

EAST INDIA (ROYAL INDIAN ENGINEERING  
COLLEGE).

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CORRESPONDENCE

RELATING TO THE

REMODELLING OF THE STUDIES

AND THE

RETIREMENT OF CERTAIN OF THE PROFESSORS AND  
LECTURERS.

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Presented to both Houses of Parliament by Command of His Majesty.

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*Presented by*  
Hon. Mr. Lallubhai  
Samaldas, Bombay.

LONDON:  
PRINTED FOR HIS MAJESTY'S STATIONERY OFFICE,  
BY DARLING & SON, LTD., 31-40, BACON STREET, E.

And to be purchased, either directly or through any Bookseller, from  
EYRE & SPOTTISWOODE, EAST HARDING STREET, FLEET STREET, E.C., and  
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HODGES, FIGGIS, & Co., LIMITED, 104, GRAFTON STREET, DUBLIN.

1901.

[Cd. 490.] Price 6½d.

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**No. 1.**

Letter from the INDIA OFFICE to General Sir A. TAYLOR, PRESIDENT  
of the ROYAL INDIAN ENGINEERING COLLEGE.

12th February, 1894.

With reference to your letter of the 2nd ultimo, I am directed to inform you that, on a consideration of the present financial condition of Cooper's Hill College, the Secretary of State for India has determined to appoint a Committee for the purpose of enquiring into the constitution and expenditure of the College, and submitting a report upon the best way of securing an equilibrium between the receipts and working expenses of the Institution.

The following gentlemen have been nominated to serve on this Committee.

Sir A. LYALL, Chairman.

Sir C. BERNARD,

Sir A. RENDEL,

Mr. R. HARDIE,

Mr. HUGH LEONARD.

The arrangements which may be considered most suitable in connection with the meetings of the Committee, and the conduct of the enquiry will be made in communication with you.

I am, &c.,

(Signed) HORACE WALPOLE.

**No. 2.**

Letter from the INDIA OFFICE to Sir A. LYALL, Sir C. BERNARD,  
Sir A. RENDEL, Mr. HARDIE, and Mr. H. LEONARD.

12th February, 1894.

The Secretary of State for India has had under his consideration recent papers relating to the financial condition of Cooper's Hill College, from which it appears that the receipts are not covering the working expenses.

His Lordship has, therefore, determined to appoint a Committee for the purpose of enquiring into the constitution and expenditure of the College, and submitting a report upon the best way of securing an equilibrium between the receipts and working expenses of the institution.

I am to state that the Earl of Kimberley will be pleased if you will serve on this Committee, and that the following gentlemen have been nominated as members in addition to yourself.

(Names of four other members.)

I am, &c.,

(Signed) HORACE WALPOLE.

Sir A. Lyall.

Sir C. Bernard.

Sir A. Rendel.

Mr. Hardie.

Mr. H. Leonard.

## No. 3.

Letter from the INDIA OFFICE to Sir RICHARD TEMPLE, Bart., M.P.

12th February 1894.

THE Secretary of State for India has had under consideration recent papers relating to the financial condition of Cooper's Hill College, from which it appears that the receipts are not covering the working expenses.

His Lordship has, therefore, determined to appoint a Departmental Committee for the purpose of enquiring into the constitution and expenditure of the College, and submitting a report upon the best way of securing an equilibrium between the receipts and working expenses of the institution.

The Board of Visitors of the College will be represented on the Committee by two of their members, viz., Sir A. Rendel and Mr. H. Leonard, and the result of the enquiry will be duly communicated to the Board.

I am, &c.,

(Signed) HORACE WALPOLE.

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## No. 4.

Report to the UNDER SECRETARY OF STATE FOR INDIA by the COMMITTEE OF ENQUIRY into the Expenditure at the ROYAL INDIAN ENGINEERING COLLEGE.

27th June 1895.

In accordance with the instructions conveyed in your letter of the 12th February 1894, we have made enquiry into the constitution and expenditure of the Royal Indian Engineering College at Cooper's Hill, and we have the honour to submit the following report.

2. The proximate cause of the present inquiry was the serious deficit shown in the College estimates for 1893-94, and, although the expenditure of that year was to some extent abnormal, it was apparent that, without exceptional measures, there was little probability in the near future of any decided improvement in the financial condition of the College.

3. The amount originally expended in the purchase of the Cooper's Hill estate was 56,275*l.*, and this sum has been raised by successive additions (*see Appendix A*) to 136,374*l.*, which now represents the total capital sum which has been laid out in the acquisition of the buildings and grounds, in extensions and improvements, and in furnishing.

In Appendix B is given a statement of the receipts and expenditure at Cooper's Hill since 1878-79. The surpluses which have hitherto been shown in the accounts of the College for the years 1886-87 to 1890-91 inclusive were entirely due to the fact that up to the latter year the accounts did not include the expenses of the foreign tours of the Forest students. Including the payments hitherto shown under the head of "Forest,"

the deficits in the College accounts since 1885-86, the year in which the Forest students were admitted to the College, are as follows :—

Year.	Amount.	Number of Students in residence.
1885-86 ... ..	£ 2,762	107.
1886-87 ... ..	1,404	123
1887-88 ... ..	236	135
1888-89 ... ..	493	134
1889-90 ... ..	823	120
1890-91 ... ..	389	124
1891-92 ... ..	20	135
1892-93 ... ..	27	136
1893-94 ... ..	3,186	123
1894-95 ... ..	1,715	117 (Budget figures).

It should be observed that these figures do not include any charge for interest on the Capital cost of the College buildings. At three per cent., this charge would amount to £4,091. We also notice that the deficits which have occurred would have been much greater but for the profits derived from the testing operations carried on in the Mechanical and Chemical Analytical Laboratories, which in the last five years have averaged about £1,170 per annum, but this income cannot be considered educational income.

4. Two causes have operated to produce the present unfavourable financial condition of the College :—

- (a.) A large falling-off in the number of students in residence.
- (b.) The high rate of expenditure at the College, which is particularly noticeable in recent years.

5. With regard to the number of students, it may be observed that the College buildings were originally intended to accommodate 150, but the actual numbers in residence have never reached that limit, even in the early days of the College. The average number in residence during the last 10 years has been 124.

Notwithstanding the inclusion of the Forest students, the numbers on the roll have been gradually diminishing. For the last three years the average numbers in residence are as follows :—

1892-93 ... ..	136
1893-94 ... ..	123
1894-95 ... ..	117 (Budget figures.)

As each Engineer or Telegraph student pays annual fees amounting to 183*l.*, and each Forest student's fees will in future amount to 193*l.*, it is apparent that a very small reduction in the numbers in residence will seriously disturb the financial equilibrium of the College.

6. With regard to the expenditure, it may be observed that the most prominent feature has been the continual growth of the cost of the teaching staff. In 1873 the cost, exclusive of the President, was 5,300*l.*, in 1880 it was 6,387*l.*, in 1884 7,218*l.*, and in 1894 9,056*l.* These figures do not include the cost of the laboratories, which within the same period has grown from

700*l.* to 2,843*l.* per annum. This expenditure, however, is mainly due to the testing work done for the Consulting Engineer and is more than covered by receipts.

Several causes have contributed to the increase of expenditure referred to. Experience has detected deficiencies in the curriculum. Additions were made to the staff on the recommendation of the Board of Visitors constituted when the College was thrown open to the public in 1880, and these additions were recommended with the object of attracting students rather than with reference to the teaching necessary for the Government service. Above all, the decision to train the successful candidates for the Forest Department at Cooper's Hill has entailed a very heavy increase in the teaching establishment, which has been inquired into by this Committee with results which will be stated further on.

7. Our inquiry has naturally fallen under two heads, viz. :—(1) Whether it is possible to increase the number of resident students by offering larger attractions to enter the College ; and, (2) to what extent it may be possible to reduce the present rate of expenditure without impairing the efficiency of the institution.

8. The most direct, and indeed only practicable, method of raising the number of students at the College is to give more chances to those entering the College of obtaining permanent employment at the end of their course. By this is not meant that more appointments in the Public Works or Telegraph Departments should necessarily be given, but that other openings should be afforded in the Government service or in the quasi-Government services, such as those of the Guaranteed Railway Companies. Much has hitherto been done by the President in obtaining employment for those students who at the end of their College training have, though they gained diplomas, been unsuccessful in the competition for the appointments offered by Government. But this has been chiefly in the way of obtaining a start in their professional career in various outside directions for the young men who are leaving the College. To produce an effect on the numbers entering it is necessary to advertise beforehand a definite prospect of permanent engagements.

9. The appointments guaranteed to the students at present are 12 in the Public Works Department and three in the Telegraph Department.

The Forest students are admitted to the service by competition before they enter the College. A proposal has been made by the President that the Forest students should in future be selected from among the students in College at the end of their first year's course in the same manner as the Telegraph Students. The Forest appointments could then be advertised the same way as the Public Works and Telegraph appointments, *i.e.*, 21 appointments to the Public Service could be offered to the students entering in any one year, instead of 15 as at present. The President states that past experience tends to show that this larger number advertised " would add 13 to the list of students in residence.

We have considered this proposal, and agree with the President in holding that it might increase the number of admissions, and would to that extent diminish the deficit, provided that it did not lead, as it ought not, to an increase of the staff. But, for their first year, the future Forest students would not be students of Forestry.

10. We have also considered suggestions that have been made by one of our number, Sir A. Rendel, that traffic officers, both for the State Railways and for the guaranteed lines, might be obtained from the College, and that the guaranteed Companies might be asked, when they require junior engineer officers, to consider applications from the young men at Cooper's Hill. Both these proposals deserve consideration. It would not be possible for the Railway Companies, even if they promised to take men from Cooper's Hill, to give three years' notice beforehand of vacancies in their establishments, so as to allow of such

vacancies being advertised for competition to students on entering the College, but the fact that these appointments might be filled up from among the students, might, if made known, have an appreciable effect on the numbers entering.

11. The number of officers in the superior grades (*i.e.*, on salaries of Rr. 250 per mensem and upwards) of the Traffic Department of State Railways, including management, is at present about 60, and the yearly recruitment necessary to maintain this number may be taken as two. It is impossible to form any correct estimate at present of the average annual number of recruits which the Railway Companies might be induced to take from Cooper's Hill for their Engineering and Traffic Departments. They would certainly require the men they took to be fully up to the standard of the men taken by Government, and to be in all respects desirable servants. It may be stated, however, that the length of State lines worked by Railway Companies together with the guaranteed lines exceeds the length of line directly worked by State agency in the proportion of more than two to one.

12. A proposal has also been made by the President that officers of the Police Service might be trained at the College, and be selected in a similar manner to that proposed for the Forest students. This proposal does not commend itself to the Committee. It would be an attempt to prop up a Government institution which is essentially an Engineering College, by making it the door of access to services which have no connection and ought not to be tied up with the Public Works Department. The above are the only suggestions which have been made with the object of increasing the number of students.

13. The expenditure at Cooper's Hill falls under two main heads, viz. :—

- (1.) The cost of the teaching establishment, which consists for the most part of fixed annual salaries.
- (2.) The cost of provisions, washing, fuel and lights, petty establishment, and miscellaneous items. This part of the expenditure is more or less capable of contraction in correspondence with a fall in the number of students.

14. With regard to the second head of expenditure, we append a report with which we have been furnished by Mr. Scott, the Deputy Accountant General, who, in company with Mr. Leonard, visited the College for the purpose of inspecting the books and making a personal inquiry regarding the cost and duties of the establishment exclusive of the teaching staff.

It does not appear from Mr. Scott's report that there is any want of economy in the general arrangements for working the College. He suggests that the following reductions might be made :—

—	Present Salary.	To be reduced to	Saving.
	£	£	£
(a) Secretary ... ..	300	150	150
(b) Chaplain ... ..	190	100	90
(c) Professors' house repairs to be in future done by the occupants ... ..	... ..	... ..	200
(d) Fuel and light allowances now enjoyed by Professors to be discontinued ... ..	... ..	... ..	140
(e) General Courteney's drill allowance to cease	... ..	... ..	20
			600



15. With regard to these proposals, we have to make the following recommendations —

- (a) The offices of the Bursar and Secretary, in respect of which £700 per annum is now being paid, might be combined, on a salary of £250, the assistance of a good clerk being given.
- (b) A salary of £190 is not required to secure the services of a clergyman who has other, perhaps parochial, duties.
- (c) The houses occupied by the Professors are part of the College estate, and we cannot recommend that the cost of the repairs should fall upon the occupants.
- (d) It has already been decided that the fuel and light allowances now drawn by some of the staff are to cease on new appointments being made. The savings of £140 under this head will accordingly be gradually realized.
- (e) We think that when Major-General Courtney retires the allowance for superintending the drill of the College Volunteers should cease.

These, however, are minor economies.

16. There are many points in the present educational arrangements in which considerable reductions might eventually be secured.

For example, the allowances now made to Sir D. Brandis in connection with the foreign tour of the Forest students, and to Mr. Baden-Powell for lectures in Forest Law should be discontinued. Much of Dr. Schlich's time is now occupied in the preparation of manuals of forestry for the use of students. When that work is finished, he will be able to perform the duties in connection with the forest tour now falling on Sir D. Brandis, without further cost than the payment of his travelling expenses. The Assistant Professor can take the lectures on Forest Law. The sum thus saved would amount to £250.

17. The cost of the school forest (viz., £450 per annum) is at present at an abnormal height, owing to special arrangements for planting which were made after the occurrence of a fire. After October 1896 the cost will fall to £250 per annum for the remaining four years of the lease. A saving of £200 will thus be effected.

18. The proposals so far put forward for reducing expenditure have hardly touched the main body of the teaching establishment. We consider it very probable that efficient teaching of the nature required for the due professional equipment of the students educated at the College could be secured at a smaller cost than that of the present staff, and it is not unlikely that economy might result from a reduction in the number of lectures, combined with increased attention to the direction of the students' private studies.

19. At present the number of the teaching staff seems largely out of proportion to the number of students, there being approximately 1 of the former to 4 of the latter. This is partly due to the reduced number of students, but in a greater measure to the special provision which has been made for the training of the Forest students. The proportion of teachers to students existing at Cooper's Hill should not be necessary in an institution of the kind. Even if the College were full, say 140 students, the teaching staff would be as 1 to  $5\frac{1}{2}$  for the whole College, but 1 to 3 for the Forest students.

20. To sum up, we cannot suggest any measures which will result in restoring equilibrium to the College finances in the immediate future. After a course of years an approach to equilibrium between current receipts and expenditure may be attained. But no return on the heavy capital expended on land and buildings is to be expected.

21. With regard to the Forest Department, we are of opinion that it is not possible to provide for the special education of Forest officers without

considerable expenditure on the part of Government, to fully cover which fees from students cannot reasonably be exacted. It would not therefore be unfair to charge part of the deficit now shown against the College to the Forest Department. The President calculates that, owing to the inclusion of the Forest students, the College will lose a sum of £754 per annum.

22. In conclusion, the Committee would observe that it is certain in their opinion that the College would not have been started in 1871 if it had been foreseen that from 1883 onwards the largest number of Engineer appointments ever made in any one year to the Public Works Department would be only 16, and that in 1892 and 1893 the number would be reduced to 12. It therefore seems to them doubtful if it be worth the while of Government to continue to maintain the College at such a heavy cost, both to the Government and to the students themselves. It is doubtful if fees so high do not even deprive the Government of men who are perhaps the best qualified to serve it, and who, there is every reason to think, would be forthcoming in more than the requisite number, and of fully the requisite quality and training, from other sources. The extension of facilities for the study of the various branches of knowledge required by the Civil Engineer has been so large during the quarter of a century that has elapsed since the College was founded as to lead to a grave doubt whether it is now required, and whether it is not an actual check on the development of training which can be obtained quite as good elsewhere, at a less cost to the student, and with considerable financial benefit to the Government.

We have, &c.,

(Signed) C. H. T. CROSTHWAITE.  
R. HARDIE.  
C. E. BERNARD.  
A. M. RENDEL.  
H. LEONARD.  
T. W. JEX-BLAKE.

(*Note.*—Sir C. Crosthwaite on becoming Chairman of the Public Works Committee of the Council of India took the place of Sir A. Lyall. At the request of the Committee of Enquiry Dr. Jex-Blake was added to their number and attended their later meetings.)

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NOTE BY MR. LEONARD.

Although I sign this Report, I feel that we have not gone far enough in pressing for a reduction of the teaching staff of the College.

There is a general agreement among the members of the Committee that the staff is far too costly for the efficient teaching of students, but there is no definite recommendation to the Secretary of State to call for a reduction, yet the case seems so clear to me I do not hesitate to recommend that a reduction should be insisted on.

At present there is a teacher for each four students for the College, and on the Forest side a teacher for each three students,—this, too, to do about two-thirds of the Forest teaching, the other third being done by the engineering side. This proportion of teachers to students cannot possibly be necessary, hence I would direct the President to make such a reduction of staff—especially the Forest staff—as would approximately equalize current income and expenditure, after charging the Forest Department of the Government of India with the sum of seven or eight hundred pounds as recommended in the Report. If this course were adopted, it would at least lessen the necessity for such an undesirable step as the closing of the College.

(Signed) H. LEONARD.

