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Technical and Industrial Education

IN THE

Bombay Presidency

FINAL REPORT

OF THE

COMMITTEE APPOINTED BY GOVERNMENT

1921-22



278.99

Technical and Industrial Education Committee, 1921-1922.

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G. N. GOKHALE, Esq., B.Sc., L.C.E. (from 6th July 1921
Also Member from 17th August 1921).

Member
and
Secretary.

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MAJORITY REPORT.

CHAPTER I.

HISTORICAL

The question of providing technical and industrial education in India has engaged the attention of the Government of India and the authorities in England since the middle of last century. The Court of Directors in their historic despatch on education in 1854 asked the Government in India to consider how useful and practical knowledge suited to every station in life might be best conveyed to the great mass of the people who, in their opinion, were utterly incapable of obtaining any education worthy of the name by their own unaided efforts and indicated their readiness to sanction a considerable increase of expenditure towards that object. No action was however taken in India to carry out the wishes of the Directors.

Technical Education under the East India Company.

2. As mining, manufacturing and other industrial enterprises became established in the land the want of technically trained men for such enterprises began to be acutely felt. As far back as 1880 the Indian Famine Commission invited attention to the necessity of promoting technical education. The Education Commission of 1884 drew attention to the oneness of the existing system of secondary education and proposed a bifurcation of the curriculum in high schools—one course leading to the University and the other, of a more practical character, fitting boys for commercial or non-literary pursuits. In their Home Department letter dated the 23rd October 1884, the Government of India invited the attention of the local Government to the necessity for improvement in the matter of practical and industrial training, and advocated an extended system of technical teaching. In 1886, the Government of India again circulated a memorandum written by Mr A. P. (afterwards Lord) Macdonnell on technical education which supported the Education Commission's recommendation to add a "modern side" to existing literary schools and attach to them a technical branch which was to be an integral part of the provincial educational system.

Early Beginnings.

3. The necessity of providing suitable instruction for subordinate officers of the Public Works Department had been felt before 1854 when the Poona Engineering Class and Mechanical School, the nucleus from which the College of Engineering was developed later, was opened. In the same year the Government of India had under consideration a scheme for the establishment of an Engineering College in the Bombay Presidency "wherein professional instruction might be given to every class in the Department of Public Works". In 1855 and 1857 the Bombay Government framed schemes for the establishment of a College at Poona for the education of (a) civil engineers, (b) surveyors and builders and (c) maistries. As a result, the original engineering class gradually developed into a regular college. In 1866 the College was affiliated to the University of Bombay and the degree of Licentiate of Civil Engineering was instituted. Government offered one appointment yearly in the engineering branch of the Public Works Department to the senior student who passed this examination and three appointments in the upper and three in the lower subordinate divisions. In 1872 the university course for L.C.E. was remodelled and architecture and mechanical engineering were added to the number of optional subjects. Classes in agriculture and forestry were later provided until separate arrangements were made elsewhere for instruction in these subjects. The engineering courses were revised in 1909 for the newly created degree of Bachelor of Engineering and they provided for the special training of

College of Engineering, Poona.

mechanical engineers. In 1911 it was decided to make separate provision for the courses leading to the degree of Bachelor of Science and the College then assumed its present designation. Since 1901, the annual admissions to the civil engineering branch have been limited to 50 in number. The mechanical engineering course, to which 10 new students are admitted annually, was started after completion of the new engineering laboratory in 1914.

4 On receipt of Mr A P Macdonnell's memorandum referred to above the Government of Lord Reay, after consulting some of the leading citizens of Bombay, issued a comprehensive Resolution No. 3-E, dated the 15th September 1886, reviewing the position as regards technical education in the Presidency and setting forth the main lines upon which the Bombay Government were prepared to take action. The time was not then considered ripe for starting a technological institute in the province for the development of mechanical industries, "even if the condition of finances admitted of the large expenditure required to pay the staff of teachers who, in the first instance, would have to be invited from Europe." A scheme of sending scholars to foreign countries to complete their studies was considered sufficient. The attention of Government was, however, directed to the question of providing instruction in the city of Bombay with a view to raising the scale of existing industries and preparing the way for other useful developments. It was proposed to establish an institution in the vicinity of the mills and railway works for the teaching of such sciences as were necessary for the practical requirements of managers and foremen on the one hand, and skilled artisans and operatives on the other. The students were to be given a grasp of scientific facts which they could readily apply to any trade and the institution was to be a training school for managers and foremen of industries. As regards the wants of the mofussil in respect of industrial training, the main dependence was to be placed on High Schools for elementary science and such institutions as local effort may start with the aid of Government. Government wished to make a cautious and small beginning.

5 Eventually the V J Technical Institute, founded chiefly with a generous endowment given by Sir Dinshaw Mahekji Petit, subscriptions to the Ripon Memorial Fund, subscriptions to celebrate the Jubilee of the Queen-Empress, and other donations, was established in 1888, with the object of imparting instruction in the principles of science and art and their application to industrial and other purposes by—

- (1) the establishment of an institute in Bombay for the instruction of apprentices, workmen, foremen and managers and for training suitable technical teachers for the whole of the Presidency;
- (2) the establishment, as funds permitted, of technical schools at places other than Bombay and the grant of assistance to such schools as may be affiliated to the Institute throughout the Presidency; and
- (3) the holding of examinations in technology and the granting of certificates of competency to those who passed the prescribed tests.

6 In 1888 the Government of India asked the local Governments to undertake an industrial survey with a view to promote such technical education of a special character as might be applied to the service of the then existing industries and emphasised the necessity for giving a practical bias to general education. The immediate result was small. The Bombay Government considered such a survey unnecessary for this province. The Reay Art Workshops were added to the School of Art in 1890, and received apprentices in wood-carving and other artistic industries. Drawing was taught in all Government High Schools and Training Schools and, though it had not been made compulsory, the number of students who took up the subject greatly increased. Some branches of

Steps taken by Lord Reay's Government.

The Victoria Jubilee Technical Institute.

Proposal for an Industrial Survey.

elementary science were made compulsory in High Schools, and the School Final Examination was instituted as an alternative to the University Matriculation. The necessity for the teaching of science in colleges was recognised and the Engineering College was improved.

7. In 1895-96 Sir E. C. Buck, K. C. I. E., was sent by the Government of India on a tour for the discussion with local authorities of a series of questions, including that of "practical education" in primary schools. It was recognised that the development of machinery and the spread of the factory system and literary pursuits were trenching on home industries and depriving large numbers of children of opportunities of learning how to use their hands in the various occupations once practised in the home. The system of practical education was intended to meet this want, to train the eye and hand of the pupil and adapt him for the reception of technical instruction of any kind. Its introduction was considered to be a necessary preparation for all technical instruction. Its progress was however checked by the difficulty of training schoolmasters with sufficient rapidity.

In 1901 Sir E. C. Buck performed another tour on a similar mission. He reported that in many of the industrial schools then existing no working plans had been constructed, no sound principles laid down, no definite aims held in view, and no practical results of any value obtained. He considered that the main defect of the attempts at technical education throughout India was that there was no differentiation of the instruction provided for different classes of students. He therefore recommended that technical education and industrial schools should be placed under the control and direction of a separate department which might be called the technological department in each province and that the nomenclature of schools, standards and courses might be brought into greater uniformity in the different provinces of India.

8. In 1901 the Government of India addressed the local Governments with special reference to the resolutions on technical education passed by the Educational Conference held in that year at Simla. One of the conclusions of the Conference was that the existing industrial schools in India had been wanting in definiteness both of methods and objects, that there had been no clear differentiation between general and technical studies in them, that they had depended for initiation and support upon the volition of local bodies rather than upon any sustained policy of local Governments, and that they had been insufficiently co-ordinated with any particular local industries or trade. In agreeing generally with these conclusions the Government of India stated that in the first place they attached great value to the dissociation of technical education from ordinary literary education, the technical or industrial school being strictly limited to scientific and technical courses. They agreed also with the principles embodied in the other conclusions of the Conference, namely, that industrial schools should be devised to encourage particular local industries or trades; that the best type is the local trade or crafts school, that they should be educational and not commercial institutions; that in country districts they should be devoted to the study and development of single indigenous products; that in towns they should deal with manufactures, several industries being there collected in one building; and that only those pupils should be admitted who intend to practise the trade taught there. The chief practical outcome of the Simla Conference was the institution of ten state scholarships to be given to selected candidates including two from Bombay, to be sent abroad to undertake definite courses of study in subjects connected with industrial science or research.

9. The report of Lieutenant-Colonel J. Clibborn's Committee on industrial education, which contained some valuable suggestions and which ultimately led to the establishment of a few more industrial schools, followed in 1903. That Committee advised the appointment of a Director of

Reports of Sir E. C. Buck.

The Simla Educational Conference of 1901.

The Clibborn Committee's Report.

Industries and Industrial Instruction with the Government of India and suggested that the provincial control might be entrusted to a Chief Inspector of Factories for each province. In regard to the training of instructors in the principal industries which are already well established in India, the Committee thought it possible to procure in factories and workshops skilful workers of the foreman rank to serve as instructors, inspectors of native workshops, and advisers to Indian craftsmen. Training schools for instructors in the wood, iron, and mechanical industries could be established in the workshops of the engineering colleges and for instructors in the artistic industries in those of the Art Schools. The important principle emphasised by the Committee was that the object and justification of industrial schools must be to impart skill in a specialised manner and to aim at improving a trade and not merely at perpetuating existing routine methods. The central recommendation of the Committee was to substitute a system of supervision of workshops for regular industrial schools, a recommendation with which the Government of India did not agree.

10. In 1912 a Committee consisting of Lieutenant-Colonel E. H. de V. Atkinson, R.E., and Mr. T. S. Dawson was appointed by the Government of India to investigate the question of bringing technical institutes into closer touch and practical relation with the employers of labour in India. They reported that the opportunities for employment of technically trained Indians in this province were extremely wide and varied in character and insisted on an apprenticeship for a year or two in civil, mechanical, and electrical engineering as well as in the textile industry. They pointed out the necessity of having a definite aim in any scheme for technical education and observed that it might prove a curse instead of a blessing if it turned out a number of men who could not obtain employment, either owing to the inefficiency of the education, or to the fact that it had been conducted on wrong lines, or because suitable and remunerative employment did not exist. The ordinary aspirant to a technical career in this country was not in a position to obtain an apprenticeship in works. They recommended the institution in suitable centres, if a satisfactory demand existed, of afternoon classes for textile jobbers and mistris to give practical demonstrations in the vernacular in the theoretical side of their work and the making of arrangements for the permanent co-ordination of the relations between institutions and employers of labour by the appointment of a controlling officer and the establishment of an employment bureau. Their special recommendations were that, as the state technical scholars did not receive any practical experience abroad, the present system of scholarships should be discontinued, and that suitable stipends should be granted to Indians who had successfully completed their theoretical and practical education in India to enable them to be apprenticed for practical experience with firms of repute in England; that minor technical institutes should be placed under the control of one central institution in each province in which such an institution existed; and that the education of skilled workmen should only be carried up to vernacular reading, writing, elementary arithmetic and sufficient knowledge of drawing to understand a dimensional sketch.

11. In February 1913, the Government of India issued a resolution on their educational policy. The policy to be pursued in regard to technical and industrial education had been discussed at a Conference held at Allahabad in 1910, and the Government of India accepted the conclusions of that Conference. As regards the provinces these were :—

(1) The larger provincial institutions should specialise along lines converging on local industries. Subsequently, as industries arise and the demand for managers and foremen increases, other and more varied courses may be found necessary.

(2) The lesser industrial schools, minor weaving institutions, such of the schools of art as have an industrial bent, and trade schools

generally, should be permanently directed toward such industries as exist in the localities where the institutions are situated

The conclusion that technical and industrial education should be related to local industries is one to which we attach great importance

CHAPTER II.

THE PRESENT POSITION

12 The Indian National Congress and the Indian Industrial Conference have both repeatedly pressed upon the attention of Government the great need of providing and extending technical education. Speaking at the Industrial Conference convened by Government in 1907, Sir John Hewett, the then Lieutenant-Governor of the United Provinces, said—

“The question of technical and industrial education has been before the Government and the public for over twenty years. There is probably no subject on which more has been written or said, while less has been accomplished.”

These words hold good to this day.

13. The subject was investigated by the Indian Industrial Commission of 1916-1918, and its recommendations appear in Chapter X of its report. The Calcutta University Commission of 1917-1919 also dealt with the subject and its views, with special reference to the Calcutta University, are recorded in Volume V of its Report.

14. Recognising the necessity for a wide extension of technical education and industrial training, the Government of Bombay appointed, in their Resolution No. 973, dated the 17th February 1921, the present Committee including a strong non-official element representing important employers of labour, both European and Indian, to draw up a comprehensive scheme of technical and industrial education for the Bombay Presidency. The instructions to the Committee were embodied in the following terms of reference :—

(1) To examine existing facilities for imparting higher education in mechanical engineering and technology and to suggest measures, including provision for research work, needed to prepare leaders, organizers and experts, that is, persons qualified to fill leading executive positions in business

(2) To submit similar proposals for imparting industrial and technical education of the high school and middle school grades, including laboratory practice, needed to train technical assistants, managers, foremen, etc., that is, persons qualified to hold subordinate positions in large or factory industries or responsible positions in smaller ones

(3) To submit proposals for making provision for vocational schools, apprentice schools, continuation schools, etc., required for training skilled craftsmen and artisans for industries and industrial arts, and for measures needed to spread, among workmen and the masses generally, a knowledge of the elements of modern business methods and discipline, and of the use of tools, machinery and labour saving devices

(4) To suggest practical measures for training girls and women to qualify them for industrial careers suited to their special aptitudes, the lower grades of training to include cookery, dress-making, and other household arts

(5) To specify the relations that should exist between each of these classes of training and the corresponding grades of general education (i.e., primary, secondary, and university) and to suggest how far the co-operation of public and private institutions and agencies and advisory committees of leading men in the professions might be enlisted for promoting industrial and technical training.

(6) To submit proposals with rough estimates of capital cost and maintenance charges for the early establishment of new institutions and for additions to or modifications of existing institutions, including provision for the administration and supervision of the entire scheme proposed.

15 The Committee was composed of the following Members :—

Sir M. Visvesvaraya, K C I E, B A, L C E, M Inst C E.
(Chairman).

R D. Bell, Esq, C I E., M A., B Sc, I C S., Director of Industries.

A M Masani, Esq, M A, B Sc, Principal, Baroda College—
Representative of the Bombay University.

J. C K Peterson, Esq, C I E, of Messrs Tata Sons and Company,
Limited—Representative of the Chamber of Commerce,
Bombay

K. H. Vakil, Esq, M Sc. Tech (Manc), A I C, B A, F C S, of
Messrs Tata Sons and Company, Limited—Representative of
the Indian Merchants' Chamber and Bureau, Bombay

Rahimtoola Currimbhoy Ebrahim, Esq—Representative of the
Millowners' Association, Bombay

Leslie Flatt, Esq, B.Sc. (Lond), A M I C E, A M I Mech E, Works
Manager, Parel—Representative of the G I P. Railway
Company.

F J Page, Esq, O B E, M I Méch E, Locomotive Carriage Super-
intendent—Representative of the B. B. and C. I. Railway
Company.

F. O J. Roose, Esq, M I Mech E., M I E E, F C S., Electrical
Engineer to Government.

Major G H Willis, C I E, M V O, R E, M I Mech E, M I E
(India), Mint Master, Bombay.

K. R. Kanitkar, Esq, M A, B Sc., Professor of Physics, Fergusson
College.

Dewan Bahadur K. R. Godbole, M C E, M L C

A J Turner, Esq, B Sc. (Lond), F I C., Principal, V. J. Technical
Institute

F. W. Marrs, Esq, M A.

Mr F Power as the representative of the Bombay Trades Association
was added in June 1921

The Committee lost one member, Mr. Rahimtoola Currimbhoy Ebrahim,
by death, and his place as a representative of the Bombay Millowners' Asso-
ciation was taken in the month of May 1921 by Mr. J. A. Kay.

Mr F W Marrs of the Indian Educational Service carried on the duties
of Secretary from 10th February to 5th July 1921. After the latter date,
he continued to be a member and his place as Secretary was taken by Mr G
N Gokhale, B Sc, L C E., of the Indian Service of Engineers (Bombay
Public Works Department). Mr. Gokhale was subsequently appointed also
a member of the Committee on the 17th August 1921.

16 The Committee first met on 7th March 1921, and in all held six
meetings up to 2nd May when they adjourned for the hot weather. The meetings were resumed from
20th June. Six meetings were held before and
fourteen meetings after the recess, making a total of twenty meetings up to
date of completion of this Report. Only two witnesses were examined,
namely, the Principal of the College of Engineering, Poona, and the
Principal, R C. Technical Institute, Ahmedabad.

Proceedings of the Com-
mittee.

17. As Government desired that the report should be submitted by 30th September to enable them to make financial provision in the next year's provincial budget and as this could not be done the Committee submitted on 3rd October 1921 an interim report

18. Before discussing the general problem of technical and industrial education, it is convenient to describe briefly the progress that education, both general and technical, has made in the Bombay Presidency up to the present time

The present position of general education. In 1921, the population of the Bombay Presidency, excluding Aden and Indian States, numbered 19,291,719 persons, of whom 10,138,575 were male and 9,153,144 females. Of the male population 1,420,655 or just over 1 per cent could read and write. Of the female population only 244,878 or 2.5 per cent were accounted literate. The average of literacy of both sexes was 8.5 per cent.

The number of pupils attending the various educational institutions in the Presidency in 1920-21 was as follows:—

		Percentage of total population.
University grade	... 7,501	0.04
Secondary schools	... 76,252	0.45
Primary schools	... 807,036	4.2
Special schools	... 14,211	0.07
Total	... 905,000	4.7

The number attending educational institutions in advanced countries does not fall below 15 per cent of the total population. For Bombay to rise to this level the number should be 2,894,000 while it is actually only 905,000 or 4.7 per cent of the total population.

19. The number of technical and industrial schools and colleges in the Presidency in 1920-21 and the number of pupils attending them were as follows:—

	Number of institutions.	Number of pupils.
College of Engineering, Poona	... 1	189
Sir J. J. School of Art, Bombay	... 1	333
<i>Technical and industrial schools for males.</i>		
Government	... 5	248
Local Board	... 4	363
Municipal	... 4	114
Aided (V. J. Technical Institute, Bombay)	... 1	321
Do (others)	... 6	308
Unaided	... 3	64
<i>Technical and industrial schools for females.</i>		
Aided	... 8	323
Unaided	... 1	25
Engineering and Surveying School in Sind	... 1	13
Total	... 35	2,301

20. The expenditure on education from various sources in the Bombay Presidency in 1920-1921 was as follows:—

	Rs
Provincial Revenues	1,49,10,070
Local Funds	13,63,450
Municipal	27,16,680
Fees	38,22,662
Endowments	8,48,115
Subscriptions, etc.	26,81,682

Total direct and indirect expenditure ... 2,63,42,659

This expenditure was distributed by institutions as follows:—

	Rs.
University grade	24,52,003
Secondary schools	49,27,677
Primary schools	1,27,21,451
Special schools	20,74,889
Buildings, etc.	18,41,683
Direction and Inspection	11,74,248
Scholarships	3,15,067
Miscellaneous	8,35,641

Total ... 2,63,42,659

The expenditure per head of population is thus 12 annas and 4 pies from provincial revenues and Rs 1-5-10 from all sources

Of this again the expenditure on technical and industrial education was under:—

	Rs.
College of Engineering, Poona	1,32,513
Sir J. J. School of Art, Bombay	1,44,882
33 technical and industrial and engineering and surveying schools (males and females), inclusive of V J Technical Institute, Bombay (Rs 1,90,000)	4,85,052
Scholarships	10,065

Total ... 7,72,512

The amount is obtained from the following sources:—

	Rs
Provincial Revenues	5,25,080
Local Funds	16,500
Municipal	39,438
Fees	53,343
Endowments	23,694
Subscriptions, etc.	1,14,457

Total ... 7,72,512

The following table shows the present number of pupils and the expenditure incurred on the three principal forms of vocational education :—

	Number of pupils.	Expenditure.		
		Provincial Revenues.	Other sources.	Total.
		Rs.	Rs.	Rs.
Technical and Industrial schools ..	9,801	5,25,080	2,47,433	7,72,513
Agricultural schools ..	268	1,34,098	8,734	1,32,832
Commercial schools ..	2,705	59,716	1,12,548	1,72,264
Total Vocational	5,274	7,08,899	3,68,714	10,77,608
Education of all kinds ..	905,000	1,49,10,070	1,14,82,589	2,68,42,659

It will be seen that out of a total expenditure on education of 263 lakhs, the provision for vocational training of all kinds does not exceed 11 lakhs.

CHAPTER III.

OUTLINE OF SCHEME

21. There is a general and well-grounded complaint that the education given in this Presidency has been too literary, that too many young men are trained to fill clerical and similar positions, and that instruction of a practical character or with an industrial bias has been neglected. Out of the total of 1,490 graduates of the Bombay University in 1920, the engineering profession was represented by 54 men of whom only 8 had passed in mechanical engineering. The University does not yet grant degrees in electrical engineering and technology. Except the V. J. Technical Institute the existing technical and industrial institutes and schools have yielded disappointing results.

Technical and industrial education can only successfully extend, however, *pari passu* with the extension of the industries and vocations of which it meets the demands. The state should ensure that technical education keeps abreast of industrial developments and should anticipate the demands which these developments will create. The scheme which we submit is therefore based on the actual requirements of the present and the prospective demands of the near future.

22. An important section of our proposals relates to the provision of technical knowledge for the artisan classes. In England the first organised attempts at providing technical education for the masses were made in 1823 by the Mechanics' Institutes and failed by reason of the very backward state of elementary education at that time. The majority of the working classes had not then a sufficient elementary school training to enable them to take advantage of systematic instruction in the scientific principles underlying their trade. We therefore emphasise here the fact that no material improvement in the technical knowledge of the artisan classes can be achieved without a wide extension amongst them of primary education. The chief obstacle which we have encountered in devising measures for imparting technical knowledge to apprentices and skilled artisans has been the general lack of a sound education among the classes from which skilled labour is recruited, and it must be recognised that proposals for the improvement of these classes must be restricted so long as present educational conditions continue. The matter is important from another point of view. It is from the skilled artisan class that the lower supervising grades should, by preference, be recruited but it is impossible to train a technically competent supervisor from an uneducated though skilled workman.

