

Dhananjayrao Gadgil Library



GRPE-PUNE-015628

T9(D).2.M6

A860

15628

No. 218.

EXTRACT FROM THE MINUTES OF CONSULTATION UNDER
DATE THE 23d MAY 1855.

Resolved that a copy of para 22 of the Despatch of the Honorable Court of Directors to the Government of India in the Public Department dated 20th December 1854, No. 96 and of the twentieth proposition in para 49th of a Minute by the Most Noble the Governor General dated 30 June 1854, be furnished to the Director of Public Instruction with a request that he will submit the arrangements he would propose for the establishment of a School or College for the training and instruction of persons for employment in the Public Works Department.

(A true Extract.)

J. D. BOURDILLON.

Secretary to Government.

To

The Director of Public Instruction.

Proposition by the Most Noble the Governor General dated 30th June 1854.

20. Lastly, that whether by the extension of Major Maitland's school, or by its incorporation with a larger institution upon the principle of the Thomason College at Roorkee, a complete system of instruction shall be provided at Madras for every class belonging to the Department of Public Works, Europeans, East Indians and Natives; whether artificers, foremen, overseers, surveyors, or Civil Engineers.

Extract from a Despatch from the Honorable the Court of Directors to the Government of India dated 20th December 1854 No. 96.

22. This proposal also has our entire concurrence. We shall of course receive the details of the proposed system of education, and we trust it will be always borne in mind that practical knowledge of mechanical Engineering is essential to the perfect efficiency of a Civil Engineer.

(A true Extract.)

J. D. BOURDILLON.

Secretary to Government.

No. 16.

To

The Chief Secretary to Government.

SIR,

1. I have the honor to reply to the Extract from the Minutes of Consultation under date the 23d May last, No. 218, directing me to submit the arrangements I would propose for the establishment of a school or College, for the training and instruction of persons for employment, in the Public Works Department, with reference to para 22 of the Honorable Court's Dispatch of the 20th December last, in which they express their concurrence in the proposition of the Most Noble the Governor General that whether by the extension of Major Maitland's school or by its incorporation with a larger institution upon the principle of the Thomason College at Roorkee, a complete system of instruction shall be provided at Madras, for every class, belonging to the Department of Public Works—Europeans, East Indians, and Natives, whether Artificers, Foremen, Overseers, Surveyors, or Civil Engineers:

2. The proposition which I have to submit for the consideration of Government, will dispose of the question referred to me in the 7th para of the Extract from the Minutes of Consultation under date the 22d Ultimo, communicating the Honorable Court's orders of the 2d May last, for the adoption of Major Maitland's school as a Government Institution and the assignment of salaries to Major Maitland and to the teachers employed by him.

3. As the enquiries which I have made, have led me to question the expediency of constituting Major Maitland's school as the basis of the new Institution it is designed to establish, it seems desirable that before proceeding to explain the grounds of my opinion and to suggest the arrangements that appear to me best calculated for effecting the object in view, I should review briefly the various propositions that have been brought before the Government of this Presidency, for providing the necessary means of instruction and training of persons intended for employment in the Department of Public Works.

4. The only school that has yet been established for this purpose at Madras, is the present so called "Survey school," in the office of the Board of Revenue, which was established some fifty years ago, and was at first attached to the observatory but for the last 30 years and upwards, has been in the office of the Board of Revenue and under the control of the Secretary to that Board, in the Department of Public Works. It only contains ten pupils, and whether, as regards the numbers, it can educate, or the nature of the instruction imparted in it, it has long been recognised as utterly inadequate for the wants of the Department.

5. So far back as 1842, it appears from a minute recorded by Colonel Sim, the then Chief Engineer, and at that time a member of the University Board, which had then recently been constituted, that in consequence of the difficulty which was experienced in affording time for the proper instruction of the few pupils taught in the school, it had been determined to discontinue it, as soon as the instruction of the pupils then under instruction was completed, "in order," Colonel Sim observed, "to relieve the Department of Public Works from an inconvenient duty, and also under the expectation that the excellent public and private schools lately established at the Presidency will hereafter supply young men sufficiently well educated, after some practical instruction in surveying and drawing, to take the place of those who have, till now, been instructed at the public expense." Under these circumstances, it was proposed to establish an institution in connexion with the Madras University, or rather, a department of that Institution, in which Civil Engineering in all its branches should be taught on better arranged and more systematic principles than had before been practicable, for the instruction of all who might choose to qualify themselves for admission into it. The department was to be designated a College of Engineers, and was to be under the government of a Council, composed of the President and one or more members of the Board of Education, of the Principal of the Madras University, the Chief Engineer of Madras for the time being, and the Professors of the College. The course of instruction was to comprize pure Mathematics, the principles of Mechanics, Hydrostatics and Hydraulics, Surveying, Levelling, and Drawing, Practical Mechanics and Practical Engineering in all its branches, Chemistry and Geology. It was at first, proposed that the tutorial establishment should consist of one Professor and two Native Assistants, who, in addition to other qualifications, were to be good Surveyors and Draughtsmen. The students were to be divided into two classes, the promotion from one class into the other being made on the result of an examination. The junior students, or those in the lower class, were to pay a fee of Rupees 30 a quarter, and the senior students, a fee of Rupees 40 a quarter; and at the final examination a diploma of graduate in Civil Engineering was to be conferred on those who passed satisfactorily; which diploma was to confer on the holder of it, a preference to employment in the engineering, survey, and building departments, over other candidates, other qualifications being equal. It was subsequently arranged that two officers of Engineers should between them conduct the duties of the Professorship, and that the student's fee in both departments should be reduced to 20 Rupees a quarter. It was also proposed that four endowed studentships should be established at a cost of Rupees 100 a month, and the cost of the College was estimated as follows—

	Rs.
The Professors or Professor.....	300.
A Teacher Surveyor.....	100.
Servants, Lascars, &c.....	30.
Sundry contingencies	50.
Studentships.....	100.

Rupees 580 or
Rupees 6960 per annum.

6. This comparatively inexpensive scheme for the instruction of those intended for the higher situations in the subordinate grades of the Public Works Department, which, it should be mentioned, comprised likewise an arrangement for the instruction of Officers of the line in Civil Engineering, was at the time negatived by the Honorable Court in a Despatch, dated the 18th October, 1843, on the ground that the then existing state of education at this Presidency was not sufficiently advanced to warrant the establishment of College for scientific or professional objects. On this occasion, advertng to the very small number of students who resorted to the Madras High school, the Honorable Court observed that it would be quite time enough to establish professional Colleges, when from among some hundreds of Native young men familiar with the use of the English language and with various important branches of general knowledge, classes could be found for the cultivation of professional and practical knowledge.

7. Matters continued in this position until August, 1847, when in reply to a proposition submitted by Lord Tweeddale's Government for improving the efficiency of the Public Works Department, involving the appointment, under each Collector, of an European executive Engineer, the Court of Directors stated their opinion that the subordinate branches of the Department of Public Works should be improved rather by means of Native, than of additional European, agency; and observed that although the formation of a class of Civil Engineering in the Madras University had been hitherto deprecated by them, as they had considered the state of education in Madras did not warrant the expectation of success, they were now of opinion, that with the stimulant of the prospect of employment proposed to be offered, it was probable that students might be found anxious to qualify themselves in this line of the service, and that therefore, if it should be found still advisable to obtain the services of an instructor in this department of knowledge, they would be prepared to engage a competent person in England.

8. Lord Tweeddale took a different view, and pronounced the arrangement proposed not at all calculated to meet the wants of this Presidency. It was referred, however, with the rest of the correspondence on the subject of improving the efficiency of the Public Works Department, for the orders of the Government of India; and that Government having concurred with the Home Government as to the expediency of establishing an Engineering Class in the University, the fact was intimated to the Honourable Court with a request that in the event of the proposition being still approved of by them, a competent Civil Engineer might be sent out to Madras for the purpose of affording instruction in Civil Engineering.

9. No definite orders would seem to have been passed upon this application, but it was apparently adverted to in a general despatch regarding the Public Works Department which was sent to the Government of India early in 1850, and which, I believe, led to the appointment of the Commissions to enquire into the system of Public Works which were constituted early in the following year.

10. Some years previous to these discussions, a school had been established by Major Maitland, the Superintendent of the Gun Carriage Manufactory, for the instruction of the Ordnance Artificers and Apprentices employed in the Manufactory. Major Maitland's object in establishing the school was to raise the Ordnance Artificers (who at the time of his joining the Manufactory were a very ignorant class of men, most of them being unable to read or write their own names) "from mere manual labourers into skilful scientific Mechanics, and to give them a good sound practical education, such as workmen of all trades require to fit them for foremen and overseers." The School had been set going and continued entirely by

Major Maitland's personal exertions, and had received no support or assistance from Government. The teachers were selected from among the warrant Officers and Sergeants of the Manufactory, who were most of them self-taught, and who were induced by Major Maitland by hopes of promotion and of eventual remuneration, in the event of their labors being successful, to devote a portion of their leisure time to the instruction of the artificers and pupils; the school hours being so regulated as not to interfere with the daily work of the Manufactory.

11. The success of the School was considerable. In May 1849 it was visited by Dr. Mouat, then Secretary to the Council of Education at Calcutta, who on his return to Bengal, made a most favourable report on it to the President of the Council, Mr. Bethune, in which he suggested that it should be taken under the direct patronage of the Government of Madras, and constituted a training institution for the Department of Public Works. Mr. Bethune visited the School in autumn of the same year. On his recommendation the Government of India on the 13th April 1850, called for a full report on the state of the School and the results which might be expected from it, if made a Government Institution, and, in consequence of its being understood to be Major Maitland's intention to dissolve it, it was at the same time requested that the School might not be dissolved until further orders were received on the subject from the Government of India.

12. Major Maitland was accordingly called upon for a report on the School, which he submitted on the 8th. June 1850, expressing his conviction of the feasibility of converting it into an institution for instructing Civil Engineers by simply adding one or two hundred to the Corps of Artificers at an average cost of 16 Rupees per man, which he observed would be "repaid to the state by their daily returns of work." "This" he remarked "formed the distinguishing feature between his Institution and that recently established by the Lieutenant Governor of the North Western Provinces at Roorkee; for while the Artificers are preparing for higher employment, they do so without infringing on their day's work, whereas at Roorkee the students receive double the pay and the whole day is devoted to study." In a former communication addressed to the Council of Education at Calcutta, he had stated his opinion that to ensure a really valuable body of practical subordinate Europeans, each student should be perfect master of at least one trade before admission into the Engineering College.

13. The Military Board, by whom Major Maitland's report was forwarded to Government, dissented from Major Maitland's opinion as to the necessity of candidates for employment as Civil Engineers being instructed in a trade, and as to the propriety of adopting his School as the foundation of Civil Engineering School. In their opinion, it would not only be useless and inconvenient for Civil Engineers generally to seek to acquire a knowledge of any "trade or handicraft in addition to the already extensive range of science with which they are required to cultivate some degree of acquaintance," but, "it would place an insuperable obstacle in the way of forming any Native profession of Civil Engineers, and would, ever among the Class whom Major Maitland has taken so much interest in, debar many of the most respectable from entering."

"A Maistry or Master workman," they observed, "must know his trade and know it well; but a Civil Engineer has a craft of his own; his skill is in his science; his tools are his formulæ, his surveying Mathematical instruments, pencil and ruler; not only is it not necessary that he should have a trade, but the practice of one would be likely to incapacitate him in a degree for the accurate performance of his proper duties."

"In fact the Civil Engineer, most of whose time must be given to study, whose labors are for the most part those of the mind, whose studies those of projecting and controlling, must be one of a very different class and status in society, as well as of totally different attainments, to those of the Mechanic whose labors he has to direct."

14. The Military Board concluded this letter by expressing their doubts as to the necessity of establishing a Government Engineering school for elementary purposes, and suggesting the establishment of stipendiary classes in the Civil Engineering Department, in which a

certain number of scholarships in Civil Engineering should be held out annually for public competition, as a sufficient arrangement for furnishing the wants of the public service.

15. The members of the Government, however, were unanimous in adopting Major Maitland's views, and forwarded his report to the Government of India, with a recommendation that the school should at once be taken up by Government and placed upon an efficient footing; the measures proposed with this object being—

- 1st. The gradual increase of the number of artificers and pupils to a total strength of 150 artificers and 60 pupils.
- 2d. The supply of books and instruments by Government.
- 3d. The assignment of an allowance for the Masters, not exceeding Rupees 300 a Month, to be distributed at the discretion of the Superintendent.
- 4th. The appointment of a Junior Officer of Engineers or any other Officer duly qualified as an Assistant to the Superintendent.
- 5th. The grant of salary of 300 Rupees a Month to the Superintendent for the charge of the school.

16. Shortly after Major Maitland's report and the letter from the Madras Government were laid before the Government of India, the Commission for enquiring into the Department of Public Works in this Presidency was appointed, and pending the submission of their report the Government of India deferred taking any further steps on the subject of Major Maitland's school.

17. In the report of the Commissioners no notice was taken of Major Maitland's school. They entered, however, at considerable length into the question of providing an adequate means of training for all grades of the Department; and for the instruction of the subordinate grades, they recommended the establishment of a College, some-what after the model of that which a few years before had been established at Roorkee by the Lieutenant Governor of the North West Provinces.

18. The scheme drawn out by the Commissioners is discussed in detail in paras: 612 to 637 of their 1st Report. It provided for the establishment of a College at Madras, to consist of three departments, in which the means of instruction were to be supplied for candidates for employment in all the subordinate grades of the Public Works Department. The arrangement of the departments of the College was similar to that at Roorkee, with the exception that while at Roorkee the first Department is confined almost entirely to Natives, the Commissioners advocated the almost exclusive employment of Europeans in the situations to which

	No. of Students.	Stipends.
1st. Department.	8	Rs. 50 each.
2d. Department.	25	Regimental Pay
3d. Department.	{ 20	10
	{ 72	5

that department was to lead. As at Roorkee the students at the College were to receive pay during the period of their studentships at rates varying from Rupees 5 to Rupees 50 a month. The stipends which it was proposed to assign to the students of the several grades are noted in the margin.

19. The aggregate expense of the College was estimated at Rupees 3,660 a month, exclusive of the annual expenditure on the formation of a library and model room and other contingent expenditure, as well as the interest on the capital expended in the construction of the buildings, which, it was calculated, would raise it to 50,000 or 60,000 Rupees per annum.

20. In the Minutes recorded by the Members of the Government on the Commissioners' report, no definite opinions were passed on their general scheme for the establishment of a Civil Engineering College; but it may be inferred from the observations of the Governor and of Mr. Elliott that they were disposed to adhere to their former proposal that Major Maitland's school of Ordnance Artificers should be adopted as the basis of the new

College. Mr. Elliott, however, expressed his decided dissent from the opinion of the Commissioners that the higher grades of the subordinate department should at first be confined exclusively to Europeans.

