corps, the present system of departmental gradation makes it difficult to provide suitable posts for Royal Engineer officers of relatively high rank, coming out to this country for the first time, in exchange for officers of similar rank reverting to the Home Establishment. The rule is that they shall rank with their contemporaries in regimental standing already in the Department, but this rule is often impossible of observance, and where observed creates many burning jealousies and much ill feeling which it is desirable to avoid.

My proposal is to graduate the pay of all Royal Engineers in the Department, below the rank of Superintending Engineers, according to their regimental standing. An officer of that corps should, according to my scheme, draw in addition to the net military pay of his regimental rank an allowance of Rs. 300, plus Rs. 20 for every year of completed service from the date of obtaining his first commission. Thus, an officer joining the Department as Lieutenant, in the 4th year of his service would draw a salary of Rs. 70+ 300 & $3 \times 20 = 430$, to begin with, and would subsequently rise by Rs. 20 per mensem as each succeeding year of service was completed. Similarly, a Captain, in the 14 year of his service, would join on Rs. $140 + 300 + 13 \times 20 = 700$ per mensem, and rise subsequently by Rs. 20 per mensem after completing each additional year of service. To put the Royal Engineers on an equality with the Civil Engineers in the matter of elegibility for

promotion to the 2nd or Superintending Engineer class, I would fix 21 years' completed service as the limit of eligibility, that is to say, ordinarily none below the rank of Major would be eligible for such promotion. Similarly, I would fix the limit of eligibility for promotion to the 1st or Chief Engineer class, at 27 years' completed service, which would correspond generally with the period in which the rank of regimental Lieutenant-Colonel is attained.

As with Civil Engineers, however, the departmental pay, and eligibility for promotion, of Royal Engineers should, in the case of exceptional good service, be open to advancement by the grant of additional increments, subject to the same limitations as those laid down for the Civil Engineers. And, similarly, in the case of inefficiency their increments should be liable to stoppage.

The pay of Royal Engineers, in the two highest classes, should be the same as that of Civil Engineers, plus the net military pay of their rank.

The general effect of this scheme would be to improve the position of the junior ranks of the corps serving in the department, while offering little inducement to officers of the rank of Lieutenant-Colonel who failed to secure promotion to the 2nd or 1st class to remain in it or to enter it, if they came out in that rank for the first time. In the latter case he would get only Rs. 31 per mensem additional for all the trouble and responsibility of an executive charge, to begin with, and after 9 years his pay would be only Rs. 190 per mensem more than if he were on military duty. As it is not desirable to have officers of this rank in comparatively subordinate positions, I think it advisable to hold out no particular inducement to them to occupy them.

The next point for consideration is that of the pensions to be granted. I do not myself see that the State gains in any way by the early retirement of its efficient officers; and as under the incremental system of salaries early retirements would practically give no promotions, they are unnecessary even in the interests of the officers themselves.

A pension, as a provision for old age or for men incapacitated by infirmities acquired in the service of the State, is of course necessary when the rate of remuneration is insufficient to allow of any adequate provision being made by the officers themselves out of their savings.

The scale of pensions proposed by the Secretary of State seems to me to meet all requirements, except in one point, and that is the restriction of the additional pensions of Rs. 1,000 and Rs. 2,000 to officers who have held the posts of Superintending and Chief Engineer respectively for 3 years. It will of course add very greatly to the relative value of these posts if they are exclusively to be so endowed; but considering how few of these posts there are, and the chances of an officer failing to obtain them, not through personal deficiencies, but simply from lack of opportunity, the restriction would tell very hardly on many deserving officers. The spirit of a rule of this kind is, moreover, so easily capable of evasion, and the temptation to evade it is so considerable, that in the long run it is pretty certain to be so applied as to embrace all officers whose services have been sufficiently appreciated to give them a claim to the consideration. The tendency will be to promote men to these higher posts only towards the close of their service, so as to enable them to serve out the necessary three years required to qualify for the higher rate of pension, and then retire. There would thus be a constant succession of Superintending and Chief Engineers—meritorious men most of them no doubt, but appointed to these posts not so much because they had shown any special aptitude for the duties to be performed, as to secure for them a better provision in their approaching retirement. Such a state of things could not but be detrimental to the efficiency of the department; and that it would inevitably ensue I have no hesitation in affirming my thorough conviction.

I see no objection to the proposal itself so far as it goes. On the contrary, I think that it would be advantageous to the Department in many ways that officers of the highest ranks in it should have special privileges. But in order to prevent the abuse I have indicated above, I would grant, after certain definite periods of service, the same additional pensions to deserving officers who had failed to attain those higher ranks to which they are now restricted.

After 28 and 31 years of completed service, respectively, I would recommend that the additional pensions of Rs. 1,000 and Rs. 2,000 be granted to all officers who have risen to or above the highest executive grade. The advantage Superintending and Chief Engineers would then have over their less fortunate brethren would be that

they would become entitled to these pensions by virtue of a comparatively short service in those ranks, and not simply like the others by long general service in the Department.

My object in fixing on 28 and 31 years as the qualifying terms for these pensions is that at those periods the aggregate allowances of Royal Engineers, inclusive of pensions earned during departmental service, would, without this additional pension to the Civil Engineers, exceed the aggregate emoluments of the latter; also inclusive of pensions, by almost exactly the value of the additional pensions. As the Secretary of State has laid such stress on the assimilation of the emoluments of the two bodies while serving together in the same Department, I have used every endeavour to produce this much-desired equality. Table P shows with what success.

That table shows that up to the 40th year of age, in an average case, the advantage lies on the side of the Civil Engineer, and that subsequently the average emoluments of both, taking pensions into account, are virtually equal.

If these incremental scales be adopted in combination with the improved pensions for Civil Engineers, it appears to me that no reasonable grounds for jealousy between the two bodies will remain. The emoluments of both will have been improved beyond anything they can expect at present, by the accelerated rate of promotion on which the incremental rate is based, and at the ages when retirement is probable or compulsory, both will have received or earned almost exactly the same remuneration for similar work, though, that remuneration from the dissimilarity in the conditions of the two services will take a somewhat different form for each.

Of course, we should still have room for jealousies in the competition for the appointments to the two higher classes; and there is very little doubt that the disappointed aspirants will be apt to excuse their own deficiencies by laying their want of success at the door of class prejudice should the choice fall on one not of their own body. But I do not see my way to extirpating feelings of this kind by rule or order. It matters little what men of an envious and carping turn of mind think or say so long as the efficiency of the service is maintained by the selection of the best men without fear or favor. If there is to be a rule, it should be to the effect that no officer has any claim what-

ever to rise either by seniority or good service higher than the incremental scale will carry him in the class to which he may belong. It should be further laid down with unmistakeable distinctness that Government reserves to itself the right to select whomever it may consider fittest, from among those eligible under its rules, for promotion from one class to another, and that it will allow no considerations but the possession of the qualities necessary for the efficient discharge of the duties of the appointment to weigh in making its choice.