These considerations have a general application. A sound and a wide-spread system of general education is one of the foundations necessary for a comprehensive scheme of technical and industrial instruction. In 1920-21 the expenditure from all sources per head of population in Bombay Presidency was Rs 1-5-10, and from provincial revenues Re. 0-12-4 (paragraph 20). In 1918-1919 the parliamentary grant-alone for educational purposes in England was about Rs 11 per head of population and in the United States of America the cost was Rs 18 per head for primary and secondary education only. These figures indicate the practical limits which are imposed on the proposals which we submit in the following chapters.

23 We are concerned, by the terms of reference, with the education *Technical and Industrial Education defined.* and training required by persons intending to engage in industries and industrial occupations.

"Technical instruction," according to the English Education Act of 1899, is defined to mean "instruction in the principles of science and art applied to industries, and in the application of special branches of science and art to specific industries and employments."

The sense in which the term "industrial education" is used in this report will be understood from the following extract from the Report of the Royal Commission on Industrial Training and Technical Education in Canada, 1913, Parts I and II, page 151:—

"Where the emphasis is laid upon the development of ability and skill in the handling of materials, tools, machines and products, the training or education may fittingly be called 'industrial,' and where the attention is given chiefly to science and calculations, and emphasis is laid upon the acquisition of knowledge of principles and their applications, the training or education may be called 'technical.' No dividing line can be used to mark the one from the other."

24 According to the Census of 1911,* the distribution of population *The Demand for Technical Education.* by occupations was as follows:—

<i>Production of raw materials</i>	..		13,456,914
Agriculture and pasture	..	13,425,843	
Fishing and hunting	..	152,757	
Extraction of minerals	..	31,071	
<i>Preparation of material substances</i>	..	..	4,282,577
Industry	..	2,458,688	
Transport	..	611,719	
Trade	..	1,212,172	
<i>Public administration and liberal arts</i>	..	..	927,385
<i>Miscellaneous—domestic servants, etc.</i>	..	..	959,601

Total population excluding Indian States .. 19,626,477

It will be seen from these figures that by far the largest number of people are engaged in agriculture, industries come next and then trade and commerce. A scheme of technical and industrial education must be proportioned to the relative importance of industries in the life of the people.

25 The following table shows the principal industries in the Bombay *Industrial Survey.* Presidency and the number of persons engaged in each according to the 1911 Census:—

		<i>Workers.</i>	
		Men.	Women.
Textiles	... ..	304,249	154,793
Hides and skins	.. ..	14,643	3,854
Wood	.. ..	97,815	25,714
Metals	... ..	43,315	3,289
Ceramics	... ..	44,542	23,987
Chemical products (oil-pressing, etc)	.. ..	17,645	6,605

* The figures for 1921 are not yet available.

	Men.	• Women.
<i>Workers.</i>		
Food industries	47,852	52,639
Building industries	61,913	13,317
Dress and toilet	155,561	38,935
Furniture	999	160
Carriage manufacture	587	21
Power stations	1,335	184
Printing, book-binding, silver-smiths, etc	60,813	2,768
Others	13,744	8,109
Total, Industries	865,013	334,375

At least two-thirds of the total number of workers engaged in industry are unskilled workers whose output will not be affected by a technical education

26 The persons engaged in organised industry may, for convenience, grades of Workers. be classified roughly under five heads:—

- (1) Unskilled including labourers;
- (2) Semi-skilled including rivetters, cranemen, machine operatives, and various helpers;
- (3) Skilled artisans including all tradesmen in the regular trades such as carpenters, bricklayers, masons, blacksmiths, plumbers, painters, copper-smiths, etc ;
- (4) Lower supervision including chargemen, inspectors and foremen; and
- (5) Administrative and executive officers including managers, or general managers, superintendents, designing engineers, chemists, etc.

No clear line of demarcation exists in most industries, but it will generally be found that all these grades are present in every industry organised on the factory system. The workers classed under (1) and (2) will amount to as much as 90 per cent. of the total employees in factories turning out products wholly manufactured by machinery and the number probably does not fall below 60 per cent. even in factories engaged in the manufacture of hand made products. From the point of view of advantage to the community it is only necessary to provide technical education for the number of workers required to fill positions in grades (3), (4) and (5) mentioned above.

If we omit the possibility of promoting men of outstanding ability from classes (1) and (2) to higher grades then little or no increase in efficiency is to be anticipated by the provision of technical education for workers in the two lowest grades. The only type of education likely to be of use to unskilled and semi-skilled workers and to adult skilled workers is such as might be given in night schools to enable them to improve their general education. We understand that most of the night schools started in Bombay, where conditions would seem most suitable for them, have not been very successful. There is, of course, no reason why the effort to establish these schools successfully should not be continued. But until it is apparent that there are considerable numbers of men with the requisite ambition and perseverance for study and self-improvement it is needless to contemplate expenditure on a large scale. Small scale experiments should, however, be continued.

27. In framing a comprehensive scheme of technical education the Basis of Scheme. following points require consideration:—

(1) What increase in the efficiency of the worker and consequent advantage to the community will be obtained by providing technical education for any class of worker:

(2) What form of technical education will secure the best development of the worker and his greatest efficiency in the position he is most suitable to fill:

(3) How can this technical education best be imparted so that the most suitable material is attracted at the correct stage of development.

A sound system of technical education should enable all who have the necessary intellectual qualifications and perseverance to fit themselves for the higher grades. Generally those occupying the highest grades have received a good general education frequently followed by a college course but in many industries this is by no means invariably the case.

In some industries in which the work performed does not require manipulative skill of a very high order but which demands a fairly high standard of theoretical training for those in the supervising grades it will be found that a number of supervisors of the lower grade have received a theoretical training as whole time students in technical institutes. In most organised industries, however, the lower supervising grades are drawn from the ranks of skilled workmen. Employers in organised industries do not usually promote to the positions of chagemen or foremen men who, whatever their other qualifications may be, have not worked for some years as skilled workmen. When the skilled workman possesses the necessary technical qualifications and powers of leadership the employer prefers him as a supervisor to men who have a superior theoretical training but are lacking in the practical knowledge which only accrues from experience. For certain classes of supervising appointments there is therefore a double problem. On the one hand there are the younger skilled workers and apprentices to whom it is desirable to afford opportunities of technical instruction. There is the advantage of training them for the higher grades that young men are not withdrawn from the ranks of producers while under training. The usual obstacles are the lack of a suitable preliminary education, or of ambition and perseverance. On the other hand there are students educated at technical institutes for whom practical training is necessary before employers will recognise them as qualified to supervise workmen. The usual difficulty to be overcome with this class is their dislike of service as workmen and their anxiety to obtain higher appointments without the preliminary period of hard work which employers usually consider essential for the making of a successful supervisor.

28. We deal with the subject of providing the education required for the grades described in the preceding paragraph under the following classes of institutions:—

(1) *An Institute of the University Grade*.—This will provide a technical education similar to that given at the best foreign universities.

(2) *Technical Institutes*.—The type of this class is the Victoria Jubilee Technical Institute, Bombay.

(3) *Middle Technical and Industrial Schools*.—The R. C. Technical Institute, Ahmedabad, is typical of this grade of institution.

(4) Other grades and types of technical and industrial education.

(5) Provision for girls and women.

29. In Bombay most boys leave the primary schools from the fourth standard when they should be about eleven years of age. Preliminary Education. Elementary manual training, e.g., paper handwork, forms part of the syllabus of education up to this age. We are of opinion that the Educational Department should see that the syllabus is enforced as regards handwork up to the age of 11.

The training of boys between the ages of 11 and 14 who are intended for industrial occupations should be educational and not vocational. An industrial tendency should be introduced, however, by giving the courses in primary schools up to standards VI and VII a practical bias, e.g., in arithmetic, and by including in the instruction general elementary science, handwork and drawing. The instruction should be given by illustrations, object lessons and practical methods and exercises.

In secondary schools up to anglo-vernacular standard III there should be good courses in arithmetic, drawing, elementary science, and handwork. The arithmetic might be simplified by the application of its principles to the ordinary facts of Indian life. From anglo-vernacular standard IV onwards

a good modern side should be introduced with a curriculum including practical elementary science, technical drawing, and manual instruction.

30 It is necessary to make some remarks regarding practical training.

Practical Training. In our opinion the practical training of boys, youths, and young men, for all grades of organised industries, should be given, as far as possible, in workshops and factories under arrangements similar to the so-called apprenticeship system. The skilled workman can, as a rule, be efficiently trained in his handicraft only in commercial workshops or by master craftsmen working on their own account, and the adequate practical training of young men who have received or are receiving a technical education can only be achieved under similar working conditions. The college, school, or class room should be reserved for the teaching of theory and for practical demonstrations. No attempts should be made to replace the training of skilled artisans in workshops and factories and under master craftsmen by a training in workshops attached to technical and industrial schools. The students in technical institutes and colleges should be made to realise that the part of their education given in college workshops is neither a practical training nor a substitute for it. It will be necessary to improve and extend the facilities for practical training in private workshops and factories, but, whatever the difficulties in achieving this may be, it should be realised that a sound solution of the problem is not provided by workshops attached to colleges and schools.

The views expressed in the preceding paragraph are believed to represent the opinion of nearly every employer of labour*.

31. The whole character of technical and industrial education in the Bombay Presidency will depend on whether Government accept these views or those of a minority of the committee which believes that young men should receive their manipulative training in workshops attached to technical and industrial schools so as to enable them to take their place in industry as skilled artisans, foremen, chargemen, and supervisors. In a later chapter we recommend as one of the best types of technical education the institution of apprentice schools attached to large workshops and factories. But we do not suggest, as the minority does, that the young men educated in these schools are thereby automatically fitted to become foremen and chargemen for organised industries.

We are aware that in other countries efforts have been made, not altogether without success, to train skilled workers in industrial or trades schools. There are some handicrafts in which instruction may suitably be given up to a certain point in such schools. Instances are given later in paragraph 84 in which the workshops classes at the School of Art, Bombay, are described. The weaving schools of the Department of Industries are organised on somewhat similar lines. These instances serve to show the limits placed by economic conditions both on the extent and value of purely industrial training in trades schools. As an extreme example it is not a practical proposition that large numbers of weavers should be trained in Government weaving schools. These schools merely endeavour to introduce improved appliances into a weaving locality by teaching their use to a few.

32 Our remarks on practical training have special reference, however, to *organised* industries, of which a good example is mechanical engineering. Attempts have been made to train fitters, blacksmiths, turners and other engineering artisans at industrial schools in this and other provinces but the finished product of these institutions has little resemblance to a skilled worker. Under better conditions it is true that better results might be expected but the inherent defects of such schools are traceable to the fact that it is not possible to reproduce in them the conditions of commercial industry. In particular the value of time as effecting the cost of work is not understood as it is in a commercial workshop. There is also difficulty in

* We are not in favour of any elaborate system of training schools for turning out supervisors of all grades and skilled managers. We think such training should generally be provided at private factories. (Evidence of the Bombay Indigenous Industries Committee before the Indian Industrial Commission. Minutes of Evidence, Volume IV, page 570.)

getting a suitable and sufficient range of work for pupils. Even under the best conditions the cost of providing organised industry with its skilled labour from specially organised training schools would be prohibitive and this consideration seems to be final.

CHAPTER IV.

TECHNICAL EDUCATION OF THE UNIVERSITY GRADE

33 We have examined the important question of providing for higher technological training of the university grade in this Presidency and in making the following recommendations, we have given full consideration to the recommendations of the Indian Industrial Commission.

34 Everyone conversant with the conditions in which Indian industries are now conducted is aware of the lack of competent Indians to conduct them. It is necessary to provide facilities for the training of Indians who can superintend, direct, and manage industrial undertakings. The men required for these duties are now with few exceptions imported from abroad, and the high salaries that have to be paid to them are a serious consideration for new enterprises. These conditions seriously retard the development of Indian industries. The ultimate remedy is not to be found in sending students abroad to obtain their training in foreign countries; this could not provide a sufficient number of highly trained men and such an education is very expensive. The present congestion in British and other foreign universities has also increased the difficulty of securing the admission of Indians to them. The remedy must be applied in this country and the men must be trained here. We are satisfied therefore that there is need of promoting higher technological education in this Presidency. The existing institutions do not satisfy this need and hardly afford a remedy. Hitherto, in this country, the education of the engineer has been confined chiefly to theoretical studies and his training and practical experience in works have been very limited. But even on the educational side there is need of improvement. The professional duties of an engineer are not bounded merely by the designing and construction of engineering projects. He is required to supplement his technical knowledge by information concerning the financial and commercial aspects of business enterprises, to estimate costs, to determine depreciations, and to forecast sales and profits; he is also required to manage men and to display a capacity for administration and organization. All these conditions must be remembered in considering what changes are necessary for the improvement of higher technical education in this Presidency.

The terms of reference on this point are as follows:—

“To examine existing facilities for imparting higher education in mechanical, engineering and technology and to suggest measures, including provision for research work, needed to prepare leaders, organisers and experts, that is, persons qualified to fill leading executive positions in business.”

This reference therefore requires —

- (a) an examination of existing facilities,
- (b) the suggestion of fresh measures

With reference to (a), the examination can only be made with due regard to the concluding portion of the paragraph and our remarks apply only in so far as the preparation of “leaders, organisers, and experts” is concerned.

35. The Victoria Jubilee Technical Institute does not train this class of men nor does it profess to be organised on a university standard. Its future development is dealt with later. The existing facilities for technical education of the university grade are provided entirely by the College of Engineering, Poona. We are of opinion that—

- (i) The class of mechanical engineering student being now turned out from this college is not of the stamp from which leaders and organisers are likely to appear

(ii) The standard of mechanical engineering education attained is not comparable with that imparted at universities and schools of technology in England and other countries from which leaders and organisers are now being drawn.

(iii) The geographical position of the College, situated at a distance from large mechanical engineering workshops, militates seriously against success in training graduates in mechanical engineering. It is out of touch with the principal industrial and commercial activities of the Presidency.

We are therefore satisfied that the existing facilities are inadequate.

36 In regard to (b), "the suggestion of fresh measures," it is necessary to consider separately—

(1) whether existing facilities can be enlarged and improved to meet present and future requirements, or

(2) whether an entirely new organisation is necessary

We have considered (1) and our opinion is:—

(a) On account of the geographical position and the difficulty of arranging efficient practical training in conjunction with the college education any attempt to enlarge the College of Engineering, Poona, to accommodate the necessary numbers of mechanical engineering students, and to improve the standard of training would be unsound.

(b) It is impracticable either suddenly to transform the Victoria Jubilee Technical Institute into a college of university grade or to add university courses to its existing curricula. As at present organised it meets a definite demand for a special grade of technical education. We do not exclude the possibilities of its gradual development and, if technical education of a higher grade is not otherwise provided, it will inevitably develop. But for the purpose under discussion in this chapter it cannot quickly provide the requisite facilities.

We are therefore of the opinion that provision should be made for an entirely new organization and recommend the creation of a Faculty of Technology by the University of Bombay, and of a College of Technology in Bombay City.

Having regard to the cost of land and the expansion of the residential area northwards, we are of opinion that a site near Matunga, served by both the Bombay Baroda and Central India and the Great Indian Peninsula Railways, would be most suitable.

Under the last of our terms of reference we are required to submit rough estimates of the cost of our recommendations. We are of the opinion that the erection and equipment of a college such as we contemplate could not be completed for less than Rs 57,00,000. The recurring expenditure is estimated at Rs 5,00,000 per annum. Rough detailed estimates are given in an appendix to this chapter.

37. We realise that at the present time the provision of these sums will be a difficult matter, and we therefore put forward an alternative proposal by which the major portion of the capital expenditure can be avoided. This scheme has the additional advantage of enabling the college to be formed more quickly than if the erection of new buildings is undertaken.

The Royal Institute of Science has recently been opened in Bombay. So far little progress has been made in carrying out research work which was one of the main purposes of its foundation. Since industrial research is included in our terms of reference and should be undertaken at a College of Technology, the combination of the Royal Institute of Science with the proposed College of Technology naturally suggests itself.

The Royal Institute of Science already has a fine building capable of accommodating 400 students which is twice the number for which we consider provision should ultimately be made. Sufficient space is available for the

construction of the additional laboratories and workshops which will be required for technological courses.

We suggest therefore for the consideration of the Government of Bombay that the Royal Institute of Science should be converted into a College of Technology and that the combined Institute should be called the Royal College of Science and Technology after the precedent of the Imperial College of Science and Technology, South Kensington, London.

38. If our recommendation is accepted we would suggest the appointment of a committee to examine :—
Committee of Enquiry.

- (1) the relationship of the College to the University of Bombay;
- (2) the subjects to be taught, regard being had to the industrial requirements of this Presidency,
- (3) the qualifications and age limits for admission to the College;
- (4) the means of providing practical training;
- (5) the staff required for the formation of such a College; and
- (6) other measures required for securing the requisite standard of instruction

39 We consider that provision should be made ultimately for 200 students and that instruction in the following subjects should be arranged—
Rough Outline of Scheme.

- (1) Mechanical Engineering;
- (2) Electrical Engineering;
- (3) Textile Industries; and
- (4) Applied Chemistry

There should be special courses in general economics, commercial practice and general administration.

We are of opinion that the " sandwich " system should be adopted for the practical training of engineering students. At present the need of a sound practical training in addition to a college education is not fully realised by Indian students. In Europe and America very great importance is attached to it

40. Since our enquiry was begun it has become evident that financial difficulties may render it impracticable to give early effect to the recommendations made in this chapter
Temporary Measures. The long discussions and delays which have occurred in connection with similar schemes at Cawnpore and Calcutta also warn us that measures are necessary to ensure that, while the scheme is under consideration, progress in technical education is not stopped.—

The Victoria Jubilee Technical Institute gives instruction in mechanical, electrical, and sanitary engineering, textile manufactures and applied chemistry. The improvement of the standard of instruction may be left, with confidence, to the Board of Trustees. We understand that the entrance qualifications of students taking the courses of mechanical and electrical engineering and applied chemistry will shortly be raised. Although the instruction given at the Institute is below the university grade it must be recollected that its improvement will help to fill the gap which now exists.

Except mechanical engineering, which is taught at the College of Engineering, Poona, a university grade of technological education can at present be obtained only at institutions outside the Presidency. We recommend that, meantime, increased use of outside institutions by local students should be encouraged by the grant of scholarships. Facilities of this kind are already provided by Government for the study of technical chemistry at the Indian Institute of Science, Bangalore, and we recommend that similar arrangements should now be made for the study of electrical engineering at the same institution. We think this is preferable, as a temporary measure, to the

introduction of instruction in electrical engineering at the College of Engineering, Poona, which should meantime concentrate on extending and improving its courses for civil engineers

We are impressed with the desirability of offering periodically state scholarships for the study abroad of technical subjects. At present the Government of Bombay maintain four state technical scholars abroad but the scholarship awards are made at long and irregular intervals. The last award was made in 1919, while three scholarships are being offered this year. It appears that, owing to extensions of scholarships, the administrative department in this Presidency cannot forecast when vacancies will occur. After a scholarship terminates it takes nearly two years before a new scholar can be selected and begin his studies. Under the present system, therefore, the small number of sanctioned scholarships is not fully utilised. We are of opinion that the correct procedure is to offer a fixed number of these scholarships *annually* instead of fixing a maximum total number. Students and others interested can then shape their courses with some certainty. The present uncertainty as to the dates of vacancies and the number of scholarships available at any time defeats the objects for which the scholarships were instituted. We are not prepared to offer a definite opinion regarding the number of scholarships which should be offered annually except that meantime it should not be less than two. From the applications received each year the selection committee which recommends the awards can judge whether at any time the deserving applicants are so numerous that a permanent increase in the number of scholarships is desirable.

If arrangements are made for providing graduates in mechanical engineering with an adequate practical training, for assisting one or two selected men annually to study electrical engineering at the Indian Institute of Science at Bangalore, for continuing the existing scholarships for the study of technical chemistry at Bangalore, and for offering annually a fixed number of state technical scholarships for study abroad then adequate measures will have been taken for paving the way to a local College of Technology. A steady demand for this grade and kind of education will be created and the increasing output of men with a technical education will be gradually absorbed by industries.

41. The question remains whether it is desirable to establish a Faculty of Technology before the institution of the College of Technology. It has been suggested that, pending the establishment of the new college, students trained in mechanical engineering at the College of Engineering, Poona, those trained in electrical engineering and applied chemistry at the Indian Institute of Science, Bangalore, and those trained in some or all subjects taught at the Victoria Jubilee Technical Institute, Bombay, may be provisionally admitted to a new degree of Technology. There are several interests involved and we recommend that the proposal should be examined by the committee whose appointment is suggested in paragraph 38.

42. Our terms of reference require us to suggest measures for research work. Experience in Great Britain tends to show that the successful organisation by Government of industrial research work cannot be undertaken on a large scale without the active co-operation of manufacturers who are prepared to share the necessary expenditure. The only industry in this Presidency organised on a scale sufficient for this purpose is the cotton spinning and weaving industry. It is premature at this stage to suggest the exact means by which research in a technological college may be directed to solve the actual problems of a local industry. Some experience will be gained if the Central Cotton Committee, on which the local cotton manufacturing industry is represented, co-operates in research with existing technical institutions. Research undertaken by a teaching staff must necessarily be limited. It has been suggested that students trained in the technological college should be sent abroad to carry on research work. We do not think that such a course is likely to provide many solutions for the technical

problems of Indian industry We consider that Government should give every possible encouragement to industrial research *in India*, but as regards research in a college of technology not yet in existence we are forced to the conclusion that at this stage it is too early to discuss a definite scheme for its organisation

APPENDIX TO CHAPTER IV

COLLEGE OF TECHNOLOGY.

Estimates.

The figures given below are intended only as a rough guide during the consideration of the proposals in Chapter IV —

	Rs
I—Capital Expenditure—	
Buildings	25,00,000
Land	5,00,000
Strength of Materials, Hydraulic Laboratory	} 15,00,000
Equipment of Mechanical Laboratory and Work-	
shops	
Equipment of Electrical Laboratory and Workshops	
Equipment of Chemical Laboratory and Workshops.	
Equipment of Textile Laboratory and Workshops	} 5,00,000
General equipment, furniture, lighting, etc.	
Library	2,00,000
Contingencies at 5 per cent	5,00,000
Total	57,00,000
II—(a) Maintenance Charges	1,20,000
(b) Staff—	
1 Principal at Rs 2,500 to Rs 3,000	} 1,29,000
4 Professors at Rs 2,000 per month	
3 Professors at Rs 1,000 per month for Mathe-	} 36,000
matics, Economics and Assistant Professor of Applied Chemistry, respectively	
1 Assistant Professor for Commercial subjects	} 27,000
1 Chief lecturer for languages	
1 Chief lecturer for civil and sanitary engineering at Rs. 750 each per month	
15 Lecturers at Rs 500 per month, each	90,000
15 Demonstrators at Rs 200 per month, each	36,000
10 Laboratory and workshop attendants at Rs 100	} 21,000
per month and	
15 at Rs 50 each	15,000
1 Secretary to Principal and Board of Management at Rs 500 per month	6,000
1 Librarian at Rs 500 per month	6,000
Chief clerk, clerks, stenographers, account staff and attendants	25,000
Total	3,76,000

III—Abstract of annual recurring charges—

	Rs.
(a) Maintenance	1,20,000
(b) Staff	3,76,000
	<hr/>
Total	4,96,000
	<hr/>
by rounding	5,00,000

CHAPTER V.