21. The proposition made by the most Noble the Governor General has been already quoted at the commencement of this letter.

22. In this proposition one of two courses is suggested; either that Major Maitland's School should be extended, or that it should be incorporated with a larger institution upon the principle of the Thomason College at Roorkee. Either course involves the adoption of Major Maitland's School as the basis of the new institution.

23. It is with much diffidence that I venture to question the feasibility of constituting Major Maitland's school the basis of such an institution as is required for the instruction of the various classes of persons who are in future to be employed in the department of public works.

24. Before stating the grounds of my opinion, it is necessary that I should advert briefly to the present constitution of Major Maitland's school. The school, as has been already observed, is attached to the Gun Carriage Manufactory, the pupils in it are the enlisted Ordnance artificers and apprentices on the establishment, all of whom are under Military discipline and in fact form a Military Corps of which Major Maitland is the Commanding Officer. The teachers are mostly Warrant Officers and Sergeants belonging to the Corps, and over the whole is Major Maitland an Officer of Artillery whose avocations as Superintendent of the Manufactory, would, I apprehend, prove incompatible with those constant demands upon his time which the superintendence of such an institution as that which appears to be required, would of necessity involve.

25. The objections which appear to me to present themselves to adopting Major Maitland's School as the basis of an institution for instruction of every class employed in the department of Public Works, are as follows—

1st. That the system of Military discipline which is a prominent feature in the plan of Major Maitland's School, and which, as the artificers under his command form a Military Corps, I imagine, could not be dispensed with, would practically operate as a bar to the more respectable classes of Natives taking advantage of the institution, and would in consequence be a serious hindrance to its efficiency.

2nd. That the duties which would devolve on the Principal of the Engineering College and those devolving on the Superintendent of the Gun Carriage Manufactory, have no necessary connexion; that it is by no means certain that Major Maitland's successor in the latter office will be competent for the duties of the former, and that therefore it is not expedient to attach the office of Principal or Superintendent of the new institution to that of the Superintendent of the Gun Carriage Manufactory—

26. The first of the above objections appears to me to be fatal to the scheme. That it would operate, and for many years to come, would prevent those classes of Natives, from among whom the most intelligent and best instructed candidates for employment in the department might be found, from entering the department, will I think be admitted by all who know the Native character. In the duties of the department themselves, there is much to which the higher classes of Natives are naturally disinclined. They have a strong disinclination to any employment which compels them to absent themselves from their homes and families, and they have an equal aversion to those handicraft employments which are urged as an essential part in the course of training for the Public Works Department. Under these circumstances it seems most necessary to abstain from coupling with the necessary course of training, any regulations which might have the effect of still further deterring them from entering the department.

27. The second objection to adopting Major Maitland's School as the basis of the new institution, on the ground that it is not expedient to attach the office of Principal of the

Engineering College to that of Superintendent of the Gun Carriage Manufactory, there being no guarantee that the Officer appointed to the one will in all cases be a fit person for the management of the other, might, I am aware, be got over by the appointment of an Assistant to the Superintendent, competent to take an active part in the instruction, and to exercise an active superintendence over all its details, as indeed appears to have been the intention of the Madras Government when they submitted their scheme in 1850 for the adoption and re-organization of Major Maitland's School; but such an arrangement, I think, is open to obvious objection and ought not to be resorted to, unless called for by more pressing considerations than appear to me to exist. I have already adverted to the possibility, and in fact probability, in the natural course of things, of Major Maitland's being succeeded in the office of Superintendent of the Gun Carriage Manufactory by an Officer, who, besides being deficient in that tact and zeal which has enabled Major Maitland to organize and keep going what has proved a most useful School for the purposes for which it was established by him, under most discouraging circumstances, might be less qualified by his attainments in those branches of knowledge which are essential to an Engineer, to superintend the details of the instruction. As a general rule, I presume the Officer would be selected rather on account of his fitness for superintending the working of the Gun Carriage Manufactory, than on account of his fitness for directing and taking a part in the instruction imparted in the School.

28. The distinguishing feature of Major Maitland's School, and that which has led to the very high estimate that has been formed of its capability of being made the basis of a more extensive training institution for the Public Works Department, is the practical instruction which is afforded in it by the daily employment of the pupils in some one or other of the handicraft trades, in the works going on in the Gun Carriage Manufactory. This is especially adverted to in Mr. Elliott's minute on Major Maitland's original report, where he draws attention to the valuable character of the instruction imparted in the School, as evidenced not only in the scientific attainments of the pupils, but by the "habits of laborious application they have acquired by working in the Artificers yard, where also they have learnt by their own experience the necessity of minute attention to details in the execution of a work, to ensure its being without a flaw, and have become practically conversant with the best expedients for saving labor and securing efficiency."

29. But admitting the practical instruction imparted in the Gun Carriage Manufactory to be very excellent in its way, and for the purposes for which it is given, the question at once arises;—"Is it of that character which is required for the Engineers and other employees of the Public Works Department? The works in which the artificers are employed are all branches of carpenter's work or smith's work; the trades which are most essential to a Civil Engineer, overseer or maistry, are those connected with buildings, brick making, mixing of mortar, earth works and water works, so that in this respect the course of instruction would have to be materially altered, and a portion of that part of the pupils' time which is devoted to practical instruction, would have to be diverted to other employments than those in which the pupils in Major Maitland's School are engaged.

30. The carpentering and smith's work, which is pursued in the Manufactory are, I am aware, not without their uses, even to those who may have but little occasion to make use of those handicrafts in after life; but when the question arises as to what is the most useful course of instruction for those to be employed as Civil Engineers, overseers or maistries in the department of Public Works, I believe I am correct in stating that the trades taught in the Gun Carriage Manufactory form but small part of the practical training which is required.

31. For these reasons I have ventured to question the expediency of adopting Major Maitland's School as the basis of a permanent training Institution for the Public Works Department.

32. When the first of the two orders now under reply was received by me, I entertained some doubt as to whether this question was still an open one, and whether the decision of the Honorable Court of Directors in confirmation of the Most Noble the Governor General's pro-

position did not preclude the consideration of any scheme for the organization of a training school for the Public Works Department, not involving the extension or incorporation of Major Maitland's School. The terms however of the Honorable Court's recent dispatch are such as to show that the question of adopting Major Maitland's school as the basis of the projected Institution has not been decided; for it is therein declared that any definitive arrangements made in respect to this School must depend upon the measures to be proposed by the Government of India and I have therefore deemed myself justified in representing the objections that appear to attach to the amalgamation of the two institutions.

33. In the course of the discussions, of which a precis has been given in this letter, the opinion has more than once been broached, that for the more elementary part of the instruction required for the Public Works Department, the establishment of a Government School is unnecessary and that provided adequate inducements be held out by Government, by placing the department on such a footing as to render admission into it an object of ambition to the educated classes, the public and private schools in and about Madras, and now rising up in the Provinces, will furnish a sufficient number of persons qualified to enter upon those studies which are necessary to the higher branches of the profession. This opinion was first enunciated by Colonel Sim, in his minute proposing the establishment of an Engineering Class or College in connexion with the Madras University, and subsequently by the Military Board, in their letter of the 9th July 1850, forwarding Major Maitland's first report to the Government on his school. The same opinion has since been propounded by Lieutenant Colonel Pears the Consulting Engineer for Railways, in a letter addressed by him to Government under date the 31st May 1853 with reference to the proposed establishment of a school for instructing youths in surveying, levelling &c., in connexion with the Madras Railway.

34. It is argued that for the lower grades in which the amount of theoretical instruction required is very inconsiderable, in comparison with the practical training which is requisite, the sort of training which can be given in a school, is comparatively useless, and that the amount of theoretical instruction that is required for what may be designated as the practical, in contradistinction to the scientific, branches of the profession, may be secured by other less expensive means than the establishment of a Government School for the instruction of such persons.

35. It appears to me to be questionable whether this opinion is not based upon too favourable an estimate of the state of education in Madras and whether to provide the large number of qualified persons who will be required for the subordinate grades of the Department, the establishment of an institution in which the means of instruction for all grades shall be available, is not absolutely required.

36. This question, however, is no longer an open one; for it has been authoritatively decided by the Court of Directors in assenting to the propositions placed before them by the Governor General that the principle shall be recognized in the system of every local Government that there shall be afforded by Government the means of instruction of the best description to every class from the highest to the lowest employed in the department of Public Works.

37. I will now proceed to state the arrangements I have to propose for the organization of the new College. In considering these arrangements I have made myself acquainted with the scheme of the Engineering College at Roorkee and with that proposed by the late Public Works Commissioners at Madras. I have also had the advantage of perusing a memorandum by Lieutenant Colonel Goodwyn, the Chief Engineer in Bengal on the establishment of an Engineering College at Calcutta, as well as a minute recorded on the subject by the Lieutenant Governor of Bengal. The arrangement which appears to me to be best adapted to the circumstances of this Presidency is a modification of that proposed by the late Public Works Commissioners. I would adopt the division into three departments proposed by the Commissioners, and based upon the Roorkee scheme, laying down a certain standard of qualificati-

on for admission into each department and adopting the course of instruction in each to the duties for which it is intended to prepare. The first important alteration that appears called for in the Commissioners' plan is the admission of all classes of persons into the several departments of which the College is to consist. The restrictions proposed by them in regard to the 1st and 2d Departments have been disapproved by the Governor General and are opposed to the principle upon which the establishment of the College has been sanctioned by the Honorable Court.

38. The next point upon which I would recommend a deviation from the Commissioners' plan is their proposal that stipends should be assigned to the pupils. This proposal is founded upon the practice obtaining in the Roorkee College. It seems to me to be open to very obvious objections and to involve a very unnecessary addition to the expenses of the institution. I would suggest that in lieu of stipends a limited number of Scholarships be assigned to each department, which should be open to public competition and should be so arranged as to render the advantages of the College available to youths in the Provinces, as well as to the inhabitants of Madras and its neighbourhood, assuming that Madras will be selected as the best locality for the College, for which the Commissioners, I think, have assigned valid reasons. I am aware that one of the considerations which weighed with the Commissioners in proposing that the students should be granted monthly stipends during the period of their studentship was the expediency of providing those who might have passed through the lower grades of the Institution with the means of returning to it, after having been employed for a time in the active duties of the the service, with a view of qualifying themselves for promotion to the higher grades. Indeed, according to the Commissioners' plan, the 1st department

See Commissioners' First Report, Para 623. was apparently to be restricted to persons who had been actually employed for a certain fixed period as overseers or superintendents of maramat. In their case the monthly stipends were to be in lieu of the salaries they would have given up on entering the College. The rejection however of the restrictions proposed by the Commissioners obviates to a great extent the necessity for making such a provision as that now under notice; for with the admission into all the departments unrestricted, it seems probable that the majority of the students will be persons having no situations to give up, and if it be considered desirable to encourage a resort to the College by those actually employed in the service, I think it would be preferable that some arrangement should be made for continuing to them a portion of their salaries as such, than to adopt the principle of providing the means of subsistence for the students generally.

39. The sum proposed by the Commissioners to be disbursed in monthly stipends is Rupees 960 per mensem. Less than a third of this sum, if granted for scholarships, would, I think, be ample for the encouragement of deserving students. Whether or not a monthly fee should be exacted from the students, it is more difficult to decide. At the commencement however I think it would be expedient to dispense with it.

40. I have already adverted to the expediency of rendering the scholarships an inducement to persons in the Mofassil to resort to the College. This might be managed either by assigning a certain number of the scholarships to the Government schools in the provinces to be competed for by the pupils of those institutions, or by holding examinations in different districts open to general competition. With a similar object I would suggest the expediency of making some provision for boarding a certain number of students. Such an arrangement I think is very desirable; for it is within my knowledge that Native residents in the provinces are not unfrequently deterred from sending their sons to the educational institutions at Madras by the difficulty they experience in arranging for their being boarded and looked after out of school hours. For the European Military students such an arrangement will of course be necessary.

41. In regard to the standard for admission and course of instruction to be followed in the several departments, I have nothing to add to that proposed by the Commissioners, an

abstract of which is annexed. The Commissioners, I think, have assigned valid grounds for their recommendation that the English language should be the sole* medium of instruction, but as a general rule a sound colloquial knowledge of one Vernacular language should be exacted from all candidates for admission.

42. The following is the establishment that I would propose—

	Monthly.
Principal, staff salary.	Rupees 700
Professor of Civil Engineering and Architecture.....	600
1st Mathematical Master.....	300
2nd.....do.....	200
Surveying Master.....	250
Drawing ...do.....	250
Mechanist.....	250
	2550
Instruments and tools, per mensem.....	400
Work-shops.....	250
Brick-fields and Lime kilns.....	200
Books and stationery.....	500
Establishment of servants, &c.....about....	400
Scholarships.....	300
House Rent.....	250
	Total Rupees 4850 or
	Rupees 58,200 per annum.

43. The above is a rough estimate which will probably be susceptible of considerable modification. The Public Works Commissioners appear to have contemplated that here, as at Roorkee, the Principal should be an Officer selected from the corps of Engineers. The advantage of this arrangement is, that if the officer appointed should not be found on trial well qualified for the duties of the situation, there would be no difficulty in transferring him to another post. It is also desirable that for the maintenance of discipline among the European military students the Principal should be a military man. I think it is of importance that the Principal should be competent not only to superintend the instruction generally, but to take a leading part in it, and that his scientific attainments should be such as to command the respect of his subordinates.

44. It has been suggested to me that the premises lately occupied by Messrs Hider and Co might be rented by Government and with some trifling alterations might be made available for the purposes of the College.

45. If the above arrangements should be approved, Major Maitland's school will, I presume, be restricted to the purposes for which it was established by him viz, the education of the Ordnance artificers under his command. From this body the majority of the artificers required for employment in the Public Works Department will be selected; and while the design of the school will be limited to the education of artificers, all due facilities should be offered to those who may manifest an aptitude for scientific duties to enter the Public Works Department.

I have the honor to be

Sir

Your most obedient Servant.

A. J. ARBUTHNOT.

Director of Public Instruction.

India.

20th July 1855.

* It may possibly be deemed expedient to relax this rule in the case of Europeans, but if dispensed with on admission into the College, a fair knowledge of one Vernacular language should be made a sine qua non for employment in the department.

*PROPOSED STANDARD FOR ADMISSION AND COURSE OF INSTRUCTION
IN THE THREE DEPARTMENTS OF THE ENGINEERING COLLEGE.*

First Department. STANDARD FOR ADMISSION.

A familiar knowledge of the English language and of One of the Vernacular languages of Southern India.

A knowledge of Arithmetic, Geometry, Algebra, Mensuration, Plane and Spherical Trigonometry, Conic Sections, and Mechanics.

COURSE OF INSTRUCTION.

I Revisal of certain branches of Mathematics.

II *Materials.* Strength of materials. Stability of structure.

III *Construction.* Masonry, Carpentry, Bridges, Foundations, Earthworks, Roads.