## NOTE BY SIR CHARLES BERNARD.

If the College is maintained, I think that a separate salaried President should not be re-appointed when the next vacancy occurs. For a College with about 120 students a separate paid President, who takes no part in the educational work, can hardly be necessary. One of the Senior Professors could perform the administrative duties now devolving upon the President, with the help of the Secretary, Bursar, and other officials who are on the College Staff.

(Signed) C. E. BERNARD.

## APPENDIX A.

## Royal Indian Engineering College.

## Capital Expenditure.

	£	£
Purchase of the Cooper's Hill Estate ... ..	55,000	
Stamp on conveyance ... ..	275	
Fittings purchased from previous owner ... ..	1,000	
		56,275
Builders' work and furniture (including new wing in 1873-74) :—		
Builders' work ... ..	50,079	
Furniture ... ..	12,722	
		62,801
		119,076
Alterations and additions to the College buildings :—		
1883-84 ... ..	5,860	
1884-85 ... ..	593	
1885-86 ... ..	555	
1886-87 ... ..	498	
1887-88 ... ..	2,267	
1888-89 ... ..	3,675	
1889-90 ... ..	810	
1890-91 ... ..	12	
1891-92 ... ..	950	
1892-93 ... ..	560	
1893-94 ... ..	1,484	
1894-95 ... ..	34	
		17,298
		£136,374

## APPENDIX B.

Statement showing for each Year from 1878-79 to 1893-94 the expense incurred in the instruction of Public Works, Telegraph, and Forest Officers.

—	1878-79.	1879-80.	1880-81.	1881-82.	1882-83.	1883-84.	1884-85.	1885-86.	1886-87.	1887-88.	1888-89.	1889-90.	1890-91.	1891-92.	1892-93.	1893-94.	1894-95.
<b>Royal Indian Engineering College—</b>	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£
Payments ... ..	21,185	20,458	19,808	19,115	19,096	18,326	19,862	20,549	21,309	22,712	22,970	22,063	21,199	23,972	24,531	25,316	22,260
Receipts ... ..	18,038	17,087	15,223	16,686	16,919	18,688	19,459	20,026	21,681	24,029	24,302	22,443	22,240	24,102	24,611	22,297	20,692
Net Payments ...	3,147	3,371	4,585	2,429	2,177	302	403	523	372	1,317	1,332	380	1,041	130	80	3,019	1,568
<b>Forest—</b>																	
Payments ... ..	3,408	3,772	3,862	4,888	4,782	5,142	3,562	3,071	1,776	1,553	1,825	1,203	1,430	150	107	167	147
Receipts ... ..	1,159	1,491	1,602	2,236	2,154	3,072	1,768	832	—	—	—	—	—	—	—	—	—
Net Payments ...	2,249	2,281	2,260	2,652	2,628	2,070	1,794	2,239	1,776	1,553	1,825	1,203	1,430	150	107	167	147
<b>Total for Education ...</b>	5,396	5,652	6,845	5,081	4,805	1,708	2,197	2,762	1,404	236	493	823	889	20	27	3,186	1,715

APPENDIX C.

ROYAL INDIAN ENGINEERING COLLEGE.  
Professors and Officers paid by fixed Salaries.

Name.	Appointment.	Date when appointed.	Whether for a term of Years or indefinitely. <i>See footnote†.</i>	Salary on first appointment.	Present Salary.
General Sir A. Taylor, R.E., G.C.B....	President ... ..	3rd November 1880	... ..	£ 1,000	£ 1,000
Dr. W. Schlich, C.I.E.	Principal Professor of Forestry	1st January 1889	For 10 years	700	700
Mr. Calcott Reilly	Professor of Construction	1st May 1871	...	200l. (allowance till provided with a house). 700	700*
„ Herbert McLeod	Professor of Chemistry	1st May 1871	...	120l. (allowance till provided with a house). 600	600*
Major-General E. H. Courtney, R.E.	Professor of Surveying	1st August 1872	...	(50l. annual gratuity.) 450	(50l. annual gratuity.) 600*
Mr. T. A. Hearson, R.N.	Professor of Hydraulic Engineering, &c.	30th September 1884	...	(Salary as Instructor.) 600	600
„ G. M. Minchin, M.A.	Professor of Applied Mathematics	27th April 1875	...	450	600
„ W. R. Fisher	Assistant Professor of Forestry	1st November, 1890	For 10 years	500	(100l. till provided with a house.) 500
„ A. H. Heath	Assistant Professor of Engineering	30th August 1875	...	450	450*
„ W. N. Stocker	Professor of Physics	23rd June 1883	...	450	450
„ A. Lodge	Professor of Pure Mathematics	23rd September 1884	...	250	450
„ H. M. Ward	Professor of Botany	9th January 1886	...	(Salary as Assistant Professor.) 450	450
„ Arthur Hicks	Instructor in Geometrical Drawing	27th September 1892	...	450	450
„ R. J. Woods	Instructor in Surveying...	27th August 1894	...	350	350
„ C. B. McElwee	Assistant Instructor in Geometrical Drawing.	21st October 1892	...	250	250
„ F. E. Matthews	Demonstrator in Chemistry	25th September 1883	...	200	250
„ T. Shields	Demonstrator in Physics	21st January 1892	...	250	250
„ J. P. Pasco, R.N.	Bursar	26th July 1873	...	250	400
Lieutenant-Colonel W. J. Boyes	Secretary	16th March 1892	...	250	250*
Rev. C. Croslegh, B.D.	Chaplain	22nd September 1876	...	175	175*

\* NOTE.—In addition to the above salaries Mr. C. Reilly, Mr. H. McLeod, Major-General Courtney, and Mr. A. H. Heath receive annual allowances of 35l. each in lieu of gas and fuel, and the Rev. C. Croslegh receives a similar allowance of 15l. The Secretary also receives 50l. per annum for work done in connection with the entrance examination.

† NOTE.—Council Minute of 10th Feb. 1871 ordered that the Professors should be engaged during pleasure, with a stipulation that the engagement may be terminated by six months' notice on either side without reason assigned.

## APPENDIX D.

### ROYAL INDIAN ENGINEERING COLLEGE

#### Lecturers, &c., paid by Fees.

Name.	Appointment.	Date when appointed.	Salary.	Amount paid in 1894-95.	Remarks.
H. E. Giffard ... ..	Medical Officer ... ..	... ..	Paid by fee ... ..	£ 181 13 0	10s. 6d. per student per term.
F. W. Harbord ... ..	Analytical Chemist ... ..	14th March 1892 ... ..	200% per annum with fees as in last column.	763 0 0	Fees 1l. each for all tests above 150 during the financial year up to a limit of 200 beyond the 150, and 10s. on each beyond that limit.
Professor H. G. Seeley ... ..	Lecturer in Geology, &c. ... ..	... ..	Paid by fee ... ..	260 0 0	
W. H. Blandford ... ..	" on Entomology ... ..	... ..	Ditto ... ..	100 0 0	
A. H. Church ... ..	" on Organic Chemistry ... ..	... ..	Ditto ... ..	64 0 0	
B. H. Baden-Powell ... ..	" in Forest Law ... ..	... ..	Ditto ... ..	94 0 0	
J. A. Ferret ... ..	Instructor in French ... ..	... ..	Ditto ... ..	97 13 0	
T. H. Dittel ... ..	" in German ... ..	... ..	Ditto ... ..	113 0 0	
Sir D. Brandis ... ..	In charge of Continental Forest Tours	... ..	Honorarium ... ..	—	150l. for each long tour. Last payment in 1893-94. No tour in 1894.
J. Duffey ... ..	Technical Instructor of Telegraph Students.	1st December, 1878 ... ..	4l. a week ... ..	208 0 0	
J. C. Hurst ... ..	Lecturer in Accounts ... ..	... ..	Paid by fee ... ..	78 15 0	
P. Reilly ... ..	Demonstrator, Mechanical Laboratory	{ Appointed 26th September 1884 ... } { Re-appointed 12th August, 1890 ... }	150% per annum, with fees as in last column.	150 0 0	Fees 40 per cent. of charges for tests over 1,000 in a financial year.
R. Dowson... ..	Instructor in Freehand Drawing ... ..	... ..	Paid by fee ... ..	198 9 0	
F. E. Matthews ... ..	Lecturer on Organic Chemistry ... ..	... ..	Ditto ... ..	36 0 0	In addition to salary of 250l. per annum as Demonstrator in Chemistry.

## APPENDIX E.

SIR,

India Office, Whitehall, S.W.  
22nd May 1894.

ON Monday, the 30th ultimo, I accompanied Mr. Leonard, a member of your Committee, to the Royal Engineering College at Cooper's Hill.

We were courteously received by the President, with whom our visit had been arranged, and he offered us every facility for its purposes of inspection and inquiry.

It was determined that I should occupy myself with an investigation of the cost and duties of the "Establishment," and I accordingly commenced my inquiries in the Bursar's office.

The following observations are submitted as the result of my investigations:—

*The Bursar* (Mr. J. P. Pasco).—I ascertained that this gentleman's time was fully occupied, in fact he seemed a comparative stranger to official hours; his own duties and those of the other officials and servants were carefully tabulated, his diaries and books of account, &c., clearly and systematically kept. The salary of the office is £400 per annum (without residence), and the present occupant has filled it for upwards of 20 years.

*The Secretary*.—This gentleman (Lieutenant-Colonel J. Boyes) was unavoidably absent. I was able, however, to inspect his various books, and to form an opinion both as to the quality and quantity of the Secretary's work.

As regards the correspondence, the President appeared to draft the letters. Those received and replied to from the 1st January last only occupied about a page and a half respectively of the Register, and, speaking generally, the duties of the office of Secretary must be light.

The remuneration amounts to £300 per annum (salary £250, with £50 added for work done in connection with Entrance Examinations, for which a total of £81 is annually granted), and I would submit that half this amount would be sufficient, viz., £150 per annum, and the post would still be an acceptable one for a retired officer, thereby assuring for it a man of some address.

*The Chaplain*.—The Rev. C. Croslegh, who has a school in the neighbourhood, when first appointed, and for some time afterwards, had rooms in the College; on vacating them he was granted compensation allowance for fuel, &c., of £15 per annum.

His Salary as Chaplain is £175, add to this the compensation allowance for fuel, &c., of £15., and his remuneration amounts to £190 per annum. He receives, in addition, some £14 per annum for assisting at the Entrance Examinations, hence his emoluments exceed £200 a year.

I would suggest that the position be offered to the Vicar of a neighbouring church, and that the remuneration be £100 a year. The College could similarly be visited morning and evening by one of the clergy for prayers, whilst the pulpit on Sunday could be alternately filled by Vicar and Curate.

*The Steward, Matron, Butler, and Men Cooks* (2), have apparently plenty to occupy their time, and their salaries are not excessive, the staff of servants is none too large, and their wages are fairly remunerative.

Whilst I made no attempt at an investigation of the salaries and allowances of the Educational staff of the College, the following, in connection with them, attracted my attention.

All the repairs, decorative and otherwise, and however trifling, required to the houses occupied by the Professors, inclusive of the President's quarters, are done by the College at a cost which may be estimated to amount to about £200 per annum. I venture to submit that this expenditure should for the future be borne by the respective tenants.

The cost of repairing breakages and damage of every sort in the College is systematically recovered from the students, either individually or collectively, so that no loss arises under this head to the Secretary of State.

In four instances £35 per annum is allowed to the householder in lieu of fuel and lights; when this amount was fixed the price of the gas supplied by the local Company was 5s. 6d. per 1,000 feet, it is now 3s. 4d. I understand, however, that these allowances are not to be enjoyed by future occupants, hence there will be an eventual saving of £140 per annum.

General Courtney has, in addition to his salary as Professor of Surveying of £600 per annum, a residence, and £35 in lieu of fuel, &c., an allowance of £20 for superintending drill.

The savings in expenditure I have indicated may be thus summarized :—

	£	£
Secretary to have ... ..	...150	instead of 300 per annum.
Chaplain to have ... ..	...100	„ 190 „
House repairs, &c. ... ..	...Nil	„ 200 „
Fuel and light allowances to cease...	...Nil	„ 140 „
And possibly		
General Courtney's drill allowance	.. Nil	„ 20 „
	—	—
	250	„ 850

showing an eventual saving of £600 per annum.

The Educational staff is a large one; true the subjects taught are many and varied, but a staff which (irrespective of the President) numbers 29 to teach 117 students, appears excessive, giving as it does a proportion of 1 to 4.

At the late East India College (Haileybury) there were (exclusive of the Principal) 7 Professors to between 90 and 100 students, a proportion of 1 to 13. A list of the staff with their salaries is attached, *vide* paper marked A.\*

In the comparative statement appended I have placed the salaries and allowances of the Educational staff at the Owens College, Manchester, side by side with those of the staff at Cooper's Hill. I had hoped to have been able to give similar particulars of University College, London, but I have had no reply to my request for them, possibly on account of a vacation; and, after awaiting his return from a holiday, the Principal of the Royal Agricultural College declines to furnish the salaries of his staff, which I have however, ascertained would have been but of little use for the purpose, as it is said to be but poorly paid (prospectus marked D\* attached). In another column I have noted the numerical strength, with their salaries, of the teaching staff at Sandhurst, and on a separate sheet, as already mentioned, will be found similar particulars relating to that of the late College at Haileybury.

The last line of the Statement shows under each head the proportion of the teaching staff to the students.

Attached, too, are prospectuses of—

The Owens College (2) marked B,\* C.\*

Royal Agricultural College, marked D.\*

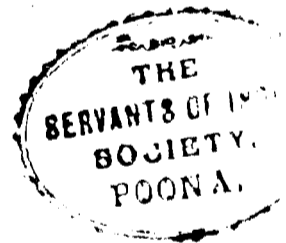
Letters received in connection with this Report are appended from—

The Owens College (5), marked E,\* F,\* G,\* H,\* I.\*

Royal Agricultural College (2), marked K,\* L.\*

Royal Military College, Sandhurst, marked M.\*

Westminster School, The Bursar, marked N.\*



It should be added that there are only 39 names down for admission to the College next September.

I may perhaps be allowed, in conclusion, to quote from a speech of the Archbishop of Canterbury at a recent meeting in connection with King's College, London (reported in the "Times" of the 8th instant, p. 12), "No University or College had ever been able to carry on a high scheme of education which had been self-supporting."

I have, &c.,

(Signed) A. G. SCOTT.

To the  
Chairman of Committee of Inquiry  
into expenditure at Royal Indian Engineering  
College.

\* Not printed.



## No. 5.

Letter from the INDIA OFFICE to General Sir A. TAYLOR,  
President of the Royal Indian Engineering College.

30th January, 1896.

I AM directed by the Secretary of State for India in Council to acquaint you that the Committee which was appointed to inquire into the constitution and expenditure of the Royal Indian Engineering College has recommended that the following measures should be adopted with the object of securing an equilibrium between the receipts and expenditure of the College.

With the view of increasing the number of students, and thereby the income of the College, it is proposed that the Forest students should in future be selected from among the students in College at the end of their first year's course in the same manner as the telegraph students. This measure would enable the Forest appointments to be advertised to the students entering the College, in the same way as the Public Works and Telegraph appointments.

The Secretary of State, however, after due consideration, is not prepared at present to make any change in the system which was adopted only a short time ago, and which has not yet been fully tried.

It has also been suggested that traffic officers, both for the State railways and for the guaranteed lines, might be obtained from the College, and that the guaranteed companies might also be asked, when they require junior engineers, to consider applications from the young men at the College.

I am to request that you will furnish the Secretary of State with your views as to these proposals, and as to the best way of carrying them into effect.

With regard to the reduction of expenditure, the Committee are of opinion that the offices of the Bursar and Secretary, in respect of which £700 per annum is now being paid, might be combined on a salary of £250, the assistance of a good clerk being given.

The Committee are also of opinion that the services of a clergyman could be secured at less cost than the remuneration, viz., £190, now received by the Chaplain, and that the allowance for superintending the drill of the College Volunteers should cease when Major-General Courtney retires.

The Secretary of State accepts these recommendations, to which effect should be given as opportunities occur.

The allowances now made to Sir D. Brandis in connection with the foreign tour of the Forest Students, and to Mr. Baden-Powell for lectures in Forest Law should be discontinued.

As soon as the work undertaken by Dr. Schlich in the preparation of manuals of forestry for the use of the Students, is finished, he will be able to perform the duties in connection with the forest tour now falling on Sir D. Brandis without further cost than the payment of his travelling expenses, and the Assistant Professor should take the lectures on Forest Law.

Though the Committee have not proposed any further specific reductions in the teaching establishment, they are of opinion that the cost of the present staff is greater than should be necessary to give efficient teaching of the nature required for the due professional equipment of the Students educated at the College, and they have suggested that economy might result from a reduction in the number of lectures, combined with increased attention to the direction of the Students' private studies.

I am to inform you that the Secretary of State concurs in the opinion expressed regarding the costliness of the teaching staff, and I am to request that your continued attention may be given to this matter, with the view of effecting

economies whenever the occurrence of a vacancy may afford an opportunity of reducing the staff. You will report what action you propose to take as each vacancy occurs.

I am to add that, looking to the fact that it is not possible to provide for the special education of Forest Officers without considerable expenditure on the part of Government, to fully cover which fees from Students cannot reasonably be exacted, the Secretary of State has decided to transfer the sum of £754 per annum from the charges of the College to the debit of the Forest Department.

I am, &c.,  
(Signed) HORACE WALPOLE.

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## No. 6.

(EXTRACT.)