TECHNICAL INSTITUTES

43 The Victoria Jubilee Technical Institute was opened in 1887 with two departments, *viz*, mechanical engineering and

1. The Victoria Jubilee
Technical Institute, Bombay.

textile manufacture The original standard of admission to the institute was low, *viz*, the fifth anglo-vernacular standard

In 1896 the Sir Dinshaw Petit School for sheet metal work and enamelling was added In 1903 the electrical department was opened and the physics classes which had already been started were amalgamated with it In 1906 the department of applied chemistry was opened

As competition for admission had increased an entrance examination of the standard of the Bombay Matriculation was instituted in 1907, this enabled the Institute to select the best of the candidates for admission The examination was strictly competitive but candidates who had passed the intermediate examination of the University were exempted The practice of exempting these candidates was abolished later, as in one year 19 candidates for one department claimed exemption on the score that they had passed the intermediate examination

About this time (1908) the textile department was put in charge of a fully qualified textile expert from Lancashire Up to this date weaving had occupied a somewhat subsidiary place

In order to raise the standard of work throughout the Institute it was next arranged to extend the courses in all departments, except the textile department, from three to four years In the textile department there was instituted a two years' course in spinning or weaving followed by a second optional period of two years in either weaving or spinning At the end of the first two years' course successful students were given a certificate and on completion of both courses the full technological diploma In 1914 the Sir Dinshaw Petit School for sheet metal work and enamelling, which had failed to attract candidates, was closed and reconstituted as the Sir Dinshaw Petit School for sanitary engineering and plumbing

The courses of study were maintained without any material change up to 1921 when it was decided to rearrange the course in textile manufacture so that all students should attend the four years' course and spinning and weaving should be taken concurrently and not consecutively It was also decided in 1921 to raise the standard of the entrance examination of candidates for the mechanical, electrical and chemical departments to that of the first year's examination in Arts or Science of the Bombay University This change was necessary in order to secure the requisite standard of preliminary general education before raising the standard of technical education in the three departments concerned

In 1896 the Institute became the centre in India for examinations held by the City and Guilds of London Institute These examinations are still held at the Institute and the results obtained by students have in many cases been above the average of the general results of the examinations

44. The total number of annual admissions is limited by the accommodation and about 120 are admitted. Last year (1921) the number of candidates who actually registered their names and paid fees was 320; of these 289 actually sat and 255 qualified for admission by obtaining over 33 per cent of the total number of marks; of these the first 121 were admitted to the various departments as follows. The figures in brackets give the normal limit to admissions in each department :—

Department.	Admissions, 1921.
1. Mechanical ...	29 (30)
2. Electrical ...	30 (30)
3. Textile ...	30 (30)
4. Chemical ...	16 (20)
5. Sanitary ...	16 (20)
	<u>121 (130)</u>

Of the total number of applicants two were graduates, 45 had passed the intermediate or first year's examinations, and 132 had passed the matriculation or school leaving examinations.

The following table shows the number of candidates for admission from each province and the percentage in each case; and (a) number admitted, (b) percentage from each province admitted, and (c) percentage of applicants from each province admitted :—

	Number of Candidates.	Percentage from different provinces.	(a) Number admitted.	(b) Per cent. admitted.	(c) Per cent. Applicants.
Bombay Presidency ...	131	40	50	42	38
Madras and Mysore ...	111	35	33	36	39
Punjab ...	34	11	11	9	32
Central Provinces ...	16	5	6	5	37
United Provinces ...	12	4	5	4	32
Bengal ...	9	5	2	1 6	22
Central India ...	3	1	1	0 8	33
North West Provinces ...	2	...	2	1 6	100
Ceylon ...	1	...	1	0 8	100
Mesopotamia ...	1	...	...	...	...
	<u>320</u>		<u>121</u>		

45. Government gave generous financial assistance at the starting of the Institute and have liberally provided additional funds as schemes for its progress were developed

In 1887 the Government recurring grant was Rs 25,000; it was raised in 1908 to Rs. 45,000; in 1913 to Rs. 1,00,000 and in 1919 to Rs. 1,25,000. In addition, Government have given special grants towards the cost and improvement of the buildings and equipment at Byculla amounting in all to Rs. 1,71,000.

By 1913, the premises at Byculla had become too small for the needs of the Institute, some of the buildings were unsuitable, the site was cramped and noisy, and extension was impracticable. To secure increased accommodation, suitable to the requirements of the times, it was decided to erect new buildings at Matunga. The present site and buildings were sold to the G I P Railway for eight lakhs and Government have made special grants amounting in all to six lakhs towards the cost of the new buildings and equipment. Since the scheme was originally drawn up the cost of construction has, however, enormously increased. The buildings completed or in progress are :—main institute building, students' quarters, workshop blocks,

kitchens and dining rooms for students; these will absorb all the funds in hand and leave no provision for the power house, quarters for teaching staff and other works. For the completion of the scheme additional expenditure amounting to ten lakhs of rupees, spread over two years, is necessary.

46. When the new Institute is opened, extended courses can be undertaken, for example, demonstrations of sizing, bleaching, dyeing, and cloth testing in the textile department; testing of electrical machinery and plant in the electrical engineering department, testing of materials in the mechanical engineering department, the small scale manufacture of paints, varnishes, soaps, candles, and oils in the chemical department, and more varied and advanced work in the sanitary department. These extensions of training and improvements in the standard of instruction will require additional staff and entail additional maintenance charges. Therefore for some time to come fresh expenditure, both initial and recurring, must be faced.

If the institute is to meet the requirements of local industries courses in tanning and glass manufacture, probably also classes in sugar manufacture, should be formed. Closer association between the institute and local workshops is also desirable. We propose later to give it a place in a scheme for providing technical instruction to apprentices in railway and engineering workshops and other industries, and we understand that a scheme is also under consideration for giving students of the institute their practical training on the "sandwich" system.

47. The scope that lies before the Institute, if funds are provided, is therefore very great. That it meets a real demand is proved by the fact that students who obtain its diplomas have little difficulty in securing employment, while employers frequently ask the assistance of the Institute authorities in engaging past students. The immediate requirements are a non-recurring grant of ten lakhs and an increase in the amount of annual income which is already insufficient to meet all recurring expenditure.

48. In 1912, the Board of Trustees of the Institute submitted to the Government of Bombay a scheme for the systematic organization of technical education in the Presidency. The proposals of the Board, after they were examined by a committee appointed by Government, were approved generally, and the institution was recognised as the Central Technological Institute of the Bombay Presidency. A committee of Direction for Technical Education was constituted, distinct from the Board of the Victoria Jubilee Technical Institute. By the character of its composition the Committee was intended to be in close touch with the Board and in a position to benefit by its special knowledge and experience and to secure the advice and assistance of the staff of the Victoria Jubilee Technical Institute. The control of technical and industrial education in the Presidency was vested in this Committee. Its composition and functions are fully discussed in Chapter VII.

49. We include these classes in this chapter as they are nearer the standard of the Victoria Jubilee Technical Institute, Bombay, than that of the Ranchhodlal Chhotalal Technical Institute, Ahmedabad, which is treated in Chapter VI. The courses are for mechanical and electrical engineering students. The qualification for admission is the anglo-vernacular standard VI with an entrance examination in mathematics and English. The length of each course is three years.

The number admitted annually to the mechanical "apprentice" course is fifteen. Instruction is given in practical mathematics including geometry, applied mechanics, prime movers, workshop appliances, engineering materials, workshop accounts, and technical drawing, workshop practice is also given. The course is intended for the instruction of young men who, after a practical training in outside workshops, will be able to sit for a second class certificate under the Bombay Boiler Act.

The electrical course, which is on similar lines, is restricted to five admissions annually and is intended for those seeking employment as wiremen, electrical fitters and switch board attendants, or to have charge of small electrical plants driven by steam, gas, or oil engines, or by water power. Under certain conditions a mechanical apprentice who has successfully completed the three years' course will be allowed after one year's work in outside shops to take the third year of the electrical course.

50. The combination of this grade of instruction with technical education of the university grade is not a desirable arrangement, but at the present time we are loath, on grounds of economy, to condemn it. While certificates under the Boiler Act are required by law the requisite instruction must be provided somehow and the facilities provided by these courses meantime fill a gap. Till the university courses in mechanical engineering are transferred to the proposed College of Technology at Bombay and while certificates under the Boiler Act are compulsory the apprentice course in mechanical engineering should be continued. We are doubtful whether the maintenance of the electrical course for five students annually is necessary or justifiable and recommend that this matter should be referred for opinion to the Advisory Committee of the College. The Victoria Jubilee Technical Institute, Bombay, provides a course of electrical engineering, and the technical knowledge required for wiremen, electrical fitters and switch board attendants might be provided under simpler, more practical and less expensive arrangements in Bombay.

51. The term "apprentice" as applied to these courses is a misnomer. The students are not apprentices and are not required to serve any term of practical training. As large a proportion of the students' time as one half is devoted to practice in the college workshops. This fact, coupled perhaps with the description of the instruction as "apprentice" courses, has created an impression, which the efforts of the college authorities have failed to dispel, that the students at the end of their course are completely trained for supervisory appointments. Efforts are being made to impress the students with the need of practical training in outside shops after their college course but the results are not very successful. A serious difficulty is that many of the students embark on the course without the financial means required for a period of practical training subsequent to their theoretical instruction. Government give assistance by means of stipends but these are not a sufficient counter-inducement to minor appointments with a small salary but smaller future prospects. The principle of paying all students to undergo education is unsound and the best that can be said for the payment of stipends to mechanical apprentices undergoing practical training is that the bribe is, except for the best student of the year, a poor one and that some action is necessary if the students are to realise the need of supplementing their college training by really practical work. It would be a sounder arrangement if a real apprenticeship were served on a "sandwich" system but, as is noticed elsewhere, the college by reason of its situation is not in contact with engineering shops. The practical training of these students is still a problem to be overcome, and should receive the attention of the Advisory Committee of the college.

CHAPTER VI.

MIDDLE TECHNICAL AND INDUSTRIAL SCHOOLS

52. A minority of our committee recommend the establishment of "middle industrial schools" as described in the following extract from the interim report referred to in paragraph 17:—

Description.

"The object of these schools is to give the training they need to persons who intend to manage and administer minor industries or to qualify as assistant foremen or hold subordinate technical positions in organised industries. In addition to these, teachers for schools of the

lower grades and supplementary courses will be also trained at these institutions, special courses being added to the curricula as required

For the training of foremen and chargemen in organised industries we recommend the establishment of apprentice schools attached to large workshops and factories

Middle industrial schools may be established in cities and head-quarter towns of districts and may be called City or District industrial schools as distinguished from Town or Taluka schools, which will be industrial schools of the lower grade

These may be of two varieties, namely, (1) technical schools in which the instruction given will be a basal preparation for industries, and (2) special industrial schools for instruction in the theoretical and practical work of particular trades

It would be desirable to have one such school for every district, but from consideration of expense we have decided to recommend for the present the establishment of 12 schools only, each capable of accommodating about 250 pupils. Some of these schools will be located in industrial centres and others distributed regionally in proportion to population

The estimated annual cost of the twelve schools will be about Rs 5 lakhs.

The candidates for admission to the course should be not less than 14 years of age, and should have passed the III standard anglo-vernacular or VII standard vernacular.

The prestige of the middle industrial school should be maintained by the character and efficiency of the training given which should be such as to secure employment for the student as soon as he completes his course.

In industrial schools of both grades, instruction and training will be given, in addition to general subjects such as languages, mathematics and science, in mechanics, mechanical drawing, smithy, fitter's work, carpentry, in special trades such as tailoring, furniture making, photography, printing, boot and shoe making, etc, and in manufacturing industries such as metal work, weaving, dyeing, pottery, painting and designing, building design and construction"

In another account* of these schools it is stated that their "primary aim..... will be to train skilled craftsmen to practise their trades or to carry on minor or cottage industries" "With the systematic training they receive, the students who pass from these schools will be able to adapt themselves, with very little additional practical experience, to fill minor technical and trade positions in organised industries also" According to this later account, candidates for admission should have completed 13 years of age

The existing schools of this grade are stated to be—

- (1) the workshop classes at the College of Engineering, Poona
- (2) The engineering classes at the Dayaram Jethmal Sind College, Karachi
- (3) Sir J J School of Art, Bombay
- (4) Ranchhodlal Chhotalal Technical Institute, Ahmedabad.

53. We devote this chapter to a consideration of the type of technical education which is based on a general education represented by the VI standard vernacular or the 3rd standard anglo-vernacular. The Ranchhodlal Chhotalal Technical Institute provides this kind of instruction and seems to approximate most closely to the class of institution which the minority describe as "middle industrial".

We may explain here how we deal with institutions (1), (2) and (3) mentioned above which have been named as schools of the "middle industrial" grade

* Vide Minority Report, paragraph 60.

Under (1) are sub-overseers' classes, mechanical apprentices' classes and electrical apprentices' classes. The sub-overseers' classes as well as (2) the engineering classes at the Dayaram Jethmal Sind College, Karachi, and (3) the Sir J J School of Art, Bombay, seem to be outside the scope of our terms of reference. The entrance qualifications for admission to the mechanical and electrical apprentices' classes at Poona are the anglo-vernacular standard VI and an entrance examination in mathematics and English. The general education required to meet these conditions and the standard of theoretical instruction given in the college mark the classes off sharply from the Ranchhodlal Chhotalal Technical Institute, Ahmedabad, and bring them nearly to the level of the Victoria Jubilee Technical Institute, Bombay. We have therefore dealt with these classes in the preceding chapter.

54 The Ranchhodlal Chhotalal Technical Institute, founded by the generosity of the late Mr Madhowlal Ranchhodlal, father of late Sir Chinubhai Madhowlal, Bart., of Ahmedabad, was opened in 1910. The subjects taught are mechanical engineering, cotton spinning and cotton weaving, and the duration of each course is three years. The minimum age for admission is fifteen years and candidates for admission must have passed vernacular standard VI or anglo-vernacular standard III. The maximum numbers of students admissible annually are—

Mechanical engineering	...	..	...	30
Cotton spinning		.	..	16
Cotton weaving	...	...	...	16
				—
		Total	...	62

In the five years ending 1920 the average annual number of candidates who applied for admission was 46, the average number admitted was 38, and the percentage of pupils completing the course was only 36.

The total number of students in each course in March 1921 was—

Mechanical engineering	...	.	..	27
Cotton spinning		.	..	12
Cotton weaving	...	...	...	17
				—
		Total	...	56

These figures suggest the degree of difficulty in filling an institute of this type at Ahmedabad with 250 students as proposed by a minority of our committee. This difficulty will be intensified in the case of the remaining 11 schools of this type and size which are proposed for places less industrially developed than Ahmedabad.

55. The careers of past students are summarised in the following statement compiled in 1921 :—

First batch, 1912.

Fifteen out of 17 hold Boiler Act certificates (1st class 2, 2nd class 1); with one exception employed in mills and factories, on salaries of Rs 300 (1), Rs. 225 (1), Rs 200 (1), Rs 150 (4), rest on Rs 70 to Rs 125

Second batch, 1913.

Eleven out of 17 hold Boiler Act certificates (1st class 1, 2nd class 9), nothing known of 3, the rest, except one, in mills and factories; salaries Rs. 373 (1), Rs 150 (1), Rs 125 (2), the remainder on Rs 50 to Rs. 115.

Sixth batch, 1917.

Eight out of 12 hold Boiler Act certificates (all 2nd class); nothing known of 1, the rest, except one, in mills and factories; salaries Rs 125 (1), Rs 110 (1), Rs. 70 (1), the remainder on Rs 40 to Rs 60

Seventh batch, 1918.

Only 4: no certificates under Boiler Act, salaries Rs 60 (2), Rs 40 (1), one not known

Eighth batch, 1919.

Two out of 12 hold Boiler Act certificates (3rd class), all but one in mills; salaries Rs. 60 (1), Rs 55 (1), Rs 45 (3), remainder on Rs 40

One conclusion which we draw from this statement is that the students have little value in the market until they have acquired practical experience. The Principal, in examination, confirmed this. The ex-students in some cases barely earn the wages of unskilled labour when they leave the institute. We do not draw attention to this fact as reflecting unfavourably on the institute. It bears out our contentions regarding the fundamental value of practical training and the necessity of obtaining this practical training in commercial undertakings.

56 As in the case of the workshops classes at Poona, the mechanical engineering classes at Ahmedabad are filled chiefly with candidates for Boiler Act certificates. It is now proposed to legislate so that these certificates will no longer be compulsory, and in the absence of this somewhat artificial stimulus it is doubtful whether the admissions to the mechanical engineering classes will be maintained.

57 The total expenditure in 1919-1920 was certainly low, *viz.*, Rs 21,000, but the annual cost of each student was Rs 344.

In comparison with this, salaries earned by past students are disappointing. One or two earn more than Rs. 300 monthly and it would be easy to match or surpass these with numerous engineers and others, working in local industries, who have been trained entirely under industrial conditions and have received no theoretical education.

The institute is well equipped as regards workshops and spinning and weaving sheds.

58 We consider that the working and results of this institute have been unsatisfactory and that, while this is the state of "middle" industrial instruction in the second most important industrial city of the province, it is useless to contemplate extending it from 50 to 3,000 students, in areas where industries are undeveloped, at an annual cost of five lakhs of rupees.

59 One reason for the poor results obtained at Ahmedabad is connected with the low admission qualification, which is the vernacular sixth standard or anglo-vernacular third standard. At the average age of entry the applicants ought to have reached a much higher standard of general education. The entrance qualification coupled with the age of admission is virtually an invitation to the stupid and backward and the Principal admitted to us that the average applicant for admission is a poor type. Many of those who are admitted are unable to follow the courses and their attendance soon ceases. As the students do not know English, instruction is given in the vernacular by means of lectures and dictated notes. We recommend that the standard of admission should be raised in the first instance to the fifth standard anglo-vernacular and that instruction in English should be given in the institute itself until it is found practicable to raise the admission standard to that of the school leaving certificate. Technical instruction should also be given as far as is necessary through the medium of English. We do not think it desirable to abolish entirely instruction in the vernacular and would allow, meantime, the use of both languages in teaching.

60 The courses of instruction seem to require re-casting. If the entrance qualification is raised and a more intelligent class of student obtained, it may be possible to reduce the spinning and weaving courses to two years each. A weakness of the textile side is the want of close association with the local cotton mill industry. The pupils of an institute of this

kind should be drawn, to some extent, from the sons of local spinning and weaving masters and possibly of jobbers. The curriculum and methods of study should be adjusted to local conditions. Until local industry takes a stronger and more practical interest in the technical training of the supervising staffs and is given the opportunity of directing this institute to meet its needs, no lasting efficiency can be expected. We deal further with this matter in Chapter X on control and administration. These remarks relate to the full time classes in spinning and weaving.

61 We consider that the full time classes in mechanical engineering should be abolished, at least as soon as certificates for boiler attendants under the Boiler Act cease to be compulsory. In their stead instruction in mechanical engineering should be provided in apprentice classes as proposed in the following chapter. Students who can afford to take full time classes and are sufficiently qualified naturally prefer attending the Victoria Jubilee Technical Institute at Bombay, and we think that there is scope for the institute at Ahmedabad in developing mainly as an apprentice and trades school.

62 Finally, an effort should be made to raise the standard of teaching. The staff requires to be strengthened and improved. On the rates of pay which were communicated to us it is almost impossible to recruit an efficient staff. The workshops' staff (including the foremen fitter, blacksmith, moulder, etc) are paid much below market rates. A good organiser is required to develop this institute and to ensure that full use is made of the facilities which it provides.

63 We are opposed to the establishment of more technical institutes on the model of the R. C. Technical Institute as at present organised. On the basis of a general education represented by the 3rd standard anglo-vernacular it is possible to give only a slight technical education, such as is more suitable for the lowest grade of apprentices classes described in the next chapter. There is no prospect of successfully establishing eleven additional institutes of the Ahmedabad type, each capable of accommodating five times the number of students who now demand this grade of education at Ahmedabad.

CHAPTER VII.

OTHER GRADES AND TYPES OF TECHNICAL AND INDUSTRIAL EDUCATION

64 In any scheme of technical and industrial education the instruction and training of boys and apprentices in large workshops and factories takes an important position. This covers a great part of our problem as it affects the artisan classes. In paragraph 22 we have referred to the general lack of a suitable primary education among these classes and to the need of extending primary education before hoping for a wider spread of technical knowledge.*

65 These considerations and the fact that instruction of a technical kind cannot be successfully imparted to young boys and apprentices before the age of 14 or 15 have led us to consider, in the first instance, what provision should be made for the education of half-timers in factories. The returns given in the annual factory reports of the Presidency of Bombay show that, in the year 1920, there were 15,400 children employed in factories, of whom 11,000 were boys and 4,400 girls. Except 1,500, these were all employed in spinning and weaving mills, mostly in Ahmedabad and Bombay. At the present time, the age of those half-timers is between 9 and 14 years but, under recent legislation, it is proposed to raise these limits to 12 and 15 years respectively. It is not possible to forecast what the effect

* We have no special knowledge or experience of what has been done in any industry to improve the labourers' efficiency and skill, and we are of opinion that it is not feasible to do anything with the adult labourer. The proper course is to train the children of labourers, so as to improve the next generation, and for this purpose there is an urgent need to spread primary education as rapidly as is compatible with efficiency and as funds permit. (Evidence of the Bombay Indigenous Industries Committee before the Indian Industrial Commission. Minutes of Evidence, Volume IV, page 589.)

of this proposal, if it becomes law, will be, but we are of the opinion that measures should be taken in the case of the boys, with whom only we are concerned in this chapter, to secure for them a suitable continuation or, in many cases, a beginning of their primary education. In these schools the three R's should be the main subjects taught but drawing should be introduced wherever possible and, for the more advanced and clever boys, facilities for the learning of English should be provided. The education should have a practical industrial bias and should be connected as far as possible with the work on which the pupils are employed. Although the great majority of these boys will be employed in textile factories, it may be expected that when they reach the age of 15 years and are able to take full-time employment, many will enter other industries.