IV *Practical Hydraulics.* Rivers, Drainage, and Irrigation Canals.

V *Motive Powers.* Machinery and tools, Hydraulic mechanics.

VI *Geodesy.* Surveying and Levelling, Practical Astronomy, Trigonometrical surveying.

VII. *Outlines of Geology.* Physical Geography, Meteorology.

Second Department. STANDARD FOR ADMISSION.

A familiar knowledge of the English Language and one of the Vernacular Languages of southern India.

A knowledge of Arithmetic, Mensuration and simple Plan drawing.

COURSE OF INSTRUCTION.

Plane Geometry, Mensuration.

Algebra, and its application to Geometry.

Plane Trigonometry the measurement of heights and distances.

Elements of Mechanics, and the practical subjects enumerated in the course of instruction for the 1st Department.

Third Department. STANDARD FOR ADMISSION.

A fair knowledge of English, speaking, reading, and writing, and a sound knowledge of one of the Vernacular languages of Southern India; a fair acquaintance with common Arithmetic, the rules of Proportion and Vulgar and Decimal fractions.

COURSE OF INSTRUCTION.

Surveying, Levelling, and Plan drawing, practical instruction in the use of tools, the strength of materials in the various species of construction and in the incidents and treatment of Hydraulic Works.

Public Department.

No. 1125.

EXTRACT FROM THE MINUTES OF CONSULTATION
DATED 15th AUGUST. 1855.

Read the following letter from the Director of Public Instruction.

(Here enter 20th July, 1855. No. 16.)

In the above letter the Director of Public Instruction submits, as required by Extract Minutes of Consultation 23d May last, the arrangements which he proposes for the establishment of a College for the training and instruction of persons for employment in the Public Works Department.

2. In their despatch of 20th December, 1854, Public Department No 96, the Honorable Court of Directors expressed their entire concurrence in the proposal of the Most Noble the Governor General that whether by the extension of Major Maitland's School or by its incorporation with a larger institution upon the principle of the Thomason College at Roorkee, a complete system of instruction shall be provided at Madras for every class belonging to the Department of Public Works, Europeans, East Indians and Natives, whether Artificers, Foremen, Overseers, Surveyors or Civil Engineers. The Honorable Court added "we trust it will always be borne in mind that practical knowledge of mechanical Engineering is essential to the perfect efficiency of a Civil Engineer."

3. In their Despatch of 2d May 1855, Public Department, No 24, on the subject of Major Maitland's School, the Honorable Court stated "we have now in compliance with the recommendation of the Government of India sanctioned the establishment of a College of Civil Engineering at Madras, and all necessary instructions relating to it will be communicated to you by that Government." "Any definitive arrangements made in respect to this (Carnatic Artificers') School must," it was added, "depend upon the measures to be proposed by the Government of India."

4. No communication has been received from the Government of India containing instructions to the effect noted in the above Despatch; and prior to its reaching Madras, the Director of Public Instruction had, as already mentioned, been desired to suggest the arrangement which he would recommend for the contemplated College.

5. In the opening of his Report, Mr Arbuthnot recapitulates the steps which have hitherto been taken in the Madras Presidency for providing the necessary means of instruction and training of persons intended for employment in the Department of Public Works. He then proceeds to consider the question, which he deems to be left open by the terms of the 24 of 1855, Public Court's late Despatch, whether Major Maitland's School should be taken Department.

as the basis of the new Civil Engineering College, or whether the College shall be constituted as an entirely distinct establishment. His reflection and inquiry upon the subject have led him to prefer the last of the two alternatives.

6. The reasons which have induced the Director to consider that it would not be advisable to adopt Major Maitland's School as the ground-work for the new institution are--

1st. That the system of Military discipline which is a prominent feature in the plan of Major Maitland's School, and which, as the Artificers under his command form a Military Corps, could not, it is to be presumed, be dispensed with, would practically operate as a bar to the more respectable classes of Natives taking advantage of the instruction, and would, in consequence, be a serious hindrance to its efficiency.

2d. That the duties which would devolve on the Principal of the Engineering College and those devolving on the Superintendent of the Gun Carriage Manufactory, have no necessary connexion, that it is by no means certain that Major Maitland's successor in the latter office will be competent for the duties of the former, and therefore it is not expedient to attach the Office of Principal or Superintendent of the new institution to that of the Superintendent of the Gun Carriage Manufactory.

Mr. Arbuthnot enlarges upon these considerations in paras 26 and 27 of his report.

7. The Director then adverts to what has been held to be the peculiar merit of Major Maitland's system; viz: that the education imparted by it is of an eminently practical character, the pupils being required to master some one or other of the handi-craft trades in the works going on in the Gun Carriage Manufactory. He notices that the trades there followed are not, however, those most in use in the Department of Public Works, being chiefly Carpentry or Smith's Work, whereas the trades which are most essential to a Civil Engineer, Overseer, or Maistry, are those connected with building, brick-making, mixing of mortar, earthworks, and water works.

8. Having thus explained the reasons which have brought him to the conclusion that the

Civil Engineering College should be an independent establishment, unconnected with the Carnatic Artificers' School, Mr. Arbuthnot next submits his scheme for the proposed institution. His plan is a modification of that sketched out by the Commissioners for Public Works in their Report, paras 618-636, the principal deviations from it consisting in the admission of all classes of persons into the several departments, and the substitution of a certain number of Scholarships to be opened to public competition for the payment of stipends to all the students in the Institution. The standard of admission and course of instruction prescribed by the Commissioners are to be adopted, and, as advised by them, the English language is to be the sole medium of instruction, but as a general rule a sound colloquial knowledge of one Vernacular language is to be exacted from all candidates for admission, except Europeans, who will, however, be required similarly to qualify themselves before employment in the Public Works Department.

9.

The Cost proposed is monthly

Principal, Staff salary.....	Rupees...	700
Professor of Civil Engineer and Architecture.....		600
1st Mathematical Master.....		300
2nd do		200
Surveying master.....		250
Drawing.... do		250
Mechanist.....		250
		2,550

To which will have to be added

Instruments and tools, per mensem.....	400
Workshops.....	250
Brick fields and lime kilns.....	200
Books and Stationery.....	500
Establishment of Servants &c., about.....	400
Scholarships.....	300
House rent.....	250
	4,858

10. The Principal will be a Military Man and preferably an Officer of the Corps of Engineers.

11. The Right Honorable the Governor in Council has attentively considered the plan of the Civil Engineering College propounded by the Director of Public Instruction, as sketched in the preceding paras: and believing the objections urged against the adoption of the Carnatic Artificers' School as a basis of the College to be valid, more especially that of the essentially and necessarily Military character of the Institution and of the discipline to be maintained in it; he approves generally of the arrangements which have been submitted by Mr. Arbuthnot and resolves to recommend them and the establishment for carrying them out for the sanction of the Government of India. He must however remark that he can in no way recognize nor tolerate any such prejudices on the part of the Natives as would disincline them to send their children to such establishments as Major Maitland's School on account of the manual labor which forms part of the course of instruction. What the Government most require are practical men who know their business; and none are likely to acquire practical habits, unless they are obliged to learn some particular trade. It is remarked that the Director's estimate includes charges for instruments, tools, workshops, brick fields and lime kilns, and in the opinion of Government, every student should be required to master some one trade or craft; his knowledge of which should not be merely theoretical or confined to general principles; but practical, extending to a familiarity with details and acquaintance with the use of tools and implements gained by personal labor in the yard or workshop.

12. The Director concludes by remarking that if his arrangements be approved, "Major Maitland's School will, I presume, be restricted to the purposes for which it was established by him; viz: the education of Ordnance Artificers under his command. From this body the majority of the Artificers required for employment in the Public Works Department will be selected, and while the design of the School will be limited to the education of Artificers;

"all due facilities should be offered to those who may manifest an aptitude for scientific duties
"to enter the Public Works Department."

13. To these views the Government quite subscribe; but it is believed that in order that Major Maitland's School be in a condition to supply any considerable number of Artificers to the Public Works Department, in addition to the Ordnance, it will need to be increased. The Director of Public Instruction will after communicating with Major Maitland and the Chief Engineer state to what extent the increase should for the present take place.

(True Extract.)

J. D. BOURDILLON.

Secretary to Government.

To

The Director of Public Instruction.

No. 1279.

Public Department.

EXTRACT FROM THE MINUTES OF CONSULTATION
DATED 27th SEPTEMBER, 1855.

Read the following letter.

Chief Engineer's Office. D. P. W.

Fort Saint George 17th September, 1855.

No. 1021.

From

The Chief Engineer in the Department of Public Works.

To

The Secretary to Government in the Public Works Department.

Sir,

Having been favoured by the Superintendent of the Gun Carriage Manufactory and the Director of Public Instruction with copies of Extract Minutes of Consultation, No. 112 dated 15th. August, 1755, relative to the Civil Engineering College proposed to be established at Madras, and been called upon by those officers to state the probable number of Artificers that would be required for the Public Works, I deem it proper to lay before Government for its consideration my views and those of my deputies on a question of great importance connected with the subject.

2. The lucid arguments adduced by Mr. Arbuthnot in illustration of his position that the proposed Civil Engineering College should be an establishment entirely distinct from the Carnatic Ordnance Artificers' school leave but little room for me to add any thing in support of that view, in which myself and the three deputies fully concur, but I would observe that the nature and scope of the two institutions are so widely different that no necessary connection or dependance, can subsist between them. The object of the Artificers' school is to train young men in the arts of carpentry and smith craft, with the view of bringing that knowledge to bear on the durable and economical construction of Gun Carriages, so that the aim of the Institution is to arrive at the greatest proficiency in the above trades, whilst on the contrary, the studies require for the Civil Engineer's Department, embracing as they do the theory of mechanics, the principles of general and special construction and the various subjects comprised under the head of hydraulic Engineering, are of so extensive range and in some essential branches so purely intellectual, that however desirable a practical acquaintance with handicraft trades may be, it forms but a very subordinate part of those studies, so that to attempt great proficiency in them, must certainly eventuate in only a moderate acquisition of the superior branches.

3. For these reasons, one of my Deputies, Major Cotton, has been led to record a Memorandum on the subject, which I beg to submit for the consideration of Government. That Officer, it will be seen, advocates the propriety of giving the artificers an education altogether distinct from that of overseers, surveyor

Enclosure.

and Civil Engineers on the principle that "to attain to excellence in any handicraft, the entire attention of the apprentice must be given to that trade." Owing also to the limited range of the instruction imparted in Major Maitland's school, he remarks that the artificers required for the Department of Public Works should be taught at the site of the great works under execution, where alone they can acquire a practical knowledge of masonry, the art of plating, the mode of combining timbers for the roof of a house or the centering of a bridge, which knowledge is infinitely more important to the Civil Engineer, than any that can be advantageously taught in the Gun Carriage Manufactory.

4. Of the justness of these views, there can be, I think, but one opinion, and though Major Maitland's artificers may doubtless be turned to good account by being taught the additional trades required to fit them for employment in the Department of Public Works, I would still recommend an entire separation of the two Institutions; and that of the Artificers' school in the College itself, from the Engineering Department of the same; for to quote the words of Major Cotton, "it cannot be expected that boys will give their attention to the study of laborious trades, when they see a probability of escaping from them by learning the simple rules of surveying and levelling; writing or painting &c.," nor can they attain to great proficiency in them when the object of their ambition has in another direction.

Chief Engineer's Office D. P. W. }
Fort St. George. }
17th September, 1855.

I have &c.
(Signed) C. E. FABER Lt. Col. of Engineers.
Chief Engineer in the D. P. W.

MEMORANDUM.

I see nothing in Major Maitland's school, except its admirable organization, and discipline, which points it out as an advisable place of instruction; and as his system may be adopted any where else, I think it better that schools in every respect suitable should be instituted for the education of pupils for the Civil Engineer's Department, distinct from the Gun Carriage Manufactory.

2. The success of Major Maitland's school as a school of artificers has not been great. It has never turned out men of remarkable skill in any trade; and when a knowledge of surveying, which could be gained in a few weeks, led to the artificers obtaining a higher rate of pay than is allowed to mechanics, a death blow was given to the utility of the institution as a place of education for blacksmith's and carpenters.

3. It cannot be expected that boys will give their attention to the study of laborious trades, when they see a probability of escaping from them by learning the simple rules of surveying, and levelling; writing, &c. painting.

4. What is now required in the Civil Engineer's Department is superior skill, not only in the two or three trades taught in the Gun Carriage Manufactory, but in all the many arts employed in Civil Engineering; and to obtain that, we must keep every trade to itself in our schools, and guard most carefully against the offer of temptations that may lead the pupils' attention from their own proper business.

5. To do this, it will be necessary to correct our rate of payments, and to keep our school of artificers quite distinct from the schools in which our ordinary overseers are educated. A skilled and experienced artificer may become a foreman in his own trade, but should never be lost as a common overseer; and so greatly is the Civil Engineer's Department in need of better skill, that every effort should be made to raise the character and condition of our artificers. It was in my opinion a great mistake to remove the pupils from Major Maitland's school and make surveyors of them. If they were even moderately good workmen, they were of far more value as artificers than as surveyors; but while we pay the Mechanics, however well skilled, lower than the boy who can level or survey, small blame either to Major Maitland, or his pupils, if they are allowed to change their trades and take advantage of the permission.

6. To attain to excellence in any handicraft the entire attention of the apprentice must be given to that trade only. There are very few who can excel in more than one; and to obtain any thing like perfection, it is found advisable to subdivide every manufacture as much as possible.

7. In Major Maitland's school it has been an object to make the youths generally useful, so that in case of accidents with guns in the field they might be ready to help as either blacksmiths or carpenters.

8. To meet our requirements now this training would not answer; and it is enough to account for the absence of superior skill in the Artificer Corps at present.

9. In teaching each trade, a certain quantity of materials must be consumed, but in workshops there need be little waste, if the inferior skill of the pupils is applied to those parts of the works which require no nicety. In such an institution as the Gun Carriage Manufactory, however, the limit of no waste is soon reached even in those trades of necessity followed there, and if builders were to be instructed, their education must be by models, or by that most depressing of all occupations, construction and reconstruction with the same materials.

10. There is a most marked difference between the energy and consequently the skill and efficiency of any body of men taught on works that show an useful result, and the school taught man, whose disheartening training has led him to take little interest in any thing and to set no value on his own utility.

11. As a school for our artificers, there is then in my opinion nothing at present suitable in Major Maitland's school nor any thing giving promise of fitness. I would give the overseers, surveyors and Civil Engineers an education altogether distinct from the artificers, not that they might not be well employed in learning to work with their own hands; but because I feel sure that while our artificers are brought up with our draughtsmen and others who have less laborious employment, they will live in the hope of a change from one class to the other and never give their whole attention to their trade.

12. I would rather see a distinct school for the overseers and others; and the artificers I would have educated in schools on the great works, where they will see the result of what they do, and learn to take a pride in their work from its visible utility.