I think the scheme I have in my mind has now been sketched out in sufficient detail to be intelligible. I therefore submit it for the consideration of Government. If the general idea is accepted, I will work out its practical application to the Department in more complete detail. But I may say that I have already tested it in a general way, and found it to fit very well with the present conditions, and have, therefore, very little fear of its failing, except perhaps in isolated instances, when the departure from the general rule is very wide; and even in these I do not apprehend any great difficulty from the trials made.

The cost of the incremental system will be practically the same as that of the graded system, which provides the same rate of promotion from the beginning to the end of service. What its advantages are I have already stated.

As an alternative to the incremental scales given in Tables P and Q, I have given others in Table T. These alternative scales are based on a rate of promotion corresponding nearly to what has prevailed in the past. They will answer the purpose equally well with those given in P & Q, but at a somewhat enhanced cost. If the scale of pay provided in the first two tables should be considered insufficient, or what is the same thing the rate of promotion on which they are based too slow, I think the rates in Table T will be found ample. As regards the immediate adoption of the incremental scales. Under prevailing conditions of age and service, those of Table T will be the easier to apply, more especially in the higher ranks of the Executive class, owing to the closer correspondence of the rate of promotion they assume with that under which the seniors have hitherto mostly served. *Mutatis mutandis* what I have said in respect to the working of the one set of scales is equally applicable to the other; it is unnecessary therefore to go into the details again.

In conclusion, I would suggest that a representative committee of departmental officers be appointed to consider any scheme which may find acceptance with Government before it is finally adopted.

As the reorganisation is being undertaken mainly in deference to the representations of the majority of those now serving, that their position and prospects are worse than they have a reasonable right to expect, or than they were led to believe they would be when they joined the Department, it would be, to say the least, expedient to give them an opportunity of advising Government through selected representatives as to the adequacy or appropriateness of any measures that it may be in contemplation to adopt for the removal of their grievance.

12th July 1883. W. S. T.

Hon'ble Member Mr. T. C. Hope.

P.

This Table compares the emoluments in the form of salary and pension earned during Departmental service of Royal and Civil Engineers respectively, under the following assumptions :—

I.—That the Royal Engineer Officer enters the Public Works Department at the age of 23, after having completed 3 years' regimental service. That he draws the net military pay of his regimental rank all the time he is in the Department, and that his departmental monthly salary is made up of Rs. 300 plus Rs. 20 for each year of completed regimental service counting from the date of his first commission.

II.—That he retires from the service on leaving the Department, receiving the commuted value of his pension as laid down in the Warrant of the 15th June 1881.

III.—That the Civil Engineer enters the Public Works Department at the age of 22 on a salary of Rs. 350 per mensem, rising by annual increments of Rs. 20 per mensem up to Rs. 650 per mensem, and subsequently by annual increments of Rs. 30 per mensem up to a maximum of Rs. 1,160 per mensem.

IV.—That the Civil Engineer on retirement receives the commuted value of his pension as laid down in Secretary of State's Despatch No. 18 of 22nd March 1883, with this addition, that after 28 years' completed service he obtains Rs. 6,000 per annum, and after 31 years' completed service Rs. 7,000 per annum, whether he has served 3 years as Superintending or Chief Engineer or not.

V.—Retirement is assumed to be compulsory at the age of 55 in both cases. The commutations of pensions have been made on the basis of the Carlisle tables and money at 4 per cent. per annum, and the exchange at Rs. 12 = £1.

ROYAL ENGINEERS IN PUBLIC WORKS DEPARTMENT.									CIVIL ENGINEERS IN PUBLIC WORKS DEPARTMENT.					
Year of army service.	Year of departmental service.	Year of age.	Amount of net military pay per mensem.	Amount of departmental pay per mensem.	Total salary drawn per mensem.	Aggregate of salary from entering the Department to end of each year of service.	Commuted value of pension earned at end of each year.	Total emoluments up to end of each year of completed service.	Total emoluments up to end of each year of completed service.	Commuted value of pension earned at end of each year.	Aggregate of salary from entering the Department to end of each year of service.	Monthly rate of pay in each year's service.	Year of age.	Year of departmental service.
...	...	...	Rs.	Rs.	Rs.	£.	£.	£.	£.	£.	£.	Rs.		
4	1	24	70	360	430	...	...	...	...	...	350	350	23	1
5	2	25	70	380	450	880	...	...	...	...	720	370	24	2
6	3	26	70	400	470	1350	...	...	...	...	1110	390	25	3
7	4	27	70	420	490	1840	...	...	...	...	1520	410	26	4
8	5	28	70	440	510	2450	...	...	...	...	1950	430	27	5
9	6	29	70	460	530	2880	...	...	...	...	2400	450	28	6
10	7	30	70	480	550	3430	...	...	...	...	2870	470	29	7
11	8	31	70	500	570	4000	...	...	...	...	3360	490	30	8
12	9	32	70	520	590	4590	900	5490	5579	1379	3870	510	31	9
13	10	33	140	540	680	5270	923	6193	6862	1972	4400	530	32	10
14	11	34	140	560	700	5970	943	6913	7953	2433	4950	550	33	11
15	12	35	140	580	720	6690	1280	7970	9051	2941	5520	570	34	12
16	13	36	140	600	740	7430	1300	8730	10156	3436	6110	590	35	13
17	14	37	140	620	760	8190	1318	9508	11267	3917	6720	610	36	14
18	15	38	140	640	780	8970	1667	10637	11867	3867	7350	630	37	15
19	16	39	140	660	800	9770	1684	11454	12497	3817	8000	650	38	16
20	17	40	140	680	820	10590	2562	13152	13157	3767	8680	680	39	17
21	18	41	183	700	883	11473	2551	14024	13850	3720	9390	710	40	18
22	19	42	183	720	903	12376	2537	14913	15797	4897	10130	740	41	19
23	20	43	183	740	923	13299	3155	16454	16537	4837	10900	770	42	20
24	21	44	183	760	943	14242	3130	17372	17300	4770	11700	800	43	21
25	22	45	183	780	963	15205	3102	18307	18090	4700	12530	830	44	22
26	23	46	183	800	983	16188	3072	19260	18910	4630	13390	860	45	23
27	24	47	243	820	1,063	17251	3643	20894	20892	5692	14280	890	46	24
28	25	48	243	840	1,083	18334	3595	21929	21742	5592	15200	920	47	25
29	26	49	243	860	1,103	19437	3537	22974	22609	5479	16150	950	48	26
30	27	50	243	880	1,123	20560	4228	24788	24575	6435	17130	980	49	27
31	28	51	243	900	1,143	21703	4144	25847	25464	6284	18140	1,010	50	28
32	29	52	243	920	1,163	22866	4055	26921	26380	6130	19180	1,040	51	29
33	30	53	243	940	1,183	24046	3966	28012	28321	6971	20250	1,070	52	30
34	31	54	243	960	1,203	25252	3870	29116	29263	6783	21350	1,100	53	31
35	32	55	243	980	1,223	26475	3772	30238	30231	6591	22480	1,130	54	32
											23640	1,160	55	33

N. B.—Officers of the rank of Superintending and Chief Engineers are excluded from this comparison.

It may be observed that in the above table the salary of Royal Engineers is made up of net military pay and departmental salary, the latter having been regulated so as to effect an equality regarding emoluments between the civil and military element.