66 We are of opinion that, if practicable, the education of half-time employees should be compulsory and free. But we are opposed to any proposals that would compel the employers to provide this education. This, we consider, is the duty of local authorities and of Government. We see, however, no objection to the employment of half-timers being made contingent on the provision by employers of suitable school accommodation when the half-timers exceed a prescribed minimum number, say twenty. We recognise that, apart from the difficulty of providing funds, buildings and teachers, the successful establishment of half-time schools must depend greatly on the good will of employers. We are strongly of opinion that when employers themselves undertake the duty of providing this form of education under adequate arrangements as regards inspection they should be assisted in every possible way, and that generous grants-in-aid should be afforded by Government.

67 Till compulsion is introduced we think that the number of half-timers who will take advantage of our scheme will not exceed 4,000 at a very liberal estimate. The cost of these is estimated to be Rs 1,20,000 annually the whole of which will be additional expenditure. We are hopeful that the non-recurring expenditure will be restricted to a small sum for school equipment and that the school accommodation will be provided, in nearly all cases, by the employers. These half-time schools will be administered by the Department of Education.

68. To get the best results from these proposals and to encourage working class parents to give their children some education in their earlier years, employers should be persuaded to give somewhat higher rates of pay to half-timers who have reached a certain standard of primary education. The increased remuneration might vary with the standard reached. Both the Railway Companies in Bombay have their apprentices graded in four classes according to educational qualifications and give higher rates of pay to the higher classes.

69 In paragraph 30 we have stated our opinion that the training of skilled artisans for organised industries is best given in workshops and factories under apprenticeship conditions. In the paragraphs which follow we shall deal first with a scheme for the training of apprentices in large engineering workshops where the conditions are generally more favourable than in other industries for giving technical instruction to youths and young workmen. We shall then indicate how our system of training engineering artisans can be applied, with suitable modifications, to other large scale industries. We again point out (see paragraphs 22 and 27) that on the successful application of such schemes depends the creation of a class of competent foremen and supervisors.

70 At the outset we are confronted with the difficulty that, on account of educational deficiencies, only a comparatively small proportion of apprentices and young workmen will be sufficiently equipped to undergo technical instruction. We also recognise that any scheme must be elastic to the extent of providing different ranges of technical education for those who have been educated to different standards. In this connection we may refer to the

II. Training of boys and apprentices in large workshops and factories.

difficulty connected with the choice of the language in which instruction should be given, a difficulty which is accentuated in Bombay City by the fact that more than one vernacular is current in the local workshops. Till now, technical text books in the vernaculars have practically not existed and technical education in the vernaculars, in this Presidency at least, has been a failure. Amongst the apprentices and young workmen in engineering workshops there will be, however, an appreciable number who would benefit by a simple technical education if there were text books in the vernacular on such subjects as drawing and mensuration, applied mechanics, steam and steam-engines, and gas and oil engines. There are also other industries or crafts in which a simple technical education on similar lines might be provided, *e.g.*, carpentry, smithy-work and foundry work. In all those industries where success depends on the skill of the individual craftsman, *e.g.*, smithy-work, fitting and carpentry, we lay much stress on the advantage of giving to all who can be taught, elementary drawing and mensuration so that they may be able to understand a drawing and to work from it. As primary education is extended and as the proposals which we are now making take effect, we confidently anticipate that a demand will be created, and will increase, for simple technical text books in the vernacular, and we consider that the preparation of these should receive the early attention of whatever department is entrusted with the task of giving effect to our proposals. We anticipate further that, concurrently with the demand for this class of text book, there will arise the need of simple technical journals for the moderately educated artisan of the type exemplified in the United Kingdom by the "Mechanical World" and the "Practical Engineer."

71 In this connection we desire to record the opinion that all technical words in vernacular text books and journals should be adopted from the English language. Indian industry cannot be burdened with a variety of artificial vernacular equivalents for such words as spanner, cylinder, gear, and hundreds more.

72 We now turn to the needs of those apprentices who have a sufficient education and knowledge of English to undergo a moderate training in the theory of their trade. Here we are impressed by the advantages of the training in mechanical engineering which is already given in Bombay by the two large Railways and by the possibility of providing similar facilities in railway workshops in other parts of the province as well as in large private engineering establishments. As the Indian Industrial Commission pointed out, the railway workshops, with the technical school alongside, provide an almost ideal course of training which has been developed much more in other parts of India than in the Bombay Presidency. With the good will of the employers there is no reason why the system should not be extended to other large engineering establishments where the number of apprentices warrants the establishment of separate classes. For works which are not large enough to provide educational facilities for their apprentices within the workshops, classes should be provided in a common school conveniently situated for the works. This system has already been introduced with success in Calcutta and Madras. We may point out that under it no expensive accommodation is necessarily required. The fact that the pupils are working apprentices dispenses with the need of a school workshop. At the commencement, a scheme of this kind can be established in a few hired rooms suitable for teaching purposes and provided with the usual school accessories and models. A reference is made later to the possibility of utilising the apparatus and equipment of the Victoria Jubilee Technical Institute for certain stages of the instruction in both sets of classes. We do not go into details as regards the curricula; these should be left to the organization entrusted with the working of the scheme. The working of the existing classes in Bombay are explained in two papers given in Appendices A and B to this report.

73 The time spent by apprentices in the classes for theoretical instruction should be within the workshop hours, and should be as early in the day as possible, when the apprentices are still fresh and not fatigued by work.

We are definitely opposed to the establishment of apprentices of evening classes to be attended after a fair day's work. Lord Leverhulme's Commission in England has reported against evening classes and we endorse the opinion of the Indian Industrial Commission that, in a climate like that of India, when a boy has done a fair eight hours' work in the shop he is not in a condition to benefit by class instruction. We are not now suggesting that there is no room in certain circumstances for evening classes but we are opposed to them as any part of the scheme for the training of apprentices. Nevertheless, classes in English and other subjects for all grades of workmen might be suitably arranged in the evening.

74 One of the difficulties in the successful working of a scheme of this kind is the leakage due to boys breaking their training under the inducement of slightly higher wages elsewhere. The only remedy for this is an improvement in the prospects of the skilled artisan and the recognition by employers of the need of finding inducements for apprentices to complete their training. The youths in training will require much careful guidance and encouragement from their employers and we strongly support the recommendation of the Industrial Commission that in large engineering establishments, where the number of apprentices justifies the expense, there should be a special officer or adviser to supervise their practical training and to see that they are properly employed in each section of the workshop. This is a growing practice in England and America.

75 Similar arrangements to those suggested for apprentices in engineering workshops may be made also for electrical engineers, carpenters, apprentices in motor-car workshops, and plumbers. In few of these trades, however, will it be practicable for employers to make arrangements for technical instruction in their workshops and recourse must be had to a teaching centre. In connection with the inclusion of instruction in motor-car engineering, we desire to make it clear that the teaching provided under this head in any central class will be for working apprentices only. If instruction is considered necessary for motor-car *drivers* we think that the provision for this should be entirely separate.

76 Before leaving the subject of technical instruction in mechanical and electrical engineering we may point out that it may be practicable to award scholarships to a few selected apprentices to enable them to attend the courses in mechanical or electrical engineering at the Victoria Jubilee Technical Institute, at the College of Engineering, Poona, or at any other suitable institution.

77. The field for technical classes in trades schools such as we have just described will be an ever increasing one. The tanning industry, for example, is of some importance in Bombay City and its neighbourhood but the class of labour which it employs is so uneducated that hitherto a scheme on the lines described above had no prospects of success. Boys of the educated classes are, however, now seeking entrance to this industry and it should be possible, with the co-operation of employers, to secure for such boys as undergo a practical tannery training, facilities for the requisite technical education. It is unlikely that educated apprentices in this industry will be numerous and it seems practicable to arrange for their technical education, which will be chiefly on the chemical side, at the Victoria Jubilee Technical Institute.

Similarly the repairing of watches and clocks seems to afford scope for a trades class in which apprentices can obtain some knowledge of the theory of watch and clock making and opportunities for studying the mechanics of watches and clocks which employers have not the means of providing. This is a craft in which the manipulative skill acquired by workshop practice can be improved by class instruction, demonstration, and experiment. It is on these lines and to the extent here indicated that we think that the efficiency of workmen can be improved by technical and industrial instruction. The school instruction is complementary to the workshop training and not a substitute for it.

There are possibly openings for suitable instruction in other trades—

tailoring, painting and decorating, tin-smithy, printing and book binding to name a few. Doubtless there is no effective present demand in many of these for apprentice classes. But for all such trades the lines on which suitable instruction should be provided when there is a demand for it are similar. In particular we contend that money should not be spent on attempts at hot house cultivation of artisans in schools. The work in the schools and classes should be directed towards raising the standard of craftsmanship by teaching theory, up-to-date methods, care of tools—everything that the workshop is not organised to teach. The practice which makes perfect in workmanship will be acquired in employers' workshops. As education extends and as the demand for better workmanship grows so will the opportunities of the apprentice or trades classes extend in range and standard of instruction.

78. The organisation of the teaching staff in these classes, both in private workshops and in central classes, requires consideration. The experience of the railways in Bombay seems to point to the conclusion that employers will look with favour on our proposals, and give facilities for the theoretical education of their apprentices and, where possible, class accommodation within their workshops, provided they are relieved of the work and difficulties connected with the organisation of the classes and the recruitment of the teaching staff. In the case of the railways, the teaching staff has been organised by an outside agency though the majority of the teachers are actually employees of the railways. We are of the opinion that an independent agency of this kind is required for organising all apprentice classes in Bombay City. Fortunately an organisation which can be adapted for the purpose is already in existence. One of the objects of the society known as the Victoria Jubilee Technical Institute is "the supervision and control as regards staff, accommodation, equipment, courses of instruction, standards and conduct of examination, nature and grant of certificates, diplomas or licenses of such technical or industrial schools as may be affiliated or subordinate to the Central Institution". It is further laid down in the Rules and Regulations of the Institute that for the adequate and satisfactory carrying out of the purpose just mentioned "the Board shall delegate its powers to a special sub-committee to be called the Committee of Direction for Technical Education, consisting of the Chairman of the Board (or, in the event of his temporary absence on leave, such member of the Board of Trustees as may be appointed by Government), the Director of Public Instruction for the time being, two members of the Board to be selected by the trustees and nominated by Government (to hold office for three years), the Principal of the Central Institution for the time being and the Principal, College of Engineering, Poona". The Director of Industries has recently been added as a member of this Committee of Direction. We consider that this Committee, suitably modified, should be entrusted with the organisation of apprentice classes in Bombay City and that the teaching staff for these classes should be under its administrative control. As regards the constitution of the Committee we recommend that it should be enlarged by the addition of representatives from each of the two railways, the Port Trust, the R. I. M. Dockyard, the Millowners Association and five firms which will be directly interested in the administration of apprentice classes. For special subjects, *e.g.*, watch repairing, sub-committees may be appointed with power to co-opt members who are specially interested in the subjects dealt with by each sub-committee. The constitution of this committee is more fully dealt with in Chapter IX.

The teaching staff of the apprentice classes will probably consist of both full-time and part-time instructors and the latter may be recruited from the staff of the workshops in which or for which the technical classes are established.

79. The Committee will probably find it necessary to control the teaching staff through the Principal of the Victoria Jubilee Technical Institute. It is inevitable that the Victoria Jubilee Technical Institute should be closely associated with a scheme of this kind. Members of the junior staff of the Institute will probably be engaged as teachers either in the central classes or in the classes attached to private workshops. It is probable that it will be

advantageous, sometimes necessary, to utilise part of the accommodation of the Institute for some of the classes. To avoid the expense of duplicating expensive apparatus it is advisable that arrangements should be made for some lectures, at least, in mechanical and electrical engineering being given at the Institute. We consider also that any technical classes connected with the spinning and weaving industries must be held at the Victoria Jubilee Technical Institute. In the textile industries conditions render it impracticable for a learner to acquire technical knowledge in the mills themselves. In this case small instructional shops where learners can examine plant and machinery at leisure are required. For instruction in spinning and weaving considerations of cost render it necessary, therefore, that as much use as possible should be made of the spinning and weaving sheds attached to the Victoria Jubilee Technical Institute. Thus any technical training which it may be possible to give to jobbers and young workmen of sufficient education should be given at this institution. In these circumstances it will be seen that the apprentice classes must necessarily come into close working contact with the Victoria Jubilee Technical Institute and we think that, in practice, harmonious working will best be obtained by placing the teaching staff of the apprentice classes under the control of the Principal of the Institute. We do not think that difficulties will arise because the Principal of the Institute is under the control of the Board of Trustees for his principal duties and under the control of an enlarged Committee of Direction for his subsidiary work in connection with the apprentice classes. A further examination of the administrative arrangements for the classes is made in Chapter IX.

It will be necessary, of course, to consult the trustees of the Victoria Jubilee Technical Institute and obtain their approval of these proposals.

For the initial organisation of the apprentice classes and for the regular inspection of their work after they are established, the Committee of Direction should have the assistance of the special officer whose appointment is recommended in Chapter IX.

80 The scheme which we have outlined for Bombay City can be extended to all parts of the Presidency where industries are sufficiently organised. At every place where there is a sufficiently large railway workshop, it should be possible to organise an apprenticeship system in which practical instruction is given in the workshops and theoretical instruction is given in special classes provided for railway employees only or for apprentices of allied industries in the neighbourhood as well. Each suitable centre must be the subject of separate enquiry. We mention now the following as the most likely centres for the early establishment of technical education based on an apprenticeship system:—

Ahmedabad.	Lonawala.
Igatpuri.	Poona.
Manmad.	Sholapur.
Bhusawal.	Hubli

81 We strongly advocate that attention should be first concentrated on Bombay and Ahmedabad as much will depend upon the success of the preliminary efforts. In the mofussil Ahmedabad offers the best opportunities for the establishment of apprentice classes in engineering and possibly other industries and trades. In addition to the railway workshops there are one or two good local engineering shops and there is already a well equipped technical institute. In Chapter VI we have recommended that the full time classes in mechanical engineering at the Ranchhodlal Chhotalal Technical Institute should ultimately be abolished on their present lines and that instruction in this subject should be provided in apprentice classes as in Bombay City. The Institute will then become the centre of technical education for apprentices in Ahmedabad in much the same way as the Victoria Jubilee Technical Institute will be the centre in Bombay. The apprentice classes need not always meet at the Institute. The teaching staff of the classes may be provided by the Institute or by the employers or from other local sources, but it should be under the direct control, for teaching purposes,

of the Principal of the Institute. Good local organisation is wanted and the interest of local employers in the possibilities of local technical education must be stimulated.

82. As we are unacquainted with the conditions of Sind we have not included such places as Karachi and Sukkur in the list of likely centres for the establishment of apprentice classes. We are inclined to the opinion that Sind should have a separate Committee of Direction for Technical Education, in any event further enquiry is necessary before definite proposals can be formulated.

83. The cost of apprentice classes is estimated to be Rs 100 per head on an average. In the Presidency, excluding Sind, it is anticipated that provision will be necessary for about 300 apprentices in railway workshops. Sind and private workshops may furnish 40 per cent. more of pupils from the engineering industry and other industries and trades may require provision for another 200 or 300 students. Our proposals have been criticised because we suggest provision for hundreds of individuals instead of thousands but in the present stage of educational development we see no prospect of attracting more than 600 pupils from all kinds of industry to apprentice or trades classes. Indeed we submit this as a sanguine estimate not likely to be reached at the outset except by careful preparation and organisation. The cost of classes for 600 pupils may be estimated at Rs 60,000 annually. The initial non-recurring expenditure should not be heavy.

By restricting these apprentice classes to the teaching of theory and leaving apprentices to get their practical training in outside workshops their extension, after they are once established, will be easily arranged.

III. Workshops of the School 84. These workshops comprise classes in—
of Art, Bombay.

Carpet making	|	Jewellery and
Wood carving		Stone carving
Wrought iron work		

The entrance qualification is the third standard vernacular and the pupils are mostly quite young boys. Some are admitted without the prescribed educational qualification and in their case the necessary instruction in vernacular is given. Two hours are allotted daily to drawing and four hours to practical work. The full course lasts three years, but the boys generally leave after about 18 months and proceed to their trade. This fact merely confirms our opinion that practical training can be given only in commercial workshops or by master craftsmen working on their own account. In countries where education is more advanced, the boys attending these classes would be older and already engaged in their crafts. The important element in the education of such boys is a knowledge of how to draw and how to read a drawing. At the School of Art the boys leave as soon as they have acquired this knowledge as, although they have not exhausted the possibilities of the teaching provided, their parents and guardians wish them to start as wage-earners. The low scholarships in the workshops offer a very poor counter-inducement. As the boys complete their ordinary education at a very early age, it is in every way suitable that they should begin what corresponds to a technical education before a few years at work have made the manipulation of a pencil in their hands a difficult task. In any event arrangements for their quasi-technical education after they have begun actual working would be difficult to make as the circumstances of the crafts are different from those of the organised industries for which we have suggested apprentice classes. That the classes at the School of Art supply, in the circumstances, a want is shown by the fact that, except in one, the pupils all belong to castes practising the crafts for which the classes cater. The exception is the carpet-making class. There is no carpet-making in Bombay and this class should be at once abolished. It is understood that the Principal has already submitted to Government proposals to this effect. There are carpet-weaving factories in Ahmedabad and elsewhere in Gujarat and if arrangements can be made to give instruction in drawing and the reading of drawings in those factories,

they will be on the right lines. At Ahmedabad there is already a school of drawing and design to which the carpet-weaving class in the School of Art, Bombay, might be transferred. In the other classes at Bombay the practical work is considerable, *viz.*, four hours a day. In the special circumstances, in which the boys get their semi-technical education at a very early age before working at their craft some practical work must be given in conjunction with the instruction in drawing, but we are inclined to think that part of this time would be better spent in advancing the ordinary education of most of the pupils. It may be advisable to reduce the practical work to two hours and devote the other two hours to ordinary education, but as an experimental beginning we recommend that the ordinary education should be restricted to one hour a day thus leaving three for practical work. The classes will thus approach, on account of the early age of the boys attending them, the prevocational type discussed in the following section.

85. Finally, we desire to point out that, without larger scholarship stipends it is impossible, for the reasons already explained, to retain the boys long enough in the class to enable them to become artists in their calling, as well as craftsmen. As the development of the artistic faculty should be, and presumably is, a principal object of the workshops we recommend that boys of real ability should be induced to complete the full course by the grant of adequate stipends.

86. There are 20 so-called technical and industrial schools in the Presidency which are at present under the control of the Department of Education which is assisted in their administration by the Committee of Direction for Technical Education. The description of any of these as technical schools is misleading. Even the industrial schools have been a complete failure if their object is considered to be, as it frequently is considered by the general public, the output of finished artisans. None of these schools turn out young men who can take their place in industries as skilled workmen or anything approaching this. Their chief internal defect is the lack of suitable teachers and one of the first steps to be taken in reorganising them should be the improvement of the teaching staff. This will involve a considerable increased expenditure in salaries. But so long as teachers in schools of this kind are paid smaller wages than can be earned by a good workman nothing can be expected but failure. Stricter inspection and more careful though more generous award of grants will be necessary in future to stimulate the authorities in control of those schools to improve the standard of the teaching staff.

87. We have examined the lines on which all these schools are run and have ascertained that the majority approximate generally to schools of a prevocational type. They all teach or attempt to teach carpentry and drawing, a few have classes or workshops in metal work, and some have classes in weaving, but the type may be taken to be a school imparting an ordinary vernacular education with instruction in carpentry and drawing. We are of the opinion that it should now be recognised that these schools can never become, in their present circumstances, more than prevocational schools, and that they should now be definitely organised as such and their internal administration arranged accordingly. At present, the carpentry course lasts for three years and the first matter to be examined is the possibility of reducing this period to one of two years. We do not object, however, to schools of both kinds, one group with carpentry classes of two years and another with carpentry classes of three years. No boy should be admitted to the carpentry course below the age of 12 and the minimum qualification should be the completion of standard IV. No boy should be allowed to remain in these schools after the age of 16. One difficulty which will require investigation is connected with the careers of the boys after they leave the schools. There are at Ahmednagar, for example, three of these schools but there are no local industries to which the boys can afterwards be apprenticed. It should be understood that, although the prevocational education is given in carpentry, we do not regard this as the preliminary education of a car-

penyer Such an education will fit a boy for any craft in which skilled workmanship is required. We recommend that steps should be taken to assist boys who, after leaving these schools, desire to follow an industrial career to obtain the necessary training. Assistance may, for example, be given to enable them to undergo a short apprenticeship under approved craftsmen or in Government, railway or other workshops. We also recommend, and lay stress on the recommendation, that instruction in English should be imparted in those prevocational schools and that the ordinary education should approximate to the anglo-vernacular type.

88. In one or two cases it may be possible to modify the school course or to introduce special courses associated with local industries. At Jacobabad there are classes for lacquer work. At Surat a revival of classes in wood carving should be considered. The school at Sukkur, where there are railway workshops, might be converted into a school for the technical training of apprentices on the lines suggested for Bombay, Ahmedabad, and other large industrial centres. This is a matter for the consideration of any organization which may be established in Sind for promoting technical and prevocational education.

The results of admitting non-weavers to weaving classes should be watched. A demand has recently sprung up in non-weaving castes for instruction in hand-weaving, but as pupils cannot reckon upon the assistance of the women and children of the family in warping and sizing, it is likely that the instruction frequently fails to serve any practical end. When instruction is given to actual weavers and to the children of weavers in the use of improved appliances and better methods we approve of weaving sections in prevocational schools.

The Technical School at Dhulia has a supplementary Public Works Department Mistry course which, so long as its ex-pupils find ready employment, meets a real demand and should be continued. There is indeed a good deal of scope for special or supplementary courses in subjects like sign painting, tailoring, oil engine driving, care of motor cars, and the like. The exact scope of classes in fitting, moulding, turning, blacksmithy, and the like must be very carefully considered. It is mainly the introduction of these classes which have given the schools a fictitious character as technical institutions and training shops for skilled artisans and supervisors.

89. The administrative control of these schools has been in charge of the Department of Education and they have been inspected by the teaching staff of the Victoria Jubilee Technical Institute working under the Committee of Direction for Technical Education which makes recommendations to Government for the grants-in-aid for the technical and industrial classes. The future arrangements for administration are discussed in Chapter IX.