Notes by the President, Colonel J. W. Ottley, C.I.E.

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### *Entrance Examination.*

The late Board of Visitors expressed the opinion that the examination for admission to the College had been too easy, and considered that the standard might be raised with advantage.

The present Board agreed with the above recommendation. They stated that they had been informed by Colonel Pennycuick that of the students admitted to the College, 10 per cent. were unable to follow the course with advantage to themselves, while they obstructed the progress of their better-instructed comrades. The Board accordingly recommended that the President should be permitted to raise the standard of the entrance examination tentatively.

Commenting on this recommendation, Colonel Pennycuick remarked that it was a matter that might safely be left in the hands of the President. He mentioned that, as a matter of fact, the standard had been raised in the then recent entrance examination (June, 1898), and expressed the belief that in future the percentage of incapable men would be found to be much less than it had been for some years past.

From what I have myself observed, and from the reports made to me by various Professors, I am satisfied that my predecessor's views in this matter were too sanguine, for in both the first and second years at the present time there are many students who have not progressed as they should.

Whether it will be possible to eliminate all such in future is a question to which time alone can supply the answer. I propose, however, to instruct the Examiners in Mathematics to endeavour to still further raise the entrance standard, so as, if possible, to exclude those who are unlikely to be able to follow our College course with advantage.

I am, however, inclined to think that at least a certain amount of the blame of the failures must be laid at the door of our own course of instruction, and this I am proposing to remodel.

*The Functions of Tutors.*

The late Board of Visitors discussed the question of individual instruction as apart from formal lectures. They explained the existing system, and considered that the practice of separate instruction might be still further encouraged.

The present Board agreed that more attention might be paid to individual students out of class hours. They went on to say that they understood that, under a system in force at Cooper's Hill, each student is told off to one or other of the Professors, whose duty is to act towards him as his tutor and adviser, and that all that was required was an amplification of this system, so that a student who found any difficulty in any part of his work could obtain assistance to overcome it from the proper quarter.

Colonel Pennycuick merely remarked that this was a matter that must be left to the discretion of the President. He said that there could be no doubt that the majority of the Professors had plenty of spare time, but added that, "whether the students have any, is another matter altogether."

The Secretary of State pointed out that he was in general agreement with the views recorded by both Boards on this point; and, while Lord George Hamilton had no objection to leave this matter to the full executive discretion of the President, he recommended the remarks of the Visitors on this subject to Colonel Pennycuick's serious attention.

It appears to me that the facts of the case have never been laid with sufficient clearness before the Board of Visitors. The contention of the Board would seem to be that a student's tutor is the proper person to afford assistance to his particular pupils, but this argument is based on a misconception of the functions of the tutors here at Coopers Hill. The students are divided in fairly equal proportions between the various Professors and Instructors. Now, one tutor's subject is botany, another deals with chemistry, a third with physics, a fourth with forest management, and so on. The subjects on which the students ordinarily require additional help are Mathematics, Applied Mechanics, and the higher branches of Engineering. It is obvious that it would be worse than useless for a student needing instruction out of lecture hours on any of these subjects to approach his tutor if the latter happened to be a man entirely ignorant of the subject.

The *tutors* (in the Cooper's Hill sense of the term) only look after the material welfare and general behaviour of the students allotted to them, and conduct the necessary correspondence regarding them with the parents or guardians. They are in no sense "tutors" as understood by the Board.

In many cases, too, the term "lecture" is a misnomer, for, as explained apparently to the late Board of Visitors, the "lecture proper" very often only occupies a fraction of the time devoted to a subject, the balance being occupied in solving individual difficulties. In my judgment, this principle requires further extension. Quite apart from this, however, it has been customary for Mr. Lodge, the Professor of Pure Mathematics, to hold a tutorial class one evening in the week, at which any student can attend for additional instruction. Dr. Brightmore has also worked on these lines, and I hope, when the curriculum is remodelled, that we shall have a good deal more *individual* instruction than is at present found practicable.

I venture to think that, with this explanation, I shall carry the Board with me, and that it will not be thought that I am throwing difficulties in the way when I say that the *tutors, quâ* tutors, are for the most part incapable of giving the assistance desired. I think the end we all have in view can be best attained by reducing the length of the "lecture" proper, devoting more time to individual cases during what are now called "lecture hours," and by extending as much as possible the system of optional tutorial classes wherever these are found to be really needed.

10th February, 1900.

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*Mr. Shields and Electrical Engineering.*

Two questions were raised by the Board of Visitors. (a) Whether attendance at an electrical engineering class should be compulsory, and (b) whether Mr. Shields had sufficient practical knowledge to fit him for the post of instructor?

As regards (b) Colonel Pennycuick reported that Mr. Shields' practical experience was sufficient for the purpose. As regards (a) he did not consider it advisable to make the study compulsory. The Secretary of State accepted the view that attendance should be confined to those who have special aptitude for and an inclination towards the study.

Personally, I am inclined to think that the study of at any rate the elements of the subject should be made compulsory on all engineer students.

14th February, 1900.

*Instruction in Canal and Railway Construction.*

The Board of Visitors stated their opinion that the regular Engineering curriculum should be supplemented by special series of lectures dealing with the special features of Canal and Railway Construction and Management. They thought, however, that arrangements should be made for carrying out their views without increasing the cost of the teaching staff. The Secretary of State asked the President what measures he would suggest as most suitable for giving effect to these views. Colonel Pennycuick remarked that it was not clear why the matter had been alluded to by the Board.

With reference to this reply, the Secretary of State pointed out what the proposal of the Board really was, and invited Colonel Pennycuick to submit proposals for carrying out that recommendation. Colonel Pennycuick replied as follows:—"The really important point of my letter was the course of lectures on Railway Construction and Management, and I thought I had made it clear that, *with the staff as at present organised*, it was not possible to provide for this 'without increasing the cost of the teaching staff,' *inasmuch as no member of the existing staff is competent to give the exact instruction which is required.*"

In this, from my experience, I am inclined to agree with my predecessor, but I do not consider that the cost of the teaching staff should be increased, and I think that the remedy lies rather in reorganising the staff.

The present system is antiquated, illogical, and quite out of date. What is required is a thorough overhauling of the whole system. If this were done, I feel quite certain that we could devise a much better curriculum and could provide not only for instruction in Railway and Canal and Electrical Engineering, but also for many other important matters, such, for instance, as waterworks, drainage, &c., which are at present either not taught at all or else slurred over in a very perfunctory manner. The first thing is to settle what we want the men to learn, and then to decide how best to afford the necessary instruction. In concert with some of my colleagues I am preparing a scheme on these lines, and, should it meet with the support of the Board, I imagine it could be carried out without difficulty.

16th February, 1900.

P.S.—I may mention that Colonel Pennycuick remarked that further experience had shown the necessity of devoting rather more time than is given at present to *Mathematics* and *Applied Mechanics*, and stated that it was doubtful whether this would leave time for an additional course on Railway Engineering. I quite agree that more time should be given to Mathematics, but I think this can be arranged for without omitting instruction on Railway Engineering.

## No. 7.

(EXTRACT.)

## MEMORANDA BY COLONEL OTTLEY ON THE EDUCATIONAL COURSE.

13th June, 1900.

Present system unsatisfactory and expensive.

During the past seven months I have devoted a good deal of time to the investigation of the facts connected with the education of the Engineer students at Coopers Hill. The conclusion I have arrived at is that in many respects the existing system leaves much to be desired, and that it is certainly not an improvement on that devised by the late Sir George Chesney when the College was instituted. I am persuaded, in short, that a much better education might be given at much less cost. In some departments the staff is excessive, in others the teachers are too few, the result being that an imperfect system of instruction has been necessarily adopted. Again, the relative importance of the various subjects has evidently not always been borne in mind, the consequence being that sufficient time has not, in my judgment, been allowed for instruction in some of the more important subjects, whilst others of relatively minor importance have absorbed too much of the limited time at our disposal.

Conditions governing the choice of curriculum.

To enable the members of the Board to form their own opinions on these points, I propose to lay before them some at least of the facts which have led me to the conclusions above stated. Before doing so, however, I think it desirable to invite attention to the two fundamental conditions on which any curriculum should, in my opinion, be based.

In the first place it is necessary to have a clear idea of the amount of time at our disposal for instruction; and in the second place we must be quite clear as to the relative importance of the subjects we propose to teach, in order that the less important (from our particular standpoint) may give way to the more important in the event of the time available not being sufficient for the thorough mastery of the whole.

There are, doubtless, other important considerations, but they must, I think, all be considered as subsidiary to the two above named.

Time available for instruction is limited to 90 weeks of 5½ days.

The Coopers Hill course is usually spoken of as of three years' duration, and the idea conveyed by this statement is that it is a fairly long one. This impression is, however, certainly incorrect. Each scholastic year is made up of three terms, and an inspection of the calendar will show that, after deducting periods set apart for examinations and recess week, the actual time available for teaching in each term does not exceed ten weeks, so that the year really consists of only 30 weeks of barely 5½ days each, whilst the whole course is completed in 90 such weeks.

A moment's consideration will show that this period is all too short for all that we profess to teach, and the only logical conclusion is that we must adhere to essentials, and rigorously discard all luxuries, however tempting they may appear to be.

Time available in hours per week.

There is yet another way in which the time available can be shown, viz., in *hours per week*.

I find from Colonel Chesney's timetable of 1871 that no less than 42½ hours per week were allotted to work in class or lecture. The corresponding figures at the present time are as follows:—

1st year students, 33·9 hours per week, including drill.

2nd year students, 30·7 hours per week, including drill.

3rd year students, 14·4 hours per week, including drill,

whilst the average for the whole three years works out to 26·3 hours per week.

After a very careful consideration of all the conditions, I have drawn up a fresh time table, from which the following figures are deduced :—

1st year students 35·9 hours per week, including drill, &c.,

2nd year students 35·9 hours per week, including drill, &c.,

3rd year students 25·5 hours per week, including drill, &c.,

or an average of 32·4 hours per week as against 26·3 hours at present, thus obtaining in the course of the three years no less than 549 additional hours for instruction. To do this, I have necessarily had to reduce very considerably the time set apart for what is called "Private Study," but, as I shall show hereafter, this will, in my judgment, be an unmixed blessing, though it will naturally not meet with universal approval, as it will increase the hours of work of some of the staff.

There can, I think, be no question but that "Engineering" should take the premier place at an Engineering College. Under this head I include "Surveying," "Drawing" in all its branches (geometrical, mechanical, and free hand), "Estimating" and "Accounts," "Electrical Engineering," and "Operations in the Workshops and Mechanical Laboratory," as well as "Engineering Construction" in all its various branches.

Relative importance of the various subjects.

Following close on the heels of "Engineering" should come "Mathematics," pure and applied, and after this "Chemistry," "Physics" (other than Electricity), and "Geology." In the limited time at our disposal no place can, I think, be found for languages, though I must say that I should like to see "Hindustani" taught at this College.

A new syllabus has been drawn up of the course of study necessary under the main head of "Engineering," and it will, perhaps, be convenient, if I subjoin a few remarks on the various sub-divisions into which the subject has been divided.

At the present time the subject of "Engineering Construction" is divided into three distinct heads, dealt with by three different professors. Mr. Heath takes what is known at Cooper's Hill as "Descriptive Engineering," which may perhaps be best described as so much of the subject as can be dealt with without mathematics. Professor Hearson takes "Hydraulics" and "Mechanical Engineering," whilst Dr. Brightmore takes what is left by the other two.

Engineering Construction.

This arrangement dates from the earliest days of the College—more than a quarter of a century ago—when it was found necessary to appoint Professor Unwin to teach "Hydraulics," because the late Professor Reilly was not competent to deal with the subject, whilst Mr. Heath was appointed to teach what was then considered to be "practical" engineering as opposed to the "theory of construction." The actual lecture hours involved in each case are as follows :—

*Mr. Heath, 3·6\* hours a week at present, though it has been as much in former years as 4·5 hours per week.*

*Professor Hearson, 10 hours a week.*

*Professor Brightmore, 7·1 hours a week.*

The cost of the arrangement, as it stands, amounts (including house rent or value of house) to 1,985*l.* a year at the very lowest figure.

The peculiarity of the situation to-day will, perhaps, better be realised when I explain that although "hydraulics" is Dr. Brightmore's strongest

\* This has been increased by 16 hours per week of "surveying."

subject, one on which, in conjunction with Dr. Tudsbury, he has published a recent and well-known text-book, he is debarred from teaching the subject which falls to Professor Hearson, the successor of Professor Unwin. Now, I have not the smallest hesitation in saying that Dr. Brightmore is perfectly capable of teaching the whole of the above subjects, and that, but for the difficulty of affording "tutorial" instruction to so large a class as, say, 40 or 50 students, he could easily teach the whole subject single handed. Owing to this difficulty, however, it would be necessary to allow him an assistant who could help him to give the necessary *tutorial* instruction in the manner usual at, say, the Royal Military Academy. There would be no difficulty whatever in finding a suitable assistant to Dr. Brightmore on 450*l.* a year, and in this case the combined emoluments would amount to 1,150*l.* or a saving of 835*l.* a year, whilst, in my judgment, the work would be done better, and more satisfactory results would be secured.

Dr. Brightmore and his assistant would then each have an average of 24·62 hours' work per week, including class and laboratory work. This amount will, I think, be held to be sufficient, but not excessive.

**Surveying.** "Surveying" used to be one of the strong points of the Cooper's Hill course. Of late it has fallen behind; the time devoted to it has been reduced, as has also been the staff. The subject is taught during one year (the last half of the first year, and the first half of the second year), and we propose to raise the number of hours per week devoted to this subject during this period to 12. This works out to an average of four hours per week over the whole three years' course, as against 2·7 hours at present. It is impossible for one man to teach this subject; two at least are necessary, because, although "divisions" (or, say, 24 men) are dealt with, no instructor can properly manage more than about 12 men as a *maximum* in the field. I should propose an Instructor on 450*l.* and an Assistant Instructor on, say, 350*l.* The total cost would therefore be 800*l.* a year, whilst the hours of work of each man would be 24 hours per week throughout the year. The cost formerly was 950*l.*, so that I think my proposals may be considered moderate, and at any rate I feel sure the subject could not be taught satisfactorily for much less.

**Drawing, Geometrical.** Under the head of "Geometrical Drawing" I propose no change. The subject is well taught, and we cannot afford more time than is at present allotted to it, viz., an average of 3·3 hours per week over the whole course.

**Estimating.** Mr. Hicks also teaches "Estimating," to which also I have allowed the same time as at present.

**Architecture.** Further, Mr. Hicks lectures on "Architecture," and this is a subject that I have been compelled to reduce considerably. Mr. Hicks' emoluments would remain, as at present, at 450*l.* a year, and his total hours of class-work would average 24 hours per week.

**Freehand.** I am most strongly of opinion that every Engineer Student should be taught "Freehand" drawing. By this term I do not mean "Landscape Drawing," or the drawing of pretty pictures, but I hold that it is absolutely necessary that every engineer should be capable of making an intelligible freehand sketch for the information of his superiors or the guidance of his subordinates. At present this subject is only taught at Cooper's Hill as an *alternative* to French and German. I propose to alter all this, and to compel every man to go through this course, and I have allotted time equivalent to one hour per week over the whole course. The subject would be taught by Mr. McElwee on the same terms as at present. He would have fully 20 hours per week, including the time spent on certain days in assisting Mr. Hicks in Geometrical Drawing. I regard the proposal to make "Freehand" drawing compulsory on all Engineer Students as one of the most important reforms I desire to see carried out.

**Electrical Engineering.** Electrical work is becoming daily more and more important to Engineers, and no man at the present day can be said to be properly equipped if he has not been taught at least the rudiments of the science, and something.

of its numerous applications in the profession. Hitherto, this subject can hardly have been said to have been taught at Cooper's Hill. It is true that some half a dozen men or so in each year are allowed to take it up as an *alternative* subject, but under my proposals every student would take up this subject, and would devote to it time equivalent to an average of  $2\frac{2}{3}$  hours per week during the whole of the three years' course. About half of this time would be in the lecture room, and the remainder in the laboratory. I understand from Sir William Preece, who has been consulted by me on this subject, that he is satisfied with my proposals. He points out that the instructor should be a thoroughly practical man, and such an one could, it is believed, be obtained for, say, 300*l.* a year, with free quarters in the College. The work would not be excessive as the time required in both class-room and laboratory would not exceed an average of about 21 hours per week of term time.

I have been compelled to slightly reduce the time allowed at present for "Accounts," and have allotted an average of 0.33 hour per week as against 0.4 hour. I am of opinion, moreover, that considerable changes ought to be made in the tuition of this subject. In my judgment, more attention should be paid to the initial accounts of disbursers, such, for instance, as fall to the lot of sub-divisional officers in India, than to the more elaborate and intricate mercantile and banking accounts to which attention is now largely directed. Accounts.

As matters stand at present, the time spent on the obligatory course in the workshops amounts to an average of 20 minutes a week, or say a total of 30 hours in three years. It is hardly necessary to comment on these figures. I find that I can allot  $1\frac{1}{2}$  hours per week to the workshops, but even this extension of time (more than quadruple the existing allowance) will not suffice to turn out finished "workmen," but we can at least show the students how work is done in the shops, and we can give them some clear ideas regarding the various classes of motors and the different kinds of machinery in common use. In addition to the workshops, students at present pay eight visits to the mechanical laboratory for the purpose of learning to test materials. This is a most useful course, but requires to be extended, and I therefore propose to allot an average of one hour per week to this subject in future. Workshops  
and  
mechanical  
laboratory.