Many arguments, however, have been adduced on the part of the Royal Engineer in support of a claim to net military pay apart from the same departmental emoluments allowed to the civilian.

Q.

This Table shows the probable average cost of an establishment of 816 Executive and Assistant Engineers divided into classes and grades, so as to give an average rate of promotion which will carry an officer through the 2nd grade of Assistants in 3 years, and through each of the other grades up to 1st grade Executive Engineer in 5 years. It is assumed that retirement is compulsory at the age of 55, and that officers join at the age of 22; also that all the Superintending and Chief Engineers are over 23 years' service. A table showing how the present scale of salaries could be converted into an incremental one is attached for purposes of comparison.

Table showing the numerical proportion of the several grades that would have to be maintained to establish a regular flow of promotion at the proposed rate, and the amount of pay drawn at prevailing rates.					Number serving in each year.	Table showing how the substitution of incremental salaries for promotion by grades and classes could be effected at approximately the same cost to the State and to the benefit of individual officers.				
Year of service.	Present designations of classes and grades.	Monthly rate of pay in each year of service.	Aggregate of pay drawn to end of year of service.	Amount of monthly pay for the number serving in each year.		Amount of monthly pay for the number serving in each year.	Aggregate of pay drawn to end of year of service.	Monthly rate of pay in each year of service.	Proposed designation of classes.	Year of age.
		Rs.	£	Rs.		Rs.	£	Rs.		
1	Assistant Engineers,	350	350	11,900	34	11,900	350	350	Engineers, 4th class	23
2	2nd grade.	350	700	11,550	33	12,210	720	370		24
3	100	350	1,050	11,550	33	12,870	1110	390		25
4	Assistant Engineers,	450	1,500	14,850	33	13,530	1520	410		26
5	1st grade.	450	1,950	14,850	33	14,190	1950	430		27
6		450	2,400	14,400	32	14,400	2400	450		28
7		450	2,850	14,400	32	15,040	2870	470		29
8	162	450	3,300	14,400	32	15,680	3360	490	504	30
9	Executive Engineers,	550	3,850	17,600	32	16,320	3870	510	Pay rising from Rs.	31
10	4th grade.	550	4,400	17,050	31	16,430	4400	530	350 per mensem by	32
11		550	4,950	17,050	31	17,050	4950	550	annual increments of	33
12		550	5,500	17,050	31	17,670	5520	570	Rs. 20 per mensem	34
13	155	550	6,050	16,500	30	17,700	6110	590	to a maximum of Rs. 650.	35
14	Executive Engineers,	650	6,700	19,500	30	18,300	6720	610		36
15	3rd grade.	650	7,350	18,850	29	18,270	7350	630		37
16		650	8,000	18,200	28	18,200	8000	650		38
17		650	8,650	17,550	27	18,360	8680	680	Engineers, 3rd class	39
18	141	650	9,300	16,900	27	19,170	9390	710		40
19	Executive Engineers,	800	10,100	20,800	26	19,240	10130	740		41
20	2nd grade.	800	10,900	20,800	26	20,020	10900	770		42
21		800	11,700	20,000	25	20,000	11700	800		43
22		800	12,500	19,200	24	19,920	12530	830		44
23	124	800	13,300	18,400	23	19,780	13390	860		45
24	Executive Engineers,	950	14,250	14,250	15	13,350	14280	890	312	46
25	1st grade.	950	15,200	14,250	15	13,800	15200	920		47
26		950	16,150	13,300	14	13,300	16150	950	Pay rising from Rs.	48
27		950	17,100	13,300	14	13,720	17130	980	680 by annual incre	49
28		1,000	18,100	13,000	13	13,130	18140	1,010	ments of Rs. 30 per	50
29		1,000	19,100	13,000	13	13,520	19180	1,040	mensem to a maxi-	51
30		1,000	20,100	13,000	13	13,910	20250	1,070	mum of Rs. 1,160.	52
31		1,000	21,100	13,000	13	14,300	21350	1,100		53
32		1,050	22,150	12,600	12	13,560	22480	1,130		54
33	134	1,050	23,200	12,600	12	13,920	23640	1,160		55
	Totals ...	23,200	...	5,15,650	816	5,22,760	...	23,640		
	Average ...	703	...	632	...	641	...	716		

R.