90. We desire to draw attention here to the necessity of altering the system of awarding grants-in-aid. At present, the grant is limited to half the expenditure on salaries and is to a large extent based on this expenditure. Thus a grant up to one-sixth of the expenditure on salaries is allowed for good attendance, an equal amount is allowed for efficiency as shown by the state of tools and similar circumstances, and a third sum of equal amount is allowed for the number of pupils passed, the full one-sixth in the last instance being earned if 66 per cent of those examined pass. These conditions encourage extravagance rather than efficiency and the amount of the grant for each pupil who passes the annual examination prescribed by the Committee of Direction varies enormously. Under present conditions, two schools may have the same number of pupils, show the same regularity of attendance, give evidence of equal efficiency and pass an equal number of pupils in the annual examination, but if the one school pays its masters twice the salaries given by the other, it will earn twice the grant earned by the other. In actual practice it is found that inefficient schools earn grants ranging from Rs. 200 to Rs. 250 per pupil passed while efficient schools obtain a grant of less than Rs. 100 per passed pupil. We consider that the basis of assessing the grants-in-aid should be the efficiency of the school and not the cost of the teaching staff. The grant should therefore be regulated by a *per*

capita limit, after taking into consideration the general efficiency of the school, the regularity of attendance and the number of students who successfully complete each annual course. We also suggest for the favourable consideration of Government that the total grant thus earned should not be limited to half the expenditure on salaries. This type of education requires special encouragement and we are inclined meantime to place no limit on the total grant-in-aid less than the total approved expenditure on salaries. The grants awarded in the past show that in some cases Government have been paying grants to inefficient schools at a rate more than twice as great as that paid to efficient schools for each successful pupil. This indicates that, if efficiency is measured against grants-in-aid, Government are likely to get a better return for every Rs. 100 which they spend under our proposal than they have obtained in the past. The total annual expenditure may increase—and we hope that it will increase—but this type of prevocational education will become more extensive and more successful in its results. Every encouragement should be given to school organisers to obtain the maximum results for a given expenditure and the best way to secure this is by grants *per capita*. We do not now make any proposals regarding the amount of the grant which should be allowed per pupil admitted as qualifying for grant. A classification of the courses given at the various schools is necessary as well as an examination of the figures of grants in former years. Proposals under this head can more suitably be made by the Committee of Direction for Technical Education.

91. The amount of grant-in-aid paid to these schools in the last three years has been, on the average, about Rs. 64,000 annually. For the improvement of the teaching and equipment of the existing schools we think that an immediate increase of 50 per cent. is necessary. Once this type of school is reorganised on efficient lines we think it will provide a very suitable form of education in rural areas and we recommend the establishment of these schools wherever the circumstances are favourable. For some time, however, lack of suitable teachers, will prevent their rapid extension and at the end of the next five years we anticipate that the total aid required from Government will not exceed Rs. 1,50,000 annually.

92. We have received a report from the Criminal Tribes Settlement Officer, regarding the working of his system of training for the Bijapur Settlement. This Settlement provides for the elementary education of the children of the settlers and gives them drawing and educational hand work in special schools; this corresponds to the type of education in the prevocational schools just dealt with. When the boys leave school, some are trained as carpenters by being apprenticed to craftsmen in the town, others are trained as masons on constructional works. This training is precisely on the lines which we advocate; the important feature is that the actual practical training is given under craftsmen working on their own account or on large works. The apprentice carpenters and apprentice masons are given drawing lessons in the evening; this instruction corresponds to that given in our apprentice classes. These conditions of education explain the result that, so far, no lads who have been trained by the Settlement as carpenters or masons have afterwards left their craft. At the date of the Settlement Officer's report there were working in Bijapur 10 carpenters and 46 masons who have been trained on these lines.

93. Cottage industries cover a wide field. To illustrate our arguments we may mention hand weaving, dyeing, carpet manufacture and casein making as typical of one group of cottage industries, carpentry, and blacksmithy as typical of another, and pottery, basket-weaving, rope-making, and cane-work as typical of a third.

94. In the first group, the chief needs of the workers are a knowledge of improved appliances and methods as well as a means of finding an outlet for improved or increased production. In hand-loom weaving and dyeing no theoretical education is necessary; but it is desirable that hand-weavers should be taught the use of such improved appliances and methods as will

raise the standard of their work and increase their output. In hand weaving instruction and demonstrations are already given in the use of such appliances as fly shuttle sleys and mechanical dobbies. Similarly in carpet-making success lies in the selection of suitable materials, *e.g.*, wool and dyes, as well as good workmanship. Both in hand weaving and carpet making there arise problems of design and these again are connected with the technique of dyeing. Finally when the weaver, calico printer or carpet maker has been taught to execute good designs in a better manner than he has previously done, a market must be found for his improved productions. A similar consideration applies to the manufacture of casein by village methods; the instruction in improved methods of manufacture must be accompanied by measures to secure for the maker of an improved product a better price than is secured by the maker of an indifferent one. The existing conditions in all these industries preclude attempts at the technical education of the workers and their special problems can be dealt with only by a special organisation providing purely "industrial" instruction.

95. In the second group, of which carpentry and blacksmithy are typical, we are merely dealing with the units which, when multiplied, form organised workshops. The condition of these crafts in most rural areas makes technical education for their members impracticable. The best way of assisting these, as well as other rural industries, appears to be, in the first instance, the provision of an elementary education with a strongly utilitarian bias. In particular, accuracy should be inculcated by the inclusion in the curriculum of elementary mensuration with the use of the foot-rule as well as a thorough grounding in simple arithmetic and, in addition, some simple dimensional drawing. The proper use of suitable tools and their upkeep in efficient working order may be spread to some extent through the prevocational schools described in an earlier part of this chapter. The value of demonstrations, such as are possible in the case of handloom weaving, carpet making and casein manufacture is doubtful, but there may be special localities where they might be tried.

96. The third group of industries comprising pottery, basket-making, rope-weaving, cane-making, etc., combine some of the problems of the first group and second group. Manual skill is essential but there is little scope for improved appliances and methods. On the other hand, improved output can only be undertaken when the market is assured. We do not see any method of assisting those simple industries otherwise than indirectly by an extension of elementary education amongst the children of the workers. We are led to make these remarks by a request, which has been forwarded to us by Government, of the Namdhari caste of North Canara that industrial classes may be attached to vernacular schools for teaching cane-work, basket-making, rope making, etc. Nothing of this kind should be attempted without preliminary inquiry into local conditions and possible outlets for the industries which it is proposed to create or improve. The Namdhari caste might be put to great loss by being organised to manufacture cane work of a high order for which there was no local demand and for which the freights to other markets are prohibitive.

97. It is impracticable for us to make proposals for every line of activity allied to those previously described. When the Department of Education is strengthened as we propose in Chapter IX it will be equipped to work in conjunction with the Departments of Industries and Co-operation and with the public for organising and controlling and assisting any practicable scheme for the spread of technical knowledge.

VII. Supplementary.

CHAPTER VIII.

INSTITUTIONS FOR GIRLS AND WOMEN.

98 This chapter contains the views of the Indian members of the Committee. The other members, while recognising the necessity of the training of girls and women, feel diffident about making recommendations on a question of such importance with the materials at their disposal.

99 A serious obstacle in the way of women's industrial education is the amount of illiteracy. The total female population in the Presidency (exclusive of Indian States) in 1921 was 9,153,144 and of those only 224,878 or 2 per cent were literate. Even this percentage, small as it is, disguises the infinitesimal progress that has been made among certain considerable sections of the people, as the following table will show —

Lack of Elementary Education, a Serious Obstacle.

Religion.	Total female population	Number of literates.	Number of literates per 1,000.
Hindus	7,144,175	134,451	19
Jains	94,730	11,617	123
Zoroastrians	39,947	26,921	674
Musalmans	1,691,445	21,059	12
Christians	112,999	28,441	252
Minor Religions	69,848	2,389	34

These figures, it is urged, emphasise the urgent need for the rapid expansion of elementary education for girls which can only be effected by compulsion.

100 Among the middle and higher classes there are comparatively few who work for a living. The women of the poorer classes are ignorant and earn a living by the cheaper and more primitive forms of manual labour, many of them in towns like Ahmedabad and Poona are employed in mills.

Among the agricultural classes women help their menfolk in the field and in the care of the cattle, and among the artisan classes, in the practice of their vocations or handicrafts, this work being in addition to their household duties and the care of their children.

The field of employment for women has undergone considerable expansion in the West, particularly since the war. An increasing number of women are qualifying as doctors, chemists, designers, sales-women, secretaries, clerks, etc., while typists' work tends to become more and more exclusively a women's occupation. Thousands of women are employed in organised industries and even on engineering works.

In India social customs come in the way of a rapid increase in the number of occupations opening to women and in the number of women engaged in these and traditional occupations. In this country, however, as in other countries, the chief occupation of women is, and will continue to be, the care of the home. School education should take this into consideration more than it has done hitherto and provide training suitable for all classes, both in primary and secondary institutions.

101. The courses should include (1) cultural, (2) domestic, and (3) industrial or vocational subjects.

The following lists will illustrate the types of subjects that may be included under (2) and (3) —

Domestic subjects.

Cookery	Domestic Science.
House-management	Hygiene
Sewing.	Nursing
Laundry work	Simple remedies
Child study	

Vocational or industrial subjects.

Field work	Rope making
Textiles	Lace making
Mat making	Embroidery.
Basket making	Knitting
Rattan work	Painting
Bamboo work.	Weaving
Dairy work.	Lacquer work.

Complete lists should be maintained by the agency responsible for the development of technical and industrial education of all the subjects in which organised instruction should and can be imparted. Selections can then be made from the list to suit girls of different ages and the circumstances of different localities. It cannot be too strongly emphasised that some form of domestic training should form an essential part of the curriculum in all grades of women's institutions.

102. For some time to come few women are likely to seek technical education of the university grade to qualify for industrial careers and no special women's college of this grade will be needed. Those who want education of the university standard will attend the regular men's colleges. The only change needed to accommodate them will be the addition to the courses of study of a few special optional courses suited to the needs and aptitudes of women.

Technical Education of University Grade.

103. To meet the wants of the girls and women population under present-day conditions, the following classes of institutions are proposed by the members of the Committee whose views are here represented :—

(1) *Higher Industrial and Art School.*—They recommend the starting of one school of this grade in Bombay or in Poona to give advanced instruction and training in art, domestic economy, and industrial occupations suitable to women of education. An important function of this school would be the training of teachers for middle industrial institutions. The admission should be restricted to women who have obtained their full school leaving certificate, whether of the type accepted by the University or the alternative type hereinafter suggested.

(2) *Middle Industrial Schools.*—Three schools of this type are proposed, one in Karachi and two in two other selected cities in the Presidency proper, chiefly with the object of training women teachers in artistic and domestic work and industrial occupations for the lower grade girls' schools. The subjects will be similar to those in higher industrial and art schools, but the standard aimed at will be lower.

(3) *Mass Industrial Classes.*—A large number of classes should be started wherever required, independently of any existing school, in order to give girls and women courses of instruction, of three to six months' duration at a time, in home occupations such as cooking, washing, sewing, dairying, etc., in hygiene and in a suitable handicraft.

A very large number of adult women of the poorer and labouring classes and also widows from the middle classes who are thrown on their own resources should be able by attending those classes to acquire greater efficiency in the occupation or occupations specially studied and thus increase their earnings.

Classes should be provided in existing educational institutions for girls and women to give domestic instruction suitable for both mistresses and servants and to give industrial training in occupations open to women.

It will not be possible to start regular Lower Industrial Schools on account of the cost. It has already been said that domestic training should figure in the curriculum of all women's institutions. Work of this nature

* The terminology used is that of the Minority Report.

will, therefore, be carried on in existing girls' schools. Whatever industrial training local circumstances demand may be added by special branches or classes. These branches or classes, whether domestic or industrial, should be open to girls or women who are not attending other classes in the schools.

Many women may be able to snatch a couple of hours or so to attend these classes who could not devote their whole time to school work. Most of these classes and courses, even those attached to elementary schools, will be taken advantage of by girls and women of 14 years of age or more. Girls of tenderer years are not likely to benefit by the regular vocational courses.

104 Anglo-vernacular schools should be able to help in and consolidate this work. The Committee are aware that for the type of girl found in an anglo-vernacular school a course which leads to a university entrance examination has a certain attraction, on the other hand, the percentage of girls who complete the course successfully is very small. Such a course is unquestionably necessary in order to provide teachers, doctors, etc., and to meet the demands of the cultured classes. It cannot, however, be denied that a course complete in itself and calculated to turn out a girl with some general culture and at the same time a training that will make her an intelligent and competent manager of her household would be of greater benefit to the majority. It is, therefore, recommended that special encouragement should be given to all schools desirous of undertaking a new secondary course in which the medium of instruction and examination would be the vernacular, English being taught as a subject, and in which domestic economy would figure prominently. In other words, the ordinary secondary schools might be divided, not necessarily rigidly, into two sections, one section for women who are aspiring to become university graduates and the other, the larger section, for those who want only general culture with a knowledge of domestic economy. A special school leaving certificate at the end of the course could doubtless be arranged.

105 The following is a rough estimate of the cost of the institutions and classes proposed :—

	Rs lakhs
Girls' and Women's Education—	
Technical High School in Bombay, 150 pupils ..	1 05
Middle Schools (3 schools with 200 pupils each), total 600	1-20
Lower Schools, 1,200 pupils	1-00
Supplementary schools for girls (both urban and rural), 3,100 pupils	1 50
Women's Mass Industrial Classes (both urban and rural), 4,000 pupils	1 25
Total	6 00

Private enterprise in this direction will need to be liberally subsidised for some years. The Seva Sadan in Poona, which is a purely indigenous institution, is being helped by Government in this way. The management should be entrusted more and more to local Advisory Committees of women wherever possible. Propaganda should be encouraged to spread sound ideas as to the character and quality of vocational education to be imparted to girls and women and to make such education popular.

106. The establishment of welfare centres in the neighbourhood of mills, if successfully inaugurated, might do much to improve the lot of the girls and women employed therein. These establishments might elevate the standard of living by inculcating habits of cleanliness, and by teaching cooking, sewing, and elementary hygiene. They would be helpful chiefly to the half-timer, but might attract and help adults also.

Associations for Welfare Work.

if the latter were provided with facilities for cooking their own food and intelligent and sympathetic supervision, and were helped with the making of their clothes and the care of their young children. Efforts on these lines would be best made by voluntary agencies, and where effective would be deserving of public support. Such centres would not exclude women in the vicinity employed in small industries and it might be possible to extend the range of training for their benefit. All those engaged in earning a living by various forms of needlework, to mention one occupation only, would, no doubt, profit from skilled instruction and from organizations which would assist in the disposal of their work. These organizations would be able to advise what was saleable and what was not, to discourage misdirected efforts, and demonstrate the commercial value of skilled handwork. Associations which undertook instruction would have few sources of income beyond endowments and subscriptions and would require liberal aid. Their sales departments would aim at being self-supporting, but would need loans to tide them over the early stages. Experiments on these lines have already been made with some success; much good, it is thought, could be effected by encouragement of such efforts.

107 In order that welfare work and women's industrial education may proceed as far as possible under the guidance of women themselves, we recommend that the formation of women's associations should be encouraged.

Women's institutes have come into existence in Canada and Belgium and young women's associations are common in Japan, the primary object of these being to secure the social, economic, and moral improvement of country life. The following account of the Women's Institutes in Belgium taken from a report made to the Board of Education in England will explain the object and working of one such class of organizations.—

"The Women's Institute is an association of farmers' wives, daughters, and sisters, who meet periodically for the following, among other purposes: to hear lectures, read papers, and study books on professional subjects, *ie*, dairying, poultry keeping, gardening and all the minor rural industries, on cooking, laundry work and dressmaking; on household sanitation, home hygiene and ambulance methods, on the choice and care of furniture and pictures; on the rearing and education of children, and on other means for the improvement of country life. The institutes have also a recreative side, and attention is given to music and literary subjects."

The women work in association with the State Agronomist, the peripatetic classes, and the local schools of domestic economy. Assistance is given by the Government under certain regulations, and the members pay a small subscription, but as the conference and discussions are chiefly addressed by members, by teachers in state institutions, and by others who give their services free, the expenses are not great.

The report goes on to add —

"There can be no doubt that these institutes will exert an incalculable influence upon the social life of rural Belgium."

CHAPTER IX.

CONTROL AND ADMINISTRATION

108 We have considered very carefully the main problems of the control and administration of technical education. Recent developments in other provinces have followed the recommendations of the Industrial Commission. These were that the higher grades of theoretical instruction, such as that required by engineers and specialised technologists, should be given in institutions of collegiate rank, of which the expenditure should be administered and the teaching controlled by joint boards on which the Department of Industries, the local university, and local employers should be represented, and that the lower grades of technical education and all industrial education should be under the control of the Department of Industries.

Our proposals for the organisation and administration of technical education of the university grade are contained in Chapter IV and require no further reference here. The education of girls and women is also excluded from the scope of this chapter.

In considering the future arrangements for all other kinds of technical education and for industrial education it is necessary to make a brief survey of the existing arrangements.

109 The *Central* Technological Institute of the Bombay Presidency at the present time is the Victoria Jubilee Technical Institute, of which the constitution and functions have been fully described in Chapter V.

In paragraphs 48 and 78 we have referred to the sub-committee of this Institute known as the Committee of Direction for Technical Education. The duties of this Committee at the present time are to advise the Director of Public Instruction in the supervision and control of the technical and industrial education given in the Ranchhodlal Chhotalal Technical Institute, Ahmedabad (Chapter VI), and in the so-called technical and industrial schools described in Chapter VII (paragraphs 86—91).

The Victoria Jubilee Technical Institute and the Committee of Direction for Technical Education now supervise and control, in some measure, directly or indirectly, all the aided and state technical and industrial education given in the Presidency except a special type of instruction and demonstration in cottage industries which is controlled by the Department of Industries. The Victoria Jubilee Technical Institute corresponds direct with Government in the Department of Education. The Committee of Direction is consulted not only by the Director of Public Instruction but also, on occasion, directly by Government. In paragraph 78 we have proposed that, in terms of its constitution, this committee should assume the control of apprentice classes or trades schools in Bombay City.

This Committee at present consists of—

- 1 The Chairman of the Board of Trustees of the Victoria Jubilee Technical Institute
- 2 The Director of Public Instruction
- 3 & 4 Two members of the Board of Trustees of the Victoria Jubilee Technical Institute to be selected by the Trustees and nominated by Government (to hold office for three years)
- 5 The Principal of the Victoria Jubilee Technical Institute
- 6 The Principal, College of Engineering, Poona
- 7 The Director of Industries

We propose that the committee should be remodelled as follows:—

- 1 & 2 The Chairman and one member of the Board of Trustees of the Victoria Jubilee Technical Institute
3. The Principal, Victoria Jubilee Technical Institute
- 4 The Director of Public Instruction
5. The Director of Industries
- 6 A representative of the Millowners' Association
7. A representative of the G I P Railway
- 8 A representative of the B B and C I Railway
- 9 A representative of the Bombay Port Trust
- 10 A representative of the Royal Indian Marine Dockyard
- 11—15 Representatives of five employing firms, directly interested in technical education especially apprentice classes.

When the College of Technology is established its Principal and a representative of the Bombay University may be added.

Nos. 7 to 10 should preferably be officers in charge of workshops with which apprentice classes are associated

We are unable to make any definite recommendation regarding the chairmanship of this committee other than that this appointment should be held by the Chairman of the Board of Trustees of the Victoria Jubilee Technical Institute, or by the Director of Public Instruction, or by the Director of Industries. There are various considerations in favour of each of these which are difficult to balance and Government might appoint any of the three mentioned as circumstances render desirable

The question remains what should be the relations of this committee with the Director of Public Instruction, the Director of Industries and the Government of Bombay

110. The circumstances in Bombay are not identical with those in other provinces but, in common with most other provinces, the provincial Department of Education has not handled with confidence the problems of technical education because the Director, stationed at Poona, was out of touch with the requirements of industries and only in occasional contact with technical education in Bombay City. Moreover, he has had no technically trained officer in his department competent to advise him and to assist him in the administration of technical and industrial education.

111. Whether the Department of Public Instruction or the Department of Industries controls technical education it is essential that there should be a special officer attached to one or other of these departments who will be the chief active organiser of technical education, its chief inspector, and its real administrator

After full and careful consideration we recommend that this special officer should hold the appointment of Deputy Director of Technical Education under the Director of Public Instruction. He should be a technically trained man, with headquarters in Bombay and should be the Secretary, but not a member, except as a deputy in the absence of the Director of Public Instruction, of the Committee of Direction for Technical Education

112. The main reasons for retaining technical education under the Director of Public Instruction, assisted by a Committee and a Deputy Director, are—

(1) All technical and much industrial training requires and includes a general education of the kind already controlled by the Department of Public Instruction

(2) The Department of Public Instruction is best qualified on the whole to prescribe courses, methods of teaching, and the qualifications of many of the teachers

113. In view of the fact that our proposals are a departure from the current tendencies in other provinces we reproduce the main arguments for the control of technical education by the Department of Industries from paragraph 178 of the report of the Industrial Commission:—

“It must be borne in mind, that, in the first place, education designed to produce men who will readily find industrial employment must in any case be very largely controlled by an agency which, by its training and constant association, is in touch with the industries that will furnish that employment. Both in devising educational schemes and in ensuring by inspection that they are actually followed in working, this class of agency must have a predominant part. It is not enough to appoint a man with an industrial training as an inspector of industrial schools; he must throughout be kept in touch with industries and industrialists, or the training given will soon degenerate. Speaking generally, the different forms of technical and industrial education have as their object the training of a man who will ultimately direct industrial opera-

tions or the production of a workman skilled in some form of handicraft. Of the success of the teaching, the private industrial employer must remain the ultimate judge. The Department of Industries is the only Government organisation capable of entering into his point of view, and the only one with which he can readily associate himself. It is the only agency of any kind that can correlate the training to the requirements as ascertained by it. Almost every educationalist of standing who appeared before us was in general agreement with these views."

We propose to achieve the objects set forth by the Industrial Commission by associating employers of labour with the control of technical education through the Committee of Direction on which the Director of Industries has a place and of which, if it is deemed necessary to secure more industrial influence, he may be appointed Chairman.

114. Where the instruction given is purely industrial, that is, in pure craftsmanship or in the use of new appliances and methods, we recommend that control should be retained, as at present, by the Department of Industries. Thus demonstrations and instruction in weaving, sizing, dyeing, calico printing, casein making and all cottage industries will remain under the Director of Industries.