I think it desirable in this place to invite attention to the extraordinary position of affairs in connection with the "workshop" and the "mechanical laboratory." Instead of being combined or in close connection with each other, these two shops are 50 yards apart, and are quite separate establishments. Each has its own complete staff of superintendents and workmen, its own engines, and machinery; in short the two establishments have no more to do with each other than if they belonged to rival firms. It is hardly necessary to point out that such duplication of men and material must lead to unnecessary expense when both belong to the same concern. The workshop was started under the late Professor Reilly, whilst the mechanical laboratory, which was subsequently built, was placed in charge of Professor Unwin. At present both are under Professor Hearson. The best way of amalgamating the two concerns is by no means an easy problem; I have, however, devoted considerable time to its consideration, and have come to the conclusion that the best solution would be the following: Hand over the present mechanical laboratory to Telegraph instruction, and build a new mechanical laboratory in continuation of the workshops at its western end. If the Board agree with me, I would have plans drawn out in detail. Such amalgamation would lead, I think, to economy in working, whilst it is evident that some fresh arrangements must be made for the better housing of the telegraph shops.

The importance to an engineer of a really sound training in mathematics can hardly be over-estimated. In a recent address Sir William Preece placed this knowledge foremost amongst the tools with which the engineer Mathematics.



should be equipped, and aptly styled mathematics "the shorthand of thought and purest form of logic." It is not that we require any extraordinarily advanced knowledge of the subject from all our students, but we do require that their grounding should be thorough. The position I take up in this matter is so admirably expressed in a passage I lately came across, that I am constrained to quote the words: "The principles should be so instilled into a student by a "lengthy course of study that the use of them becomes a kind of second nature."

Now, the knowledge of mathematics possessed by the average student at Cooper's Hill leaves much to be desired. There appears to be quite a consensus of opinion on this point, and the mathematical professors themselves are amongst the first to recognise and regret the fact, which appears to be due to several causes, prominent amongst which are the following:—

Many of the students come to the College badly equipped in this respect. This can gradually be overcome by stiffening up the entrance examination.

The course at present ends with the second year. This I propose to alter by continuing the teaching to the very end of the third year's course. I have it from many present and past students that many men know more of the subject at the end of the second year than they do a year later at the end of the course. In fact as soon as the final examinations in this subject at the end of the second year are over, many seem to make haste to forget all they have learnt, and this is easy, as much of the work has been "cram," and, in consequence, is easily forgotten. The postponement of the final examination to the end of the third year will, at any rate, give more time for learning, and must at least help to mitigate the evil of "want of familiarity" with the various operations. My proposals allow an average of 7.4 hours per week, spread over the whole course, in place of the present average of six hours per week compressed into the two first years of study.

The last great objection to the present method of teaching mathematics at the College appears to be that owing to the size of the classes, the professors have had to adopt the "lecture" as opposed to the "tutorial" system, because time does not admit of one teacher giving individual instruction to say 40 to 50 students within the time available in class. The remedy for this would clearly seem to be the addition of an instructor to aid each of the mathematical professors. The cost of two such men should not be great, and would probably be covered by 500*l.* a year and free quarters in the College.

It will be readily understood that the "lecture" system is fatal to good results when it is considered that a class of 50 students consists of a few exceedingly good men, of a certain number of average attainments, and of a considerable number who are distinctly weak. It is impossible to lecture profitably on mathematics to men of such diverse capabilities. The only possible way of obtaining fair results in such a case is to adopt text-books and the "tutorial" system, or individual instruction. It is unquestionable that this latter was the system approved of by the late Sir George Chesney. In his first "Regulations," he laid down the rule that in mathematical and similar subjects the students should be broken up into classes of about 25 each, whilst on the other hand, in the case of Experimental Science and some parts of the Engineering course, the "Lectures" would be delivered to the whole class collectively. This is the principle that I now wish to revert to, after having seen the failures due to a departure therefrom.

In my judgment the present course needs complete remodelling, inasmuch as I think it should be understood that we are not aiming at turning out "Chemists" but "Engineers," who only need sufficient knowledge of chemistry *to enable them to interpret the results given them by professional chemists.* To go beyond this is to waste time. Chemistry.

The expenditure under this head is, in my opinion, far heavier than is warranted. Professor McLeod draws (including value of house and allowance for gas and coals and for overlooking the analytical laboratory) £785 a year. To this must be added the pay and allowances of Dr. Matthews, which are fully £350 a year, or in all £1,135 a year. In order to arrive at the full cost of the teaching of this subject, we must add £75 for the Lecture Assistant, £35 for Laboratory Boy, and £60 for chemicals, making a total outlay of £1,305 a year. The hours of work (including the time spent in the Laboratory with the advanced chemical class of half a dozen men) is returned at about 15 hours a week during term time; this holds for both the Professor and the Demonstrator. My impression is that all that we require could be taught by one man on much less pay, and that the whole cost need not exceed say £645, or a saving of £660 on this one subject alone.

I should not propose to make much change in this subject, but I think it is open to question whether the Electrical Engineer could not teach all that was wanted, or, if not, that an occasional lecturer might be imported. The present cost of the teaching of this subject may be put at 90*l.* for the Professor and Demonstrator in addition to 75*l.* for the Lecture Assistant, and say 90*l.* for apparatus, &c., or a total of 1,065*l.* per annum. Physics.

I have cut "Geology" down very largely, as I cannot find time for more than 30 lectures in all. This should suffice to give a general idea of the subject, and more cannot be asked for. Geology.

As previous remarked, I have cut out both French and German from my proposed timetable. At present those subjects are taken up as *alternatives* with freehand drawing. Only four Engineers are at present attending the German Class, whilst 26 go to the French Professor; of these latter, five are natives of Mauritius or Egypt, with whom French is practically their mother tongue. These students consequently take up the subject, not for the sake of learning, but for the purpose of making marks in competition with those learning drawing. This is in itself a reason for discontinuing the *alternative* class; moreover, as I have already stated, *all* Engineer students should learn drawing, and I cannot find the time for French and German in addition to all the other work they have to learn. French and German.

Having dealt above with the various subjects referred to in paragraph 5, I propose now to add a few remarks on some other points to which my attention has been drawn from time to time, and will commence with the P.S. or "Private Study" system, which is at present much in evidence at this College. This system formed no part of Colonel Chesney's original scheme, but has since then gradually grown up until, to my mind, it has assumed very objectionable proportions. The figures already given will have given some idea of the extent to which the practice is carried, but a clearer idea will perhaps be gathered from the following timetable of the third year students at the present time:— Private Study system.

On Mondays, they have one lecture between 11.30—12.30.

On Tuesdays, they have one lecture between 10.10—11.20.

On Wednesdays, they have two lectures between 8.30—12.30.

On Thursdays, they have two lectures between 8.30—11.20.

On Fridays, they have two lectures between 9.40—12.30.

On Saturdays, they have one lecture between 8.30—9.30.

All the work, therefore, that is done "under supervision" during the week is 13 hours in all, or a little over two hours a day, the balance of the working day being supposed to be taken up by private study. Possibly some of the best men do work steadily in their rooms, but I know that a good many do not. The system leads, in the first place, to idleness during a considerable portion of the time, and then to night work towards the end of the various periods. It also affords most objectionable facilities for copying of note books and the fudging of plans and plates. In regard to this, I should like to quote the words of one of the Professors, who, in most respects, is strongly opposed to any change at this College. He says:—"A practice has grown up of lending assistance in the "completion of designs which works out unfairly to the less popular students." I may add, that it is notorious that note books are copied, designs assisted, and plates finished up, and all this is solely due to the P.S. system, and would be at once done away with if the mass of the work were done in class and under supervision. In my judgment the practice has nothing to recommend it, and I find that it has been abandoned at Sandhurst, whilst, so far as I know, it has never been permitted at all at Woolwich. I have no objection to men studying in their rooms in the evening, but I am very strongly of opinion that, during the day all work should be done in class and under supervision.

Altern-  
ative  
courses.

Another practice to which I strongly object is that of *alternative courses*. I have already said that I object to "Freehand" drawing being pitted against "French" and "German," but the practice does not end here, as a third year student may elect one of the three following alternatives:—

Turbine Design and Architectural Design,	}	or	}	Turbine Design and Chemical Laboratory,	}	or	}	Electrical Engineering.
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Now, quite apart from the fact that I do not favour the "turbine design" from any point of view, and that I consider that every student should be taught electrical engineering, it seems to me practically impossible to frame any standard that shall be common to such very distinct studies. I am opposed to these alternative courses, which should, in my opinion, be discontinued in the future.

System of  
marking  
and  
qualifying  
minimum.

The question of the "qualifying minimum" is one of very considerable importance, especially in view of the fact that the Institution of Civil Engineers accepts the College diploma of "Associate" in lieu of its own examinations, on the understanding, of course, that this diploma represents considerable proficiency in the subjects taught at the College. Now, to my mind, the system of "marking" in force at Cooper's Hill is peculiar, to say the least of it. To make this clear, I must go into considerable detail. In the first place it must be understood that the various subjects now taught are arranged in *Branches*, and no "qualifying minimum" is required in any *individual subject*. The minimum *only applies to the total of each Branch, and to the total of all the Branches*. As will be seen from the following statement, the "qualifying minimum" is not always the same, but varies according to the Branch dealt with.

*Branch I. (Engineering).*—The qualification is  $\frac{3}{4}$ ths (40 per cent.) of the obligatory marks. This Branch includes the following subjects:—

1. Descriptive Engineering.
2. Surveying.
3. Architecture.
4. Geometrical Drawing.

5. Estimating.
6. Accounts.
7. Project Survey.
8. Engineering Design (bridge).
9. Mechanical Design (turbine).
10. Part of Electrical Engineering.
11. Workshop.
12. Reports on Works.
13. Mechanical Laboratory.
14. Architectural Design.

Now, from what has been said above, it will be understood that a man might miss out one or more of these subjects, and yet, so long as he managed to qualify on the total of the Branch, he would be shown as qualified.

*Branch II. (Applied Mechanics).*—The qualification is  $\frac{1}{4}$  (25 per cent.) of the obligatory marks. This Branch comprises—

1. Construction.
2. Hydraulics and Mechanism.

As regards this Branch, the first observation that I have to make is that it should not exist at all; these two subjects should clearly come under *Branch I. (Engineering)*. The second observation is that the qualifying minimum is very low.

*Branch III. (Mathematics).*—The qualification here, too, is  $\frac{1}{4}$  (25 per cent.) of the obligatory marks. The subjects are—

1. Pure Mathematics.
2. Applied Mathematics.

This Branch should stand, but the remarks above made regarding the lowness of the minimum apply in this case also.

*Branch IV. (Natural Science).*—Here the qualification is  $\frac{1}{3}$  (say 33·3 per cent.) of the obligatory marks. The subjects comprised in this Branch are—

1. Chemistry.
2. Physics.
3. Geology.
4. Part of Electrical Engineering.

The qualification here also appears to be low.

In addition to qualifying in each of the above Branches separately, every student is required to obtain  $\frac{2}{3}$ ths (40 per cent.) of the total obligatory marks of all the subjects.

There is yet another condition towards the obtaining of a diploma on leaving the College, viz., the student must have obtained  $\frac{2}{3}$ ths (40 per cent.) of the total obligatory marks *awarded for the third year's work*.

I am told that this condition had to be imposed because it was found that many men had made enough marks by the end of the second year to carry them

right through to the end, and they consequently "slacked off" during the third year. It seems to me that this explanation alone is sufficient to condemn the "minima" adopted. If in the first two years a good student can earn enough marks to carry him through the whole three years' course, it seems clear that the qualification adopted must be preposterously low.

I am inclined to think that a minimum of, say, 40 per cent. should be insisted on in *each subject*, 50 per cent. of the *total of each Branch* for a "pass" or second class certificate, and 75 per cent. for a first class in any particular Branch, and, as previously remarked, I should amalgamate Branches I. and II. under the general head of "Engineering."

Weight attached to each subject and influence of external examiners.

The next point to be considered in connection with this subject is the weight attached to each subject, and the influence of external examiners in the final results. The system of marking at this College is so fearfully complicated that it is impossible to state shortly what the exact figures are in any particular case, but the following figures for the obligatory course are sufficiently near the truth to enable a general idea to be formed:—

Branch.	Subject.	Marks.			Proportion of External to Total.
		College.	External.	Total.	
Total for Branch I., Engineering	Descriptive Engineering ...	375	145	520	27 per cent.
	Surveying ... ..	220	140	360	38 per cent.
	Architecture ... ..	—	80	80	100 per cent.
	Geometrical Drawing ...	315	85	400	21 per cent.
	Estimating ... ..	20	60	80	75 per cent.
	Accounts ... ..	35	35	70	50 per cent.
	Project Surveying ... ..	140	—	140	Nil.
	Bridge Design ... ..	—	180	180	100 per cent.
	Electrical Engineering ...	100	80	180	44 per cent.
	Workshop ... ..	30	—	30	Nil.
	Mechanical Laboratory ...	60	—	60	Nil.
... ..	1,295	805	2,100	36 per cent.	
Total for branch II., Applied Mechanics	Applied Mechanical Construction.	410	140	550	25 per cent.
	Mechanism and Hydraulics.	390	160	550	29 per cent.
	... ..	800	300	1,100	27 per cent.
Total for Branch III., Mathematics	Applied Mathematics ...	275	125	400	31 per cent.
	Pure Mathematics... ..	300	100	400	25 per cent.
	... ..	575	225	800	28 per cent.
Total for Branch IV., Science.	Chemistry ... ..	80	80	160	50 per cent.
	Chemical Laboratory ...	30	70	100	70 per cent.
	Physics ... ..	160	—	160	Nil.
	Physical Laboratory ...	100	—	100	Nil.
	Geology ... ..	120	120	240	50 per cent.
	Electrical Engineering ...	80	130	211	61 per cent.
	Electrical Laboratory ...	—	180	180	100 per cent.
... ..	570	580	1,150	50 per cent.	

The total weight of the external examiners over the whole course is 37 per cent., as they allot 1,910 marks out of a total of 5,150.

I think it is a matter for consideration whether the scheme of marks should not be remodelled, and whether it would not be desirable to give more weight to the opinions of external examiners.

The theory is that the external examiners are nominated by the President. The practice appears to have been that the Professors have invariably put forward the names for the President's formal nomination. This is a matter that admits of easy remedy directly the President is possessed of information as to suitable examiners. Possibly some members of the Board of Visitors may be able to afford the President some valuable hints in this direction.

Selection  
of ex-  
aminers.

There is another matter in connection with the marks obtainable that may be fitly mentioned here. Extra marks are given for drill (70) and gymnastics (30).

Extra  
marks for  
bodily and  
other  
exercises.

These marks, of course, affect the total, and consequently the final order of merit, but they do not affect the "diploma," the grant of which is, of course, based only on the work done in the various branches.

I think this system of "extra" marks is sound, and merits considerable extension. For instance, I think marks might be given for "marksmanship," for "football," various kinds of athletics, and "rowing." They might also be given for "photography" and for "first aid," both of which subjects are from time to time studied here; the idea being to encourage, as far as possible, both bodily and mental development.

Lastly, there is one particular extension of this system of "extra" marks to which I desire to invite special attention. Shortly after I came to the College, I was much struck with the very elaborate system of "fines" which had gradually grown up, but which seemed in many cases to have but little deterrent effect on the students. As matters stand—short of dismissal or removal, which are obviously only suited to very special cases—fines are the only possible form of punishment, except perhaps stoppage of leave in certain cases. I omit "gating" as being notoriously useless in such a place as Coopers Hill. After considerable thought, it occurred to me that it might be possible to allot marks for discipline, and to deduct marks for infraction of rules. Professor McLeod worked out the question for me, and we came to the conclusion that if we allowed a total of 800 marks, we could consider one mark equivalent to 1s., so that where a man was now fined 1s. he should lose one mark.

Marks for  
discipline.

The suggestion was then discussed by the College Board, and in the end it was decided, almost unanimously, that the idea was a good one, and at least deserved trial; the general feeling being that it would be well to introduce it in conjunction with fines, rather than as an absolute substitute for them, whilst many thought that the power of reducing marks should lie entirely with the President, except in those cases where the action would be automatic. My own feeling is that the adoption of some such system as I have outlined would make for discipline, the want of which is certainly one of the weakest points at Coopers Hill.

It would be well to record here another decision arrived at by the College Board since I took over charge of this College.

Special in-  
dulgencees.

I refer to the question of the grant of indulgences or exemptions to certain students.

As the Board is probably aware, the students at this College have hitherto prepared certain projects and designs during the private study hours, and these have had to be handed in at noon on a specified day. In November last it was brought to my notice by one of my colleagues that during the last year or

two extensions of time had been granted to various students, in some cases for a few hours only, in others the extensions of time ran into days. The argument against this practice was that a "general" extension to a whole class gave an advantage to the more dilatory, and therefore the less deserving, students at the expense of their more studious and punctual classmates, whilst "special" extension to an individual was even worse, as it was practically a gift to him at the expense of all his fellows. On going further into the question, I found that "indulgences" had not ended here, but had been allowed even in the case of written examinations. I was informed that on more than one occasion students had been allowed to take their examinations in their own rooms, and practically without supervision. Indeed, I was told of one case where the papers had been actually sent to a student at his own home.