PRESENT ESTABLISHMENT. Number of each age serving in each rank.						Year of age.	TYPICAL ESTABLISHMENT. Number of each age and each year of service in each rank.						Year of service.	PRESENT ESTABLISHMENT. Number in each year of service in each rank.					
Assistant Engineers, 2nd and 3rd grades.	Assistant Engineers, 1st grade.	Executive Engineers, 4th grade.	Executive Engineers, 3rd grade.	Executive Engineers, 2nd grade.	Executive Engineers, 1st grade *et supra*.		Assistant Engineers, 2nd and 3rd grades.	Assistant Engineers, 1st grade.	Executive Engineers, 4th grade.	Executive Engineers, 3rd grade.	Executive Engineers, 2nd grade.	Executive Engineers, 1st grade *et supra*.		Assistant Engineers, 2nd and 3rd grades.	Assistant Engineers, 1st grade.	Executive Engineers, 4th grade.	Executive Engineers, 3rd grade.	Executive Engineers, 2nd grade.	Executive Engineers, 1st grade *et supra*.
22	...	...	...	...	...	22	37	...	...	..	...	...	0	...	...	...	...	...	...
27	...	...	...	...	...	23	36	...	...	...	...	...	1	32	5	1	...	...	...
42	1	...	...	...	...	24	36	...	...	...	...	...	2	42	3	...	...	...	...
48	1	...	...	...	...	25	36	...	...	...	...	...	3	40	1	...	...	...	...
36	8	1	...	...	...	26	36	...	...	...	...	...	4	47	1	...	...	1	...
33	23	...	...	...	...	27	35	...	...	...	...	...	5	41	15	1	...	...	...
13	40	...	...	...	...	28	35	...	...	...	...	...	6	24	30	...	...	...	...
12	30	2	1	...	...	29	12	23	...	...	...	...	7	11	46	1	...	...	...
12	50	2	1	...	...	30	...	35	...	...	...	...	8	9	49	7	3	...	...
4	40	8	1	...	...	31	...	34	...	...	...	...	9	6	55	7	2	...	1
4	30	7	9	...	...	32	...	34	...	...	...	...	10	6	29	12	13	3	...
1	14	7	12	...	...	33	...	34	...	...	...	...	11	...	13	8	15	5	1
3	9	8	17	2	...	34	...	33	...	...	...	...	12	3	15	4	16	5	3
1	7	2	24	10	1	35	...	33	...	...	...	...	13	1	4	4	12	2	3
3	4	3	7	4	2	36	...	32	...	...	...	...	14	...	5	6	17	5	9
1	5	3	10	15	1	37	...	20	11	...	...	...	15	...	2	...	23	36	13
...	1	3	13	18	6	38	...	...	30	...	...	...	16	...	2	3	14	18	4
1	4	3	6	18	6	39	...	...	14	16	...	...	17	...	...	...	1	12	3
...	2	...	4	1	6	40	...	...	...	29	...	...	18	...	2	...	...	4	10
..	3	3	2	13	13	41	...	...	...	29	...	...	19	...	...	...	3	8	6
...	1	...	3	8	15	42	...	...	...	28	...	...	20	...	1	...	1	2	11
...	1	1	6	7	14	43	...	...	...	18	9	...	21	1	...	...	...	4	14
...	1	2	1	2	17	44	...	...	...	...	26	...	22	...	...	1	...	1	10
...	...	...	2	5	17	45	...	...	...	...	26	...	23	...	...	...	...	5	16
...	...	...	...	4	20	46	...	...	...	...	26	...	24	...	...	...	...	1	13
...	1	...	...	...	14	47	...	...	...	...	25	...	25	...	...	...	...	...	13
...	1	...	1	1	9	48	..	...	...	...	...	25	26	...	...	...	...	...	9
...	...	...	...	2	10	49	...	...	...	...	...	24	27	...	...	...	...	...	6
...	1	...	...	2	5	50	...	..	...	...	...	24	28	...	...	...	...	...	13
...	...	...	...	...	3	51	...	...	...	...	...	23	29	...	...	...	...	...	8
...	...	...	...	...	6	52	...	...	...	...	...	22	30	...	...	...	...	...	4
...	...	...	...	...	6	53	...	...	...	...	...	21	31	...	...	...	...	...	4
...	...	...	...	...	4	54	...	...	...	...	...	19	32	...	...	...	...	...	...
...	...	...	...	...	1	55	...	...	...	...	...	18	33	...	...	...	...	...	2
263	278	55	120	112	176	...	263	278	55	120	112	176	...	263	278	55	120	112	176

S.

Comparative Table showing the monthly pay during each year and aggregate of salary up to end of each year of departmental service of a Royal Engineer according to present and proposed proportions of grades and according to the incremental scale of Table P.

Year of regimental service.	Year of age.	Monthly net military pay.	According to present gradation. Rank in Department.	Total monthly pay in each year.	Aggregate of pay to end of each year's service.	According to proposed gradation. Rank in Department.	Total monthly pay in each year.	Aggregate of pay to end of each year's service.	According to incremental scale. Class in Department.	Total monthly pay in each year.	Aggregate of pay to end of each year's service.
		Rs.		Rs.	£		Rs.	£		Rs.	£
4	24	70	Assistant Engineer, 2nd Grade.	420	420	Assistant Engineer, 2nd Grade.	420	420	4th Class.	430	430
5	25	70		420	840		420	840		450	880
6	26	70		420	1260		420	1260		470	1350
7	27	70		420	1680	Assistant Engineer, 1st Grade.	520	1780		490	1840
8	28	70		420	2100		520	2300		510	2450
9	29	70		420	2520		520	2820		530	2880
10	30	70	Assistant Engineer, 1st Grade.	520	3040		520	3340		550	3430
11	31	70		520	3560		520	3860		570	4000
12	32	70		520	4080	Executive Engineer, 4th Grade.	620	4480		590	4590
13	33	140		590	4670		690	5170		680	5270
14	34	140		590	5260		690	5860		700	5970
15	35	140		590	5850		690	6550		720	6690
16	36	140		590	6440		690	7240		740	7430
17	37	140		590	7030	Executive Engineer, 3rd Grade.	790	8030		760	8190
18	38	140	Executive Engineer, 4th Grade.	690	7720		790	8820		780	8970
19	39	140		690	8410		790	9610	3rd Class.	800	9770
20	40	140		690	9100		790	10400		820	10590
21	41	183	Executive Engineer, 3rd Grade.	833	9933		833	11233		883	11473
22	42	183		833	10766	Executive Engineer, 2nd Grade.	983	12216		903	12376
23	43	183		833	11599		983	13199		923	13299
24	44	183		833	12432		983	14182		943	14242
25	45	183	Executive Engineer, 2nd Grade.	983	13415		983	15165		963	15205
26	46	183		983	14398		983	16148		983	16188
27	47	243		1,043	15441	Executive Engineer, 1st Grade.	1193	17341		1063	17251
28	48	243		1,043	16484		1193	18534		1083	18334
29	49	243	Executive Engineer, 1st Grade.	1,193	17677		1193	19727		1103	19437
30	50	243		1,193	18870		1193	10920		1123	20560
31	51	243		1,193	20063		1193	22113		1143	21703
32	52	243		1,193	21256		1193	23306		1163	22866
33	53	243		1,193	22449		1193	24499		1183	24049
34	54	243		1,193	23642		1193	25692		1203	25252
35	55	243		1,193	24845		1193	26885		1223	26475
Average monthly pay.				776			840	...		827	...

N. B.—The total monthly pay in this table includes all allowances, Military and Civil.
This table excludes officers of the rank of Superintending Chief Engineer from the comparison.

T.

This table compares the gross emoluments of Civil and Royal Engineers on the following assumptions:—

First, that the departmental pay of the former increases by Rs. 25 per mensem after each year of service beginning with Rs. 350 on joining or on attaining the age of 22 if younger at the time of entering the Department; and secondly, that the pay of the Royal Engineers is made up of the net military of his rank, plus Rs. 335, plus Rs. 20, for each year of completed service counting from date of first commission.

The commuted values of the pensions are the same as in Table P.