13. On those works, they will be taught the particular branches of each trade most required by the Civil Engineers, which will not be the case in the Gun carriage Manufactory, unless work unconnected with the purpose of the establishment is taken up for the special object of teaching. A man may make any number of carriages without gaining experience in the combination of timbers for a roof or centering; and let him be ever so well skilled in fitting nuts and screws, he will require a new apprenticeship before he is able to temper boring tools to suit each variety of rock, a branch of the ironsmith's trade infinitely more important to the district Engineers than any of those which could be advantageously taught in the Gun Carriage Manufactory.

14. Before closing these remarks, I must be allowed to say that the supposition of the Gun Carriage Manufactory school being a suitable place of instruction for our Artificers, must in my opinion, have arisen and be supported upon the personal qualifications of Major Maitland as a controller of the establishment. I am free to admit the advantage of that officer's admirable skill in the organization of such a school, but I cannot allow that he has himself sufficient practical knowledge of the trades required, either to qualify him as a teacher, or even to enable him to judge of the skill of his pupils as working Engineers. Should the artificers' school, as I propose, be upon the Engineering works, they will be under the tuition of Engineers; whatever changes may take place in the individual Officers managing them; whereas on Major Maitland leaving the Gun Carriages Manufactory, the Officer who succeeds him will, I imagine, be no Engineer, and the probabilities are greatly against his having his predecessor's peculiar talent for training pupils. Under these circumstances, I would venture to recommend:

even now a reconsideration of this important subject.

(Signed) F. C. COTTON.

1st September 1855.

Deputy Chief Engineer.

(True Copy.)

(Signed) C. E. FABER, *Lieutenant Colonel, Engineers.*

Chief Engineer in the D. P. W.

Resolution. Resolved that the foregoing letter and its enclosure be communicated to the Department of Public Works, and also to the Director of Public Instruction for his consideration with reference to Extract Minutes of Consultation No. 1125. dated 15th Ultimo.

(True Extract and Copies.)

J. D. BOURDILLON.

To

Secretary to Government.

The Director of Public Instruction.

Public Department.

No. 172,

EXTRACT FROM THE MINUTES OF CONSULTATION
DATED, 4th FEBRUARY 1856.

Read the following letter.

No. 94.

From

Lieutenant Colonel W. E. BAKER,

Secretary to the Government of India.

To

J. D. BOURDILLON Esq.

Secretary to the Government of Fort Saint George.

Dated the 12th January 1856.

Sir,

I am directed to acknowledge your letter No. 85 of the 15th August, 1855, forwarding for submission to the Government of India, a Report from the Director of Public Instruction on the measures proposed for the establishment of a Civil Engineering College at Madras, and with an Extract from the Minutes of Consultation of the Government of Fort Saint George on the same subject.

2. The Most Noble the Governor General in Council concurs with the Government of Fort Saint George in general approval of the scale of establishment, and the classification of Departments in the College which Mr. Arbuthnot has proposed.

3. But the Government of India still holds a decided opinion that such a training school as Major Maitland's should be incorporated with the Civil Engineering College at Madras, because the system of instruction would be incomplete without it.

4. The Civil Engineering Colleges at the different Presidencies are intended to supply a complete course of instruction for all who may be employed in the Public Works Department, from the highest to the lowest.

5. The instruction afforded in Major Maitland's school forms an essential element in such a course.

6. The want of such an element has been felt in the Thomason College at Roorkee, and has been supplied in the schema of organization for the College in Bengal.

7. In Madras alone, the means of supplying the want are at hand in Major Maitland's school.

8. Two objections are brought against such an incorporation by the Director of Public Instruction, and their validity is admitted by the Right Honorable the Governor in Council. These objections are—

1st. The necessity for maintaining the connexion of Major Maitland's school with the Gun Carriage Agency, whilst there is not only a want of any necessary connexion between that Agency and the Civil Engineering College, but the obvious fact that Officers for the superintendence of these two institutions must be selected on very different grounds of qualification.

2d. The strong reason which exists to apprehend that the compulsory enlistment of all College students in the corps of artificers, and the obligation to spend a large portion of their time in the acquisition of a handicraft, would deter classes whom otherwise it would be very desirable to attract, and would occupy much of the short time allotted to education which might be more usefully employed.

9. It does not appear to the Most Noble the Governor General in Council that the connexion between the Gun carriage agency and the training school need be maintained.

10. Major Maitland in consideration of his past services, might as an exceptional case be allowed to retain superintendence of this department in the College, together with the charge of the Gun Carriage Agency.

11. If this should be found inconvenient, he might be allowed to select either appointment, and should receive adequate remuneration.

12. But the Government of India, strong as they hold Major Maitland's personal claims to be, do not admit the determination of the present question to hinge in any degree upon those claims.

13. The selection of Officers for the new institution rests, as a matter of course, with the Government of Fort Saint George; and the Governor General in Council has no doubt that Major Maitland's past services, in connexion with his school, will meet with fair consideration at their hands.

14. As regards the question of enlistment, it appears doubtful whether Major Maitland himself would make enlistment compulsory on all who might wish to enter the College. There appears to be no reason why all classes in the College should not have the full benefit of his training school, by making attendance in the workshops part of the course, and by allowing a certain number of marks in the examinations for certified proficiency in the use of mechanics' tools. If it be considered that enlistment is necessary for the ordnance service, the candidates for that department may continue to be enlisted; but it should be clearly understood that they are to have the same advantages of general tuition as the rest of the 3d department and that they are equally eligible, if qualified, for promotion to the higher grades.

15. It may further be desirable that students of the 3d department who are not enlisted, should be apprenticed for a certain term of years. This is for the consideration of the Government of Fort Saint George.

16. But in the course of instruction for all three classes in the College, a regulated attendance in the workshops should form an essential part, allowing shorter periods for the first class and longer periods for the second and third.

17. A scheme embracing the features which have now been indicated, the Most Noble the Governor General in Council will be prepared finally to approve.

Fort William, }
The 12th January, 1856. }

I have &c.

(Signed) W. E. BAKER, Lieutenant Colonel.
Secretary to the Government of India.

1. Resolved that copy of the above letter be furnished to the Director of Public Instruction in reference to Extract Minutes of Consultation 15th August and 27th September last and that he be requested to submit his opinion on the arrangements proper to be made in the scheme of the Civil Engineering College to give effect to the wishes of the Supreme Government.

2. The Government may, however, remark that it was not their intention, that such a course of practical instruction as is imparted at Major Maitland's establishment, should not form a part of the system at the Engineering College. They merely doubted whether a school for such a purpose should be attached to the Gun Carriage Manufactory.

(True Extract and Copy)

(Signed) T. PYCROFT.

Chief Secretary.

To

The Director of Public Instruction.

No. 193.

To

MAJOR J. MAITLAND,

Superintendent of the Gun Carriage Manufactory.

Sir,

I have the honor to transmit to you the annexed copy of an Extract from the Minutes of Consultation under date the 14th Ultimo, communicating copy of a letter from the Government of India on the subject of the scheme proposed in my letter of the 20th July last for the establishment of a Civil Engineering College at Madras and to request that you will be good enough to favour me with your views as to the best mode of carrying out the orders of the Governor General in Council for the incorporation of the school at present attached to the Gun Carriage Manufactory into the scheme of the projected College.

2. I presume it is the intention of the Governor General in Council that the 3d Department of the projected College should be established on the premises belonging to the Gun Carriage Manufactory in order that the pupils may attend the workshops; but how such an arrangement would be consistent with the eventual separation of the offices of Superintendent of the Gun Carriage Manufactory and of Superintendent of the 3d Department of the Engineering College to which reference is made in the 9th and 10th paras of Colonel Baker's letter, I do not very clearly comprehend.

3. I take this opportunity of sending for your perusal and for any remarks you may have to offer, an original order of Government under date the 27th September last, communicating copy of a letter from the Chief Engineer and a memorandum by Lt. Colonel F. C. Cotton. I also enclose the draft of my letter to Government of the 20th July last in which the scheme of instruction proposed for the several departments of the projected College is set forth in detail.

I have the honor to be

Sir,

Your most obedient servant,

(Signed) A. J. ARBUTHNOT.

Director of Public Instruction.

12th March, 1856.

No. 192.

To

The Chief Engineer,

Department of Public Works.

Sir,

I have the honor to transmit to you the annexed copy of an Extract from the Minu-

tes of Consultation under date the 14th Ultimo, communicating copy of a letter from the Government of India on the subject of the scheme proposed in my letter of the 20th July last for the establishment of a Civil Engineering College at Madras, and to request that you will be good enough to favor me with your own views and those of the two deputy Chief Engineers who are now at the Presidency as to the best mode of carrying out the orders of the Governor General in Council for the incorporation of the school at present attached to the Gun Carriage Manufactory into the scheme of the projected College.

2. You are aware that I have all along doubted the feasibility of this measure, and I may mention here that I fully concur in the opinion recorded in your letter to Government of the 17th September last, and in Lieutenant Colonel Cotton's Memorandum of the 1st idem.

3. I presume it is the intention of the Governor General in Council that the 3d Department of the projected College should be established on the premises belonging to the Gun Carriage Manufactory in order that the pupils may attend the work shops; but how such an arrangement would be consistent with the eventual separation of the offices of Superintendent of the Gun Carriage Manufactory and of Superintendent of the 3d Department of the Engineering College to which reference is made in the 9th and 10th paras of Colonel Baker's letter, I do not very clearly comprehend.

I have &c.

(Signed) A. J. ARBUTHNOT.

Director of Public Instruction.

12th March 1856.

No. 2481.

Central Office of Public Works.

Fort Saint George 15th April, 1850.

From

The Chief Engineer,

To

The Director General of Public Instruction, Madras.

Sir,

I have had the honour to receive your letter No. 192. of the 12th Ultimo and regret to have delayed replying to that important reference for so long a period as has already intervened; I beg however to assure you that notwithstanding the pressure of other occupations I should have addressed you at an earlier date, but for the difficulty I found in so interpreting paras 9 & 10 of Lieutenant Colonel Baker's despatch of the 12 January 1856. No. 94 that they should harmonize with the succeeding paras 14 & 15 of the same letter.

2. Without dwelling further however on the difficulty at present, I will at once proceed to state some of the reasons.

3. In regard then to that nonincorporation contemplated by Colonel Baker in the 9th para of his letter, I have to observe, that the ordnance artificers being a regularly enlisted military body, are in that respect quite distinct and are moreover necessarily employed during the whole of their time in the workshops, on those specific occupations for which the Gun Carriage Manufactory was originally instituted and is still maintained, and their hours of attendance being exceptional, are not such as would suit general pupils. But the workshops of a Civil Engineering College should not be arranged for the mere purpose of giving a special training in chiefly one or two branches of handicraft; on the contrary the object should be to impart a practical knowledge of the details required in several or in many of the multifarious processes with which the accomplished Engineer may be expected to be familiar, such e. g. as centerings, timber bridges, joints of roofs, and other constructive specialties. Then too the Civil Engineering pupils should be exercised in the preparation, the designing and the actual manual construction of models, whether of various roofs, lock-

gates, sluices, valves, or framing of bridge-centres, together with carefully wrought examples of different kinds of scarping, fishing, straps, joints &c. &c. &c. All these, whilst adding to practical expertness, should be used as furnishing ready examples of the principles of mechanics taught in the theoretical branches of the College. These models should moreover be frequently constructed for the special instruction of all departments of the Institution, of which the workshops would then be a clearly connected element, accessible and easily and readily referred to by all classes.

4. I am by no means prepared to altogether admit that the sketch above given of what the workshops of our intended College, and of what the staple instructions therein given should be, is decidedly opposed to such workshops being supervised by the officer now in charge of the Gun Carriage Manufactory. But I am of opinion that the arrangement (however becoming and apt a tribute to Major Maitland) might limit the beneficial influence of the workshops upon the College generally, and might prevent the Institution from reaping that advancement in education which it surely would do if, there were nothing in the etiquette connected with its subdivisions to deter each instructor from readily using the workshops in immediate aid and illustration of his own instruction.

5. But fully admitting that, as an integral portion of a complete institution for the instruction of Civil Engineers, workshops cannot possibly be dispensed with, and whilst warmly advocating their establishment, I fully concur with my colleague Lieutenant Colonel Fredrick Cotton that the forge and carpenters-yard are not the schools in which the Civil Engineering student should be detained for any great or lengthened period of his educational course. Nor would I require the invariable attainment of any defined standard of dexterity in handicraft. It is essential indeed that the opportunity of acquiring practical knowledge should be afforded, and when manual skill continues to be personally deficient, a thorough acquaintance with the manner and means of doing what the student can himself only imperfectly perform, should of course be insisted upon; but it is the head and not the hand that the Civil Engineer has the oftenest to employ; and it is trite to remark how often it happens that the dullard at his equations and formulæ is dexterous at the turning lathe, or with the adze; and vice versa, that the able mathematician or even the clever mechanic spoils tools, and wastes material, when he attempts what the heavy youth often does with little or no effort.

6. It will be gathered from the foregoing observations that, although I believe a comparatively only imperfect education will be afforded to the professional student, unless workshops of every kind form part and parcel of the Civil Engineering College at Madras, I yet strongly deprecate any attempt to incorporate the ordnance school as now organized with the proposed institution. I have also ventured to express an opinion in favor of that school being maintained upon its own merits, as more than repaying the expenses at which it is supported. I am not aware of any reason, why the present superintendent of the Gun Carriage Manufactory should not be invited to preside over the workshops (distinct from his own) which are to form the third department of the new College, and if that Officer consents to assume the direction of the practical instruction in different handicrafts, and if the plurality of appointments will not diminish his efficiency as Superintendent of the manufacture of Gun Carriages, I should entertain no fears of Major Maitland failing to yield you full satisfaction, if it should please His Lordship in Council to nominate him to the office upon your recommendation.

7. But it is particularly stated in the 14th para of Colonel Baker's letter, that all the pupils in the present ordnance school are to have "the same advantages of general tuition as the rest of the 3d department and that they are equally eligible, if qualified for promotion to the higher grades." Now unless this passage is an admission, that without remodelling, Major Maitland's school cannot at once and per saltum, be constituted the 3d Department of the College, I find it difficult to understand it at all, and if there be this admission, then cadit quæstio. In such case, it remains only that your scheme of the 20th July, 1855, should

prominently provide for a set of workshops unhampered by further conditions than the consideration of the Major's claims to preside over the 3d department of the Civil Engineering College, and the admission of the Ordnance School pupils on the same terms (to be laid down by the Director General) as those from the survey school or from any other seminary. This presupposes in fine the substitution of a suitable instead of an unsuitable course of practical instruction, whereby the curriculum will be enlarged to meet the comprehensive demands of a Civil Engineering student, who shall be versed in all the details of workmanship, instead of being restricted, as he now is, to the common operations of the smith, the carpenter, and the wheelwright.