115. We now describe the functions of the Committee of Direction for Technical Education and the duties of the Deputy Director of Technical Education. We contemplate that in Bombay City the Committee of Direction will be the controlling body with powers similar to those of the Board of Trustees of the Victoria Jubilee Technical Institute. In these circumstances we have already suggested that the teaching staff of the apprentice classes should be under the control of the Principal of the Victoria Jubilee Technical Institute. The Deputy Director, who will be the Secretary of the Committee, will be responsible for initiating the organisation of new classes, he will be the chief inspector, and in other respects he will carry out the instructions of the Committee of Direction. The Deputy Director, in these circumstances, might well be the controlling head of the teaching staff of the apprentice classes instead of the Principal of the Victoria Jubilee Technical Institute. We do no more than suggest this alternative now as the final decision will doubtless depend on the recommendation or decision of the Committee of Direction.

116. If the Committee of Direction is constituted not as an administrative but as an advisory body then all control of the apprentice classes should vest with the Deputy Director of Technical Education and co-operation with the Victoria Jubilee Technical Institute as regards the part time, services of their staff and the utilisation of their building and equipment should be secured through the good offices of those officials and non-officials who are members both of the Board of Trustees and of the Committee of Direction.

117. For the mofussil we do not think that the Committee of Direction can usefully serve as a controlling body. It would be unsound, for example, to give it charge of technical education at Ahmedabad. Any mofussil town where there is a sound demand for apprentice classes or other kinds of technical education is capable of furnishing also a capable local advisory committee, composed of employers and others, on the lines of the Committee of Direction. This advisory committee might subsequently develop into a committee of control. We do not think that any stronger link with the central technological institute is necessary than is supplied by the association of the Deputy Director of Technical Education and officers of the Department of Industries with the local committees.

118. With the reform of the prevocational schools (paragraphs 86—91) and the appointment of a Deputy Director of Technical Education we think that the present relations of these schools with the Committee of Direction

may be severed. If this is considered undesirable, a sub-committee of the Committee of Direction consisting of—

- 1 The Chairman of the Victoria Jubilee Technical Institute,
- 2 The Principal of the Victoria Jubilee Technical Institute,
- 3 The Director of Public Instruction (or in his absence the Deputy Director of Technical Education),
- 4 The Director of Industries,
- 5 & 6 Two more members

might serve as a purely advisory body on questions of policy, organisation, curricula, examinations, inspection, and provision of funds. The ordinary education in these schools will be subject as usual to inspection by the Department of Education, while the prevocational training will now be inspected by the Deputy Director of Technical Education and not as at present by the teaching staff of the Victoria Jubilee Technical Institute working under the Committee of Direction. The services of the latter may in some cases be required but they will inspect on behalf of and at the request of the Deputy Director of Technical Education. The present "teaching inspectors," if retained, will also come under the control of the Deputy Director of Technical Education. We doubt whether there is any scope for local advisory committees for prevocational education and manual training.

119 The Deputy Director of Technical Education will be the adviser of the Director of Public Instruction in the organisation of the modern side of the high school which we have recommended in paragraph 29. He and his staff will inspect in manual training and technical drawing. There is scope and probably need of utilising the staff of the Victoria Jubilee Technical Institute in examining in these subjects and in practical science.

120 At the outset there will be much new ground to be broken and it is essential that the first Deputy Director of Technical Education should be a man of energy and organising ability. He should be as young as is compatible with adequate experience, preferably between 30 and 35 years of age. As his headquarters will be in Bombay the salary of the appointment should be that of a member of the senior selection grade in the Indian Educational Service, *viz.*, Rs 1,800 to Rs 2,000 per mensem.

CHAPTER X.

GENERAL EDUCATION IN RELATION TO TECHNICAL AND INDUSTRIAL TRAINING

121 Primary education given through the medium of a vernacular is usually divided into two stages, one terminating with the fourth standard and the other with the seventh. A boy who has completed satisfactorily the fourth standard in a vernacular primary school is eligible for admission to an anglo-vernacular school which may have as many as seven standards, the first three of which are known as middle school standards and the last four as high school standards. A boy who has completed the lower primary stage may be regarded as having acquired little more than the minimum of education likely to be of any permanent value. Among the young employees in industrial concerns will be found many who have not attained this stage, and it is not at present possible to lay down rigidly a minimum qualification for admission to industrial training. After the introduction of compulsory education admission to apprenticeship in industrial workshops will tend to become restricted to those who have completed at least the primary stage. Still, even with this improvement, the technical instruction that can be given will be very slight. Those who can aspire to something above the status of the ordinary skilled workman will require further courses of study which can be, or are, provided in the vernacular or anglo-vernacular schools, in the prevocational schools advocated in Chapter VII, or in the schemes for the training of apprentices. The stages at which pupils may enter institutions such as the Ranchhodlal Chhotlal Technical Institute, Ahmedabad, the Victoria

Jubilee Technical Institute, Bombay, and the proposed College of Technology have been indicated in the chapters dealing with these institutions

122 The following quotations from the report of the Industrial Commission of 1916-1918 deserve attention :—

Defects in General Education.

“ The influence of environment on the Indian school boy of the better classes is probably more important than hereditary tendencies, and the sooner he is brought in contact with constructive activities and taught to use both hand and eye, the more readily will he respond to the measures which may be devised to counteract the sedentary tendencies of the home life ”

In another place the report observes :—

“ A factor which has tended in the past to delay the progress of Indian industrial development has been the ignorance and conservatism of the uneducated workman ”

“ Reluctance to use their hands on the part of boys of the better classes and ignorance and conservatism on the part of the workmen have contributed towards the backward condition of our industries. During the last few years attempts have been made to reduce the illiteracy in the masses, but they have not gone far enough ”

At a third place the same report says .

“ The spread of education among the artisan classes tended to bring manual labour into contempt and sons of artisans, educated beyond the primary stage, showed a distinct tendency to forsake their father's calling in favour of clerical work, but we think that this view must be due to the wrong system of education which has been made available. The present system of general education has many beneficial tendencies but it has also its drawbacks. It has limited the equipment of the sons of better class parents mainly to literary or non-productive professions, has produced a distaste for manual labour among classes used to it, and has failed to touch the ignorant and conservative masses. Modifications are necessary to give it a practical turn; and concurrently, by propaganda and otherwise, the advantages of vocational education should be brought home to the public ”

123. While agreeing generally with the views of the Commission we consider it axiomatic that the most valuable preliminary to industrial employment is a sound general education in which due attention is given to the cultivation of the powers of observation and accurate thought and to the development of body and character. Too early specialization in the direction of vocational training is deprecated. Fortunately, however, there are subjects which should go a long way to remedy the defects pointed out by the Commission and which at the same time will justify their place in the curriculum of primary and middle schools as valuable elements of a scheme of general education. Such subjects are educational handwork extending from occupations suitable for infants to work in wood and metal, drawing, nature study, and general elementary science. The Educational Department has a vernacular school syllabus which includes kindergarten occupations, drawing, nature study and school gardening in the earlier stages, and elementary science in the later. There is in operation a scheme for the training of teachers in nature study, and also in wood and paper sloyd, but the general introduction of sloyd into primary schools has been delayed for want of funds. Paper sloyd does not require any very expensive equipment, but wood sloyd means considerable expenditure if universally introduced, and it has been suggested by Mr K R Kanitkar that there are other forms of handwork which would not entail large expenditure on buildings and apparatus, which would bring the village school more into touch with village life, and in which instruction could be obtained locally. There is doubtless a field for experiment in this direction, but in towns opportunities for work in wood could be provided at not too prohibitive a cost by manual training centres

We have noticed a tendency for reasons of economy towards what is commonly termed "the double shift system" whereby one teacher is expected to do the work of two (and thus halve the present cost per head of education) by taking one batch of children in the morning and another in the afternoon. We are of opinion that this system, if applied after the first year or two of a child's school life, will restrict primary school instruction to reading, writing, and arithmetic and will thus perpetuate the defects mentioned by the Industrial Commission. Manual training, drawing, and nature study demand time. People will insist upon a certain efficiency in reading, writing and arithmetic, and will compel the teacher to devote the 2½ hours available for each batch to these subjects. What is to become of physical training and character building under this "double shift system" has never been explained. Cheap education is not necessarily true national economy.

124. We are of opinion that there should be two secondary syllabuses. One as at present would lead up to the examination accepted by the University as an entrance test, the other would exclude a classical language and include English, mathematics, science, and a choice from a variety of subjects such as work in wood, work in metal, elementary mechanics, mechanical drawing, book-keeping, etc. Schools would specialise in one or more of these optional subjects according to local demand. A course could be selected from this curriculum that would not only be specially suitable for those who leave to enter works at 14 or 15 years of age, but should enable those who successfully complete it to embark upon technical instruction with a mathematical and scientific equipment and an acquaintance with practical work that should be of great value in their future training. Work in wood in our opinion should figure in both syllabuses in the middle school stage.

CHAPTER XI.

SUMMARY OF PROPOSALS

125. Our scheme is based on a wide extension and improvement of I. General Education. general education in the following directions:—

- (a) the expansion of primary education (paragraph 22),
- (b) simple hand work up to standard IV (paragraph 29);
- (c) a practical bias in primary schools up to standards VI and VII and in secondary schools up to anglo-vernacular standard III, with good courses in arithmetic, drawing, general elementary science, and hand work (paragraph 29),
- (d) a good modern side in secondary schools from anglo-vernacular standard IV with practical elementary science, technical drawing, and manual instruction (paragraphs 29 and 124),
- (e) general education for half-timers at an additional annual cost of Rs 1,20,000 (paragraphs 65 to 68)

126. The proposal for a College of Technology (Chapter IV) requires further investigation. Meantime facilities for obtaining technological instruction should be provided by the grant of scholarships (paragraph 40). The additional cost need not exceed Rs 25,000 per annum at the outset.

127. The provisions for girls and women (Chapter VIII) are those of our Indian colleagues and we do not attempt to measure their urgency relative to our proposals in Chapters V, VI and VII. We are inclined to think that the estimate made by our fellow members of the demand among women for "mass industrial classes" and for the special schools which they advocate is highly optimistic.

128. Our definite recommendations regarding expenditure in addition to the scholarships just mentioned are:—

- (1) For the Victoria Jubilee Technical Institute ten lacs are required at once to complete the new buildings and an additional annual income

of Rs. 25,000 is required to render the institute solvent. Further non-recurring and recurring grants will be required for extensions and improvements. These requirements should have precedence over all others.

(2) For the re-organisation and development of technical education throughout the Presidency, a Deputy Director of Technical Education should be appointed at an estimated annual cost for the officer himself, his establishment and other charges of Rs. 30,000 to Rs. 35,000.

(3) The first duties of the Deputy Director will be —

(a) to organise apprentice classes in Bombay and Ahmedabad, at an estimated cost of Rs. 30,000 non-recurring and Rs. 60,000 recurring,

(b) to re-organise the so-called technical and industrial schools in the mofussil as described in paragraphs 86 to 91 at an estimated cost of Rs. 25,000 non-recurring and Rs. 32,000 additional recurring.

(4) Other types of technical education, such as that given in the Reay Art Workshops, can be improved and organised at comparatively small cost.

129 We offer no estimates for the development of cottage industries. The scope for work in these is very great but the Advisory Committee of the Department of Industries is fully qualified to make recommendations for them from time to time.

130. These proposals are extremely modest in comparison with others which have been considered by us. Our fear is, however, that the provision which we propose for technical education will exceed the demand for instruction. The fact that the greater part of the expenditure on the Victoria Jubilee Technical Institute is now incurred for the benefit of students from other provinces is significant, and is a circumstance which might be considered in connection with the proposals for an expensive College of Technology which can only be organised on an advanced standard if it succeeds in attracting students from all parts of India.

There cannot be an immediate leap from the technical instruction of a few hundreds to provision for many thousands. We are confident that, if our proposals are accepted, although it may take time to work up to our estimates, nevertheless progress will be sound and real.

R D BELL
 LESLIE FLATT
 JOSEPH A KAY
 F. W. MARRS.
 F J PAGE.
 J C K PETERSON
 FRED POWER
 F O J ROOSE
 A J TURNER
 G H WILLIS

20th March 1922

APPENDIX A.

NOTE ON THE CONDITIONS GOVERNING THE ENGAGEMENT, RATES OF PAY AND TRAINING OF APPRENTICES IN THE G. I. P. RAILWAY SHOPS AT PAREL AND MATUNGA.

By MR. LESLIE FLATT, *Loco Works Manager*

1. *Engagement.*—In view of the various types of boys desirous of entering the Shops for training it has been necessary to lay down certain rules regarding educational attainments. Four grades of boys are provided for and in all grades physical fitness is essential.

* Grade "A".—Boys who have completed a general education up to the 7th standard.

Grade "B"—Boys who have completed a general education up to the 5th standard.

In both these grades, candidates are required to sit for an entrance examination of approximately the 7th standard conducted by the railway authorities. Subsequent to the examination all boys have a personal interview with the Locomotive Superintendent before final acceptance.

Grade "C".—Boys who are literate in one of the local vernaculars and have a knowledge of English up to standard II.

Grade "D".—Boys who do not possess any literary attainments

2. *Age Limits.*—All boys must be between the ages of 16 and 18 years at the time of engagement. Exceptions can be made to the lower limit but not to the higher

3. *Period of Training.*—The normal minimum period of training is four years but boys joining at 16 years of age do not complete their apprenticeship till they are 21

4. *Rates of pay.*—The rates of pay for the various grades during the four years of service are shown below :—

Grade	"A"	"B"	"C"	"D"
	Rs.	Rs.	Rs.	Rs.
1st year	45	18	24	12
2nd year	60	30	30	18
3rd year	70	45	40	22
4th year	80	60	50	25

5. *Training in shops.*—The periods spent in the various Shops depend upon the trades which the candidates elect to follow. The four years are divided as shown below for "A", "B" and "C" class apprentices :—

(a) *Fitters and erectors.*

Machine Shop	1 year.
Fitting "	1 "
Erecting "	2 years.

(b) *Millwrights.*

Machine Shop	1 year.
Fitting "	1 "
Erecting "	1 "
Millwright "	1 "

(c) *Boilermakers*

Machine Shop	3 months.
Fitting "	3 "
Boiler "	3½ years.

(d) *Coach builders and similar trades.*

Saw Mills	6 months.
Marking-off	6 months.
Body-building	2 years.
Finishing	1 year.

(e) *Moulders.*

Pattern Shop	6 months.
Foundry	3½ years.

(f) Patternmakers, blacksmiths, turners, tinsmiths, coppermiths, welders, painters, bricklayers and all such specialised tradesmen spend the whole time in their respective Shops.

D grade apprentices spend all their time in one Shop.

6. *Technical Instruction.*—Technical instruction is given in Company's time by the educational staff of the Y. M. C. A. to such of the boys as have sufficient education to take advantage of it. As no instruction is given in the vernacular it is limited to grades A and B.

Instruction totalling 16 hours per week is given in the following subjects :—
 machine construction and drawing,
 mathematics,
 applied mechanics,
 heat engines.

The classes are held on certain afternoons during the week for nine months in the year.

In addition to the particulars set out above it is necessary to give certain figures in regard to the numbers of the various grades now serving their time and their relative value on the completion of their apprenticeship.

Grade.	Parel.		Matunga.		Total.
	European and Anglo-Indian.	Indian.	European and Anglo-Indian.	Indian.	
A	40	..	18	4	62
B	7	..	4	1	12
C	3	12	3	3	21
D .. ..	..	551	..	412	963
Total ..	613		445		1,058

The following statement shows these figures split into trades :—

Parel.

Trades.	Grades.				Total.
	A	B	C	D	
Fitters and erectors	31	6	7	220	264
Millwrights	3	..	..	12	15
Turners and machmemen .. ..	..	..	8	127	135
Boilermakers	6	1	..	121	128
Blacksmiths .. ..	..	..	..	44	44
Moulders .. ..	..	..	..	14	14
Painters .. ..	..	..	..	3	3
Coppersmiths .. ..	..	..	..	10	10
Total	40	7	15	551	613

Matunga.

Trades.	Grades.				Total.
	A	B	C	D	
Fitters	18	4	3	74	99
Electricians	3	1	2	15	21
Machmemen	1	..	1	35	37
Carpenters .. ..	..	..	..	170	170
Riveters .. ..	..	..	..	66	66
Painters .. ..	..	..	..	15	15
Trimmers .. ..	..	..	..	14	14
Moulders .. ..	..	..	..	12	12
Blacksmiths .. ..	..	..	..	11	11
Total	22	5	6	412	445

Attention is called to the following points :—

(1) Preponderance of fitters. Only about half of these lads stay for their full term as they find after two or three years' service they can get outside as "Assistant Fitters" more than their wages as apprentices.

(2) Lack of apprentices in the upper grades for the following trades :—

turners,	patternmakers,
blacksmiths,	coach-builders,
moulders,	cabinet-makers.

Distribution of apprentices trained.—It is necessary to deal with the grades separately.

The majority of the boys in grades A and B finish their apprenticeship but only a small percentage remain on with the Railway

Of the boys who stay the majority are only fit to rise to positions as chargemen. There are however a number of cases in which Parel and Matunga trained boys have reached positions as foremen. The cases in which they have risen to the supervising grade are more rare but there are four examples at the present time

In regard to the boys who leave at the end of their apprenticeship it is difficult to say where they are absorbed. A number of them go to sea for a time and generally return to duty on one or other of the Railways after a period of sea-life.

As regards grade "C" the number of apprentices is too small to necessitate any comments.

The question of grade "D" is one of the utmost importance. It has been pointed out above that only about 50 per cent. of this grade complete their full apprenticeship owing to the large market for semi-skilled labour

This is having a serious effect upon the class of men obtainable and this effect will become more and more marked as the older men who are good tradesmen and at present form the backbone of the skilled labour in the Shops gradually resign and retire.

Special Apprentices—In addition to the boys taken on by Railway there are certain students who are sent from Colleges for courses of training varying from twelve months to three years. These boys enter the Shops as ordinary workmen and are paid according to their proficiency with their tools. It is impossible in the majority of cases to put them through a thorough training but programmes to suit the various periods are drawn up and every endeavour is made to give them the maximum advantage for the time they spend in the Shops. Since these boys are continually changing, no useful purpose can be served by giving a list of them



APPENDIX B.

A NOTE ON THE APPRENTICES SCHOOL ATTACHED TO THE B. B. AND
C. I. RAILWAY WORKSHOPS, PAREL.

BY THE EDUCATIONAL SECRETARY, YOUNG MEN'S CHRISTIAN ASSOCIATION, BOMBAY.

Session.—The technical classes for apprentices which were started in September 1919 by the Young Men's Christian Association were continued regularly throughout the year 1920. The session under review was comprised of two terms, the first commenced in January and ended in April and the second commenced in July and ended in November. The school closed for vacation in May, June and December.

Attendance.—During January no classes were held owing to the mill strike as the apprentices were told off for guard duty. Otherwise the attendance during the year was good. In the English literature classes the numbers on the roll were Europeans and Anglo-Indians 18, Indians 11, while the average attendances were 16 and 11 respectively. In the literate vernacular classes the number on the roll was 21 and the average attendance 18. The average attendance for European and Anglo-Indian shown is much higher than the actual on account of the practice of marking apprentices present when absent on "Indian Defence Force" duty. This practice we shall discontinue in 1921.

Accommodation and equipment.—The new class room provided ample accommodation and we are well supplied with drawing tables, writing desks and other furniture. But we are still without apparatus for experimental purposes. We had hoped to make a number of appliances ourselves in the Railway Workshops but unfortunately we were unable to do so.

Progress and subjects taught.—The progress during the year has been marked, especially has this been so in the subject of machine construction and drawing. When we commenced work there was a general tendency on the part of apprentices to attempt the drawing of intricate machine parts before being able to complete satisfactorily a finished working drawing of easy parts. This tendency has been overcome and the majority are now able to make a clean, neat and accurate drawing of simple objects. In the other subjects taught, namely, applied mechanics, mathematics and the steam engine, satisfactory progress has been made by the greater number of apprentices, but there were some unable to profit by the instruction given on account of having forgotten the rules of arithmetic.

* * * * *

In closing I beg to offer a few very brief remarks arising out of the report :—

- (1) After three years work with Railway apprentices in Bombay I am of opinion that the technical instruction given in our classes should be of a very elementary character, dealing almost exclusively with first principles.
- (2) That the course of instruction should be worked out in minutest detail and issued to the apprentices in leaflet form to ensure orderly and systematic progress
- (3) That as the majority of apprentices neither desire nor require the technical instruction given to engineering students in Colleges and Universities, it is advisable that a complete course in mechanism be given to apprentices by practical demonstration as improvements and inventions in machinery in the past have been largely the triumphs of skilled workmen who have not risen above the rank of foreman.
- (4) That facilities should be given to promising apprentices to further their studies in the higher branches of engineering by providing scholarships.

(Signed) E. W. POTTER,
Educational Secretary,
Young Men's Christian Association.

MINORITY REPORT.

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MINORITY REPORT.

INTRODUCTION

A few words seem necessary in this place to explain why two reports came to be written

The Committee submitted an Interim Report (Appendix C), under date the 3rd October 1921, to which the members constituting the majority have appended a supplementary statement. By desire of the Committee the present Minority Report was first prepared substantially in the form in which it is now presented, and on account of fundamental differences of opinion a majority of the members have compiled an independent report, incorporating therein portions from this report with which they were in agreement

2 The main points of difference between the two reports may be summed up under the following four heads —

- (1) Types of schools or institutions
- (2) Number of pupils to be trained and estimates of cost
- (3) Organization and agencies for carrying out the scheme
- (4) Other points of a general or minor character

3. Taking types of schools first, we find that the majority hold to view that the best means of giving practical training to young men is by establishing apprentice schools attached to large workshops and factories

This type of school is mainly intended for training wage-earners in a factory or workshop. It is at best a part-time school in which the pupils are able to devote to their education 6 to 10 hours a week during working hours with the consent of their employers

The number of factories and workshops in this Presidency being limited, there will not be more than a dozen places where schools of this type could be maintained. There will be no place for full-time day students in such schools.