CIVIL ENGINEERS.						ROYAL ENGINEERS.				
Year of age.	Year of service.	Monthly during each year of service.	Total of pay from beginning of service to end of each year.	Commuted value of pension earned at end of each year.	Aggregate of all emoluments at end of each year.	Aggregate of all emoluments at end of each year.	Commuted value of pension earned at end of each year.	Total of pay from beginning of service to end of each year.	Monthly pay during each year.	Year of regimental service.
		Rs.	£	£	£	£	£	£	Rs.	
23	1	350	350	...	...	...	...	...	...	...
24	2	375	725	...	...	...	...	465	465	4
25	3	400	1125	...	...	...	...	950	485	5
26	4	425	1550	...	...	...	...	1455	505	6
27	5	450	2000	...	...	...	...	1980	525	7
28	6	475	2475	...	...	...	...	2525	545	8
29	7	500	2975	...	...	...	...	3090	565	9
30	8	525	3500	...	...	...	...	3675	585	10
31	9	550	4050	...	...	...	...	4280	605	11
32	10	575	4625	1379	6004	5805	900	4905	625	12
33	11	600	5225	1972	7197	6543	923	5620	715	13
34	12	625	5850	2433	8283	7298	943	6355	735	14
35	13	650	6500	2941	9441	8390	1280	7110	755	15
36	14	675	7175	3436	10611	9185	1300	7885	775	16
37	15	700	7875	3917	11792	9998	1318	8680	795	17
38	16	725	8600	3867	12467	11162	1667	9495	815	18
39	17	750	9350	3817	13167	12014	1684	10330	835	19
40	18	775	10125	3767	13892	13747	2562	11185	855	20
41	19	800	10925	3720	14645	14654	2551	12103	918	21
42	20	825	11750	4897	16647	15578	2537	13041	938	22
43	21	850	12600	4837	17437	17154	3155	13999	958	23
44	22	875	13475	4770	18245	18107	3130	14977	978	24
45	23	900	14375	4700	19075	19077	3102	15975	998	25
46	24	925	15300	4630	19930	20065	3072	16993	1018	26
47	25	950	16250	5692	21942	21734	3643	18091	1098	27
48	26	975	17225	5592	22817	22804	3595	19209	1118	28
49	27	1000	18225	5479	23704	23884	3537	20347	1138	29
50	28	1025	19250	6435	25685	25733	4228	21505	1158	30
51	29	1050	20300	6284	26584	26827	4144	22683	1178	31
52	30	1075	21375	6130	27505	27936	4055	23881	1198	32
53	31	1100	22475	6971	29446	29065	3966	25099	1218	33
54	32	1125	23600	6783	30383	30207	3870	26337	1238	34
55	33	1150	24750	6591	31341	31367	3772	27595	1258	35
Average	...	750	...	...	...	...	...	...	862	...

This table excludes officers of the rank of Superintending Chief Engineer from the comparison.

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VZ

Supplementary Note on the reorganisation of the Department.

In my note dated 12th instant, I have suggested that the pay of Royal Engineers in the Departmental ranks of Chief and Superintending Engineers, or in the 1st and 2nd Classes of the proposed incremental scale, should be the same as that of Civil Engineers in the same ranks plus their net military pay.

I made this recommendation advisedly in view of the many temptations that will offer for Royal Engineers to sever their connection with the Department at a time when their services would be most profitable to it, and the desirability, on economical and other grounds, of always retaining a full proportion of them in every class of our Departmental establishment.

My proposal would not, however, be absolutely consistent with the principle of assimilating the emoluments of Royal and Civil Engineers as far as possible, with a leaning in favor of the latter, which the Secretary of State is apparently anxious to have adopted.

This object would, I think, be more nearly attained, certainly towards the close of Departmental service which is the most important period for the establishment of such equality, if the civil salaries of Royal Engineers appointed to, either the 1st or 2nd class of the incremental scale were Rs. 100 per mensem less than those of Civil Engineers, the net military pay of their Regimental rank being drawn in addition.

The accompanying comparative tables X and Y show the degrees of correspondence between the emoluments of the two bodies that would be secured by adopting this reduced scale of pay for Royal Engineers, assuming that both obtain promotion to the the 1st and 2nd classes at the ages of 48 and 42 respectively, and that the previous Departmental career of both has been an average one, according to the standard adopted in my previous notes.

If the civil salaries of the Royal Engineers serving in these two higher classes were the same as those of the Civil Engineers, their respective gross emoluments would, *cæteris paribus*,

compare as per margin. It will be seen that the equality in these tables occurs about midway in the whole period of class service instead of towards its close as in tables X and Y.

Total emoluments drawn by a Royal Engineer if retired at the end of the year of his age in centre column.	Year of age.	Total emoluments drawn by a Civil Engineer if retired at the end of the year of his age in centre column.
£	2nd Class.	£
15293	42	16127
17244	43	17217
18604	44	19542
20007	45	20705
21460	46	21917
23621	47	24290
25219	48	25590
26854	49	26905
29288	50	28265
30997	51	29664
32751	52	31110
34555	53	33601
36102	54	35114
38297	55	36671
	1st Class.	
25619	48	25990
27704	49	27755
30638	50	30688
32897	51	32611
35251	52	34632
37705	53	36751
40252	54	38964
42897	55	41271

As regard, the 2nd or Superintending Engineer class there is practically no disadvantage in this to the Civil Engineers, as few who had risen to that class would fail to be promoted to the 1st class before attaining the age of compulsory retirement. In the 1st class the Civil Engineers would certainly be at a practical disadvantage of something like 4 per cent. on the total emoluments earned in the course of 33 years' service, but when we take into account the chances of irregularity in the times of promotion to each of these classes, this slight disadvantage on the general average is scarcely worth considering in its application to individual cases. On the other hand the additional pay of even Rs. 100 per mensem to the Royal Engineers in these classes might, and probably would, prove an inducement to many of the more able among them to resist the temptation to abandon an Indian Departmental career for the advantages of Home service at a time when their knowledge and experience of local requirements were at the best and when therefore their retention in the Department would generally be most desirable.

I have said nothing in the note to which this is supplementary about the stoppage of promotion or increments in the case of officers failing to pass the various professional and linguistic examinations laid down in the Code because it seemed obvious that whatever tests are now deemed indispensable for the purpose of determining an officer's fitness for promotion or retention in the service, could be applied as easily under one system as under another.

Under the incremental system it would only be necessary to rule that no increments would be given until an officer had passed a certain examination, and that subsequently only a certain number of increments would be given until he had passed certain other tests. And finally if he failed to pass all the prescribed compulsory examinations within a certain time, his services would be dispensed with altogether.

As regards the accrument of increments while on leave, it seems to me that the fairest general rule would be to allow all leave which counts for pension to count also as service for increments, if an officer's previous record showed him deserving of

the indulgence. In exceptional cases, such as that of an officer's health breaking down under arduous work or trying exposure on duty, and necessitating furlough on medical certificate in excess of what would count for pension, part or the whole of such leave might be allowed to reckon as service carrying increments.