I brought both questions before the College Board, with the result that it was decided that in future the order that designs should be handed in punctually at noon on a fixed date should in future be rigorously adhered to. It was further held that, although the President might advantageously reserve to himself the power of treating exceptional cases in an exceptional manner, the general rule should be that special indulgencies in the matter of examinations should only be granted on the understanding that the student concerned should retire from competition with his fellows. This, then, is the principle I am now acting on. I have permitted examinations to be conducted in a student's room on the Medical Officer's representation that it was undesirable that the individual should go to the general examination room, but in all such cases I have insisted on the presence in the room of one of the College staff told off for that duty.

If, as I propose, all designs in future are completed under supervision, there will be no necessity for the rule enforcing punctuality in their submission.

Unfair practices during examination.

So far as I can learn, there is no suspicion of "cribbing" or other unfairness in the written examinations so far as the competition for appointments are concerned, but the same does not hold in the case of some men low down the list who are endeavouring to "qualify" for a pass degree, and special measures will have to be taken to guard against improper practices in such cases.

Failures during course.

I have been asked to state the percentage of failures both in the intermediate and final examinations.

Failures in Intermediate examinations.

As regards the former, I have found that it would be a most laborious business to trace the disqualifications in every branch for any considerable period. I have therefore decided to take the last two terms only as an example. The figures relate solely to the first and second year students, as third year students only come under examination at the final.

*Second Year Students.*

	Autumn Term, 1899.	Easter Term, 1900.
Qualified ... ..	31	29
Not qualified ... ..	5	4
Total number of students ...	36	33

The percentage of failures in these cases were 14 and 12 per cent. respectively.

*First Year Students.*

	Autumn Term, 1899.	Easter Term, 1900.
Qualified ... ..	28	29
Not qualified ... ..	17	13
Total number of students ...	45	42

The percentages here were 37 and 31 respectively.

When it is considered how low the qualification minimum has been pitched, it is not very satisfactory to find that in the first year an average of say 34 per cent. fail to qualify, and that in the second year so many as 13 per cent. fail to qualify. The conclusion would appear to be that the entrance examination should be stiffened up considerably.

Turning now to the question of failures in the *Finals*, it has been easier to get at the figures, and another very curious fact has been brought out, viz., that in every batch, a great number of men drop out during the three years. This will be apparent from the following figures for the five years 1895-99 inclusive :—

Failures at  
Finals.

	1895.	1896.	1897.	1898.	1899.
Number of students in first year ... ..	31	32	39	42	46
"    "    second year {	21	23	26	31	40
"    "    "    {	3	3	3	3	3
"    "    third year ... ..	19	21	25	27	36

These figures show that out of every 100 men entering the college, 20 have dropped out before the commencement of the third year.

These men leave, of course, for various reasons, but, speaking broadly, it may be said that the great mass of these men are "failures"

We now come to the balance left during the third year, and regarding these the facts for the same five years are as follows :—

	1895.	1896.	1897.	1898.	1899.
Number of students in third year ... ..	19	21	25	27	36
Number obtaining diploma ... ..	17	21	22	23	33
Number who fail ... ..	2	—	3	4	3

In these five years the number of men who completed their three years' course was 128, of these 116 obtained diplomas, whilst 12 failed to do so.

The failures, therefore, average 9·4 per cent. of the number of men competing in the Final, and it will be seen that only 70 men obtain diplomas out of every 100 entering the College, the remaining 30 being "failures," either dropping out during the course or else failing to qualify at the end of the three years' course. This is a somewhat startling result.



I have been asked to state the terms on which the staff holds office. I believe I am correct in stating that without exception they retain their posts only so long as they give satisfaction to the President, whilst I believe that in all cases there is an additional clause that it shall be open to either side to determine the agreement—without reason assigned—on one term's notice.

I attach statements showing the times now occupied in teaching the various engineering subjects; also the hours devoted in class by students to the various studies; also my proposed timetable for the future.

In conclusion I should wish to bring to the notice of the Board the following extract from a private letter I have just received from Mr. Benton, the senior "Fellow of Cooper's Hill College" and a man of known ability. He remarks that:—"If professional subjects receive more attention, and the sciences less, I am sure the students will bless you in after life for their better adaptation to the work they have to do. Many is the time I have heard Cooper's Hill men regret having had their time taken up with what they have no use for, whilst compelled to come away from the College before fully mastering what is constantly turning up in practice. The syllabus for many years past has required 'revisions' in the light of what is of most use in Indian and English practice."

## Enclosure 1 in No. 7.

Times of Actual Teaching spent by Members of the Staff (exclusive of Forestry), compiled from the Timetables for Session 1898-99 (Summer Term) and 1899-1900 (Autumn and Easter Terms). Compiled by Dr. Matthews.

Names.	Subjects.	Hours per Week.				Remarks.
		1899. Summer Term.	1899. Autumn Term.	1900. Easter Term (Two Time- tables).	Means.	
Professor Hearson	M. E. ... ..	9.5	11.4	9.0	10.0	Time also spent in workshop and mechanical laboratory, and in mechanical design.
Dr. Brightmore...	E. ... ..	*—	6.5	7.6	7.1	Surveying times omitted.
Mr. Heath ...	Survey ... ..	16.0	—	16.0	16.0	19.6 hours per week with survey; 3.6 hours per week without. The summer term of 1899 was exceptional, the average D. E. in former years being 4.5 hours per week. Has also project (?) and railway station design (1 week).
	D. E. ... ..	1.2	4.5	4.1	3.6	
Mr. Hicks ...	G. D. ... ..	8.8	10.6	11.1	—	Time spent also on architectural design, two mornings per week for seven weeks.
	Estimating ...	2.7	2.8	2.9	—	
	Architecture ...	2.2	—	—	—	
	Total ... ..	13.7	13.4	14.0	13.7	
Mr. Woods ...	Survey ... ..	16.0	16.0	16.0	16.0	
Mr. McElwee ...	G. D. ... ..	8.8	10.6	11.1	—	
	F. D. ... ..	7.8	7.8	8.3	—	
		16.6	18.4	19.4	18.2	
Professor Minchin	A. M. ... ..	9.3	9.3	10.0	9.5	Has also 1½ hours per week for 14 weeks with electrical engineers.
Professor Lodge	M. ... ..	11.2	9.6	11.3	10.7	Has also evening classes 1 to 2 hours per week.
Professor McLeod	Chem. and Chem. Lab.	13.0	14.0	14.0	13.7	Has also 100 hours per annum advanced chemical laboratory during the Easter Term.
Professor Stocker	Physics and Lab.	17.8	17.8	17.8	17.8	
Mr. Shields ...	Physical Lab. ...	20.0	15.5	14.0	17.0	Has also 15 hours per week for 15 weeks with electrical engineers during the Autumn and Easter Terms.
	Drill ... ..	1.5	—	—	—	
		21.5				
Dr. Matthews ...	Chem. Lab. and Org. Chem.	14.0	14.0	13.0	13.7	Has also 100 hours per annum advanced chemical laboratory during the Easter Term.

\* Only joined at commencement of last autumn term.

Enclosure 2 in No. 7.

The number of hours of work under supervision. Compiled by Dr. Matthews.

				G. D.	Surveying.	Freehand Drawing or French or German.	Estimating.	Accounts.	Workshop.	D. E.	Architecture.	Applied Mechanics, E.	M. E.	Mathematics.	A. M.	Chemistry.	Chemical Laboratory.	Physics.	Physical Laboratory.	Geology.	Drill.		
Autumn Term	3 Y.	—	—	—	3·7	2·0	—	1·2	—	4·0	4·7	—	—	—	—	—	—	—	—	—	—	15·6 hours.	
	2 Y.	3·5	8·0	—	—	—	—	1·0	—	3·0	3·8	3·7	3·7	—	—	—	1·2	3·0	2·0	—	—	32·9 hours.	
	1 Y.	7·2	—	2·0	—	—	1·5	2·0	—	—	—	5·0	7·5	2·0	3·0	1·2	—	3·0	—	—	—	34·4 hours per week.	
Easter Term	3 Y.	—	—	—	3·4	2·0	—	1·6	—	3·9	3·8	—	—	—	—	—	—	—	—	—	—	13·8 hours.	
	2 Y.	4·2	4·0	—	—	—	—	1·6	—	2·8	3·9	3·6	3·7	—	—	—	1·1	3·0	2·1	—	—	30·0 hours.	
	1 Y.	6·4	4·0	2·0	—	—	0·8	2·0	—	—	—	4·3	5·9	2·0	3·0	1·1	—	3·0	—	—	—	34·5 hours per week.	
Summer Term	3 Y.	—	—	—	2·7	—	—	1·2	—	3·8	4·7	—	—	—	—	—	—	—	—	—	1·5	12·4 hours + 1½ hours' drill per week.	
	2 Y.	3·8	—	—	—	—	—	1·3	2·2	2·7	5·3	4·2	4·0	—	—	—	1·2	3·0	—	—	1·5	27·7 hours + 1½ hours' drill per week.	
	1 Y.	5·0	8·0	2·0	—	—	—	1·2	2·2	—	—	4·0	3·8	1·0	3·0	1·2	—	—	—	—	1·5	31·4 hours + 1½ hours' drill per week.	
Total	—	30·1	24·0	6·0	9·8	4·0	2·3	13·1	4·4	20·2	26·2	24·8	23·6	5·0	9·0	7·0	9·0	10·1	4·5	—	—		
Hours per week during three years...	—	3·3	2·7	0·7	1·1	0·4	0·3	1·0	0·5	2·2	2·9	2·8	3·2	0·6	1·0	0·8	1·0	1·1	0·5	—	—	—	= 26·5 hours' work per week.
Time for subject (percentages)	—	12·4	10·2	2·5	4·1	1·5	1·1	5·6	1·9	8·3	10·9	10·6	12·1	2·3	3·8	2·9	3·8	4·1	Drill,	—	—	—	
Branch I., 39·3 per cent.											Branch II., 19·2 per cent.		Branch III., 22·7 per cent.		Branch IV., 16·9 per cent.					1·9 per cent.	= 100 per cent.		

## Enclosure 3 in No. 7.

## Suggested Time Table for First Year Students.

Autumn Term, and First Half of Easter Term to end of February, say 15 Weeks.			Second Half of Easter Term, from 1st March, and Summer Term, say 15 weeks.		
Day.	Hours.	A Division.   B Division.	Hours.	A Division.   B Division.	
Monday ...	8.30—10.0	Mathematics.	6.45—7.45	Gymnastics.   Musketry.	
	10.10—11.10	Engineering.		Phys. Drill.   Field Work.	
	11.20—12.20	Chemistry.	8.45—10.0	Mathematics.	
	1.0—3.0	F. Drawing.   Workshops. G. Drawing.   Chem. Laby.	10.10—11.10	Engineering.	
	9.0—11.0	Private Study (Note 9—10 Optional Mathematics).	11.20—12.20	Surveying.   Architecture.	
			1.0—4.0	F. Drawing. G. Drawing.	
			9.0—11.0	Private Study.	
Tuesday ...	8.30—10.0	Applied Mathematics.	6.45—7.45	Musketry.   Gymnastics.	
	10.10—11.10	Engineering.		Field Work.   Phys. Drill.	
	11.20—12.20	Physics.	8.45—10.0	Applied Mathematics.	
	1.0—3.0	Workshops.   F. Drawing. Chem. Laby.   G. Drawing.	10.10—11.10	Engineering.	
	9.0—11.0	Private Study (9—10 Optional Mathematics).	11.20—12.20	Architecture.   Surveying.	
			1.0—4.0	F. Drawing. G. Drawing.	
			9.0—11.0	Private Study.	
Wednesday ...	8.30—10.0	Mathematics.	6.45—7.45	Drill.	
	10.10—11.10	Engineering.	8.45—10.0	Mathematics.	
	11.20—12.20	Electricity.	10.10—11.10	Engineering.	
	1.0—2.0	Geometrical Drawing.	11.20—12.20	Physics.	
	9.0—11.0	Private Study.	1.0—2.0	Geometrical Drawing.	
			9.0—11.0	Private Study.	
Thursday ...	8.30—10.0	Applied Mathematics.	6.45—7.45	Phys. Drill.   Field Work.	
	10.10—11.10	Engineering.		Gymnastics.   Musketry.	
	11.20—12.20	Physics.	8.45—10.0	Applied Mathematics.	
	1.0—3.0	G. Drawing.   Chem. Laby. F. Drawing.   Workshops.	10.10—11.10	Engineering.	
	9.0—11.0	Private Study (9.0—10.0 Optional Mathematics).	11.20—12.20	Surveying.   Electricity.	
			1.0—4.0	G. Drawing. F. Drawing.	
			9.0—11.0	Private Study.	
Friday ...	8.30—10.0	Mathematics.	6.45—7.45	Field Work.   Phys. Drill.	
	10.10—11.10	Chemistry.		Musketry.   Gymnastics.	
	11.20—12.20	Geology.	8.45—10.0	Mathematics.	
	1.0—3.0	Chem. Laby.   G. Drawing. Workshops.   F. Drawing.	10.10—11.10	Engineering.	
	9.0—11.0	Private Study (9.0—10.0 Optional Mathematics).	11.20—12.20	Electricity.   Surveying.	
			1.0—4.0	G. Drawing. F. Drawing.	
			9.0—11.0	Private Study.	
Saturday ...	8.30—9.40	Applied Mathematics.	6.45—7.45	Drill.	
	9.50—10.50	Geology.	8.30—9.40	Applied Mathematics.	
	11.0—12.0	Geometrical Drawing.	9.50—10.50	Engineering.	
			11.0—12.0	Geometrical Drawing.	

## Suggested Time Table for Second Year Students.

Autumn Term, and First Half of Easter Term to end of February, say 15 Weeks.				Second Half of Easter Term, from 1st March and Summer Term, say 15 Weeks.		
Day.	Hours.	C Division.	D Division.	Hours.	C Division.	D Division.
Monday ...	8.30—10.0	Applied Mathematics.		6.45—7.45	Bridge Wk.   Reposy. Wk.	
	10.10—11.10	Geometrical Drawing.		8.45—10.0	Applied Mathematics.	
	11.20—12.20	Surveying till 4.0.	Engineering.	10.10—11.10	Geometrical Drawing.	
	1.0—2.0		Electricity.	11.20—12.20	Engineering.	
	2.10—3.0		Eng. Design. Phys. Laby.	1.0—4.0	Workshops.   Mech. Laby Chem. Laby.   Phys. Laby.	
	9.0—11.0	Private Study.		9.0—11.0	Private Study.	
Tuesday ...	8.30—10.0	Mathematics.		6.45—7.45	Reposy. Wk.   Bridge Wk.	
	10.10—11.10	Geometrical Drawing.		8.45—10.0	Mathematics.	
	11.20—12.20	Engineering	Surveying till 4.0.	10.10—11.10	Geometrical Drawing.	
	1.0—2.0	Electricity.		11.20—12.20	Engineering.	
	2.10—3.0	Eng. Design. Phys. Laby.		1.0—4.0	Chem. Lab.   Phys. Laby. Workshops.   Mech. Laby.	
	9.0—11.0	Private Study.		9.0—11.0	Private Study.	
Wednesday ...	8.30—10.0	Applied Mathematics.		6.45—7.45	Drill.	
	10.10—11.10	Geometrical Drawing.		8.45—10.0	Applied Mathematics.	
	11.20—12.20	Engineering.		10.10—11.10	Geometrical Drawing.	
	1.0—2.0	Physics.		11.20—12.20	Engineering.	
	9.0—11.0	Private Study.		1.0—2.0	(9) Lectures Electricity. (6) Lectures Metallurgy. Iron and Steel	
	9.0—11.0	Private Study.		9.0—11.0	Private Study.	
Thursday ...	8.30—10.0	Mathematics.		6.45—7.45	Bridge Wk.   Reposy. Wk.	
	10.10—11.10	Geometrical Drawing.		8.45—10.0	Mathematics.	
	11.20—12.20	Surveying till 4.0.	Engineering.	10.10—11.10	Geometrical Drawing.	
	1.0—2.0		Electricity.	11.20—12.20	Engineering.	
	2.10—3.0		Phys. Laby. Eng. Design.	1.0—4.0	Mech. Laby.   Workshops. Phys. Laby.   Chem. Laby.	
	9.0—11.0	Private Study.		9.0—11.0	Private Study.	
Friday ...	8.30—10.0	Applied Mathematics.		6.45—7.45	Reposy. Wk.   Bridge Wk.	
	10.10—11.10	Geometrical Drawing.		8.45—10.0	Applied Mathematics.	
	11.20—12.20	Engineering	Surveying till 4.0.	10.10—11.10	Geometrical Drawing.	
	1.0—2.0	Electricity.		11.20—12.20	Engineering.	
	2.10—3.0	Phys. Lab. Eng. Design.		1.0—4.0	Phys. Laby.   Chem. Laby Mech. Laby.   Workshops.	
	9.0—11.0	Private Study.		9.0—11.0	Private Study.	
Saturday ...	8.30—9.40	Mathematics.		6.45—7.45	Drill.	
	9.50—10.50	Geometrical Drawing.		8.30—9.40	Mathematics.	
	11.0—12.0	Engineering.		9.50—10.50	Geometrical Drawing.	
				11.0—12.0	Engineering.	