8. A difficulty may suggest itself as to the location of the new workshops distinct from Major Maitland's, and yet forming a part of the College. It is desirable that if practicable there should be only one group of buildings, and that in lecturing there should be every facility of adjourning from the lecture room to the workshops. Moreover for the various pursuits that would enter into a full scheme of practical education, such for instance as brick making, the process of which should be thoroughly understood by the pupils, though certainly not by personal manipulation, very extensive premises would be required. Perhaps then as connected with the project of a College, the whole of Major Maitland's buildings might be transferred to you, and the Manufactory of Gun Carriages be removed to St. Thomas's Mount, where the officers of Artillery could be instructed in the several processes, which (whilst the the carriages are made at Vepery) they unfortunately have no means of inspecting. But this is a digression from my subject on which I have already said, and I fear, with the prolixity attendant on hasty writing, everything that occurs to me.

9. I had written thus far when the accompanying original memoranda by my two colleagues Major Lawford and Captain Collyer were brought to me for despatch, I having called for an expression of their opinions in pursuance of your desire that I should do so.

10. Major Lawford's paper seems rather to refer to the best means of obtaining qualified youths for subordinate employment in the D. P. W. at the earliest possible moment, than to the organization of a 3d department in a general Civil Engineering College. The only objection that I see to the suggestion contained in para 1. is that probably several of the present Survey pupils under a mistaken sense of being degraded by the manual operations in Major Maitland's School, will decline to attend, and by their withdrawal from the Survey school, we shall lose the benefit of their previous teaching, which has been of a kind to make them, in the present dearth of qualified agents, exceedingly useful, and eagerly sought for by officers in the Mofussil, who can confide minor, but indispensable, processes to them, which they have not leisure to undertake themselves to the great detraction of public business—often very important. Nevertheless, as it has been ruled that henceforth handicraft knowledge shall always be combined with that of books, this objection must, I conclude, be overruled, but the probable loss thus entailed happens to be peculiarly illtimed and it will occur at a juncture when numerous projects have been sent back to the Provinces as rejected from the current budget, owing to defective preparation, in remedying which, pupils from the Survey school would have been of the greatest use. In respect to the 2nd para, it may apply to Major Maitland's, but hardly to Mr. O'Hara's pupils, the latter being only instructed if they evince aptitude and ability. The 3rd para is generally deprecatory of a fusion of the Ordnance school with the new College, and the 4th para advances the opinion that boys will not work at trades without being paid for doing so. I have nothing particular to say to Captain Collyer's paper, but I gather generally from it, that the writer is greatly averse to the Ordnance school becoming the 3rd Department of the Madras College for Civil Engineering.

I have the honor to be,

Sir,

Your most obedient servant,

EDWARD FABER, Colonel.

Chief Engineer.

Central Office of P. W. }
Fort Saint George, 15th April 1856. }

MEMORANDUM BY CAPTAIN G. C. COLLYER.

Major Maitland's school is one in which boys enlisted for the Carnatic Ordnance artificers are, in addition to their actual work, educated in a higher branch of education that they may become surveyors. &c. The consequence is that their education as handicraftsmen is less complete than it would be, were the prospect of becoming surveyors not held out to them, and so long as there is the great difference in pay, so of course will boys strive to gain the highest grades and to make Major Maitland's school what it now is not, viz: a school for mechanics. They should either in the Railway work shops, or the Dowlaiswaram work shops, under such practical men as Messrs. Wright and Merrall and scientific men as Captain Hutchinson go through such an apprenticeship as the former of these two gentlemen know well exists in England. Those of these, thus educated, who evince that skill which could ensure them employment on good salaries in England should have the opportunity of employment here and of such remuneration as would keep them to their employment. The boys in the Survey school are generally of a better description than those as originally enlisted for the Carnatic ordnance artificers, but I do not think that qualified boys from Major Maitland's school should be excluded from the Survey school; if they can pass an examination, and wish to become surveyors, they should cease to be Ordnance artificers. I do not see why Major Maitland's school should be interfered with or form in any way a part of the Civil Engineer College, nor do I see the use of men who are to be educated as *Civil Engineers*, being educated as *mere mechanics*.

The kind of carpentry at Major Maitland's school is not such as to be generally useful to Civil Engineers, though particularly so, to that description of mechanist called I believe mill wrights in England, the perhaps lowest grade of the mechanical Engineer; and this particular branch of Engineering will be better acquired as above pointed out. If it be thought necessary for boys to go through Major Maitland's course, there could be no difficulty in a certain number being formed into a class and sent there for instruction; but I am of opinion that the Superintending Engineer's Yard would offer better instruction in the carpentry of roofs, centerings for bridges &c. while neither of them give any instruction whatever in the varied practical knowledge of the mechanist that could be gained in the Railway or Dowlaiswaram shops. Let both institutions be distinct; let Major Maitland's recruits, if qualified, enter the College, ceasing to belong to the *artificers* and run their chance; let the College students go to Major Maitland's or the Superintending Engineer's or the Dowlaiswaram workshop, and let the two classes be paid as they would be in England, according to their actual efficiency, and the line of life that each is to pursue will declare itself to the students who will choose that in which they are most likely to excel.

March, 7th }
1856. }

(Signed) G. C. COLLYER, *Captain.*

Deputy Chief Engineer C. D.

(True Copy.)

Central office. of P. W. }
Fort Saint George. }
12th April, 1856.

EDWARD FABER, *Colonel.*

Chief Engineer.

MEMORANDUM.

I am of opinion that to meet the immediate wants of the Department of Public Works the boys now employed in the survey School under the Chief Engineer may be sent to the Gun Carriage Manufactory and there trained in the same manner as the Artificer pupils, and that the best lads of the whole establishment should be drafted off as their services are required for the Engineer Department.

2. As soon as it is decided that any pupil is not likely to make a good surveyor, he should discontinue the practice of surveying, and his whole time should be given to the trade he may be intended to follow; for admitting the principle of leaving to all the pupils the opportunity of becoming surveyors if their talents are such as to render them good ones, there can be no advantage in taking up the time of men who never can be anything but mechanical Engineers by studies which will not be of practical use to them.

3. When the Engineering College is built, there must of necessity be a school in it for practical mechanics, which cannot be permanently connected with the Gun Carriage Manufactory; as that establishment may be in a few years under an officer not employed in the Engineer College, but so long as Major Maitland remains the Superintendent, the schools may be combined under his direction.

4. I consider a monthly stipend indispensable for pupils who study handicraft.

Fort Saint George, }
27th March 1856. }

(Signed) E. LAWFORD.
Deputy Chief Engineer.

(True Copy.)

Central office. P. W. }
Fort Saint George, 21st April, 1856. }

EDWARD FABER, *Colonel.*
Chief Engineer.

No. 23.

Gun Carriage Manufactory, Madras 28th May, 1856.

From

MAJOR J. MAITLAND.

Superintendent Gun Carriage Manufactory.

To

A. J. ARBUTHNOT Esq.

Director of the Public Instruction, Madras.

Sir

1. I have the honor to forward you the information alluded to in the following Extract 15th May 1856, from Minutes of Consultation, No 548.

"Major Maitland will be good enough to afford the Director of Public Instruction the information sought for in his letter of the 28th March and 10th Ultimo, first taking his own interpretation of the Despatch from the Government of India, dated 12th January, 1856, on the point* at issue, and secondly, adopting that of Mr. Arbuthnot."

2. To arrive at a correct interpretation of the Despatch from the Supreme Government, it is necessary to read the previous correspondence on the subject which began in 1850, and has been continued up to the receipt of Colonel Baker's letter. A considerable part of the correspondence has been printed and published by order of Government and is referred to in your letter of the 20th July, 1855.

3. In the year 1850, the Supreme Government called upon the Government of Fort St. George for a report on my School, with a view to make it a Government institution for training Civil Engineers. To this you are aware the Madras Government replied by recommending that my school should be taken up and placed upon an efficient footing with "a junior Officer of Engineers or any other Officer duly qualified, to be placed under the Superintendent as his Assistant in the school."

4. In a letter No 757, dated 5th April, 1853, this Government repeated the recommendation above alluded to, when forwarding the Report of the Public Works Commissioners and were unanimous in repeating it a second time in the following manner.

"12. The Commissioners, in paras 606 to 626, have largely discussed the subject of training a succession of subordinate Officers, European and Native, for the Department of Public Works. This subject has long engaged the attention of this Government, and the Government of India will remember that a project has been already submitted for raising a Government Institution for this purpose on the foundation of the existing school for the instruction of Artificers established by Major Maitland."

* Note. Reference is here made to a correspondence between the Director of Public Instruction and Major Maitland regarding the meaning of the Dispatch of the Supreme Government under date 12th January 1856.

"13. The Right Honorable the Governor in Council would again urge this project on the attention of the Most Noble the Governor General in Council."

5. In Sir H. Potttnger's Minute it is written as follows—

"70. I beg to conclude this subject by expressing my hope, that whenever such an Institution shall be sanctioned at Madras, it may be placed under the guidance and direction of Major Maitland of the Artillery, now Superintendent of the Gun Carriage Manufactory, an Officer eminently qualified for the charge; that he may be granted whatever subordinate assistance he may apply for; and, that he may not be interfered with by the Chief Engineer, as Visitor, or under any other capacity, or denomination; such interference being, in my judgment, certain to lead to continued and useless disputations."

"71. I cordially adopt the following remark from the 84th para of the Honorable Mr. Thomas' Minute." "I should, therefore, notwithstanding the institution of a College, advocate the introduction into the Public Works Department of men from all Departments or wherever they might be found, with the requisite qualifications of Civil Engineers, and advance such men, as Lord Tweeddale proposed, to the highest posts and duties in the Civil Department"

6. The Honorable D. Elliott writes,

"187. The Commission propose to form a great establishment for this purpose on the model of the Roorkee College, with some modifications.

"188. This Government under date the 9th August, 1850, recommended to the Government of India to take advantage of the foundation for a school of theoretical and practical instruction calculated to form men for the duties of the Public Works Department, afforded by the school already existing established by Major Maitland for the instruction of the ordnance artificers under his command, by which he designed to raise them from mere manual laborers into skilful scientific mechanics, and to give them a good sound practical education, such as workmen of all trades require to fit them to serve as foremen and overseers. I went pretty fully into the subject in my minute of the 25th July 1850, in which I endeavoured to shew how well the plan of this school is calculated to furnish men thoroughly qualified for the duties of Overseers in the Department of Public Works, by the combination of science with the actual practice of mechanical arts. I need not repeat what I there expressed, but I will repeat my conviction that by extending and improving this school as a Government Institution under the direction of the Superintendent of the Gun Carriage Manufactory with an Officer of Engineers, or any other Officer duly qualified, to assist in the scientific instruction of the pupils in the manner proposed, a very effectual and at the same time a very economical provision would be made for the immediate object of preparing men for this department of the service with qualifications eminently fitting them to give the Engineer Officers the aid they so urgently require."

7. The above will shew the part taken by Sir H. Potttinger's Government on this subject, and with evident reference thereto according to the Court's abstract of a Despatch No. 102, dated 4th July 1854, this Government "express a hope that the Artificers' school may be placed upon a permanent and efficient footing, and observe that had this establishment been supported and enlarged at an earlier period, the severe want of Surveyors and superintendents in the Public Works and surveying Department which is now felt would not have occurred."

8. When I visited Calcutta in February and March 1852, the Governor General had just returned from Simlah and had not until then seen the Papers from Madras about my school. I found the Honorable Mr. Bethune, Dr. Mouat, and others had written very strongly in praise of my system of training, and the result of the impression made on the Governor General by all these testimonials in my favor was, that His Lordship told me he intended to make it a Government Institution and see me fully compensated for all my expenses. Lord Dalhousie then informed me that he proposed establishing a Civil Engineering College in Bengal for all In

dia and that he intended I should be at the head of it, "not to teach," but "to direct and govern the Institution."

9. The Honorable Court in its Despatch No. 24 of 1855, Public Department, authorizes this Government to reimburse me for the expense I had been put to in regard to my school, and gives me a salary for the superintendence of it, leaving every thing connected with the Civil Engineering College to be settled by the Government of India. This Government in Minutes No. 1125 dated 15th August 1855, observe on your letter No. 16 dated 20th July 1855, that "he then proceeds to consider the question, which he deems to be left open by the terms of the Court's late Despatch, No. 24 of 1855 Public Department, whether Major Maitland's school should be taken as the basis of the new Civil Engineering College, or whether the College shall be constituted as an entirely distinct establishment." The Despatch in question certainly does not raise the point; it refers to my own remuneration for past and salary for future service.

10. In the 2d para of your letter No 310 of the 10th April 1856, you say, "the wishes of the Supreme Government, as I read the Despatch, are that your present training school of Ordnance Artificers should be incorporated with the 3d Department of the projected College, and that you should be placed in charge of the 3d Department in particular and of the practical instruction generally in the new Institution;"—in plain terms, to be in charge of a section, instead of being at the head of the Institution. Possibly to teach may be meant, but it certainly cannot mean what the Governor General told me, that I was "not to teach" but "to direct and govern an Institution;" and although His Lordship referred to a proposed Institution in Bengal, still the correspondence of this and the Supreme Government and of the Honorable Court shews the principle kept in view throughout.

11 Now as your interpretation of Colonel Baker's letter implies a great change in the sentiments of the Governor General, and as Colonel Baker does not say what you consider he means, I venture to hope I shall be excused not only for differing from you but for stating why I do so. His letter, when read with the correspondence preceding, would not indicate any change of opinion on the part of the Government of India; and the late Governor General when last here condescended to inform me, that before leaving Calcutta November, 1855. for the Hills he had issued final orders on the subject of the Engineering Colleges. He was pleased to add that his early impressions had continued unaltered. It was during this conversation he had become aware for the first time through me that your letter No. 16 of the 20th July 1855, had been sent, and His Lordship concluded by intimating he would dispose of the matter when he returned to Calcutta, and Colonel Baker's letter contains his instructions which you have construed as I have already quoted. In a matter so important to my character and interests, I must oppose what, I have no doubt, are wrong interpretations by you of the orders of the Court in the one case and of Supreme Government on the other, when in both a safe decision could only be arrived at by referring to what had taken place antecedently.

12. The view I take of Colonel Baker's letter is, that it contemplates that the following arrangement suggested by this Government recommended by the Governor General, and concurred in by the Court of Directors, in their Despatch No. 96. will be carried out either at the Gun Carriage Manufactory or elsewhere, maintaining the same system as at present of combining theory and practice.

" 20. Lastly that whether by the extension of Major Maitland's school, or by its incorporation with a larger institution, upon the principle of the Thomason College at Roorkee a complete system of instruction shall be provided at Madras for every class belonging to the Department of Public works, Europeans, East Indians, and Natives, whether artificers, foremen, overseers, surveyors, or Civil Engineers.