In the matter of temporary and officiating promotions under the incremental system, I think some rules to the following effect would fully meet all cases.

There should, in my opinion, be no temporary or officiating promotions from the 4th to the 3rd class of Engineers.

Officers in the 4th class may hold charge of Executive Divisions or serve as Assistants to officers holding Divisional charges, according to circumstances, or they may while administratively subordinate to an officer in charge of an Executive Division be placed in responsible and professionally independent charge of some important work. Officers of the 3rd class should never be required to serve as Assistants, but they may occasionally hold independent professional charge of an important work under the general administrative control of another officer of the same class. Whatever the nature of their charges, officers of these classes should draw no additional allowance for holding them.

Relative seniority among officers of the same class should not be recognised at all.

An officer appointed from the 3rd class to act for an officer of the 2nd class who may be absent, or an officer of the 2nd class acting for one of the 1st class, should in either case, if it be the first time he has been so appointed, draw the minimum pay of the higher class for the first year. He should, however, be elegible to draw the increments of that class after each year of completed and approved temporary service just as though he were permanent in the class. On reverting to his own class, he would draw the pay to which his length of service in that class inclusive of the time passed in the higher class, may entitle him, just as if he had continued to serve in it during his period of temporary promotion to the higher class.

On being reappointed at any subsequent period temporarily to the higher class, his pay would begin at the amount which he drew when he last reverted, and his

increments would continue to accrue according to his total service in the class as if there had been no break or reversion.

On permanent appointment to the higher class, an officer would count the whole of his previous temporary services in it for determining the amount of his initial salary and subsequently towards future increments.

In short the only difference between temporary and permanent service in the two highest classes would be the liability to revert which the former implies.

The limit of eligibility for appointment to these classes coupled with the rule for compulsory retirement at the age of 55, will effectually prevent the maximum salaries being ever exceeded or being prematurely attained.

As an officer, whether permanent or temporary, performs precisely the same duties in the class in which he is serving, there is no reason why such temporary service should not count as well as permanent service, if approved, towards the same end *i.e.*, the permanent improvement of his pecuniary position in respect both to pay while in the service and pension after retirement.

Illustration :—

A is an officer in the 3rd class, drawing a salary of Rs. 860 per mensem. His next increment is due in six months. *A* is appointed to officiate for *B* in the 2nd class, absent on furlough for 18 months. This being the first time of his being appointed to that class, he will begin on a salary of Rs. 1,100, the minimum, but after one year's officiating service he will obtain the increment of Rs. 50 per mensem and draw it for the remaining six months that he acts for *B*. On *B's* return *A* will revert to the 3rd class and will draw the pay due to 2 years' additional service since the date of his last increment in that class, *viz.*, 860+60=920 per mensem. After 6 months, *A* is again appointed to act for *C* absent on furlough for 2 years. He will then begin to draw Rs. 1,150 per mensem, and after six and eighteen months, Rs. 1,200 and Rs. 1,250 respectively. If *A* again reverted, he would draw at once in his own class 920+60=980 and at the end of 6 months 920+90=1,010.

If *A* were now appointed permanently to the 2nd class on the retirement of *D*, he would begin on a salary of Rs. 1,250 per mensem having had $1+\frac{1}{2}2=3\frac{1}{2}$ years' temporary service in that class. At the end of 6 months he would draw Rs. 1,300 per

mensem and his subsequent increments would be given on the basis of his having had that amount of class service.

Two and a half years after his permanent appointment to the 2nd class *A* would have completed 6 years' service in that class and would be eligible for holding appointments in the 1st class at the discretion of Government. If *A* retired after he had officiated 3 years in the aggregate in the 2nd class, he would be eligible for the additional pension of Rs. 1,000 per annum.

I will in another note show how I propose to carry out the conversion of the present graded scale into the proposed incremental one, if the latter be accepted by Government so as to secure to present incumbents the rights they have acquired under existing conditions of service, while at the same time allowing them to participate in the advantages of the new orders.

W. S. T.
22-7-83.

TABLE X.

Superintending Engineers, or 2nd Class.

Year of age.	Royal Engineers.							Civil Engineers.				
	Year of Regimental service.	Amount of net Military pay per mensem.	Amount of Civil Departmental pay per mensem.	Total monthly pay.	Aggregate amount of pay drawn to end of each year.	Commuted value of Departmental pension due at end of year.	Total of emoluments, pay and pension received if retired at end of year.	Total of emoluments, pay and pension received if retired at end of year.	Commuted value of pension due at end of year.	Aggregate amount of pay drawn at end of each year.	Total monthly pay.	Year of Departmental service.
		Rs.	Rs.	Rs.	£	£	£	£	£	£	Rs.	
41	21	...	...	...	11473	...	...	...	...	10130	...	19
42	22	183	1,000	1,183	12656	2537	15193	16127	4897	11230	1,100	20
43	23	183	1,050	1,233	13889	3155	17044	17217	4837	12380	1,150	21
44	24	183	1,100	1,283	15172	3130	18302	19542	5962	13580	1,200	22
45	25	183	1,150	1,333	16505	3102	19607	20705	5875	14830	1,250	23
46	26	183	1,200	1,383	17888	3072	20960	21917	5787	16130	1,300	24
47	27	243	1,250	1,493	19381	3640	23021	24290	6810	17480	1,350	25
48	28	243	1,300	1,543	20924	3595	24519	25590	6710	18880	1,400	26
49	29	243	1,350	1,593	22517	3537	26054	26905	6575	20330	8,450	27
50	30	243	1,400	1,643	24160	4228	28388	28265	6435	21830	1,500	28
51	31	243	1,450	1,693	25853	4144	29997	29664	6284	23380	1,550	29
52	32	243	1,500	1,743	27596	4055	31651	31110	6130	24980	1,600	30
53	33	243	1,550	1,793	29389	3966	33355	33601	6971	26630	1,650	31
54	34	243	1,600	1,843	38232	3870	35102	35114	6784	28330	1,700	32
55	35	243	1,650	1,893	33125	3772	36897	36671	6591	30080	1,750	33

TABLE Y.

Chief Engineers, or 1st Class.