## Suggested Time Table for Third Year Students.

Autumn Term, and First Half of Easter Term to end of February, say 15 Weeks.				Second Half of Easter Term, from 1st March, and Summer Term, say 15 Weeks.		
Day.	Hours.	E Division.	F Division.	Hours.	E Division.	F Division.
Monday ...	8.30—10	Workshops. Mech. Lab.	Phy. Lab. Designs.	8.30—10	Workshops. Mech. Lab.	Phy. Lab. Designs.
	10.10—11.10	Mathematics.		10.10—11.10	Applied Mathematics.	
	11.20—12.20	Estimating.		11.20—12.20	Electricity.	
	1—3	Engineering including Designs.		1—3	Engineering and Designs.	
	3—4			3—4	Photography, &c.	
9—11	Private Study.		9—11	Private Study.		
Tuesday ...	8.30—10	Mech. Lab. Workshops.	Designs. Phy. Lab.	8.30—10	Mech. Lab. Workshops.	Designs. Phy. Lab.
	10.10—11.10	Applied Mathematics.		10.10—11.10	Mathematics.	
	11.20—12.20	Electricity.		11.20—12.20	Electricity.	
	1—3	Engineering including Designs.		1—3	Engineering and Designs.	
	3—4			3—4	Photography, &c.	
9—11	Private Study.		9—11	Private Study.		
Wednesday ...	8.30—10	Designs.		6.45—7.45	Drill.	
	10.10—11.10	Mathematics.		8.45—10	Designs.	
	11.20—12.20	Estimating.		10.10—11.10	Applied Mathematics.	
	1—2	Engineering.		11.20—12.20	Estimating.	
	9—11	Private Study.		1—2	Designs.	
			9—11	Private Study.		
Thursday ...	8.30—10	Phy. Lab. Designs.	Workshops. Mech. Lab.	8.30—10	Phy. Lab. Designs.	Workshops. Mech. Lab.
	10.10—11.10	Applied Mathematics.		10.10—11.10	Mathematics.	
	11.20—12.20	Electricity.		11.20—12.20	Estimating.	
	1—3	Engineering including Designs.		1—3	Engineering and Designs.	
	3—4			3—4	Photography, &c.	
9—11	Private Study.		9—11	Private Study.		
Friday ...	8.30—10	Designs. Phy. Lab.	Mech. Lab. Workshops.	8.30—10	Design. Phy. Lab.	Mech. Lab. Workshops.
	10.10—11.10	Mathematics.		10.10—11.10	Applied Mathematics.	
	11.20—12.20	Estimating.		11.20—12.20	Estimating.	
	1—3	Engineering including Designs.		1—3	Engineering and Designs.	
	3—4			3—4	Photography, &c.	
9—11	Private Study.		9—11	Private Study.		
Saturday ...	8.30—9.40	Designs.		6.45—7.45	Drill.	
	9.50—10.50	Applied Mathematics.		8.30—9.40	Designs.	
	11—12	Accounts.		9.50—10.50	Mathematics.	
			11—12	Accounts.		

## No. 8.

Letter from the SECRETARY, PUBLIC WORKS DEPARTMENT,  
INDIA OFFICE, to the BOARD OF VISITORS.

16th July, 1900.

It is proposed to hold a meeting of the Board of Visitors of the Royal Indian Engineering College at the India Office on Tuesday, 24th July, at 2.30 p.m., and I hope that it will be convenient for you to attend on that day.

The subjects which will be under discussion are contained in the two notes by Colonel Ottley, the President of the College, which are enclosed herein.

I am, &c.,  
(Signed) EDMUND NEEL.

Sir C. H. T. Crosthwaite, K.C.S.I.  
Sir J. Wolfe Barry, K.C.B.  
Col. Sir W. S. S. Bisset, K.C.I.E., R.E.  
Sir D. Fox.  
Sir C. P. Ilbert, K.C.S.I.  
H. Leonard, Esq.  
Col. G. F. Pearson.  
Sir W. H. Preece, K.C.B.  
Sir A. M. Rendel, K.C.I.E.

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 No. 9.

(EXTRACT.)

REPORT BY THE BOARD OF VISITORS.

Dated 24th July, 1900.

We have had under our consideration the memorandum drawn up by the President of the Royal Indian Engineering College on the Educational Course at Cooper's Hill, and have discussed the various proposals which Colonel Ottley has made for the improvement of the instruction imparted at that Institution.

We now proceed to state the conclusions at which we have arrived.

*Time available for Instruction.*

Colonel Ottley shows that in 1871 no less than 42½ hours per week were allotted to work in class or lecture. At present the average for the whole three years' course works out to 26.3 hours per week. He has drawn up a fresh time-table which gives an average of 32.4 hours per week, thus obtaining in the course of three years no less than 549 additional hours of instruction.

It has been ascertained that the average time spent in class by the cadets at Woolwich Academy is 31.4 hours per week, to which must be added an average of 9.4 hours of drill, riding, &c., making a total of 40.8 hours per week.

The corresponding figures at Cooper's Hill under the proposed time-table would be 32½ hours in class and 2½ hours drill, gymnastics, or a total of 34.6 hours per week.

We recommend the adoption of the time-table proposed.

We also recommend that the length of the vacations at Sandhurst and Woolwich be ascertained. Colonel Ottley says that the working time "is all too short for all that we profess to teach." It may be found that the vacations are too long.

#### *Engineering Construction.*

This subject is at present taught by three Professors,\* whose combined emoluments, including house rent or its value, may be set down at 1,985*l.* a year.

Colonel Ottley is of opinion that tuition in the three branches of this subject, viz., Descriptive Engineering, Mechanical Engineering, and Hydraulics, could be more efficiently given by the Professor of Engineering (Dr. Brightmore), with a suitable assistant on £450 a year. The combined emoluments would amount to £1,150 a year, thus effecting a saving of £835 a year.

This scheme would involve the retirement of Mr. Heath and Professor Hearson, and we commend it to the consideration of the Secretary of State. The saving would be sufficient, perhaps, to give these gentlemen a moderate pension on their retirement.

#### *Surveying.*

The President proposes to raise the number of hours per week devoted to this subject, during the second half of the first year and the first half of the second year to 12, being an average of four hours per week over the whole three years' course as against 2·7 hours at present.

For this duty Colonel Ottley recommends one Instructor on £450 a year, one Assistant Instructor on £350 a year. The total cost would therefore be £800 a year.

For the post of Assistant Instructor we consider that an outsider should be chosen, and, preferably, a young Lieutenant of Royal Engineers experienced in surveying.

In recommending two Instructors for this work, Colonel Ottley says: "It is impossible for one man to teach this subject, two at least are necessary, because, although 'divisions' (or say 24 men) are dealt with, no instructor can properly manage more than about 12 men as a maximum in the field."

On this point we are in favour of a reduction of the class in the field from 12 to 6, and we think that the time proposed to be given by the Instructors—24 hours per week throughout the year—might be increased.

#### *Architecture, Freehand Drawing.*

From the Syllabus, Architecture, First Year, we would omit "a course of elementary lectures, to include a description of the principal styles and their chief characteristics."

We agree that Freehand Drawing should be compulsory for all Engineering students.

#### *Electrical Engineering.*

We concur with Colonel Ottley in the opinion that Electrical Engineering should be made a compulsory class for all students.

Colonel Ottley proposes the appointment of a Resident Instructor with a salary of 300*l.* a year, with free quarters in the College.

Our Colleague, Sir W. Preece, strongly advises that in addition lectures should be delivered at the College by Professors engaged from outside.

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\* Dr. Brightmore, Professor Hearson, Mr. Heath.



The advance of this branch of science is very rapid, and in order that the students may keep abreast of it, it is advisable to supplement the teaching of the Permanent Instructor by calling in the best Lecturers obtainable from London or elsewhere.

The adoption of this plan will involve two retirements from the existing staff, namely, Mr. W. N. Stocker, Professor of Physics, and Mr. T. Shields, Instructor in Electrical Engineering, and we suggest that Colonel Ottley be called upon to submit proposals with this object.

#### *Accounts.*

We agree with Colonel Ottley that the instruction to be afforded in regard to Accounts should be such as to enable young Engineers to check disbursements, and that a knowledge of intricate mercantile or banking accounts is not needed.

#### *Workshops and Mechanical Laboratory.*

We concur in the proposal to amalgamate these two workshops in the interests of economy and efficiency, and we recommend that Colonel Ottley should submit detailed plans for this purpose.

We also desire to record our opinion that carpentry should occupy a prominent place in the course of instruction.

#### *Mathematics.*

We fully endorse the views expressed by the President as to the importance of a sound training in Mathematics to an Engineer, and we entirely approve of his proposal to prolong the teaching of this science to the end of the third year's course, in which it should take a prominent place. We further support his recommendation that two Instructors be engaged to assist the Mathematical Professors.

The system of large classes and lectures is unavoidable at present, and individual instruction, so necessary in this subject, is impossible without assistance.

The Instructors might be appointed for periods of three or five years.

#### *Chemistry and Physics.*

We agree that only an elementary knowledge of chemistry is required to equip an Engineer Student for the practice of his profession, and that the reduction of the Chemical Teaching Staff contemplated by Colonel Ottley is practicable and advisable.

We hold that the term "Physics" might cover chemistry, electrical engineering and physics, and that the instruction to be imparted in these three subjects could properly be undertaken by the Professor of Electrical Engineering.

#### *Geology.*

An elementary knowledge appears to be all that is called for.

#### *French and German.*

The President proposes to discontinue the study of these languages which are taken at present as alternatives to freehand drawing, as he is unable to find room for them in his amended timetable.

If the Students at Cooper's Hill were all destined for service in India the study of these languages might, perhaps, be omitted without great detriment to their education as Engineers. Some, however, must fail to obtain appointments in the Public Works of India and must look for employment elsewhere. Our colleague, Sir J. Wolfe Barry, strongly advocates therefore the retention of these languages, as he attaches great importance to a thorough familiarity with French and German, not only from the professional point of view, but also from the circumstance that the competition of Germany and France with Great Britain in many parts of the globe renders it necessary that the Englishman should neglect no advantage which will enable him to deal with his rival on fairly equal terms.

We therefore recommend that the President should endeavour to retain French and German in the programme, but not as alternatives with freehand drawing.

#### *Private Study System.*

We are in entire accord with the President that during the day all work should be done in class and under supervision. The private study system, as now allowed, is in many cases a sham.

#### *Alternative Courses.*

The objections pointed out to this practice satisfy us that it should be discontinued.

#### *System of Marking and Qualifying Minimum.*

The scale of marks proposed commends itself to us.

#### *Weight attached to each Subject and Influence of External Examiners.*

Thirty-seven per cent. is the total weight of the external examiners over the whole course, as they allot 1,910 marks out a total of 5,150.

Colonel Ottley raises the question whether the scheme of marks should not be remodelled and more weight given to the opinions of external examiners.

We would accept the proportion of marks as at present laid down, subject to future revision, if the President finds that it can be altered with advantage.

#### *Selection of Examiners.*

The nomination of the Examiners should not be left to the Professors. They should be appointed by the President with the sanction of the Secretary of State, and we recommend that the Oxford and Cambridge Boards for the supply of Examiners may be asked for assistance.

#### *Extra marks for bodily and other exercises.*

Extra marks are given for drill and gymnastics. We are not inclined to accept the President's proposal to go further in this direction and to give marks for the several kinds of athletic exercises mentioned by him.

#### *Marks for discipline.*

The proposal to assign a given number of marks to each student for good conduct, and to substitute deductions from that number in lieu of the existing system of fines, has our approval.

*Special indulgences, and Unfair practices during Examination.*

These matters call for no special observations from us. It may be left to the President to deal with them.

*Failures during course, and Failures in Subordinate Examinations.*

These paragraphs do not call for any remark.

*Entrance Examination.*

Colonel Ottley has satisfied himself that the standard of the Entrance Examination should be still further raised. We concur with him that this should be done, and that a good knowledge of mathematics should be exacted from all candidates for admission to the College.

Having now reviewed in detail the several recommendations which Colonel Ottley has made for improving the course of studies at Cooper's Hill, we desire, in conclusion, to express our appreciation of the thoroughness with which he has dealt with the subject. The report which he has presented has by its fulness aided us in arriving at the conclusions which are recorded above and, under his administration, we anticipate that the Royal Indian Engineering College is about to enter on a career of increased usefulness.

(Signed) C. H. T. CROSTHWAITE,  
Chairman.

J. WOLFE BARRY.

HUGH LEONARD.

W. H. PREECE.

W. S. S. BISSET.

A. M. RENDEL.

GEO. F. PEARSON.

C. P. ILBERT.

Sir D. Fox,  
*Absent.*

(Sir D. Fox acknowledged the receipt of No. 8, but did not attend the Meeting, being on the Continent.)

**No. 10.**

Letter from the PRESIDENT ROYAL INDIAN ENGINEERING COLLEGE  
to the UNDER SECRETARY OF STATE FOR INDIA.

13th August, 1900.

I HAD recently occasion to bring to the notice of the Board of Visitors that additional accommodation for the instruction of the telegraph students was urgently needed; also that the present arrangements, whereby the engineer workshops and the mechanical laboratory were separate and distinct establishments, were very unsatisfactory; and lastly, that there were no conveniences for the teaching of carpenters' work, a serious blot in our system of instruction. I suggested that the present mechanical laboratory building should be made available for the telegraph students, that a new mechanical laboratory should be built in continuation of the existing engineer workshops, and that a carpenter's shop should be provided.

2. I understand that my views under all these heads were unanimously agreed to, and at the same time I was asked to ascertain and report the cost of carrying out the various alterations proposed. I explained my views to Mr. Hicks, who, after consulting Dr. Brightmore and Mr. Hopps, the Superintendent of the Workshops, has placed in my hands the estimates for the two new buildings proposed.

3. These estimates, together with the plan, I have now the honour to submit for the favour of sanction. In both cases the estimate includes the cost of its preparation and also of the supervision of the work by Mr. Hicks to whom the construction should be entrusted.

The first of the two estimates—that for the new mechanical laboratory—amounts in all to £1,056, and includes the removal of the testing machinery to its new site and its re-erection there. The second of the estimates—that for the carpenter's shop—amounts to £882, and includes the provision of the necessary tools for fourteen students together with three treadle lathes and eight carpenter's benches. The total cost of both buildings in working order will therefore be well below £2,000, and, so far as I can judge, the improved facilities for teaching will far more than repay this outlay, whilst economy in working the workshop and mechanical laboratory will undoubtedly result.

4. When complete it is my intention to place the whole of these buildings and the work done in them under the direct superintendence of Mr. Hopps, under the general supervision of the Professor of Engineering. I am most anxious to make the course here thoroughly practical, and at the same time to enforce economy as far as possible. It is because I am persuaded that the present proposals will make for both these ends that I recommend the two estimates for sanction.

I have, &c.,  
(Signed) JOHN W. OTTLEY.

## No. 11.

Letter from the INDIA OFFICE to the PRESIDENT ROYAL  
INDIAN ENGINEERING COLLEGE.

6th September, 1900.

I am directed by the Secretary of State for India in Council to acknowledge the receipt of your letter, No. 216 of the 13th August, in which you recommend

- (a) that the present Mechanical Laboratory should be made available for the Telegraph Students ;
- (b) that a new Mechanical Laboratory should be built in continuation of the existing Engineer Workshops, at an estimated cost of £1,056 ; and
- (c) that a Carpenter's Shop with equipment should be provided at an estimated cost of £882.

2. In reply, I am directed to inform you that your proposals are sanctioned.

I am, &c.,  
(Signed) HORACE WALPOLE.

## No. 12.

Letter from INDIA OFFICE to the PRESIDENT ROYAL INDIAN  
ENGINEERING COLLEGE.

2nd November 1900.

YOUR Memoranda on the Educational Course at the Royal Indian Engineering College and the Report of the Board of Visitors on the proposals which you have submitted for the improvement of the instruction afforded there, have been carefully considered by the Secretary of State for India in Council, and I am now directed to convey to you the decision arrived at.

*Revised Time-table for Study.*—The increase in the number of hours per week to be allotted in future to work in class or lecture is approved.

*Engineering Construction.*—The recommendation that tuition in the three branches of this subject be entrusted to the Professor of Engineering, Dr. Brightmore, with an Assistant on £450 a year, is sanctioned.

Under this arrangement the services of Mr. T. A. Hearson, Professor of Hydraulic Engineering, and Mr. A. H. Heath, Assistant Professor of Engineering, will not be required; and I am desired to request that you will submit proposals for the retirement of these gentlemen.

*Surveying.*—The raising of the number of hours per week to be devoted to this branch of study is agreed to, and the staff proposed, viz.: one Instructor on £450 a year, and one Assistant Instructor on £350 a year (preferably a Lieutenant of Royal Engineers), is sanctioned.

The Board of Visitors are in favour of a reduction of the class in the field from 12 to 6, and consider that the time proposed to be given by the Instructors, 24 hours per week throughout the year, might be increased.

These suggestions should be considered by you.

*Freehand Drawing.*—Freehand drawing should be compulsory for all engineer students.

*Architecture.*—From the Syllabus Architecture (1st year), “a course of elementary lectures to include a description of the principal styles and their chief characteristics” should be omitted.