" 22. This proposal also has our entire concurrence. We shall of course receive the details of the proposed system of education; and we trust it will always be borne in mind

“that practical knowledge of mechanical Engineering is essential to the perfect efficiency of “Civil Engineer.” “I therefore proceed to shew what the course of instruction is at present and what should be added to render it complete.

13. Arithmetic, Geometry, Mensuration, Plan Drawing, and Mechanics are laid down in every standard work, such as Peter Nicholson’s, as essentially necessary for working men who are to attain any proficiency in their business. Geography, Astronomy, Mangnall’s Questions, and Botany are more or less useful for all men, but they are necessary for those whose peculiar turn of mind give them a taste for surveying. The only work not strictly applicable to a school where Apprentices for both the Artillery and Engineer branches of the Ordnance service are to be instructed is Major Oakes’ Manual of Artillery which might be omitted.

14. The Manual arts comprised at the Manufactory are as follows—

Armourers work.	Engraving.
Black smith’s work.	Filing and Fitting.
Cabinet making.	Foundry.
Carpentry and Joinery.	Turning.
Coopering.	Sawing.
Copper smiths.	

and by the end of this year there will probably be three Engines at work daily in the yard which will give instruction in Engine working and the use of steam hammers, which is considered an art distinct from that of an ordinary blacksmith.

15. The above mentioned course of theoretical instruction, when combined with the practical information attained in the workshops of the Gun Carriage Manufactory, has had the effect of raising the ordnance Artificers above any other class of workmen in this country, which is proved by the frequent requisitions I have for their services. But it is incomplete for the ordnance Artificer pupils, and equally so for any other practical man, and on this account I suggested to Government two years ago that two Professors of Civil Engineering should be obtained from England for my Institution, so as to enlighten them in all modern improvements and fit them thoroughly for the Ordnance or Engineer Department.

16. In the year 1830, an effort was made by Lieutenant Braddock, who then commanded the corps of Carnatic Ordnance Artificers, to improve the men by combining theory with their practice in the workshops, but his immediate superiors obliged him to give up the theoretical instruction. As Lieutenant Braddock was perhaps the most able practical man we have ever had at Madras, I herewith give you an interesting extract from one of his papers.

“There are two points which I think deserving of being mentioned as means of instruction. Their suitableness or propriety I must leave to be determined by higher authority.”

“The first is, whether a small elementary book on carpentry, the use and care of “tools, a few simple problems in Geometry, on scales of parts, on planning and working “by plans, on the strength of materials, and some other subjects might not be useful; “both for reading in the Corps Library; and for presenting to every intelligent Artificer, on “his finally leaving the establishment. Such a book cannot be a compilation; it must be “widely different from any elementary treatises published for workmen in England; and its “character should be that of plain usefulness rather than of scientific illustration, which would “in this case be utterly misapplied and lost. The book must have some plates, which might “be lithographed, and it is presumed that the cost of the letter press for 3 or 500 copies “would not be much.”

“The second point is, that if to a work of this kind, there were added a few familiar “lectural conversations illustrated by experiments, the lads would possess advantages of “instruction which very few workmen, would in India, and which it is hoped, would be of “benefit to all, though some might profit by them less than others. Explanations of the use “and application of the mechanical powers, of the strength of timber, of the uses of ties and

“ bracings in roofing, bridges, and carpentry, &c., &c., would, if attended with well selected experiments, give them a valuable insight into the principles which should guide them in every piece of work they execute, and if they are hereafter called into actual service, or are sent to distant frontier stations, occasions of emergency may arise when such knowledge might be turned to good practical account, and be of benefit to the state. But even in the commonest work, such information is useful, and would often prevent a workman from making gross blunders by giving strength to his work where none is required, and leaving exposed those parts where strength and soundness are imperative. Ignorant workmen perpetually make such mistakes. I see them constantly in the native work, and where the observation applies only to the execution of work from a given plan. I see them also in my own establishment, for the Pupils as well as Artificers understand that they must give their work a neat appearance when finished, though I am often dissatisfied in the manner in which it is secured together by its various mortices, joints, dovetails and tenons. These being not of sight in many cases, are not attended to as they should be ; workmen who are ignorant of the principles which should guide them, see no evil in such a method of working and think it unnecessary to make joints and inserting pieces fit each other. A little wear and tear, however, discovers the imperfection, the work becomes loose and rickety, and by and bye falls into pieces of its own accord. Workmen ought to be taught to understand true principles and to work by them, and if they do not, they will at least know that they do wrong ; if they then commit blunders they cannot at least urge the plea of ignorance.”

“ Should these auxiliaries of instruction be approved by the Board, and should it be thought desirable to introduce them in the establishment, I would beg leave to suggest the propriety of requesting the Home Authorities to send out a small model of the mechanical powers, which requires better workmanship than I can conveniently command in the corps ; but other models, and requisites for illustration and experiments I could make up myself. I would simply add, that if a small working model of a Steam Engine could be added to the other model, it might be a valuable auxiliary, but one that can be dispensed with, if the cost (30 or 40£) should be an object of consideration.”

17. It must be remembered, it is since the year 1830, the principles Mr. Braddock refers to have been widely disseminated among practical men of all classes in Europe and America. Professor Mellington in the preface to his work dated 1839 states, “The subject of Civil Engineering is one upon which much has been written by some of the first scientific character of the world ; but their writings are so diffuse, so various, and so detached on account of their investigations having been directed to particular objects, that there is perhaps no branch of science in which the student or young beginner finds so much difficulty in obtaining the knowledge necessary to qualify him for his business, as in Civil Engineering. Among the almost numberless works which the presses of Great Britain and France issue annually it is surprising that no attempt has yet been made (to the knowledge of the writer) at any thing like a compendium of the science of Engineering. The English nation is even avowedly poor in practical works of this description, for until the formation of the Society of Civil Engineers of London, and the more recent establishment of the Institute of Civil Engineers, the persons who followed the profession appeared to harbour a jealous suspicion of their modes of operating and proceeding meeting the public eye ; and with the exception of Smeaton’s account of the building of the Eddystone Light-house, and that of the building of Essex Bridge in Dublin, there was scarcely a work of any importance to be found in the English language.”

18. If you will look at the annexed list of scientific works, you will see the connexion between the illiterate artizan and the practical scientific Engineer, and as I believe that among the many first Mathematicians and scientific men that we have in the service, we have not one who can expound the principles on which the several proportions of machines are made

or the art of building in all its branches, it appears to me that what is now most wanted for the instruction of practical men in this Presidency are two or more first rate Professors of Mechanical and Civil Engineering.

19. If the Government wish to have the College distinct from the Gun Carriage Manufactory I would attach to the institution an Engineer's yard for the Presidency, wherein every thing required for building and for the construction and repair of machinery could be carried out. There is a great deal of valuable instruction to be obtained in a well regulated yard of this kind in addition to the different handicrafts. It is seeing works in progress, as well as actually working that enables a lad to pick up a trade, and nothing improves a person so much as seeing a variety of work. I would suggest that efficient men should be selected as Foremen, Overseers, Storekeepers, Draughtsmen, and Estimate-makers who would also (as at the Gun Carriage Manufactory) instruct the students in the preliminary branches of their studies in which the Professors would perfect them. An Engineer's yard would answer a double purpose by supplying a great want, and at the same time it would be the most suitable place for practical instruction.

20. The workshops at Roorkee are chiefly employed in making up articles for the construction of the Ganges Canal, but there is another department for the repair of the mathematical instruments in use in the Agra Presidency; and as that requires very fine work and much skill, I would suggest that a similar department should be attached to the Engineering College for this Presidency.

21. Successfully to carry out the practical instruction of the College students, as laid down by His Lordship in Extract from the Minutes of Consultation, Public Department, No. 1125 para 11, they must go to work as carpenters, blacksmiths, filers and

15th August, 1855. fitters, boiler-makers, turners, coopers, founders, or sawyers, &c., and as I am told on good authority that Brahmins are coming forward eagerly to learn these trades at Bombay, we may reasonably expect the same results at Madras. The brickfields and manufacture of cements must be in some convenient spot to be afterwards determined, and as there is every prospect of water works being established at Madras for sanitary and useful purposes, there will be some means of initiating the students in Hydraulics.

22. There must be lathes, drilling, boring, punching, planing, and screw cutting machines. There should be a Foundry, a Forge, and, I should think Nasmyth's hammers for heavy iron work. The timber yard should have sawing apparatus of the latest and best sort, and all this machinery to be worked by steam might be put up within a twelve month. The establishment of Engineers and Overseers required for such a yard will of course depend upon the quantity and kind of work to be done in it.

23. But should the Government resolve to make the workshops of the Gun Carriage Manufactory available for the practical instruction of the College students, the same work must be carried on there, that would otherwise be done in an Engineer's yard, by increasing the staff of the Overseers of the Gun Carriage Manufactory for that purpose. At present, there are lathes, planing, serew cutting and punching machines that are worked by manual labor, but by the end of this year all the machinery I have enumerated above will be in full operation.

24. About two thirds the work now executed at the Gun Carriage Manufactory is ordnance, and one third includes a variety of all kinds of miscellaneous articles for the Barrack Master, Revenue Board, Public Works Department, Medical stores and Arsenal.

25. The course of instruction you have laid down for the 3d Department of the College appears to me nearly the same as for the 1st. If you will look at the 1st Vol. Page 452 and the 2d Vol. Pages 113 and 176 of Cape's Mathematics, you will observe he places surveying, hydrodynamics and the strength of materials and friction as subjects for the instruction of persons well acquainted with Algebra, Geometry, and Mensuration. I think, therefore, this will require some modification. All these subjects are taught in the Artificers' school to the more advanced students.

18th March 1856. 26. In my letter No 8. I begged of you to favor me with a perusal of your scheme for the Civil Engineering College in detail that I might know for whom practical instruction is to be provided; but instead of this, you*
 * In letter No. 245. 28th March, 1856. refer me to the 42d para and appendix of your letter No. 16† which contain only the salaries of the teachers and establishment, and a list of the subjects which are to form the course of instruction in the College. I have, therefore, only stated in a general way what I consider is required to carry out the orders of the Most Noble the Governor General in Council.

I have the honor to be,

Sir,

Your most obedient servant,

J. MAITLAND, Major.

Superintendent Gun Carriage Manufactory.

*Gun Carriage Manufactory }
 Madras, 28th May, 1856. }*

Dr Jamieson's Mechanics for practical men.

Tredgold on Carpentry, edited by P. Barlow.

Tredgold on the Steam Engine.

Tredgold on the strength of cast iron and other metals intended for Engineers, Millwrights, Architects, Founders, Smiths and others engaged in the construction of machines buildings, &c.

Practical Essays on Mill Work and other machinery with examples of tools of modern invention, first published by R. Buchan and improved and edited by T. Tredgold, and now re-edited with the improvements of the present age by G. Rennie.

P. Nicholson's Operative Mechanic.

P. Nicholson's Carpenter's new Guide.

P. Nicholson's Carpenter and Joiner's Assistant.

P. Nicholson's Treatise on the construction of staircases and handrails

From

A. J. ARBUTHNOT, Esq.

Director of Public Instruction.

To

The Chief Secretary to Government.

No. 549.

Sir,

I have the honor to reply to the extract from the Minutes of Consultation under date the 14th February last, No. 172 communicating the orders of the Government of India with reference to the arrangements proposed in my letter of the 20th July last, for the establishment of a Civil Engineering college and calling upon me to submit my opinion as to the arrangements proper to be made in the scheme of the projected College to give effect to the wishes of the Supreme Government.

2. I have already laid before Government copies of the correspondence which has passed between Major Maitland and myself on the subject of these orders, from which it will be seen that considerable difference of opinion exists as to the meaning and intentions of the Supreme Government, as conveyed in the Colonel Baker's letter; and from a further letter which I have since received from Major Maitland in compliance with the requisition made to him by Government in the Extract from the Minutes of Consultation under date the 15th ultimo, I find that on one of the points mooted in our previous correspondence, the difference of opinion between that officer and myself as to the intentions of the Supreme Government is greater than his previous letters had led me to suppose, and that construing the orders in connexion with the former correspondence regarding the ordnance school, Major Maitland considers it to be the desire of the Supreme Government that not only the practical instruction in the projected Civil Engineering

College but the general superintendence of the entire institution should be entrusted to him;— in fact that he should be appointed Principal of the new College.

3. Major Maitland supports his opinion by a reference 1st to the proposal made by this Government in 1850 and repeated in April 1853 that his school should be constituted a Government Institution for the training of Civil Engineers with a junior officer of Engineers or any other officers duly qualified, to be placed under the Superintendent (Major Maitland) as his Assistant in the school; 2nd to the recommendation based on this proposal by the late Governor General and assented to by the Honorable Court, and 3rdly to certain communications made to him verbally by the late Governor General, from which he gathers that it was the intention of the Marquis of Dalhousie that he should be placed at the head of the new Institution.

4. I have carefully considered the terms of the dispatch, and while there is nothing in that document which can be adduced in support of "Major Maitland's construction, there is one passage which is clearly fatal to it. I refer to the suggestion made in the 10th paragraph "that Major Maitland, in consideration of his past services, might, as an exceptional case, be allowed to retain superintendence of *this* Department of the College, together with the charge of the Gun Carriage Agency." It is not very clear what was intended by the expression "Department," as made use of in this paragraph, whether it had reference to the 3d Department only, as might be inferred from the wording of a subsequent paragraph (para 15.) or whether, as I am inclined to think, it meant rather a branch of instruction than a particular class of students, and referred to the Department of practical instruction as distinguished from that of theoretical instruction; but in either sense, the use of this term seems fatal to the supposition that it was the intention of the Government of India to place Major Maitland at the head of the Institution.

5. Another point on which Major Maitland and I differ in our construction of the Dispatch is, in regard to the workshops to which reference is made in it. Major Maitland considers that the workshops alluded to are not those attached to the Gun Carriage Manufactory but other workshops to be attached to the new Civil Engineering College "quite distinct from the Gun Carriage Manufactory," and in this construction I must admit, that he is, to some extent, borne out by the remark which occurs in para; 9 of the dispatch that it does not appear to the Most Noble Governor General in Council that the connexion between the Gun Carriage Agency and the Training School need be maintained.

6. But in construing the late orders of the Government of India, it is necessary to bear in mind that the scheme proposed in my letter of the 20th July last, and recommended for adoption by the Right Honorable the Governor in Council, provided for a complete course of instruction for all who might be employed in the Public Works Department, from the highest to the lowest, and for the establishment of workshops in connexion with the Institution. It was in fact very nearly similar to the scheme proposed for the organization of an Engineering College in Bengal to which reference is made in the 6th Para of the Dispatch, and bearing this circumstance in mind, I am unable to apprehend the force of the objections raised by the Government of India to sanctioning the scheme as it stood, unless it was the intention to incorporate the school under Major Maitland's charge with its present appliances (including among the latter the facility of working in the workshops attached to the Gun Carriage Manufactory) with the projected College. If the Government of India merely intended that the College should be provided with workshops (which was likewise the intention of the Government of Madras) that the several Departments should be practised more or less in those workshops (which was also the intention of the Government of Madras); that Major Maitland should have a place in the new College, and that his present pupils should be transferred to it, I cannot help thinking that that intention would have been stated in terms somewhat different from those adopted in the Dispatch.