Year of age.	Royal Engineers.							Civil Engineers.				
	Year of regimental service.	Amount of net Military pay per mensem.	Amount of Civil Departmental pay per mensem.	Total monthly pay.	Aggregate amount of pay drawn to end of each year.	Commuted value of Departmental pension due at end of year.	Total of emoluments pay and pension received if retired at end of year.	Total of emoluments, pay and pension received if retired at end of year.	Commuted value of pension due at end of year.	Aggregate amount of pay drawn at end of each year.	Total monthly pay	Year of Departmental service.
	Rs.	Rs.	Rs.	Rs.	£	£	£	£	£	£	Rs.	
47	27	...	...	...	19381	...	...	...	...	17480	...	25
48	28	243	1700	1943	21324	3595	24919	25990	6710	19280	1800	26
49	29	243	1800	2043	23367	3537	26904	27755	6575	21180	1900	27
50	30	243	1900	2143	25510	4228	29738	30688	7508	23180	2000	28
51	31	243	2000	2243	27753	4144	31897	32611	7331	25280	2100	29
52	32	243	2100	2343	30096	4055	34151	34632	7152	27480	2200	30
53	33	243	2200	2443	32539	3966	36505	36751	6971	29780	2300	31
54	34	243	2300	2543	35082	3872	38952	38964	6784	32180	2400	32
55	35	243	2400	2643	37725	3772	41497	41271	6591	34680	2500	33

Explanation of Tables.

It is assumed in these tables (X & Y) that both Royal and Civil Engineers are promoted to the 1st and 2nd classes as soon as they have become eligible for such promotion by 6 and 3 years' completed service respectively, in the class below. Their service in the 4th class is in both cases, assumed to have been neither accelerated nor retarded beyond the normal rate which the receipt of each increment as it becomes due would give. The pensions of Civil Engineers are calculated on the assumption that they will get the additional pensions of Rs. 1,000, and Rs. 2,000 per annum after 3 years' completed service in the 2nd and 1st classes respectively, and that those in the 2nd class who have completed 31 years' Departmental service will get the higher additional pension.

In all other respects the assumptions are the same as those on which the calculations for the tables attached to previous notes are based.

The Civil pay of officers shown in these tables, compared with the rates of pay now in force for the different classes of Chief and Superintending Engineers, would correspond to the following lengths of service in each class.

Superintending Engineers.

Royal Engineers.	Civil Engineers.
5 years in 3rd Class	1 year 3rd Class
5 „ „ 2 „	9 „ 2 „
3·94 „ „ 1 „	4·81 „ 1 „

Chief Engineers.

3 years in 3rd Class	1 year 3rd Class
1 „ „ 2 „	3 „ 2 „
3·6 „ „ 1 „	3·76 „ 1 „

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VII

Secretary of State's Despatch No. 18, dated 22nd March 1883.

Supplementary note on the method of adjusting the pay of officers in the Executive and Assistant grades, when they are brought under the incremental scale of pay.

In assigning positions and initial salaries on an incremental scale to officers now in the department, should it be decided to adopt such a scale, it will be necessary to recognise the positions they now hold both as regards immediate salaries and prospects of promotion, so that the interests of none may suffer by the change.

The great block of promotion is at present in the assistant's class, but the congestion in that class will be relieved for the time being when the promotions consequent on the Secretary of State's sanction to equalise the numbers in the executive and assistant classes have been made. Advantage must be taken of that opportunity to rectify as far as possible the irregularities in the standing of officers of the assistant class, due to the different rates of promotion which have prevailed in the several lists, so that deserving men of equal service may start fair relatively to each other, and on an initial salary corresponding as nearly as may be with that laid down for their length of service on the accepted scale.

After the numbers in the two classes of Assistants and Executives have been made equal, the rate of promotion that may be expected for the next five years, supposing no further changes to be introduced, is somewhat as follows.

About one-third of the men serving in the 2nd, 3rd, and 4th grades of Executive Engineers will, at the end of the 5 years, have been promoted from their present grades to the grades above each. And similarly about one-fourth of the Assistant Engineers, 1st grade, will have been promoted to Executive Engineer, 4th grade; and one-fourth of the Assistant Engineers, 2nd grade, to 1st grade.

After that period retirements on account of superannuation will become more numerous, and, during the succeeding 10 years, the *annual* promotions from grade to grade will average about the following.

From Executive Engineer, 2nd grade, to Executive Engineer, 1st grade ; and from Executive Engineer, 3rd grade, to Executive Engineer, 2nd grade ; one-fifth the number in the lower grades may expect to be promoted to the next higher grade *each year.*

From Executive Engineer, 4th grade, to Executive Engineer, 3rd grade ; the *annual* promotions will average about one-sixth the number in the lower grade.

From Assistant Engineer, 1st grade, to Executive Engineer, 4th grade ; and from Assistant Engineer, 2nd grade, to Assistant Engineer, 1st grade ; the *annual* promotions may be expected to average about one-ninth and one-eighth of the numbers serving in 1st and 2nd grades of Assistants respectively.

The probabilities are therefore that the whole of the present Executive Engineers in the 2nd and 3rd grades will be promoted to the next higher grade in the course of the 9th year from the present time, and the seniors now in those grades will be on the point of getting another step.

Similarly the whole of the *present* Executive Engineers, 4th grade, may expect to be promoted to 3rd grade about 4 years hence, and all those who may have been advanced to that rank under the approaching preliminary rectification, within ten years from the present time.

Of the Assistants who remain after the rectifications all those in the 1st grade will probably become Executive Engineers, 4th grade, in about 12 years, and all those in the 2nd grade will all be promoted to 1st grade in about 11 years.

Taking the establishment as it now stands, *i.e.*, before any rectification, the number of steps from grade to grade that may be expected annually on each list during the next 5 or 6 years is as follows :—

						Madras.	Bombay.	Bengal.	N. W. P.	Punjab.	L. A.	Railway.
Exe. Engr.	2nd to	Exe. Engr.	1st ...	·606	·639	·725	·863	·751	·804	1·404
„ „	3rd „	„ „	2nd ...	·735	·775	·879	1·047	·911	·975	1·702
„ „	4th „	„ „	3rd ...	·845	·890	1·010	1·203	1·046	1·120	1·955
Asst. „	1st „	Exe. „	4th ...	·895	·944	1·070	1·275	1·109	1·187	2·072
„ „	2nd „	Asst. „	1st ...	1·151	1·313	1·376	1·639	1·423	1·526	2·665

From the above it would appear that in the local lists one step from 2nd to 1st grade, Executive Engineer, may be expected in the course of about every 14 to 20 months, and on the Railway list in about from 8 to 9 months' intervals.

From 3rd to 2nd grade, Executive Engineer, a step may be expected at intervals of from 11 to 16 months on the local Government lists, and on the Railway list about every 7 months.

From 4th to 3rd grade of Executive Engineer there would be one step in about every 10 to 14 months on the local Government lists, and in about 6 months on the Railway list.

It would, therefore, be perfectly equitable to allow that any officer who had been senior for promotion in his grade as Executive Engineer for one year on local Government lists, or for six months on the Railway list, should, on being brought on to the incremental scale begin on the salary of the next higher grade. Or if he had not quite completed the requisite term in that position, that he should get the full salary of the higher grade on completing it, in the meanwhile drawing one increment less.