*Electrical Engineering.*—The proposals under this head are accepted, viz. :—

- (a) That it be made a compulsory class for all students;
- (b) That a resident Instructor, with a salary of £300 a year and free quarters in the College, be appointed;
- (c) That in addition Lecturers from outside be engaged.

Proposals (b) and (c) will involve the retirement of Mr. W. N. Stocker, Professor of Physics, and Mr. T. Shields, Instructor in Electrical Engineering, and a further communication from you on the subject will be awaited.

*Accounts.*—The course of instruction recommended is sanctioned.

*Workshops and Mechanical Laboratory.*—These matters have been dealt with in Sir H. Walpole's letter of the 6th September, 1900.

*Mathematics.*—The prolongation of the teaching of this science to the end of the third years' course is approved, and also the recommendation to appoint two Instructors to assist the Mathematical Professors.

The Instructors will be appointed for terms of three or five years.

*Chemistry and Physics.*—The reduction of the Chemical Teaching Staff may be carried out, and the instruction in Chemistry, Electrical Engineering, and Physics should be undertaken by the Professor of Electrical Engineering.

*Geology.*—Only an elementary knowledge need be acquired by the students.

*French and German.*—As the Board of Visitors attach importance to the retention of these subjects in the programme of study, you will endeavour to find a place for these subjects in the time-table, but not as alternatives with freehand drawing.

*Private Study System; Alternative Courses.*—These will be discontinued.

*System of Marking and Qualifying Minimum.*—The scale of marks proposed is agreed to.

*Weight attached to each subject and influence of External Examiners.*—The proportion of marks now laid down may be adhered to, on the understanding that it is subject to revision if, in your judgment, and in that of the Secretary of State in Council, it can be altered with advantage.

*Selection of Examiners.*—In future the Examiners will be appointed by the President with the sanction of the Secretary of State. The Oxford and Cambridge Schools Examination Board for the supply of Examiners may be consulted.

*Extra Marks for Bodily and other Exercises.*—An extension of the present practice is not considered desirable.

*Marks for Discipline.*—The plan proposed is approved.

*Special Indulgences; Unfair Practices during Examinations; Failures during Course; Failures in Subordinate Examinations.*—These matters do not call for any special remark.

*Entrance Examination.*—The proposal to raise the standard of the Entrance Examination is entirely approved. A good knowledge of mathematics should be exacted from all candidates for admission to the College.

In conclusion, I am desired by Lord George Hamilton to acquaint you that he has much pleasure in concurring in the appreciation which the Board of Visitors have expressed of the thoroughness with which you have dealt with this important subject of the re-modelling of the studies at the Royal Indian Engineering College.

I am, &c.,

(Signed) A. GODLEY.

## No. 13.

Letter from the INDIA OFFICE to the CHAIRMAN of the  
BOARD OF VISITORS.

2nd November, 1900.

THE Secretary of State for India has perused with much interest the Report of the Board of Visitors of the Royal Indian Engineering College, in which they have submitted their recommendations on the proposals contained in the Memorandum of the President of the College for the reconstitution of the studies at that Institution.

In transmitting to you, for your information and that of the Board, a copy of a letter\* to Colonel Ottley conveying the decision of the Secretary of State on the various matters discussed in their Report, I am desired by Lord George Hamilton to request that you will communicate to the members of the Board his cordial acknowledgements for the searching inquiry which they have instituted into the course of study pursued at the Royal Indian Engineering College, and for the valuable recommendations which they have embodied in their Report as the result of their investigations.

I am, &c.,  
(Signed) A. GODLEY.

## No. 14.

(EXTRACT.)

Letter from the PRESIDENT ROYAL INDIAN ENGINEERING COLLEGE to the INDIA OFFICE.

26th November, 1900.

I HAVE the honour to acknowledge the receipt of Sir Arthur Godley's letter of the 2nd instant, conveying the decisions arrived at by the Secretary of State in Council on the proposals submitted by the Board of Visitors in connection with the remodelling of the educational system of this College.

The orders now under acknowledgment involve the retirement of Messrs. Hearson, Heath, McLeod, Stocker, Shields, and P. Reilly. I propose to give the last named gentleman notice that his services will not be needed after Easter.

I trust I may be permitted to tender my grateful thanks for the very handsome appreciation of my services expressed by Lord George Hamilton and the Board of Visitors of this College, and to add that it will be my earnest endeavour to merit a continuance of their good opinion.

I have, &c.,  
(Signed) JOHN W. OTTLEY.

## No. 15.

Letter from the INDIA OFFICE to the PRESIDENT ROYAL INDIAN ENGINEERING COLLEGE.

14th December, 1900.

THE Secretary of State for India has had under his consideration in Council certain recommendations which have been laid before him by the Board of Visitors of Coopers Hill College for remodelling the course of studies at the College, with a view to reducing the present excessive cost of the Staff, and increasing the efficiency of the teaching.

\* No. 12.

The changes proposed in the curriculum, which have already been indicated in my letter to you of 2nd November 1900, necessitate the retirement of the following gentlemen from the appointments which they hold at the College :—Mr. T. A. Hearson, M.Inst.C.E., Professor of Hydraulic Engineering, &c. ; Mr. H. McLeod, F.R.S., Professor of Chemistry ; Mr. W. N. Stocker, M.A., Professor of Physics ; Mr. A. H. Heath, Ass.M.Inst.C.E., Assistant Professor of Engineering ; Mr. T. Shields, M.A., Demonstrator in Physics ; Mr. P. Reilly, Demonstrator, Mechanical Laboratory ; Mr. J. C. Hurst, Lecturer in Accounts.

I am accordingly to request that you will inform these gentlemen that the Secretary of State, while regretting the necessity for reducing the Staff, and fully recognising the value of their past services, is compelled to give them notice that they will be required to vacate their appointments at the end of the next Easter term.

A further communication will be made to you in respect of any claims to pension that may arise in consequence of the reduction of the Staff, and regarding other matters connected with the re-arrangement of the course of study at Coopers Hill.

I am, &c.,  
(Signed) HORACE WALPOLE.

## No. 16.

(EXTRACT.)

Letter from the PRESIDENT ROYAL INDIAN ENGINEERING COLLEGE to the INDIA OFFICE.

1st January, 1901.

I HAVE the honour to report that, as directed in yours, dated the 14th December, I forwarded a copy of that letter to each of the gentlemen named by you with a forwarding letter on the 17th December last.

As, under their agreements, the gentlemen named at foot of page\* are entitled to a term's notice of the termination of their engagements, and as this condition has been complied with, the notices appear to be valid and all that can legally be demanded.

I venture, however, to represent that these gentlemen, or some of them at any rate, had been left so long in undisturbed possession of their appointments, that the notice given, though perfectly legal, may be regarded as unduly short under all the circumstances of the case, and I would urge that it would, if anything, be better to err on the side of liberality. The recommendation I make is in the direction of extending in some sense the period during which the gentlemen in question will receive pay. I suggest, therefore, that they be granted three months' full pay at the expiration of the notice issued to them.

This grant would amount to 642*l.* 10*s.*, as per following detail :—

	£	s.	d.
Mr. McLeod at 635 <i>l.</i> , for three months ... ..	158	15	0
Mr. Heath at 485 <i>l.</i> , for three months ... ..	121	5	0
Mr. Stocker at 450 <i>l.</i> , for three months ... ..	112	10	0
Mr. Hearson at 600 <i>l.</i> , for three months ... ..	150	0	0
Mr. Shields at 400 <i>l.</i> , for three months ... ..	100	0	0
	<hr/>		
	642	10	0
	<hr/>		

\* 1. Mr. McLeod.  
2. Mr. Heath.

3. Mr. Hearson.  
4. Mr. Stocker.

5. Mr. Shields.



It will be observed that I have not included Mr. Reilly in the list. His salary is 150*l.*, but it was distinctly ruled when he was appointed in August 1890 that he would only be entitled to one month's notice. His case, therefore, differs from the others.

I have also not included Mr. Hurst in the list, as he is not a regular member of the staff in the sense that the others are. For nearly 20 years he has been employed to give 15 lectures annually on "Accounts" at five guineas a lecture, or £78 15*s.* in all. This, however, is a fee, not salary.

It will of course be understood that the special grants here suggested are intended to help the recipients whilst looking for other work, and are recommended over and above any pensions or gratuities to which the individuals may be entitled, or which it may be decided to grant.

*Mr. McLeod* has been here for nearly 30 years, for the first 12 of which he taught the Natural Sciences without the aid which was subsequently afforded.

*Mr. Heath* has been here over 25 years.

*Mr. Stocker* has been here about 17½ years.

*Mr. Hearson* has been here about 16¼ years.

*Mr. Shields* has been here about 8 years, but has only been lecturer in Electricity for 3¼ years.

I have, &c.,

(Signed) JOHN W. OTTLEY.

## No. 17.

Letter from the PRESIDENT ROYAL INDIAN ENGINEERING COLLEGE to the INDIA OFFICE.

1st January, 1901.

I HAVE the honour to forward herewith, in original, a letter addressed to the Secretary of State by seven members of the College staff to whom copies of your letter of the 14th December, 1900, were forwarded under your direction.

I desire to explain that, although the enclosure is dated the 27th December, it only reached me at 6 p.m. last evening.

Under the rules which obtain in India, such collective petitions are not admissible, but, as I am not aware of the procedure adopted in this country in such matters, I have deemed it desirable to forward the document as it stands. I would venture, however, to point out that a form of collective memorial would not appear to be peculiarly suitable in the present case, inasmuch as the circumstances of each individual would appear to present important peculiarities not common to the other petitioners.

I have, &c.,

(Signed) JOHN W. OTTLEY.

Enclosure in No. 17.

Memorial from Mr. HEARSON AND OTHERS to the SECRETARY OF  
STATE FOR INDIA IN COUNCIL.

Cooper's Hill, Englefield Green, Surrey,  
27th December, 1900.

WE, the undersigned members of the teaching staff of the Royal Indian Engineering College, Cooper's Hill, who have received a copy of a letter from the India Office, dated 14th December, 1900, stating that, "with a view to reducing the present excessive cost of the staff and increasing the efficiency of the teaching," we are required to vacate our appointments at the end of the next Easter term, beg to submit for your Lordship's favourable consideration a proposal that an independent committee of experts on scientific engineering education and college management may be appointed to inquire into the working of the College, and that the whole of the teaching staff may be allowed state their experience to that committee.

We have the honour and pleasure to represent to your Lordship that Cooper's Hill has won a high reputation in India and in the engineering profession, and we can claim that the men supplied to the Indian Services by the College during the last 27 years have in the most eminent degree proved the efficiency of the training which they have received. The College at the present time is in a flourishing condition both educationally and financially, there being no lack of eligible students to fill the College and such a demand for Cooper's Hill men that everyone who qualifies in the College course is practically certain of the offer of a good appointment. We may also state that the diploma of Associate of Cooper's Hill is accepted by the Institution of Civil Engineers in lieu of its examination for associate membership.

We believe that the suggested inquiry would show that the radical changes indicated by the abrupt dismissal in the midst of the work of the session of such a large proportion of the College staff will not lead to economy with the maintenance of efficiency.

Having devoted some of the best years of our lives to the College, and having borne our full share in securing the success which the College has achieved, as past presidents of the College and our colleagues will admit, we feel that it would be not only just to us but also for the good of the College and for the advantage of the public services in India that the proposed committee should be appointed.

We beg to submit to your Lordship's notice the fact that no member of the staff has been consulted respecting the changes proposed in the curriculum indicated in the letter of the 2nd November, 1900, to which reference is made in the communication of the 14th December previously referred to. We are at present in ignorance of what those changes are, and also of the recommendations which have been made by the Board of Visitors.

We have, &c.

(Signed) T. A. HEARSON.  
HERBERT McLEOD.  
W. N. STOCKER.  
A. H. HEATH.  
H. SHIELDS.  
P. REILLY.  
JAMES C. HURST.

## No. 18.

Letter from INDIA OFFICE to the PRESIDENT ROYAL INDIAN  
ENGINEERING COLLEGE.

15th January, 1901.

I AM directed by the Secretary of State for India in Council to acknowledge the receipt of your letter of the 1st January, 1901, forwarding a memorial signed by seven members of the teaching staff of Cooper's Hill College, who have recently received notice that their services will not be required after the Easter term.

The memorial suggests that an independent committee of experts on scientific engineering education and college management may be appointed to inquire into the working of the College, and that the whole of the teaching staff may be allowed to state their experience to that committee.

In reply, I am to request that you will inform the memorialists that His Lordship, while fully accepting all responsibility for the measures which have been decided upon, has acted with the advice of the Board of Visitors, who in respect of technical and scientific knowledge are fully qualified to deal with any question concerning the management of the College, and that, in His Lordship's opinion, no useful purpose would be served by the appointment of such a committee as is suggested in the memorial.

I am, &c.,

(Signed) HORACE WALPOLE.

## No. 19.

Letter from INDIA OFFICE to the PRESIDENT ROYAL INDIAN  
ENGINEERING COLLEGE.

15th January, 1901.

In continuation of my letter of the 14th December 1900, and with reference to your letters of the 26th November 1900 and the 1st January 1901, I am directed to convey to you the decision of the Secretary of State for India in Council as to the amount of pension or bonus to be granted to the members of the Educational Staff at Cooper's Hill College who have recently received notice that their services will not be required after the end of the Easter Term.

2. The seven gentlemen here referred to have received the notice to which they were entitled under the conditions of their engagement. In view, however, of your recommendations, the Secretary of State in Council has decided to grant the following sums by way of gratuity on the termination of their services, viz :—

						£
To Mr. McLeod	...	...	...	...	...	135
„ Mr. Heath	...	...	...	...	...	135
„ Mr. Stocker	...	...	...	...	...	125
„ Mr. Hearson	...	...	...	...	...	165
„ Mr. Shields	...	...	...	...	...	105

These are given in addition to the retiring allowances referred to in paragraphs 4 and 5 below.

3. In the case of Messrs. Reilly and Hurst, the conditions of whose service are of a different character, Lord George Hamilton has also decided to sanction a gratuity to the former of £75 and to the latter of £50.

4. Messrs. McLeod and Heath are entitled by the terms of their engagement to retiring allowances in accordance with the provisions of the Civil Service Superannuation Act, and the Secretary of State has accordingly sanctioned the following pensions :—

				£	s.	d.	
To Mr. McLeod	...	...	...	466	3	7	a year.
„ Mr. Heath	...	...	...	273	9	9	„

5. Messrs. Hearson, Stocker, and Shields are not entitled to any retiring allowances, but, in consideration of their length of services, the Secretary of State is pleased to make the following grants to them, viz., to Mr. Hearson a pension of 150*l.* a year ; to Mr. Stocker a pension of 120*l.* a year ; and to Mr. Shields a gratuity of 420*l.* in addition to the gratuity of 105*l.*

6. I am to remind you that the pensions to which Messrs. McLeod and Heath are entitled under the Superannuation Act of 1859 are necessarily subject to the provisions of Clause 8 of that Act, and those provisions will, as a matter of course, govern also the pensions and gratuities granted, as an act of grace, outside the Act.

7. I am to request that you will furnish each of the gentlemen concerned with a copy of this letter.

I am, &c.,

(Signed) HORACE WALPOLE.

## No. 20.

Letter from the PRESIDENT ROYAL INDIAN ENGINEERING COLLEGE  
to the UNDER SECRETARY OF STATE FOR INDIA.

19th January, 1901.

WITH reference to your letter of the 15th instant conveying the orders of the Secretary of State in Council relative to certain pensions and gratuities granted to various members of the Educational Staff at this College, I have now the honour to forward in original for favourable consideration a letter just received from Mr. Heath asking that, for reasons assigned, his pension may be increased to £347 15*s.*

I am not aware whether, in calculating the pension due, account has been taken of the fact that, in addition to his salary of £450 per annum, Mr. Heath has also drawn an allowance of £35 yearly in lieu of fuel and light, and has also for over 20 years occupied a house free of all charges. I observe that Mr. Heath puts the nominal value of this at £100 a year, but in my judgment it was really worth considerably more than this, as it was not only rent and taxes free, but *all* repairs within and without were charged to the College, and water also was supplied free of charge. My own calculations, which of course could only be approximate, tended to show that the true value of these houses was nearer £125 than £100.

I trust that these points may be taken into consideration, if this has not already been done, and that full weight may be given to the claims now put forward. Personally, I should be very pleased if an improvement could be made in Mr. Heath's pension, as, so far as I can judge, his case is harder than that of the other gentlemen affected. He is no longer a young man ; he has a family ; and, as I have already verbally represented, he may find some difficulty in finding other employment.

I have, &c.,

(Signed) JOHN W. OTTLEY.

Enclosure in No. 20.

Letter from Professor A. H. HEATH to the PRESIDENT ROYAL  
INDIAN ENGINEERING COLLEGE.

19th January, 1901.

DEAR COLONEL OTTLEY,

I THANK you for the sympathetic appreciation of my work at the College, and for the kind expressions contained in your letter of 16th January, forwarding to me the printed copy of an India Office letter of the 15th January.

I am obliged to make a speedy request for the service you kindly offer to me. From the amount stated as pension granted to me, I infer that the emolument of an official residence at the College has been omitted. The claim for pension according to the regulations appears to me to be  $25\frac{2}{3}$  years of service, plus a bonus of not less than 10 years (according to clauses IV. and VII., 22 Victoria, Cap. 26, 19th April, 1859); I having quitted a pension bearing appointment on the Great Northern Railway to take up my appointment at the College, thereby sacrificing my pension payments already made, and my claims.