7. The latter part of para 14 appears to me to be conclusive as to its being the intention of the Government of India that the existing school of Ordnance Artificers, as at present constituted, should be amalgamated with the 3d Department of the projected College, and

that the workshops referred to are those at present under Major Maitland's charge. In this para: express reference is made to the existing school of Ordnance Artificers, and it is observed that "if it be considered that enlistment is necessary for the Ordnance, the candidates for that Department may continue to be enlisted, but it should be clearly understood that they are to have the same advantages of general tuition as the rest of the 3d Department, and that they are equally eligible; if qualified for promotion to the higher grades." It can hardly have been intended that the candidates for the Ordnance alluded to in the foregoing passage should receive their practical instruction in any other workshops than in the Ordnance workshops, and that in addition to those already in operation in the Gun Carriage Manufactory, there should be attached to the new Civil Engineering College a set of workshops specially adapted for the instruction of Ordnance Artificers, but some of which, at all events, would be useless for the particular purpose for which the College is to be established. Such a measure, I imagine, would necessitate one or other of the following arrangements;—either that a separate manufactory of Gun Carriages intended for actual use should be carried on in the workshops to be attached to the new College, with a view of affording to the candidates for the Ordnance that practical instruction which they have hitherto received in the workshops attached to the Gun Carriage Manufactory or that their practical instruction should, in future, be confined to working at models, or to what has been justly characterised by Lieutenant Colonel F. C. Cotton in

Vide Extract from the Minutes of Consultation under date 27th September 1855, No 1279.

the memorandum submitted to Government by the Chief Engineer in September last, as "that most depressing of all occupations construction and reconstruction with the same materials." I cannot believe that either of these arrangements can have been contemplated by the Government of India and can only suppose that in proposing to sever the connexion which exists between the Gun Carriage Agency and the Training School at present attached to it, that Government must have overlooked circumstances connected with the constitution of the School of Ordnance Artificers which, with all deference I would submit, render such a separation impracticable.

8. It must be borne in mind that the majority of those who compose Major Maitland's School are the persons by whose labour the work of the Gun Carriage Manufactory is actually carried on. Major Maitland draws special attention to this circumstance in his report of the 18th June 1850, where referring to a proposition that the Corps of Artificers should be increased with the view of providing for the wants of the Public Works Department, the expense of which measure would be repaid to the state by the daily returns of work, he remarks that "this forms the distinguishing feature between his institution and that recently established by the Lieutenant Governor of the North West Provinces at Roorkee, for while the Artificers are preparing for higher employment, they do so without infringing on their day's work, whereas at Roorkee the students receive double the pay, and the whole day is devoted to study." If then the School is to be separated from the Gun Carriage Manufactory, what has all along been urged as the distinguishing excellence of Major Maitland's School must be abandoned, and either two establishments must be kept up for the manufacture of Gun Carriage or the practical training of the Ordnance Artificers must be most seriously impaired.

9. In my letter of the 10th April last, I requested Major Maitland, in the event of his interpretation of the despatch being adopted and its being determined that the workshops contemplated by the Government of India are those for which provision is made in my letter of the 10th July 1855," to inform me in what manner the training in the new workshops, which I presumed would be specially adapted to the wants of the Public Works Department, could be made compatible with the training which candidates for the Ordnance Department should receive, to fit them for their special calling."

10. His letter of the 28th ultimo professes to contain a reply to this among other queries, but I can find nothing in that communication at all bearing upon the point or in any way tending to remove the difficulties I have suggested. In the 19th paragraph, he suggests the establishment, in connexion with the new College, of a Civil Engineer's yard for the Presi-

dency "wherein every thing required for the construction and repair of machinery could be "carried out," but he does not show that this would suffice for the special training required by the Ordnance Artificers, whose principal work being the construction of Gun Carriages, it would, I imagine, be necessary, if the plan of an Engineer's yard be adopted, that the latter should contain a manufactory for the construction of Gun Carriages, as well as for the construction of other sorts of machinery.

11. I am forced, therefore, to the conclusion (and I cannot help thinking that it is self evident) that the only possible means of amalgamating Major Maitland's school of Ordnance Artificers with the projected Civil Engineering College, is to place the entire institution under Major Maitland's charge, and to make the workshops attached to the Gun Carriage Manufactory, with such extension as may be found necessary, the means of imparting to the candidates for the two Departments such practical instruction as may be requisite for each. This, I submit, is the only feasible mode of carrying out the proposed amalgamation; but it is clearly inconsistent with the eventual separation of the offices of Superintendent of the Gun Carriage Manufactory and of Superintendent of the practical instruction in the Engineering College for which the Government of India have deemed it necessary to provide; for if the workshops of the Gun Carriage Manufactory are to form an essential feature in the scheme of the projected College, which, I think, it is manifest, that they must, in any scheme which provides for the training of the Ordnance Artificers, it follows that the superintendence of that Manufactory and the superintendence of the training school must be vested in the same person. There would otherwise be a constant collision of authority which would be fatal to the success of the scheme.

12. On this ground alone, I should have felt myself bound to suggest that the peculiar constitution of Major Maitland's school and the impossibility of amalgamating it with the projected Civil Engineering College without at the same time entailing the permanent union of the two offices above referred to, should be brought to the notice of the Government of India with a request that the orders conveyed in Colonel Baker's letter might be reconsidered; but there are other circumstances connected with the school on which I am disposed to think that a good deal of misapprehension has existed and which should be fully considered before any final decision is passed on the question now at issue.

13. When it was first proposed to constitute Major Maitland's school into a training institution for the department of Public Works, the proposal was based on the alleged excellence of the instruction, both practical and theoretical, which was imparted in it. The proposal to amalgamate it with the more extensive institution which has been since projected, has I presume, been based on a similar assumption; and if it can be shown that, in both departments (practical and theoretical), the success of the school is not so unquestionable as has been hitherto supposed, one of the main arguments, I imagine, in favor of its amalgamation with the projected College for Civil Engineering will be removed.

14. In regard to the first point viz: the efficiency of the practical instruction, I have not considered myself authorized to institute such an enquiry as may probably be deemed requisite to enable the Government to form a satisfactory judgement on the subject; but I find it broadly stated by Lieutenant Colonel F. Cotton in the Memorandum above alluded to that "the success of Major Maitland's school, as a school of Artificers, has not been great and that "it has never turned out men of remarkable skill in any trade." It is within my knowledge that by some of the Ordnance officers, under whom the Artificers trained in the Gun Carriage Manufactory have been employed, their efficiency has not been highly estimated, and from statements which have been made to me, I am disposed to think that if the several Commissaries of Ordnance be called upon to state their opinion as to the efficiency of the work done in the Manufactory and the skill of the artificers trained in it, in so far as either have come under their notice, the opinions which have been passed upon Major Maitland's training school will be found to have been somewhat premature.

15. On the other branch of instruction, the theoretical, I am in a position to speak more

decidedly and to assert that there is nothing whatever in this department of the school which would justify its being taken as a model; that on the contrary the system of instruction is radically defective and that even if it is to be maintained on its present footing, an important alteration in that system will be required. In March last I took the opportunity of Mr. Powell, the Principal of the Presidency College, being temporarily relieved from his duties, to request that he would inspect and furnish me with a report on Major Maitland's school, stating his opinion of the attainments and qualifications of the several teachers, of the books in use, and of the system of instruction generally. A copy of Mr. Powell's report is enclosed. It will be seen that Mr. Powell has been most careful to guard against an opinion being formed, from a perusal of his report, which might in any way bear hardly on those employed in the school, considering the disadvantages under which they have laboured. The strictures indeed which he has felt himself bound to pass on the system of instruction are so intermingled with encomia on the exertions made by Major Maitland and his employees, that a cursory perusal of his report is calculated to produce a favorable impression, rather than otherwise, as to the efficiency of the school. But if the facts stated in the report be carefully,

See paras 6, 7, 8, and 12. scrutinized, it will be seen that in all the subjects which are calculated to exercise the reasoning faculties, the instruction has been confined almost entirely to a mere exercise of the memory; that higher subjects have been attempted than were warranted by the attainments of the students in those more elementary, and that with* one exception the teachers are incompetent to give instruction in the principles of those branches of science which are taught in the school; and if the above be a true picture of the actual state of things (which considering Mr Powell's reputation I hold to be unquestionable) it will, I think, be admitted that the arguments which have been hitherto adduced in favor of adopting this school as the basis of an institution, in which it is obviously of the utmost importance that such theoretical instruction as may be given should be of the soundest and most thorough description, have been based on an unduly favorable opinion of the efficiency of the instruction imparted in it. In thus urging that the success of Major Maitland's school in one of its departments is not so unquestionable as it has been hitherto considered, and that in the other department the system has been radically defective, I feel that I am performing a most invidious task, and am running counter to opinions which had naturally been deemed entitled to the highest consideration, and against which under ordinary circumstances, I should not presume to set up any conclusions of my own. But I would submit that the reports and opinions which have hitherto guided the Government of India in this matter, especially as regards the theoretical instruction imparted in the school, cannot be put into competition with the report which I have now brought forward. They were in each case the result of a brief visit to the school, unaccompanied, if I mistake not, by any such scrutinous examination into the system of instruction as that which has been instituted by Mr. Powell; and with one exception (I refer to Mr. Bethune) the reporters were persons whose competency to judge of the efficiency of that system is not to be compared with Mr. Powell's. They were naturally gratified at the order and discipline which pervaded the establishment, and at the unusual spectacle of East Indians, both boys and men, working vigorously at handicraft trades, with their muscles developed by their daily labors and their physical appearance so different from that which characterizes the majority of their class. In regard to the instruction given out of working hours, and the qualifications of the teachers, they were probably led away by Major Maitland's somewhat too sanguine estimate of both.

16. I submit herewith a letter from the Chief Engineer from which it will be observed that that Officer concurs with me as to the inexpediency of amalgamating Major Maitland's school with the projected College, although the particular difficulties which appear to me to stand in the way of carrying out that amalgamation elsewhere than in the Gun Carriage Manufactory, and which seem to me insuperable, have not occurred to him; and I would take the

* Note. On this point, I should mention that on receiving Mr. Powell's report, I requested him to inform me to which of the teachers the suggestion made in the 12th para. of his letter had reference. He replied that with the exception of Serjeant, Skinner, there was not one of them competent to teach the subjects as they ought to be taught.

liberty of suggesting that Colonel Faber's letter, as well as the other documents now submitted, and Lieutenant Colonel Cotton's Memorandum of the 1st September last should be forwarded for the consideration of the Right Honorable the Governor General in Council. The papers recorded by the two Engineer Officers abovementioned contain a clear exposition of the description of practical instruction that is required for the Public Works Department, and Colonel Cotton's remarks as to the fittest mode of educating artificers appear to me to be deserving of the most serious consideration.

17. In conclusion I must apologize for the great delay which has occurred in the submission of this letter and which has been caused principally by the lengthened correspondence which passed between Major Maitland and myself regarding the meaning of the orders conveyed in Colonel Baker's letter.

19th June, 1856.

I have &c.

(Signed) A. J. ARBUTHNOT.

Director of Public Instruction.

From

E. B. POWELL. Esq.

Principal of the Presidency College.

To

A. J. ARBUTHNOT Esq.

Director of Public Instruction.

Sir

1. In accordance with the directions conveyed to me in your letter of the 15th instant I placed myself in communication with Major Maitland immediately on the close of the examination for Government Certificates and Rewards, and arranged with that gentleman regarding the inspection of the School attached to the Gun Carriage Manufactory. As I did not think it necessary or advisable to interfere with the ordinary routine of the institution, I attended at the Manufactory during the regular school hours on Monday, Tuesday, and Thursday of last week.

2. On Monday, between 7½ and 9½ A. M. I went round all the classes in company with Major Maitland, making myself acquainted with the nature of the instruction imparted, the mode in which it is conveyed, the strength and material of the several classes, and generally the course of procedure in the establishment.

3. On Tuesday, between 7½ and 9½ A. M. I examined the senior class, composed almost entirely of Artificers, in mechanics, plane trigonometry, including the measurement of heights and distances and the construction and use of the theodolite, and in the nature and application of logarithms. I also sat with the pupils while they were questioned by Sergeant Skinner, the teacher of the class. I attended again on the same day between 7 and 8 P. M., and heard the young men of the senior class examined by Sergeant Skinner in surveying and botany. I then visited a junior class which was engaged in the study of the globes, heard the members of the class tested by the teacher, and proposed a few questions to them myself upon the same subject.

4. On Thursday morning I completed my inspection, remaining about two hours at the Manufactory. I first heard one of the junior classes examined by the teacher in gearing and in the mensuration of areas and solids. On the latter branch of knowledge I put a few questions from time to time, and I also tested the young men in the elements of algebra. I next visited the senior arithmetical class, heard the teacher propose a certain number of queries, and then examined the class both viva voce and on slates. After having satisfied myself as to the arithmetical attainments of the students, I proceeded to the geographical class and heard the pupils examined by the teacher as to the positions of countries and towns, the courses of rivers, &c, &c; the map being open before the class. This closed the inspection: and though

undoubtedly additional time would have made me more thoroughly acquainted with details, still I feel pretty confident that my four visits to the school have afforded me a fair insight into the nature and working of the institution. I must mention that my thanks are due to Major Maitland for the trouble he took in causing information of all sorts to be placed before me, and in meeting my wishes in every possible way.

5. In forming an opinion of the instruction afforded in the school, and of the teachers who impart that instruction, it is necessary to bear in mind certain facts. First, that in the Gun Carriage Manufactory, tuition is not the real business of each day, as in an ordinary scholastic establishment, but merely a graft upon that business, so that the time now given up to teaching would, under other circumstances, be devoted to relaxation, if not to simple idleness, or even to dissipation. Secondly, that the teachers are neither more nor less than the most intelligent or best instructed of the men in the Manufactory, selected therefore out of a limited number and altogether untrained in the art of teaching. Thirdly, that till very lately Major Maitland had actually no hold upon the teachers, beyond the influence that an energetic head naturally possesses over all in his Department. Recollecting then these facts, I have no hesitation in saying that I consider the school attached to the Gun Carriage Manufactory to reflect great credit upon the Superintendent and the teachers: and I fully believe that a system of mental training, combined and harmonizing with the manual labours more immediately belonging to the yard, cannot fail of developing an intelligent set of workmen, capable of executing in a superior manner the work entrusted to them; from whose ranks men will from time to time arise, competent to discharge higher duties than those pertaining to the department, and who would otherwise have no opportunity of feeling their own powers and benefiting their country in the endeavour to advance themselves in life. While thus stating my views respecting the objects likely to be attained by the school, and the success hitherto secured under great disadvantages, I must also mention that in my opinion considerable changes are requisite to be made in the course of instruction pursued at the Manufactory.