Similarly officers who had been 2, 3, 4, &c., years in the position of 2nd, 3rd, 4th, &c., on the list for promotion under local Governments, or 1, 1½, 2, &c., years on the Railway list, should be brought on to the new scale on the pay of the next higher grade, or have their pay so fixed that, in the ordinary course of increments, they would attain it by the time they had completed those periods.

This plan of grading for incremental salaries would protect and meet the vested interests in promotion of all those who are near the tops of their respective grades. But it would obviously not accelerate promotion as measured by increase of pay, present and future. To effect this it will be necessary to fix a period for passing men through the rates of pay corresponding to those now established for the different grades. This should be 5 years for each of the grades from Assistant Engineer, 1st grade, to Executive Engineer, 2nd grade, inclusive.

Every officer who was recommended for it by the Government under which he was serving would begin on the new scale with a salary consisting of the pay of his grade, *plus* as many increments as he had years of completed service in that grade, provided that the total of such increments did not make his salary greater than that of the grade above, on the present scale. The increments for this adjustment, assuming that the scale given in Table Q be adopted, would be for Assistant Engineer 1st and 2nd grades, and Executive Engineer 4th grade Rs. 20, and for Executive Engineer 3rd and 2nd grades Rs. 30 per mensem for each year of completed service in the grade up to 5.

In the case of Assistant Engineers, 2nd grade service in the grade will count only from the date of their attaining the age of 22 in the event of their having been younger when appointed to that grade.

If the beginning salary of any officer under this rule exceeded what he would get by virtue of his position for promotion on his list, he would of course have the option of taking it.

After the system had been started on the above basis, officers' increments would go on under the rules of the scale until their salaries amounted to Rs. 950 per mensem.

The monthly increments of officers in the Executive Engineer class now drawing Rs. 950 per mensem, and of those now in the service who may hereafter attain that rate of pay under the incremental system, will be determined by dividing the difference between the maximum pay of the class (Rs. 1,160) and Rs. 950, by the difference between their age at next birth-day and 55—subject to a maximum of Rs. 30 per mensem.

The pay of Royal Engineer officers now in the department, whose vested interests have to be protected equally with those of Civil Engineer, will be fixed at starting, and subsequently carried on under the above rules, their departmental pay only being made the basis of the calculation. Their net military pay will continue to be drawn as at present in addition to the civil incremental pay that may be deduced in each case from the rule.

All Royal Engineer officers that may hereafter join the department to come under the special rates of pay laid down for them in the scheme.

Illustrations.

A is an Executive Engineer, 2nd grade, with 2 years and 3 months' service in the grade, and 36 years and 7 months old when the change to the incremental system is made. He will begin on a salary of Rs. $800+2\times30$=Rs. 860 per mensem, and 9 months later get an additional increment of Rs. 30 per mensem. In the two succeeding years he would get increments of Rs. 30 per mensem, when his salary would amount to Rs. 950 per mensem. His age would then be 39 years and 4 months and his next increment would become due 8 months later when he completed his

40th year. The amount of that increment and all succeeding increments until *A* was promoted or retired would be determined by the rule to be $\frac{1160-950}{55-40}$=Rs. 14 per mensem.

B is an Executive Engineer, 3rd grade, 34 years and 8 months old and having 4 years and 5 months' service in the grade when the change is made. He has also been senior on the local Government list for promotion for 9 months. *B*'s initial salary by virtue of his position on the list would be Rs. $650 + 4 \times 30 =$ Rs. 770 per mensem, and his next increment would become due 3 months later. By length of grade service his initial salary would also be Rs. 770 per mensem, but his next increment would not become due for 7 months. *B*'s salary would amount to Rs. 950 per mensem when his age was 39 years and 11 months, and therefore one month later he would begin to draw an additional increment of Rs. 14 per mensem calculated as in the case of *A*.

Superintending and Chief Engineers.

On the introduction of the incremental system, the initial salaries of officers then serving in the ranks of Chief and Superintending Engineers might be determined as follows:—

In the case of Chief and Superintending Engineers of the present 2nd and 3rd classes; to the pay of their present class would be added as many increments, at the rates laid down in my scheme for the 1st and 2nd classes respectively of the incremental system, as may be due to each officer for his length of service in his own class and in any higher class, officiating and temporary service being reckoned in the calculations as supplementary to the permanent service in the class.

Thus, for example, an officer in the 3rd class of Superintending Engineers who had officiating and temporary service in that class amounting in the aggregate to 1 year and 3 months, and had been permanent in his class for 1 year and 5 months, of which 7 months had been passed as temporary or officiating 2nd class, would reckon the sum of these periods, or 3 years and 3 months towards the increments with which his salary on the new system would begin. That is to say he would draw to start with Rs. $1,100 + 3 \times 50 =$ Rs. 1,250 per mensem, and 9 months later he would receive another increment of Rs. 50 per mensem. He would subsequently get an

additional increment of Rs. 50 per mensem for every year's completed and approved service until his salary amounted to Rs. 1,600 per mensem after which his increments would be determined by the same rule as has been laid down for Executive Engineers whose salaries have amounted to Rs. 950 per mensem, subject always to the condition that such subsequent increments are limited to Rs. 50 as a maximum.

The initial salaries of Superintending Engineers, 1st class, would be that of their rank, and their subsequent increments would be determined in the same manner as those for officers who may be holding the rank of Executive Engineer, 1st grade, at the time of the change of system.

In the case of officers holding the rank of Chief Engineer, 1st class, when the incremental system is introduced there would be no alteration of salaries. They would continue to draw the pay of their rank until retired in due course.

Officers promoted from one class to another of the incremental scale after that system has come into force would have their initial salaries and subsequent increments regulated by the rules of that system.

It will be noticed that this scheme allows temporary service in a higher class of the present gradation of Superintending and Chief Engineer to count twice over towards reckoning the initial increment, *viz.*, (1) as permanent service in the officer's own class, and (2) as temporary service in the superior class. This is to compensate for the loss of temporary promotions from class to class in each of the two ranks which the new system would abolish. With one or two exceptions, which could be dealt with on their own merits, this method of compensating for loss of temporary steps within the ranks of Superintending and Chief Engineers would liberally meet the claims of all present incumbents.

The proposal is based on the general assumption that Superintending Engineers now in the 2nd and 3rd classes may expect on the average to be three years' permanent in the class to which they belong, of which one year will be passed with temporary rank in a higher class. Also that in the 3rd class, one year's temporary service will precede permanent appointment.

In the case of Chief Engineer, 2nd and 3rd classes, the assumption is that present incumbents, with possibly three exceptions, may on the average expect to be permanent in each class for two years of which 6 months will be passed in a higher class as temporary and that the permanent service in the 3rd class will be preceded by 6 months' temporary service in that class.

15-8-83. W. S. T.

Hon'ble Member.

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