This makes not less than  $35\frac{2}{3}$  years' claim on a salary of £450 per annum, plus coal and gas allowance of £35, and plus an official residence valued at £100 per annum, making a total of £585 of salary and emoluments.

My claim appears to work out to not less than £347 15s. per annum as pension, instead of the sum of £273 9s. 9d. as stated in the Secretary of State's letter; a difference of considerable importance to me.

I have had an official residence for more than 20 years, in fulfilment of a personal promise made by Col. G. Chesney, R.E., then President of the College, on my appointment, that he would give me an official residence at the first opportunity, which promise he carried into effect on the retirement of Lieut. G. S. Clarke, R.E. in 1880.

I trust you will oblige me by forwarding this statement for the favourable consideration of the Secretary of State for India in Council.

I have, &c.,

(Signed) A. H. HEATH.

No. 21.

Letter from the PRESIDENT ROYAL INDIAN ENGINEERING  
COLLEGE to the UNDER SECRETARY OF STATE.

21st January, 1901.

PROFESSOR McLEOD, F.R.S., has enquired from me as to how the pension of £466 3s. 7d. has been calculated, as, after studying the Superannuation Act, he has been unable to discover the mode of calculation. As I have no information on the subject I have thought it best to apply to you for the same.

I have, &c.,

(Signed) JOHN W. OTTLEY.

## No. 22.

Letter from the INDIA OFFICE to the PRESIDENT ROYAL INDIAN  
ENGINEERING COLLEGE.

5th February, 1901.

I AM directed by the Secretary of State for India in Council to acknowledge the receipt of your letters of the 19th and 21st January regarding the pensions which have recently been granted to Messrs. H. H. Heath and H. McLeod.

The two notes by the Accountant-General, dated the 2nd and 24th January respectively, of which copies are enclosed will explain the principles on which the pensions in questions have been calculated.

It will be seen that the calculation has been made as favourable to Mr. Heath as was possible, consistently with the provisions of the Superannuation Act, and with the practice of the Treasury, which necessarily governs the practice of this office, inasmuch as all warrants for pensions granted by the Secretary of State in Council have, under the Act 21 and 22 Vict. c. 106, to be countersigned by the Chancellor of the Exchequer. Lord George Hamilton regrets, therefore, that he is unable to comply with Mr. Heath's application for an addition to the amount of his pension.

I am to add that all the pensions, the grant of which was conveyed to you in my letter of the 15th January, 1901, will commence from the date on which the recipients vacate their appointments at the college.

I am, &c.,  
(Signed) HORACE WALPOLE.

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Enclosure 1 in No. 22.

Report by the ACCOUNTANT-GENERAL, India Office, dated the  
2nd January, 1901.

In the cases of Mr. Cotton Mather and Professor Reilly (both of whom were appointed in 1871) seven years were in each case added to the pensionable service in respect of professional qualifications.

Mr. McLeod appears to be in the same position as Mr. Reilly, and if, as seems equitable, a similar course is adopted, his pension would be determined as follows :—

	£	s.	d.
Mr. McLeod's salary is ... ..	600	0	0
He receives for fuel and gas ... ..	35	0	0
He has also, in connection with the Analytical Laboratory, drawn for the past 10 years an annual honorarium of ... ..	50	0	0
	<hr/>		
	685	0	0

In a letter from the Treasury, dated the 16th  
March, 1898, it was stated that it is the "in-  
variable practice to estimate the value of an  
official residence or apartments at one-sixth of  
the officer's salary and other emoluments."

One-sixth of £685 ... ..	114	3	4
Making the total salary and emoluments ...	<hr/>		
	£799	3	4

Mr. McLeod having served 29 years and upwards, and under 30, would on this basis receive as pension  $\frac{2}{60}$ ths of this sum, together with a further  $\frac{7}{60}$ ths in respect of his professional qualifications. This addition would, however, apparently be subject to the limitation approved by Council on the 4th March, 1890, regarding appointments on the establishments of the Secretary of State, which was that no officer should, in the matter of added years, be "treated as if he had entered the service before the age of 25." The calculation cannot, therefore, be completed until it is known whether Mr. McLeod's present age exceeds 61.

On the same terms, Mr. Heath's pension would be determined as follows :—

	£	s.	d.
His salary is ... ..	450	0	0
He receives for gas and fuel ... ..	35	0	0
	<hr/>		
	485	0	0
Add one-sixth as value of house ... ..	80	16	8
	<hr/>		
Making the total salary and emoluments ...	<u>£565</u>	<u>16</u>	<u>8</u>

Mr. Heath's service being one of 25 years and upwards, and under 26 years, he would receive as pension  $\frac{2}{60}$ ths of this sum, plus the maximum of  $\frac{7}{60}$ ths for professional qualifications, the addition being subject to a similar age limitation as in the case of Mr. McLeod, *i.e.*, to the proviso that his present age exceeds 57.

It is observed that the exact dates of birth have been applied for.

P. S.—Mr. McLeod being now stated to have been born on the 19th February, 1841, his additional years for professional qualifications cannot be reckoned from a date prior to the 19th February, 1866. He will thus at Easter next have served, with the added period, 35 years and upwards and under 36 years.

$$\frac{35}{60}\text{ths of } \pounds 799\ 3s.\ 4d. = \pounds 466\ 3s.\ 7d.$$

Similarly, Mr. Heath having been born on the 22nd May, 1846, the commencement of his service cannot be dated earlier than the 22nd May, 1871. This, at Easter, will give 29 years and upwards and under 30 years.

$$\frac{29}{60}\text{ths of } \pounds 565\ 16s.\ 8d. = \pounds 273\ 9s.\ 9d.$$

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Enclosure 2 in No. 22.

Report by the Accountant-General, India Office, dated 24th January, 1901.

The basis of calculation of the amount of Mr. Heath's pension was given in Mr. Scott's reply to the Public Works reference of the 1st instant, and in the postscript added on the 3rd, when the date of his birth had been ascertained.

It will be seen that allowance was made for the value of his house, and that, as stated more fully in Mr. McLeod's case, it was done in accordance with the invariable Treasury practice of estimating the value of an official residence at one-sixth of the officer's salary and other emoluments.

The Superannuation Act to which Mr. Heath appeals does not allow of fractions of a year of service being taken into account in reckoning pensions.

Clause II. grants "To any person who shall have served 10 years and upwards and under 11 years, an annual allowance of  $\frac{1}{60}$ ths of the annual salary and emoluments of his office . . . and in like manner a further addition to the annual allowance of  $\frac{1}{60}$ th in respect of each additional year of such service." Thus Mr. Heath, having served at Easter 25 years-and upwards and under 26 years, is entitled to  $\frac{25}{60}$ ths of his salary and emoluments.

Mr. Heath claims that "not less than 10 years" of service should be added under Clauses IV. and VII. of the Act, the latter of which deals with the addition of years on account of re-organization or abolition of appointment; but these clauses provided no such minimum as he claims. Moreover, since the report of the Ridley Commission, the Treasury have ceased to grant additional years on re-organizations of offices; and the practice of the Treasury is necessarily followed here. Seven years' service is the recognized Treasury addition for professional qualifications; and it is this addition that was granted in the similar cases of Mr. Cotton Mather and Professor Reilly.

There is the further point explained by Mr. Scott on the 2nd instant, specially in connection with Mr. McLeod, that, by Council decision of the 4th March, 1890, no officer on the establishment of the Secretary of State shall in the matter of added years be treated as if he had entered the service before the age of 25. Thus the commencement of Mr. Heath's service cannot be dated earlier than the 22nd May, 1871, giving him at Easter a service of 29 years and under 30 years.

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## No. 23.

(EXTRACT.)

Letter from the PRESIDENT ROYAL INDIAN ENGINEERING COLLEGE to the UNDER SECRETARY OF STATE FOR INDIA.

26th January, 1901.

As requested by Mr. James C. Hurst in a letter just received, I have the honor to forward a letter with two enclosures addressed by that gentleman to the Secretary of State for India in Council.

Mr. Hurst is an occasional lecturer, *i.e.*, he is paid to give 15 lectures on Accounts annually at five guineas a lecture. As a matter of fact he gives I believe only 13 lectures, as he also holds an intermediate (or preliminary) examination which is allowed to count as two lectures. This latter arrangement appears to date from 1893, whilst the original appointment dates from 1881.

As Mr. Hurst has been an Accountant and Auditor for some 50 years or so, he may be presumed to be a past master of his subject, but it by no means follows that our students are therefore properly prepared for the work that they will have to do on arrival in India.

I have, &c.,

(Signed) JOHN W. OTTLEY.

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Enclosure 1 in No. 23.

Letter from Mr. J. C. HURST to the PRESIDENT ROYAL INDIAN  
ENGINEERING COLLEGE.

19th January, 1901.

DEAR COLONEL OTTLEY,

I beg to thank you for your note of the 16th instant with an enclosure from the India Office, also for the kind expressions from yourself.

The gratuities and pensions offered do not wipe out the grievous slur of inefficiency, the first that has been placed upon me during a connection of nearly half a century with Government Departments.

I must say that if you were not satisfied with the results of my labours, and had told me so, giving me the opportunity of resigning, I would have done so at once, or if you had any suggestions to make I would have met your views with pleasure.

My subject, I see by the new Prospectus dated the 1st January, 1901, is to be continued, with an addition, the meaning of which the Secretary could not explain, so that presumably you have already selected someone to replace me.

When that subject was prescribed for one of the divisions of the War Office I prepared every candidate in "Accounts," and not one failed when examined by the Civil Service Commissioners.

I have testimonials from a host of people under whom I have served, Lord de Grey, Sir J. Pakington, Sir B. Hawes, Lord Panmure, Mr. Edward Stanhope, Sir Ralph Knox, Mr. Woodall, Lord R. Churchill as Chairman of a Parliamentary Committee, of which Lord George Hamilton was a member, besides several from Sir Alexander Taylor with regard to the successful results of my teaching, also from Mr. H. W. S. Whiffin (a former Accountant General to the War Office), who went out for the India Office to "investigate the Account System of the Public Works Department in India," and was afterwards the final Examiner of the Cooper's Hill students who had attended my lectures, so that my supersession is absolutely incomprehensible to me. As I intend to represent these facts to the Secretary of State for India, will you kindly say if I should do so through you or direct to the India Office. The noise alluded to arose purely from so many men being crammed into such a small lecture room, as I explained to you and the late President.

In conclusion, allow me to say that in sending you the above I beg you will realise that no disrespect whatever is intended either to you personally, or to the important position you hold as President of a College where for nearly 19 years I have received many kindnesses which I shall never forget. With kind regards,

I am, &c.,

JAMES C. HURST,

Late Accountant and Auditor, War Office.

P.S.—Since writing the foregoing I have received thanks from the present Secretary of State for War for my services in connection with a War Office Committee on "Accounts."

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Enclosure 2 in No. 23.

Letter from the PRESIDENT ROYAL INDIAN ENGINEERING COLLEGE to Mr. HURST.

21st January, 1901.

DEAR MR. HURST,

I HAVE to acknowledge your letter of 19th instant received this evening. You ask me to inform you whether any representation you have to make to the Secretary of State for India should be sent through me, or direct to the India Office. I believe the former is the usual official routine, and anything you send me for that purpose will be promptly forwarded.

Yours sincerely,

(Signed) JOHN W. OTTLEY.

Enclosure 3 in No. 23.

Letter from Mr. J. C. HURST to the SECRETARY OF STATE FOR INDIA.

25th January, 1901.

WITH regard to the notice I have received from the India Office dispensing with my services as Lecturer in Accounts at the Royal Indian Engineering College, Cooper's Hill, at the end of this term, I beg to send your Lordship herewith copy of a letter addressed by me on the 19th instant to Colonel Ottley, and of his reply. I can get no information as to the direction in which I have failed to give satisfaction to him, or to the Board of Visitors, whom I have never seen, therefore, I most respectfully beg that your Lordship will be good enough to instruct some member of your Department to give me the desired information.

I wrote to the President on the 28th December asking him to tell me if he was aware whether or not "Accounts" would be included in the College curriculum in the future; that gentleman's reply, dated the 30th December, was "I am making enquiries." By the new Prospectus, dated the 1st January, I gather that the study of "Accounts" is to be continued under, it may be assumed, another lecturer. With regard to my competency I would ask your Lordship to read the enclosed short testimonials as to the results hitherto of my lectures.

As stated in my letter to Colonel Ottley I have, on official War Office papers, received most favourable testimonials from many high officials (therein named) as to my general efficiency and public services.

Your Lordship was a member of a Parliamentary Committee on "Army and Navy Estimates," of which the late Lord Randolph Churchill was chairman; he, on behalf of the Committee, thanked me for my services, my examination having lasted two days. The late Mr. Edward Stanhope also expressed his high sense of my services. I may mention for your Lordship's information that I was appointed soon after the late Sir George Chesney left the college and have

since carried on the same system of teaching as Sir George, who (himself) instructed the students in "Accounts."

Under all these circumstances this cruel blow, implying inefficiency or something worse, is to me inexplicable, never having received suggestion or word of complaint. I therefore beg to express an earnest hope that your Lordship may be pleased to reconsider the matter and allow those members of the Cooper's Hill Staff, who are now under notice of dismissal, the opportunity of continuing their connection with the college where for nearly 19 years I have held the appointment of "Lecturer in Accounts."

If your Lordship should wish for further explanations and would grant me an interview, I should be very grateful.

I have, &c.,

(Signed) JAMES C. HURST.

Late Accountant and Auditor, &c., War Office.

Annexures to Enclosure 3 in No. 23.

COPIES OF A FEW TESTIMONIALS *re* JAMES C. HURST, ACCOUNTS  
LECTURER, COOPER'S HILL.

3rd March, 1888.

I heartily congratulate you. Thirty-five men out of forty have made half marks in your subject, a most unusual proportion in the most tempting of studies and quite without precedent in the somewhat dry subject of accounts.

(Signed) ALEXANDER TAYLOR,

President Royal Indian Engineering College.

27th February, 1889.

I have looked over these satisfactory papers by Long, Meredith, and McHay, and congratulate you on the satisfactory result of your labours.

It is a comfort to see one's fag bear useful fruit.

A very high average even in a soft subject.

(Signed) ALEXANDER TAYLOR,

President Royal Indian Engineering College.

25th February 1890.

For most men accounts have but little attraction, and out of the thirty-six recently examined there are only nine who have made less than quarter marks.

Amongst the remainder there is quite a large number who have done very well, six having made nearly full marks.

This is as much as can reasonably be expected, as accounts can never be popularized.

(Signed) ALEXANDER TAYLOR,

President Royal Indian Engineering College.

Mr. H. W. S. Whiffin, who some time since investigated in India the Public Works Department for the India Office, and who for some time finally examined the Cooper's Hill students after my lectures, said in one of his reports (so far as I can recollect) "that the system of teaching practised by Mr. Hurst is in my opinion well calculated to give the students a thorough knowledge of accounts."

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26, Anerley Hill,  
Upper Norwood, S.E.,  
19th January, 1901.

MY DEAR MR. HURST,

I LEARN, with much regret, that it is intended to dispense with your services as Lecturer in Accounts at Cooper's Hill. For many years I was appointed examiner, set the student's papers on the subject, and inspected their answers. On several occasions I drew attention in my annual report to the very intelligent manner in which many of your students had dealt with the subject, so much so that I considered it a duty to you to inform the authorities that to your system of teaching was due this satisfactory result.

Yours, &c.,

(Signed) H. W. G. WHIFFIN.

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I am directed by the Secretary of State for War to acknowledge the receipt of your letter of the 11th instant respecting the late Committee on Ordnance Factory Accounts, which will be duly considered.

I am to take this opportunity of conveying to you the thanks of the Secretary of State for your services on this Committee.

(Signed) E. FLEETWOOD WILSON.

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## No. 24.

Letter from the INDIA OFFICE to the PRESIDENT ROYAL INDIAN  
ENGINEERING COLLEGE.

5th February, 1901.

I AM directed by the Secretary of State for India in Council to acknowledge the receipt of your letter of the 26th January, 1901, forwarding a memorial from Mr. J. Hurst asking for a reconsideration of the orders under which he has received notice that his services will not be required after the present Easter term.

2. In reply I am to request that you will inform Mr. Hurst that it has been decided to substitute for the present system of teaching Accounts at Cooper's Hill a scheme of teaching more in accordance with the requirements of the Accounts Department in India, and for that purpose it has been considered desirable to engage the services of an officer having personal experience of the Indian system.

3. The words used in my letter of the 14th December did not imply, and were not intended to imply, any disparagement of his ability as an accountant.

4. The Secretary of State expressly stated in that letter that he fully recognized the value of the past services of the gentlemen to whom notice was given, in accordance with the terms of their agreements, of the termination of their appointments. And in the case of Mr. Hurst, personally, Lord George Hamilton perfectly recollects the circumstances in which he received the thanks of the Select Committee on Army and Navy Estimates, which in his opinion were most thoroughly earned and deserved.

5. The changes which are about to be introduced in the teaching establishment were decided upon after long and careful consideration, and Lord George Hamilton, adhering as he does to that decision, desires me to express his regret that he cannot comply with Mr. Hurst's request for a reconsideration of the matter

I am, &c.,

(Signed) HORACE WALPOLE.

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