The Majority Report puts the estimate of the number to be trained in apprentice schools at 600. To us it is unthinkable that a provision so small for industrial education of the lower grades will satisfy the needs of a population of 20 million

We have followed the example of advanced countries and recommended an extension and improvement of the existing system, by the institution of full-time Day Industrial Schools with workshops and laboratories attached. It is stated in the Majority Report that no attempt should be made to *replace* the training of skilled artisans in workshops and factories and under master craftsmen, by training in workshops attached to technical and industrial schools. But we may remark that hardly any schools of this type exist at present. We agree that an apprentice school is a useful type of institution, but we contend that its importance should not be exaggerated. There is no country in the world where apprentice schools attached to workshops are accepted as an exclusive means of imparting industrial training

4 The signatories of the Majority Report consider that the number of 31,000 pupils for whom provision is made in our scheme is too large for the demand that is likely to arise within the next ten years and that the annual direct outlay of Rs 29 lakhs estimated for training that number is too small. The provision actually made is for 3,950 pupils at an annual outlay of Rs 16 lakhs in Middle Industrial Schools and in institutions of higher grade, and for 27,000 pupils at an annual outlay of Rs 13 lakhs in Lower Industrial Schools and in Supplementary Classes and Courses. This last provision of Rs 13 lakhs is intended for the training of skilled and semi-skilled workmen. The instruction will be of a very elementary character,

and the majority of the pupils who will benefit by it will be from rural areas. If this provision be omitted, the rural population of the Presidency, numbering roughly 16 million, will go without even the rudiments of industrial and occupational training, contemplated in the scheme

We admit that, relatively to the population as a whole, primary education is very inadequate, but, even so, 650,000 male students are already attending primary schools to-day and when this class of education is made compulsory, the number will be more than doubled in the next ten years. We do not consider we are too sanguine in estimating that 31,000 of these at least will need some sort of technical education and industrial training

5 There are also differences of opinion as regards the agencies to be created for the administration of the scheme. The majority of the members suggest an extension of the existing agencies and methods. We consider, however, that industrial education is a complex problem and, in any scheme for administration and control, arrangements should be made, as far as possible in every local centre, for close co-operation between the Departments of Industries and Education, the representatives of employers and labour, and the general public. The reason that past methods have not succeeded justifies the adoption of new methods. Our scheme accordingly provides for the formation of a Development Council and a Development Committee which will ensure this close co-operation between the various Government agencies and the public and for the necessary propaganda work

6 We differ from the majority in the opinion that the existing industrial schools have failed from every point of view. Such partial failure as is noticeable is mainly due to lack of funds and proper equipment and organization

The majority have stated that "it will be necessary to experiment in many directions before successful types of schools can be standardised." The necessary experience has been gained in other countries, at some sacrifice, by decades of experiment; and we should take full advantage of, and benefit by, the lessons they have to teach us. In the case of University and general education we follow the example of other advanced countries. There is no reason why in respect of technical and industrial education we should act differently, or why new experiments should be thought necessary in this country

There is, however, a unanimity of opinion among the members of the Committee about the necessity for special effort to raise the standards and extend all grades of technical and industrial education

We agree with the signatories of the Majority Report that primary education should be extended and that public attention should be roused to the value of technical and industrial education; and we have suggested suitable arrangements for carrying on propaganda for this purpose

From the analogy of the systems followed in countries like Japan and Canada, we have devised a scheme which we consider to be comprehensive and consistent. We attach much importance to the scheme of organization we have outlined, to the maintenance of a ten-year programme of progressive development and expenditure, and to the enactment of a suitable Technical Education bill. We are convinced that the path to progress lies along lines which have proved successful in other lands and that the time has arrived when some of the routine methods of the past should be discarded in favour of new measures and practices suggested by the latest experience abroad

Section I.—Preliminary and Outline of Scheme.

CHAPTER I.

HISTORICAL

The question of providing technical and industrial education in India has engaged the attention of the Government of India and the authorities in England since the middle of last century. The Court of Directors, in their historic despatch of 1854 on education, asked the Government in India to consider how useful and practical knowledge suited to every station in life might be best conveyed to the great mass of the people, who in their opinion were utterly incapable of obtaining any education worthy of the name by their own unaided efforts, and indicated their readiness to sanction a considerable increase of expenditure towards that object. No action was however taken in India to carry out the wishes of the Directors

Technical Education under
the East India Company.

2. As mining, manufacturing and other industrial enterprises became established in the land, the want of technically trained men for such enterprises began to be acutely felt. As far back as 1880 the Indian Famine Commission invited attention to the necessity of promoting technical education. The Education Commission of 1884 drew attention to the oneness of the then existing system of secondary education, and proposed a bifurcation of the curriculum in high schools,—one course leading to the University and the other, of a more practical character, fitting boys for commercial or non-literary pursuits. In their Home Department letter dated the 23rd October 1884, the Government of India invited the attention of the local Governments to the necessity for improvement in the matter of practical and industrial training, and advocated an extended system of technical teaching. In 1886, the Government of India again circulated a memorandum written by Mr A. P. (afterwards Lord) Macdonnell on technical education which supported the Education Commission's recommendation to add a "modern side" to existing literary schools and attach to them a technical branch which was to be an integral part of the Provincial educational system.

3. The necessity of providing suitable instruction for subordinate officers of the Public Works Department had been felt before 1854 when the Poona Engineering Class and Mechanical School, the nucleus from which the College of Engineering was developed later, was opened. In the same year the Government of India had under consideration a scheme for the establishment of an Engineering College in the Bombay Presidency "wherein professional instruction might be given to every class in the Department of Public Works." In 1855 and 1857, the Bombay Government framed schemes for the establishment of a College at Poona for the education of (a) civil engineers, (b) surveyors and builders, and (c) maistries. As a result, the original Engineering Class gradually developed into a regular college. In 1866 the College was affiliated to the University of Bombay and the degree of Licentiate of Civil Engineering was instituted. Government offered one appointment yearly in the engineering branch of the Public Works Department to the senior student who passed this examination, and three appointments in the upper and three in the lower subordinate divisions. In 1872 the university

course for L C E was remodelled and architecture and mechanical engineering were added to the number of optional subjects. Classes in agriculture and forestry were later provided until separate arrangements were made elsewhere for instruction in these subjects. The engineering courses were revised in 1909 for the newly created degree of Bachelor of Engineering and they provided for the special training of mechanical engineers. In 1911 it was decided to make separate provision for the courses leading to the degree of Bachelor of Science and the College then assumed its present designation. Since 1901 the annual admissions to the civil engineering branch have been limited to 50 in number. The mechanical engineering course, to which 10 new students are admitted annually, was started after completion of the new engineering laboratory in 1914.

4. On receipt of Mr A. P. Macdonnell's memorandum referred to above the Government of Lord Reay, after consulting some of the leading citizens of Bombay, issued a comprehensive Resolution No. 3-E., dated the 15th September 1886, reviewing the position as regards technical education in the Presidency and setting forth the main lines upon which the Bombay Government were prepared to take action. The time was not then considered ripe for starting a technological institute in the province for the development of mechanical industries, "even if the condition of finances admitted of the large expenditure required to pay the staff of teachers who, in the first instance, would have to be invited from Europe." A scheme of sending scholars to foreign countries to complete their studies was considered sufficient. The attention of Government was, however, directed to the question of providing instruction in the City of Bombay with a view to raising the scale of existing industries and preparing the way for other useful developments. It was proposed to establish an institution in the vicinity of the mills and railway works for the teaching of such sciences as were necessary for the practical requirements of managers and foremen on the one hand, and skilled artisans and operatives on the other. The students were to be given a grasp of scientific facts which they could readily apply to any trade and the institution was to be a training school for managers and foremen of industries. As regards the wants of the mofussil in respect of industrial training, the main dependence was to be placed on High Schools for elementary science and upon such institutions as local effort may start with the aid of Government. Government wished to make a cautious and small beginning.

5. Eventually the V. J. Technical Institute, founded chiefly with a generous endowment given by Sir Dinslaw Maneckji Petit, subscriptions to the Ripon Memorial Fund, subscriptions to celebrate the Jubilee of the Queen-Empress and other donations, was established in 1888 with the object of imparting instruction in the principles of science and art and their application to industrial and other purposes by—

(1) the establishment of an institute in Bombay for the instruction of apprentices, workmen, foremen and managers and for training suitable technical teachers for the whole of the Presidency;

(2) the establishment, as funds permitted, of technical schools at places other than Bombay and the grant of assistance to such schools as may be affiliated to the Institute throughout the Presidency; and

(3) the holding of examinations in technology and the granting of certificates of competency to those who passed the prescribed tests.

6. In 1888 the Government of India asked the local Governments to undertake an industrial survey with a view to promote such technical education of a special character as might be applied to the service of the then existing industries and emphasised the necessity for giving a practical bias to general education. The immediate result was small. The Bombay Government con-

sidered such a survey unnecessary for this province. The Reay Art Workshops were added to the School of Art in 1890 and received apprentices in wood-carving and other artistic industries. Drawing was taught in all Government High Schools and Training Schools and, though it had not been made compulsory, the number of students who took up the subject greatly increased. Some branches of elementary science were made compulsory in High Schools, and the School Final Examination was instituted as an alternative to the University Matriculation. The necessity for the teaching of science in colleges was recognised and the Engineering College was improved.

7 In 1895-96 Sir E. C. Buck, K C I E, was sent by the Government of India on a tour for the discussion with local authorities of a series of questions, including that of "practical education" in primary schools. It was recognised that the development of machinery and the spread of the factory system and literary pursuits were trenching on home industries and depriving large numbers of children of opportunities of learning how to use their hands in the various occupations once practised in the home. The system of practical education was intended to meet this want, to train the eye and hand of the pupil and adapt him for the reception of technical instruction of any kind. Its introduction was considered to be a necessary preparation for all technical instruction. Its progress was, however, checked by the difficulty of training schoolmasters with sufficient rapidity.

In 1901, Sir E. C. Buck performed another tour on a similar mission. He reported that in many of the industrial schools then existing no working plans had been constructed, no sound principles laid down, no definite aims held in view, and no practical results of any value obtained. He considered that the main defect of the attempts at technical education throughout India was that there was no differentiation of the instruction provided for different classes of students. He therefore recommended that technical education and industrial schools should be placed under the control and direction of a separate department which might be called the technological department in each province and that the nomenclature of schools, standards and courses might be brought into greater uniformity in the different provinces of India.

8. In 1901, the Government of India addressed the local Governments with special reference to the resolutions on technical education passed by the Educational Conference held in that year at Simla. One of the conclusions of the Conference was that the existing industrial schools in India had been wanting in definiteness both of methods and objects, that there had been no clear differentiation between general and technical studies in them, that they had depended for initiation and support upon the volition of local bodies rather than upon any sustained policy of local Governments, and that they had been insufficiently co-ordinated with any particular local industries or trade. In agreeing generally with these conclusions the Government of India stated that in the first place they attached great value to the dissociation of technical education from ordinary literary education, the technical or industrial school being strictly limited to scientific and technical courses. They agreed also with the principles embodied in the other conclusions of the Conference, namely, that industrial schools should be devised to encourage particular local industries or trades; that the best type is the local trade or crafts school; that they should be educational and not commercial institutions; that in country districts they should be devoted to the study and development of single indigenous products; that in towns they should deal with manufactures, several industries being there collected in one building; and that only those pupils should be admitted who intend to practise the trade taught there. The chief practical outcome of the Simla Conference was the institution of ten state scholarships to be given to selected candidates, including two from Bombay, to be sent abroad to undertake definite courses of study in subjects connected with industrial science or research.

9. The report of Lieutenant-Colonel J. Clibborn's Committee on industrial education, which contained some valuable suggestions and which ultimately led to the establishment of a few more industrial schools followed in 1903. That Committee advised the appointment of a Director of Industries and Industrial Instruction with the Government of India and suggested that the provincial control might be entrusted to a Chief Inspector of Factories for each province. In regard to the training of instructors in the principal industries which are already well established in India, the Committee thought it possible to procure in factories and workshops skilful workers of the foreman rank to serve as instructors, inspectors of native workshops and advisers to Indian craftsmen. Training schools for instructors in the wood, iron, and mechanical industries could be established in the workshops of the engineering colleges and for instructors in the artistic industries in those of the Art Schools. The important principle emphasised by the Committee was that the object and justification of industrial schools must be to impart skill in a specialised manner and to aim at improving the trade and not merely at perpetuating existing routine methods. The central recommendation of the Committee was to substitute a system of supervision of workshops for regular industrial schools, a recommendation with which the Government of India did not agree.

10. In 1912 a Committee consisting of Lieutenant-Colonel E. H. de V. Atkinson, R.E., and Mr. T. S. Dawson was appointed by the Government of India to investigate the question of bringing technical institutes into closer touch and practical relation with the employers of labour in India. They reported that the opportunities for employment of technically trained Indians in this province were extremely wide and varied in character and insisted on an apprenticeship for a year or two in civil, mechanical, and electrical engineering as well as in the textile industry. They pointed out the necessity of having a definite aim in any scheme for technical education and observed that it might prove a curse instead of a blessing if it turned out a number of men who could not obtain employment, either owing to the inefficiency of the education, or to the fact that it had been conducted on wrong lines, or because suitable and remunerative employment did not exist. The ordinary aspirant to a technical career in this country was not in a position to obtain an apprenticeship in works. They recommended the institution in suitable centres, if a satisfactory demand existed, of afternoon classes for textile jobbers and misters to give practical demonstrations in the vernacular in the theoretical side of their work and the making of arrangements for the permanent co-ordination of the relations between institutions and employers of labour by the appointment of a controlling officer and the establishment of an employment bureau. Their special recommendations were that, as the state technical scholars did not receive any practical experience abroad, the present system of scholarships should be discontinued, and that suitable stipends should be granted to Indians who had successfully completed their theoretical and practical education in India to enable them to be apprenticed for practical experience with firms of repute in England; that minor technical institutes should be placed under the control of one central institution in each province in which such an institution existed; and that the education of skilled workmen should only be carried up to vernacular reading, writing, elementary arithmetic and sufficient knowledge of drawing to understand a dimensional sketch.

11. In February 1913, the Government of India issued a resolution on their educational policy. The policy to be pursued in regard to technical and industrial education had been discussed at a conference held at Allahabad in 1910, and the Government of India accepted the conclusions of that conference that progress should continue along the lines generally followed up to that time, namely, that—

(1) The Indian Institute of Science, which provides for research, the application of new processes and the production of thoroughly trained managers, should be developed, as opportunity offers, and become eventually a complete faculty of pure and applied science,

(2) The larger provincial institutions, which attract students from different parts of India, and afford instruction in practical methods of management and supervision, should, in the first instance, specialise along lines converging on local industries—a plan which will prevent overlapping and make for economy. Subsequently, as industries arise and the demand for managers and foremen increases, other and more varied courses may be found necessary;

(3) The lesser industrial schools, minor weaving institutions, such of the schools of art as have an industrial bent, the artisan classes in Bengal, and trade schools generally should be permanently directed toward such industries as exist in the localities where the institutions are situated

12 So far as the Bombay Presidency was concerned, the Board of Trustees of the Victoria Jubilee Technical Institute submitted to the Government of Bombay, in 1912, a scheme for the systematic organization of technical education in the Presidency. The proposals of the Board, after they were examined by a Committee appointed by Government, were approved generally and the institution was recognised as the Central Technological Institute of the Bombay Presidency. A Committee of Direction for Technical Education was constituted, distinct from the Board of the Victoria Jubilee Technical Institute. By the character of its composition, the Committee was intended to be in close touch with the Board and in a position to benefit by its special knowledge and experience and to secure, whenever needed, the advice and assistance of the staff of the Victoria Jubilee Technical Institute. The control of technical and industrial education in the Presidency was vested in this Committee

Committee of Direction for Technical Education in the Bombay Presidency.

CHAPTER II.

THE PRESENT POSITION.

13 The Indian National Congress and the Indian Industrial Conference have both repeatedly pressed upon the attention of Government the great need of providing and extending technical education. Speaking at the Industrial Conference convened by Government in 1907, Sir John Hewett, the then Lieutenant-Governor of the United Provinces, said :—

The National Congress and Industrial Conference.

“ The question of technical and industrial education has been before the Government and the public for over twenty years. There is probably no subject on which more has been written or said, while less has been accomplished ”

These words hold good to this day.

14. The subject has since been investigated by the Indian Industrial Commission of 1916-1918 and its recommendations appear in Chapter X of its report. The Calcutta University Commission of 1917-1919 also dealt with the subject, and their views, with special reference to the Calcutta University, are recorded in Volume V of their Report

Recent Commissions.

15 Recognising the necessity for a wide extension of technical education and industrial training, the Government of Bombay appointed, in their Resolution No. 973, dated the 17th February 1921, the present Committee including a strong non-official element representing important employers of labour, both

The Present Committee: Terms of Reference.

European and Indian, to draw up a comprehensive scheme of technical and industrial education for the Bombay Presidency. The instructions to the Committee were embodied in the following terms of reference:—

(1) To examine existing facilities for imparting higher education in mechanical engineering and technology and to suggest measures, including provision for research work, needed to prepare leaders, organizers and experts, that is, persons qualified to fill leading executive positions in business

(2) To submit similar proposals for imparting industrial and technical education of the high school and middle school grades, including laboratory practice, needed to train technical assistants, managers, foremen, etc., that is, persons qualified to hold subordinate positions in large or factory industries or responsible positions in smaller ones

(3) To submit proposals for making provision for vocational schools, apprentice schools, continuation schools, etc., required for training skilled craftsmen and artisans for industries and industrial arts; and for measures needed to spread, among workmen and the masses generally, a knowledge of the elements of modern business methods and discipline, and of the use of tools, machinery and labour saving devices

(4) To suggest practical measures for training girls and women to qualify them for industrial careers suited to their special aptitudes, the lower grades of training to include cookery, dress-making, and other household arts

(5) To specify the relations that should exist between each of those classes of training and the corresponding grades of general education (*i.e.*, primary, secondary, and university) and to suggest how far the co-operation of public and private institutions and agencies and advisory committees of leading men in the professions might be enlisted for promoting industrial and technical training.

(6) To submit proposals with rough estimates of capital cost and maintenance charges for the early establishment of new institutions and for additions to or modifications of existing institutions, including provision for the administration and supervision of the entire scheme proposed

16 The Committee was composed of the following Members:—

Constitution of the Committee.

- Sir M Visvesvaraya, K.C.I.E., B.A., L.C.E., M.Inst.C.E. (*Chairman*).
 R. D Bell, Esq., C.I.E., M.A., B.Sc., I.C.S., Director of Industries.
 A. M. Masani, Esq., M.A., B.Sc., Principal, Baroda College, Representative of the Bombay University.
 J. C. K. Peterson, Esq., C.I.E., of Messrs Tata Sons and Co, Ltd, Representative of the Chamber of Commerce, Bombay
 K. H. Vakil, Esq., M.Sc. Tech. (Mech.), F.I.C., B.A., F.C.S., of Messrs Tata Sons and Company, Limited, Representative of the Indian Merchants' Chamber and Bureau, Bombay
 Rahimtoola Currimbhoy Ebrahim, Esq., Representative of the Mill-owners' Association, Bombay
 Leslie Flatt, Esq., B.Sc. (Lond.), A.M.I.C.E., A.M.I.Mech.E., Works Manager, Parel, Representative of the G. I. P. Railway Company
 F. J. Page, Esq., O.B.E., M.I.Mech.E., Locomotive Carriage Superintendent, Representative of the B. B. and C. I. Railway Company
 F. O. J. Roose, Esq., M.I.Mech.E., M.I.E.E., F.C.S., Electrical Engineer to Government
 Major G. H. Willis, C.I.E., M.V.O., R.E., M.I.Mech.E., M.I.E. (India), Mint Master, Bombay
 K. R. Kanitkar, Esq., M.A., B.Sc., Professor of Physics, Fergusson College.

*
Dewan Bahadur K R Godbole, M C E, M L C
A J Turner, Esq., B Sc (Lond), F I.C., Principal, Victoria Jubilee
Technical Institute
F. W. Marrs, Esq., M A.

Mr F Power as the representative of the Bombay Trades Association was added in June 1921

The Committee lost one member, Mr Rahimtoola Currimbhoy Ebrahim, by death, and his place as a representative of the Bombay Millowners Association was taken in the month of May 1921 by Mr J A Kay

Mr. F W Marrs of the Indian Educational Service carried on the duties of Secretary from 10th February to 5th July 1921. After the latter date, he continued to be a member and his place as Secretary was taken by Mr G. N Gokhale, B Sc., L C E, of the Indian Service of Engineers (Bombay Public Works Department). Mr Gokhale was subsequently appointed also a member of the Committee from the 17th August 1921

17. The Committee first met on 7th March 1921, and in all held six meetings up to 2nd May when they adjourned for the hot weather. The meetings were resumed from 20th June. Six meetings were held before, and fourteen meetings after the recess, making a total of twenty meetings up to date of completion of the Report. Till towards the middle of July the Committee was undecided as to whether any evidence should be collected from experts, employers and representatives of the public, and whether any tours should be undertaken and visits paid to educational institutions in the mofussil. Only two witnesses were examined, namely, the Principal of the College of Engineering, Poona, and the Principal of the Ranchhodlal Chhotalal Technical Institute, Ahmedabad*. On receipt of a request from Government to expedite the submission of the Report, the Committee at their meetings on 18th and 19th July decided to appoint Sub-committees, to abandon the idea of tours and to dispense with further evidence

18. It was the desire of Government that the report should be submitted by 30th September to enable them to make the necessary financial provision in the following year's Provincial Budget but as this could not be done for various reasons, the Committee decided to submit an Interim Report embodying a summary of their principal opinions and recommendations. This report which is dated 3rd October 1921 is reproduced as Appendix C.

19. Before discussing the general problem of technical and industrial education, it may not be out of place to review briefly the progress that education, both general and technical, has made in the Bombay Presidency up to the present time

In 1921, the population of the Bombay Presidency excluding Aden and Indian States numbered 19,291,719 persons, of whom 10,138,575 were males, and 9,153,144 females. Of the male population 1,420,655, or just over 14 per cent., could read and write. Of the female population only 244,878, or 2.5 per cent., were accounted literate. The average of literacy of both sexes was 8.5 per cent.

The number of pupils attending the various educational institutions in the Presidency in 1920-21 was as follows:—

		Percentage of total population.
University grade	7,501	0.04
Secondary schools	76,252	0.45
Primary schools	807,036	4.2
Special schools	14,211	0.07
Total	905,000	4.7

* Summaries of their evidence are printed as Appendices H and J.

The number attending educational institutions in advanced countries is usually not less than 15 per cent of the total population. For Bombay to rise to this level the number should be 2,894,000, while it is actually 905,000 or only 31.1 per cent, of what it should be

20. The number of technical and industrial schools and colleges in the Presidency in 1920-21 and of pupils attending them were as follows :—

	Number of institutions.	Number of pupils.
College of Engineering, Poona ...	1	189
Sir J. J. School of Art, Bombay ...	1	333
<i>Technical and Industrial Schools for Males.</i>		
Government	5	248
Local Board	4	363
Municipal	4	114
Victoria Jubilee Technical Institute (aided) .	1	321
Other aided	6	308
Unaided	3	64
Engineering and Surveying School in Sind ..	1	13
<i>Technical and Industrial Schools for Females.</i>		
Aided	8	323
Unaided	1	25
Total ...	35	2,301

21. It is difficult to obtain statistics from foreign countries to represent the same class of education in all cases, but the following figures available for England may be of some value for comparison :—

England.—Population (1911) 34,043,076

Number of Pupils attending Educational Institutions.