6. It struck me that the tuition of all the classes, with the exception perhaps of the highest, was almost entirely by rule; i. e. certain ways of producing results were laid down and committed to memory, without the principles involved in those methods being explained. This may be sufficient for the production of the results, when perfect uniformity attaches to the processes; but it leaves the reasoning faculty to a great extent unimproved, and habituates the pupils to remain satisfied with the mere statement of facts, instead of attempting to trace the relations among them. I may instance two subjects, in which the tuition appeared to me to be altogether of this objectionable nature, viz: Pasley's Geometry and Hutton's mensuration. The rules in these two subjects were repeated correctly for the most part, but the principles on which the rules are based were not known, and the demonstrations of the principles had not been studied. I cannot but think that this entire exclusion of reasoning is prejudicial to the students, not only in the way to which I have alluded, but also in depriving the subjects of study of much of the interest that would otherwise pertain to them. The senior class was certainly prepared with demonstrations of some theorems, and a few of its members displayed much sharpness in tracing relations; but processes of reasoning should surely not be confined to the highest class. Here I must not be supposed to advocate the imparting of a regular education in the mathematical and other sciences connected with the work of the Manufactory; the instruction afforded in the institution must necessarily be far more practical than theoretical; but I would urge that the fundamental principles of the subjects studied should be well explained, and even rigorously demonstrated, where, as is generally the case, no part of the higher mathematics is involved in the proofs. On the whole I derived considerable gratification from my inspection of the senior class, and I attribute the proficiency that several of its members displayed, not merely to the exertions of the students, but also to the evident intelligence and zeal of the teacher, Sergeant Skinner.

7. Very little algebra is studied at the Manufactory, and the portion that had been

gone through did not appear to be thoroughly understood. I do not think that the young men should devote much time to this subject; perhaps the point to which it is proposed they should advance, according to the existing plan, is an appropriate limit; but it is undoubtedly requisite that what is studied should be read more carefully and that the pupils should acquire much greater facility in performing the elementary operations. Without a moderate proficiency in algebra, it is impossible for a student to read with effect plane trigonometry and Mechanics.

8. In arithmetic the pupils are exercised in working sums out of Walkinghame's treatise, and my impression is that they can perform the ordinary processes with tolerable correctness and facility; but they appeared unable to explain the principles of the operations and failed to arrive at a solution when the phraseology of the question did not at once declare the exact processes that were required. Great improvement is needed in this department, the black board should be brought much more into play, and the results should be reasoned out by the scholars under the guidance of the teacher. A want of thoroughness may be unavoidable in the more advanced branches of knowledge, but in arithmetic the instruction should be as complete and as sound as it is possible to make it.

9. The answering in geography was very fair, and the young men seemed particularly interested in the subject, although not connected with their every-day work. This fact is gratifying, showing, as it does, the love of knowledge which Major Maitland has infused into his workmen. I should recommend that a skeleton map should be used in the place of an ordinary one, after the members of the class have been rendered familiar with the latter; I would also suggest that a little more information should be given to the pupils about the productions, the manners and customs, the political importance, &c. &c. of the several countries.

10. I must confess myself incompetent to pass an opinion upon the proficiency of the pupils in botany and gearing; but it occurred to me that the portion of botany prepared by the young men might be dispensed with, and their attention turned to other subjects more closely connected with their avocations. I would make the same remark with reference to the celestial globe, which is in fact elementary astronomy. The terrestrial globe should be used in the geographical class.

11. The drawings in plan and sections, executed by different members of the establishment appeared to me extremely creditable; they were drawn to an altered scale, and bore marks of great neatness and care.

12. While desirous of giving all credit to the teachers in the Manufactory, I cannot but say that I think it necessary that steps should be taken forth-with to improve some of those now employed, and to introduce new ones in the place of others. A mere professional teacher would perhaps not be suited to the circumstances of the school, as he would not have the practical element sufficiently developed in himself. Probably the best course would be for the most intelligent and improvable workmen to be sent to the Government Normal school, in order to receive instruction in the art of teaching; and while attending that institution, they might study the theory of some of the branches of elementary practical science taught in the classes at the Gun Carriage Manufactory.

13. The foregoing recommendation involves another, viz: that changes should be made in the text-books at the Manufactory. At present it may, I think, be said that there is not a harmonious system: in all classes but the highest, the books are for the most part mere collections of rules; while in the senior class, the young men have in their hands Cape's Mathematics, a work containing a very extensive theoretical course, much more extensive indeed than they can possibly go through. There seems then a chasm, separating the junior classes from the senior one, which must be prejudicial to all. I would suggest that a graduated series of text books should be introduced, the lower ones containing some theory as well as practice, and the highest being not quite so comprehensive and advanced as Professor Cape's work.

14. Having now completed my report upon the school attached to the Gun Carriage Manufactory, I must remark that the strictures I have felt bound to make in no way detract from the merits of the Superintendent and his subordinates. That defects exist in the institution is not to be wondered at; what is a matter for surprise, and also for congratulation, is that so much has been effected with such scanty means and appliances.

I have the honor to be,

Sir,

Your obedient Servant,

Eyre. B. POWELL.

Madras. }
March 24th 1856. }

No. 888. A.

EXTRACT FROM THE MINUTES OF CONSULTATION, DATED 31st JULY 1856.

Read the following letter from the Director of Public Instruction.

(Here enter 19th June, 1856.)

Ordered that the following letter be despatched to the Government of India, with reference to their orders contained in Colonel Baker's letter above referred to.

*To the Secretary to the }
Government of India. }*

Here Enter 31st July, 1856.

(True Extract.)

T. PYCROFT.

Chief Secretary.

To

The Director of Public Instruction.

PUBLIC DEPARTMENT.

No 888.

From

The Chief Secretary to Government, Fort St. George.

To

The Secretary to the Government of India.

Public Works Department.

Sir,

With reference to my letter to your address under date the 2d Ultimo on the subject of the Madras Civil Engineering College and Major Maitland's school, I am directed by the Right Honorable the Governor in Council to forward for submission to the Right Honorable the Governor General in Council the accompanying report with its accompaniments on the same question from the Director of Public Instruction.

2. From this it will be seen that Major Maitland has agreeably to the instructions of this Government replied to the enquiry made to him by the Director of Public Instruction. It appears from Major Maitland's answer that he considers it to be the desire of the Supreme Government that not only the general direction of the practical instruction in the contemplated College, but the general superintendence of the entire institution is to be entrusted to him, or in other words that he is to be appointed Principal of the new College.

3. For the views of the Director of Public Instruction on this question reference must be made to his letter. The conclusion at which he has arrived is (para: 11) that supposing as he conceives it to be the intention of the Government of India, that Major Maitland's school of Ordnance Artificers is to be amalgamated with the projected Civil Engineering College, the only possible means of effecting this object is to place the entire instruction under Major Maitland's charge, and to make the workshops attached to the Gun Carriage Manufactory

with such extension as may be found necessary, the means of imparting to the candidates for the two Departments such practical instruction as may be requisite for each. "This," he submits, "is the only feasible mode of carrying out the proposed amalgamation, but it is clearly inconsistent with the eventual separation of the offices of Superintendent of the Gun Carriage Manufactory and of Superintendent of the practical instruction in the Engineering College for which the Government of India have deemed it necessary to provide, for if the workshops of the Gun Carriage Manufactory are to form an essential feature in the scheme of the projected College, which, he thinks, it is manifest that they must, in any scheme which provides for the training of the Ordnance Artificers, it follows that the Superintendence of that Manufactory and the Superintendence of the training school must be vested in the same person. There would otherwise be a constant collision of authority which would be fatal to the success of the scheme."

4. On this ground alone, the Director states he would have felt himself bound to solicit a reconsideration of the orders conveyed in your letter of the 12th January last, but he refers to other circumstances connected with Major Maitland's school on which he is disposed to think that much misapprehension exists, and which should be fully considered before any final decision is passed on the question at issue—these circumstances being that according to his views, as more fully set forth in paras 13-16 of his letter, the merit of the school has been overrated, and that neither in the practical nor in the theoretical department has its success been such as has been hitherto supposed. Mr. Arbuthnot likewise submits a letter from the Chief Engineer objecting to the amalgamation of Major Maitland's school with the Civil Engineering College, although "he is aware of no reason why the present Superintendent of the Gun Carriage Manufactory should not be invited to preside over the work shops (distinct from his own) which are to form the 3d Department of the new College." It would seem however that Major Maitland is not disposed to accept the charge of that Department, or any post short of that of Superintendent of the entire Institution.

5. The Director lastly requests that Colonel Faber's letter (with the other papers) and a Memorandum from Lieutenant Colonel Cotton of the 1st September last may be forwarded for the consideration of the Right Honorable the Governor General in Council. The reports of Colonels Faber and Cotton contain, he states, a clear exposition of the description of practical instruction that is required for the Public Works Department, and Colonel Cotton's remarks as the fittest mode of educating artificers appear to him to be deserving of the most serious consideration.

6. As one of the questions discussed by the Director in his report, viz: as to the position to be occupied by Major Maitland in the proposed Engineering College has already been referred by this Government for the further instructions of the Supreme Government, I am directed to forward the report and its enclosures that it may be laid before the Right Honorable the Governor General in Council with the papers now before him. I am at the same time desired to state that in their present uncertainty as to the precise intention of the Government of India regarding the connection between the Ordnance school and the Engineering College, this Government do not offer an opinion upon the views held by the Director relative to the merits of the instruction imparted in the former institution.

Fort St. George, }
the 31st- July 1856. }

I have &c.
(Signed) T. PYCROFT,
Chief Secretary.

(True Copy.)

(Signed) T. PYCROFT.

Chief Secretary.
Public Department.

No. 1071.

EXTRACT FROM THE MINUTES OF CONSULTATION,
DATED 6th SEPTEMBER, 1856.

Read the following letter.

No. 3846.

From

Lieutenant Colonel W. E. BAKER.
Secretary to the Government of India.

To

J. D. BOURDILLON, Esq.
Secretary to the Government of Fort Saint George,
Dated the 8th August 1856.

Sir

I am directed to acknowledge your letter of the 2d June, soliciting from the Government of India an explanation as to the position which it was intended that Major Maitland should hold in connexion with the Civil Engineering College at Madras.

2. You submit for solution by the supreme Government the question whether it is meant that Major Maitland shall, as he considers, be made the head of the College with special charge of the practical course of instruction, or whether, as supposed by Mr. Arbuthnot, he is to be the head of the 3d Department of the College, all Departments however being required to attend, more or less, for the purpose of receiving practical instruction in the workshops under his charge.

3. The Governor General in Council does not find in the correspondence forwarded by you any authority for the statements that Major Maitland considers that he is to be the Principal; but His Lordship assumes that the Government of Madras had good grounds for putting the question in that form.

4. The Government of India is sensible of the debt of gratitude that is due to Major Maitland for his earnest and successful exertions in the walk that he has chosen for himself, and it was very far from their intention to put upon him the slight of offering him a position no higher than that of head of the third and lowest class in the proposed College. But it was as little the intention of the Government of India to indicate Major Maitland as the Principal of the College. Whether he should be, or who should be the Principal of the College is a question that must rest entirely with the Government of Madras to decide, and the decision will of course hinge, not on claims based upon other services but on qualifications for this particular post. There is a wide difference, it need scarcely be said, between the work which Major Maitland has so well performed, and the duty of organizing and guiding an Institution of such large scope as the contemplated College. The qualifications which have produced results so successful in the one task are not of necessity adapted equally to the other.

5. Before saying more on the subject of Major Maitland's personal position, His Lordship the Governor General in Council directs me to communicate a few observations on the mode of dealing with that officer's school in connexion with the new College. These observations must be held to be in supercession, as well as in explanation, of the part of my letter of 12th January, No. 94 which referred to this branch of the subject.

Although Major Maitland's school may be made a useful accessory to the Civil Engineering College, and one which shall render it unnecessary to consider the question of establishing purely Educational Workshops (the objections to which are very strong), His Lordship thinks it would be unwise to incorporate the school with the College in such manner as to alter in any material degree the position of Major Maitland's scholars.

The scholars are for the most part enlisted. Their schooling lasts about five years; and at the end of that time the best among them after passing through a higher course of teaching

for that purpose become Surveyors and Overseers and cease to be attached to the Ordnance. The rest become Ordnance Artificers.

The salaries obtained by the first class far exceed those that can be reached by the second; and if Major Maitland's scholars shall not be enlisted, and shall be free to choose the aim of their studies for themselves, all will wish to be Surveyors and none Artificers; and the main purpose, though the less ambitious one, of Major Maitland's school would be lost. A rejected Surveyor, who had neglected to perfect himself as a practical Artizan, would make a very poor Ordnance Artificer.

The Governor General in Council is therefore of opinion that Major Maitland's school should continue to train enlisted scholars under Military discipline, and that the school should not be fused into the College. But it may still be connected with the College, to the benefit of both.

It may be the practical training school at which the students of the College shall learn the use of tools and machinery, each class according to its requirements, the third class or artificers practically and thoroughly; and the higher classes more generally and so to fit them for superintendence rather than practice.

No contrivance can prevent the College, once established, from drawing to itself some of that grade of learners who now seek Major Maitland's school voluntarily to qualify themselves as Surveyors, or Overseers; indeed the College is intended for that purpose. But in order that Major Maitland's school may not thereby be deprived of the prizes which are now held out to its most promising students, and which are acting as a stimulus to all, a certain number of scholarships in the College might, with great advantage, be offered for competition in the school, giving to those who obtain them the opportunity of finishing their higher education under advantages greater than they at present enjoy.

Major Maitland should be authorized to add to his working sheds and forges, if, without such addition, he apprehends obstruction to the main purpose of his establishment from the introduction of pupils at working hours. Nothing should be spared to secure the Gun Carriage Manufactory against injury to its efficiency.

He might be designated "Director of practical teaching" or "of College Artificers," not being at the head of any one class, but receiving all in turn. He would be, although subordinate to the Principal as regards the College, entirely his own Master as regards his own branch of instruction.

It seems to the Governor General in Council that such an arrangement as this would secure for the College the best practical training available to it with some gain to Major Maitland's school, and without any disparagement of the claims which that officer has upon the consideration of the Government.

Fort William.
The 8th August. 1856. }

I have &c.
(Signed) W. E. BAKER, *Lieutenant Colonel.*
Secretary to the Government of India.

Resolution. Resolved that a copy of the above letter be furnished to the Director of Public Instruction in reference to the previous correspondence on the subject, and that he be requested to give his opinion as to the manner in which he would propose to work out the views of the Government of India in respect to Major Maitland's school, as indicated in the concluding paras (5. &c.) of Colonel Baker's letter.

(True Extract and Copy.)

(Signed) T. PYCROFT.

Chief Secretary.

To

The Director of Public Instruction.