Universities (1915-1916)	11,720
Secondary schools (1914)	187,207
Primary schools (1914)	6,078,895
Technical schools and classes (1914)	813,577
Teachers' training colleges (1914)	20,593

7,111,992

The school-going population in England forms 20.9 per cent of the total population. In America, the corresponding figure is as high as 23 per cent. In the Bombay Presidency, only two pupils receive technical education of some sort out of every 1,000 attending the schools, while in England the corresponding number is 135. One pupil out of every 10,000 population is receiving technical education in the Bombay Presidency while the corresponding number for England is over 140.

22. The expenditure on education from various sources in the Bombay Presidency in 1920-1921 was as follows :—

	Rs.
Provincial Revenues	1,49,10,070
Local Funds	13,63,450
Municipal	27,16,680
Fees	38,22,862
Endowments	8,48,115
Subscriptions, etc,	26,81,682
Total direct and indirect expenditure ...	2,63,42,659

This expenditure was distributed as follows.—

	Rs
University grade	24,52,003
Secondary schools	49,27,677
Primary schools	1,27,21,451
Special schools	20,74,889
Buildings, etc	18,41,683
Direction and Inspection	11,74,248
Scholarships	3,15,067
Miscellaneous	8,35,641
Total	2,63,42,659

The expenditure per head of population is thus 12 annas and 4 pies from provincial revenues and Rs 1-5-10 from all sources

23. Of this again the expenditure on technical and industrial education was as under —

	Rs
College of Engineering, Poona	1,32,513
Sir J. J. School of Art, Bombay	1,44,862
Victoria Jubilee Technical Institute, Bombay	1,90,000
32 other technical and industrial and engineering and surveying schools (for males and females)	2,95,052
Scholarships	10,065
Total	7,72,512

The amount is obtained from the following sources —

	Rs
Provincial Revenues	5,25,080
Local Funds	16,500
Municipal	39,438
Fees	53,343
Endowments	23,694
Subscriptions, etc	1,14,457
Total	7,72,512

24 The cost of the public system of education in England and Wales, not including naval and military education, industrial schools under the Home Office, agricultural education, or the Universities, was as follows —

	£
1913-1914	31,800,186
1918-1919	42,166,191
1921-1922 (estimated)	64,685,116

As these amounts do not include fees and income from endowments and other sources, they correspond to the first three heads in paragraph 22. The expenditure per head of population was Rs 14 before the war and has since increased to Rs. 28 in spite of other heavy expenditure on post-war reforms

25 The first organised attempt at technical education of the masses in England, made by the Mechanics Institutes in 1823, failed because of the very backward condition of elementary education at the time. The great majority of working classes were not then sufficiently prepared by elementary school training to take advantage of systematic instruction in the scientific principles underlying their trade or occupations. If the same thing is not to happen in India, we must recognise that ability to read and write is indispensable for self-improvement and for acquiring a high degree of technical skill. All education, whether liberal

or technical, must be based on a broad foundation of elementary education. As already pointed out, only 85 per cent of the population in the Bombay Presidency are literate as against 80 to 90 per cent, in advanced countries. This Committee is aware that compulsory elementary education which is imperatively necessary is engaging the serious attention of the Government of Bombay; but we mention the subject here because there is much leeway to make up in this respect, and a good elementary education is very important as a basal preparation for technical education. The problem is, moreover, so vast that it has to be attacked from numerous directions, some of which will be dealt with in our report.

26 Vocational education is required both to train industrial leaders who can plan and lead as well as to improve the capacity of the artisans who form the rank and file. It will help to increase production from agriculture and industries and indirectly also from commerce and transport. According to the Census of 1911,* the distribution of population by occupations was as follows.—

<i>Production of raw materials</i>	..	13,456,914
Agriculture and pasture	13,425,843	
Fishing and hunting	152,757	
Extraction of minerals	31,071	
<i>Preparation of material substances</i>	..	4,282,577
Industry	2,458,688	
Transport	611,719	
Trade	1,212,172	
<i>Public administration and liberal arts</i>		927,385
<i>Miscellaneous—Domestic servants, etc</i>		959,601
Total population excluding Indian States		19,626,477

It will be seen from these figures that by far the largest number of people are engaged in agriculture. Industries come next, and then trade and commerce. Adequate educational facilities are needed for training people for all the three vocations.

27 The following table will show the present number of pupils and the expenditure incurred on the three principal forms of vocational education :—

	Number of pupils.	Expenditure.		
		Provincial Revenues.	Other sources	Total
		Rs.	Rs.	Rs.
Technical and Industrial schools	2,301	5,25,080	2,47,482	7,72,562
Agricultural schools	268	1,24,098	8,784	1,32,882
Commercial schools	2,705	59,716	1,12,548	1,72,264
Total Vocational	5,274	7,08,894	8,68,714	10,77,608
Education of all kinds	906,000	1,49,10,070	1,14,82,589	2,63,92,659

It will be seen that out of a total expenditure on education of 263 lakhs, the provision for vocational training of all kinds does not exceed 11 lakhs.

In any comprehensive scheme for the expansion of vocational education, technical and industrial education obviously comes first, because it will help also agricultural occupations, rural industries, and transport facilities. We are at present concerned with provision for technical education only; but we consider that technical education by itself will not be sufficient, and adequate provision is necessary also for education in agriculture and commerce.

* Figures for 1921 are not yet available.

28 It is well known that agricultural practices over wide areas of the Presidency are still primitive and that crop production is very low, as compared with countries, where scientific agriculture is properly developed. The need of some supplementary occupations, by which the agriculturist can add to his meagre income, and a knowledge of modern business methods are of vital importance both to our urban and rural population. We therefore consider that instruction in both these vocations should be incorporated into our educational system. As already stated in the Interim Report, a comprehensive scheme of vocational education should include industries, agriculture and commerce. Although agriculture and commerce are not specially included in our terms of reference, we desire to repeat here that, in our opinion, it is of the highest importance that steps should be taken, at as early a date as may be feasible, to draw up schemes to provide the people of this Presidency with parallel courses of instruction in these two subjects also.

The expenditure will be large, but it must be faced because it will equip the people for productive occupations and, in the permanent interest of the Presidency as a whole, would be an investment of incalculable value.

CHAPTER III.

OUTLINE OF SCHEME

29. There is a general well-grounded complaint that the education given in this Presidency has been almost purely literary, that too many persons are trained to fill clerical and non-vocational appointments and that the instruction given in the past in industries and practical arts has been negligible.

For the past 50 years or more, advanced Western countries have been giving their school-going population vocational education in industrial arts, agriculture and commerce to equip them for their work in life. As we have seen already, attempts were made now and then to change the character of education in this Presidency also, but so far with little success. Out of a total number of 1,490 graduates in the Bombay University in 1920, the engineering profession was represented by 54 men and of these again only 8 graduates passed in mechanical engineering. The University has not yet begun to grant degrees in electrical engineering and technology. Some of the existing industrial schools of lower grades have not been working in close touch with industries and handicrafts and are not giving the results expected of them.

30. Vocational education, sometimes more expressively described as "bread and butter instruction," may be said to fall under four principal heads, *viz* :—

- | | |
|------------------|-------------------|
| (1) Industries, | (3) Commerce, and |
| (2) Agriculture, | (4) Home work |

Home work forms, or should form, the principal subject in the practical education of girls and women. In sea-faring countries, a fifth head is included, namely, marine occupations. The learned professions, such as law and medicine, also come under the head of vocations, but the class of vocational education required for them does not fall within the scope of our enquiry.

By the express terms of reference we are concerned only with education and training required by persons intending to engage in industries and industrial occupations.

31 "Technical Instruction," according to the English Education Act of 1899, is defined to mean "instruction in the principles of science and art applied to industries, and in the application of special branches of science and art to specific industries and employments."

Technical and industrial education defined.

The term "Industrial Education" is applied in its limited sense to the general preparation for the trades including workshop practice as well to the special courses of instruction in the theoretical and practical work of particular trades

"Where the emphasis is laid upon the development of ability and skill in the handling of materials, tools, machines and products, the training or education may fittingly be called 'Industrial'; and where the attention is given chiefly to science and calculations, and emphasis is laid upon the acquisition of knowledge of principles and their applications, the training or education may be called 'Technical'. No dividing line can be used to mark the one from the other."*

32 Innumerable professions and occupations are coming under the dominion of training. In advanced countries, systematic training is given even for the smallest occupations, such as washermen, barbers, cooks, bakers, shoe-makers, etc. Training is needed for organised industries, minor industries, cottage industries and other various trades and crafts. Perhaps all forms of technical and industrial education might be grouped under the following four main heads:—

Main heads of industrial education.

- (1) Mechanical and Electrical Engineering
- (2) Building work and Civil Engineering
- (3) Applied Chemistry
- (4) Trades and handicrafts

A complete scheme should provide for instruction and training in all these four branches

33 The following table shows the principal industries in the Bombay Presidency and the number of persons engaged in each as given in the 1911 Census:—

Industries and Survey of Industrial Occupations.

		<i>Workers.</i>	
		Men.	Women.
Textiles	...	304,249	154,793
Hides and skins	..	14,643	3,854
Wood	..	97,815	25,714
Metals	...	43,315	3,289
Ceramics	...	44,542	25,987
Chemical products (oil-pressing, etc.)	..	17,645	6,605
Food industries	..	47,852	52,639
Dress and toilet	..	155,561	38,935
Furniture	...	999	160
Building industries	..	61,913	13,317
Carriage manufacture	..	587	21
Power stations	..	1,335	184
Printing, book-binding, silver-smiths, etc	..	60,813	2,768
Sweepers, etc	..	13,744	8,109
Total Industries		865,013	334,375

A comprehensive scheme of technical and industrial education must provide for the needs of all these industries. Details of the various types of educational institutions recommended are given later, but in choosing the type of school to be set up and the subjects to be taught in any particular area, very careful attention should be paid to the special needs of the locality and the industries and industrial occupations which the school is intended to serve.

To determine the industries and occupations for which training is necessary, sufficient statistics will be available in the census figures of each

* Report of the Royal Commission on Industrial Training and Technical Education in Canada, 1918, Parts I and II, page 151

local area to make a beginning. A regular survey of industrial occupations like those carried out in some of the American cities may be undertaken later.

34. For every class of industries, particularly organised industries, Grades of Training. four grades of training will be necessary to prepare, respectively,—

- (1) Organisers, experts, directors, etc.
- (2) Foremen, managers and superintendents
- (3) Skilled workmen
- (4) Semi-skilled workmen

The education given should be of the requisite quality and standard to enable persons to take up these positions after a reasonable course of probation or preliminary practical training.

35. The training available in the country should provide opportunities for the children of all classes of people, should they desire it, of equipping themselves, according to their means and ability, for one or the other of the four grades of occupations just mentioned. The following six classes of institutions are proposed in pursuance of modern practice and with due regard to Indian conditions. The proposals are in conformity with the instructions to us from Government embodied in their terms of reference.—

(1) *Technical Education of the University Grade.*—The education and training under this head will be similar to that imparted in English, German and other foreign Universities. At present education of this class is given practically only in civil engineering in this Presidency.

(2) *Technical Institutes.*—In these Institutes the very highest class of industrial training will be given to those who do not enter the University or are not sufficiently equipped with the theory required for University education.

(3) *Middle Industrial Schools.*—These are for persons who have passed the III standard Anglo-vernacular and desire to take up an industrial career or a technical appointment, or carry on a small industry or handicraft on their own account.

(4) *Lower Industrial Schools.*—These are for persons whose general education has not gone beyond primary IV standard and who are preparing themselves to become skilled workmen.

(5) *Supplementary Classes and Courses.*—These classes and courses are designed mainly to meet the need of the very large class of persons who are semi-skilled, or unskilled and who have a desire to acquire further knowledge or skill.

The instruction given in lower industrial schools and the supplementary classes and courses will correspond to that given in continuation schools in European countries and in Japan. The standard aimed at here will be lower, because compulsory elementary education is not yet universally adopted in this Presidency. These classes and courses will be a very imperfect substitute for the regular schools, but, even so, they should be welcomed, as through their aid a systematic beginning could be made to spread industrial education among the masses.

(6) *Institutions for Girls and Women.*—All classes of institutions required for the industrial training of girls and women are brought under one group. Till compulsory primary education becomes universal, the number of girls and women to receive this class of education will be small compared with the boys and men.

The grades of institutions proposed will be similar to those given above for boys and men. Home work, that is, housekeeping and homemaking, should be the most important subject taught in all girls' and women's vocational schools.

36. Primary education is, or is about to be made, compulsory up to the age of 11 in this Presidency. Elementary manual training forms part of the education of the pupil up to this age and it should continue to be given along with elementary education.

Between 11 and 14 years of age, elementary education is compulsory in most countries of the West, but there is no likelihood of the compulsory principle being accepted in this Presidency for some time to come.

We are of opinion that the Educational Department should arrange for systematic manual training up to the age of 11 and provide prevocational courses in secondary schools for boys between 11 and 13 to give them a vocational or industrial bias.

37. Between 14 and 18 years is the age best adapted for learning a trade or industry. Such learning is made compulsory in England for boys of between 14 and 16 and in 6 years more the compulsory age will be extended up to 18 years. In this Presidency also it is most desirable that young men should undergo training in some vocation or business between the ages of 13 and 17.

Adults should be given opportunities of learning a handicraft or an industry in evening classes or Sunday classes, by attending the classes for a minimum period of 6 hours in the week.

Public opinion in this Presidency is not sufficiently advanced to enforce by law compulsory vocational education in the case of young men; and such compulsory education for girls above the age of 14 is outside practical politics for the present. All agencies connected with industrial development should carry on propaganda to induce boys and girls to submit voluntarily to this education and training between the ages in which in other countries such education is enforced by law. By suitable organization, till compulsion is accepted in this Presidency, social pressure should be brought to bear on boys and girls to undergo this class of education in their own and the country's interest. It must be remembered that compulsory training after 14 years of age makes only a small demand on the learner's time and attention, the young person being required to give a minimum of 6 hours a week only for such training.

38. The language in which instruction will be imparted should be the vernacular of the District up to the Lower Industrial School inclusive. In the Middle Industrial School instruction may be given in the vernacular or in both English and the vernacular. No instruction except in English can be thought of, above that grade, until suitable text books are prepared in the vernacular.

One of the very first duties of the agency appointed to superintend industrial education in future, will be to arrange for the preparation of suitable text-books in the vernaculars for use in the lower grades of industrial schools. In order that work may proceed along the lines of least resistance, we are of opinion that English technical terms should continue to be used in such text books for the present.

39. Although the number of persons trained in them is limited, the results of past training in the Poona Engineering College and in the Victoria Jubilee Technical Institute, Bombay, have been on the whole very satisfactory. There is more demand for admission than the institutions can cope with, and the passed men find ready employment. The results of the working of the industrial schools of lower grades have, however, not been so satisfactory. The reason seems to be that the instruction given in them is of a routine and stereotyped character, not specially adapted to local industries and occupations. The pupil is not taught a complete trade or industry under commercial conditions. When he completes his education there is no agency to take him in hand and put him in touch with employers who require his services.

40 The new scheme should remedy these defects. The school should be brought into close touch with employers and business men in the locality by placing it under the control of local Committees. These Committees should consist of representatives of manufacturers and business men as well as of officials and experts who have charge of both general education and technical education. Propaganda should be carried on in every direction that may lead to improvement. Foreign experience in the management of such institutions should be closely studied, and teachers and students should be sent abroad for the purpose. The University, technical schools and the factories should be brought closer together, as a general rule young men should be persuaded to give up purely literary careers, agencies should be created to find employment for men who pass out from industrial schools, and exhibitions of local products should be held. In these and other ways everything possible should be done to make this class of education serve effectively the industrial needs of the locality.

The chief aim of the new college of technology and industrial schools should be to promote and extend existing industries and create new ones. In centres of industry, the schools should specialise in instruction required by the principal industries and manufactures in the locality. In non-industrial areas, instruction should be given in handicrafts and cottage industries to train the people to new occupations. Persons actually engaged in industries and trades should have a hand in controlling this class of education. The number of scholars and the expenditure to be provided for in the new scheme should bear a reasonable proportion to the total school-going population and the total expenditure on general education.

These and other points will be discussed in detail in describing the several classes of institutions proposed.

Section II.—Six Classes of Institutions.

CHAPTER IV.

TECHNICAL EDUCATION OF THE UNIVERSITY GRADE.

41. In this Section of our report we propose to deal in detail with the various types and classes of institutions proposed for imparting technical and industrial education under our scheme

The highest type of institution required is one of the University grade. In every branch of knowledge, educational institutions lead up to a college at the top, which serves as their goal and beacon and which sets the standard for them. The technical schools in this Presidency having no such goal or apex at present, we recommend the establishment of a College of Technology at the earliest moment to supply the need. In making this recommendation we have given full consideration to the opinion recorded by the Indian Industrial Commission of 1916-1918 as well as to the proposals embodied in a representation, submitted to this Committee, on behalf of the Indian Merchants' Chamber and Bureau, by our colleague Mr. K H Vakil, M Sc (Appendix F)

42. The precise terms of reference to us from Government on this point
Terms of reference. are:—

“To examine existing facilities for imparting higher education in mechanical engineering and technology and to suggest measures, including provision for research work, needed to prepare leaders, organisers and experts, that is, persons qualified to fill leading executive positions in business”

The Committee is expected (a) to examine existing facilities and (b) to suggest measures which would lead to the preparation of “leaders, organisers and experts”

43. Any one conversant with the conditions under which the existing industries in India are carried on will readily realise how greatly they are handicapped for want of competent men to conduct them and will recognise the importance of training experts and leaders from among the people to superintend, direct and manage local undertakings. The men required for these duties are, with a few exceptions, imported from abroad, and the high salaries which have to be paid to them are a great drawback in existing industries and a serious deterrent to new enterprises. The recent development of industries in Europe and America has made it increasingly difficult to obtain suitable recruits even at high salaries and the concurrent development of our own industries is rapidly outgrowing the possibilities of recruitment from foreign sources. Unless therefore immediate and bold steps are taken to train a sufficient number of technical experts in the country itself, our industrial development is likely to be seriously retarded. Such training can be given either by opening a Technological College in this country or by sending students to receive training abroad. The latter course, in addition to being expensive, is open to the serious objection that the large number of experts required cannot be speedily obtained in that way. Besides, it is well known that, since the close of the war, there is already a serious congestion in English and foreign Universities, and Indian students find it more and more difficult to obtain admission.

44. Hitherto the education of the engineer in this country has been confined largely to theoretical studies and his training and practical experience on works have been very limited. Owing to changing world conditions the scope of his duties and responsibilities is growing wider. His work does not begin and terminate with the design and construction of engineering

projects He is required to supplement his technical knowledge by information concerning the financial and commercial aspects of business enterprises and to estimate costs and determine depreciation, sales and realizations He is frequently called upon to express opinions on *quasi*-technical questions In addition to technical skill, he must possess tact to manage and lead men as well as capacity for organization For these reasons we deem it essential to recommend the promotion of higher technological education in the Presidency, both by starting new types of institutions required as well as by raising the standard of training imparted in existing ones

45. There are at present two institutions in the Presidency which are doing some work of this kind, *viz.*, (1) the College of Engineering, Poona, and (2) the Victoria Jubilee Technical Institute, Bombay The former institution has within the past few years been giving instruction in mechanical engineering, but the standard of education is far below that aimed at in the Universities and Technological Schools of England and foreign countries, which turn out real leaders and organisers of industries; and the location of the college in Poona places it outside the range of the principal industrial and commercial activities of the Presidency.

The Victoria Jubilee Technical Institute, located in Bombay City, gives instruction in mechanical engineering and technology of the higher technical school grade We consider that instruction in the Institute should be reserved for that class of training. In our opinion neither institution can be conveniently developed into a College of Technology without sacrifice of its present usefulness and we consider that the starting of a new College of Technology in the vicinity of industries in Bombay is one of the earliest measures needed to promote technological education.

46 We accordingly recommend the institution of a Faculty of Technology in the University of Bombay and the establishment of a new College of Technology, in the City of Bombay, affiliated thereto

(a) *Courses of study.*—We consider that provision should be made for accommodating 400 students at the commencement, instruction being given in the following subjects:—

- (1) Mechanical engineering,
- (2) Electrical engineering,
- (3) Textile industries and
- (4) Applied chemistry.

Although the institution would be provincial, it should be open to students from all parts of India

(b) *Model courses of study.*—To give an idea of the lines of future development, it may be of interest if we reproduce here the courses of study prescribed in two of the best conducted foreign technological institutions of the University grade, namely, the College of Technology at Manchester, and the Massachusetts Institute of Technology at Boston.

The courses of study of the *Manchester College of Technology* (1920-1921) include:—

Advanced study and research in various branches of Science and Technology

University Courses in the Faculty of Technology extending over three years and leading to Degrees and Certificates in—

Mechanical engineering	Metallurgy and assaying.
Electrical engineering	Chemical technology of brewing.
Sanitary engineering	Electro-chemistry
Applied chemistry.	Photography.
General chemical technology.	Textile industries
Chemistry of textiles (bleaching, dyeing, printing and finishing).	Architecture.
Paper manufacture.	Mining.
	Administration.

The Massachusetts Institute of Technology (1918-1919) gives instruction in—

- | | |
|--|--|
| (1) Civil engineering | (9) General science. |
| (2) Mechanical engineering. | (10) Chemical engineering. |
| (3) Mining engineering and metallurgy. | (11) Sanitary engineering |
| (4) Architecture. | (12) Geology. |
| (5) Chemistry | (13) Naval architecture and marine engineering |
| (6) Electrical engineering. | (14) Electro-chemistry. |
| (7) Biology and public health. | (15) Statistics and economics. |
| (8) Physics | (16) Engineering administration. |

We would here emphasise the necessity of providing special courses in commercial and administrative subjects pertaining to costs, repairs, depreciation, capital outlay, relation of labour to industries, and allied problems in economics, which form an integral and important part of the equipment of the modern engineer. Provision should be made for all the technology students to attend lectures in these subjects as part of their degree course.

(c) *Practical training.*—As regards the question of practical training, we consider that as soon as the student has completed satisfactorily his three years' course at the college, a diploma should be conferred on him. In order to qualify for the University degree, however, he must undergo one or two years' practical training on works, or do research for one year in the college and spend one year on works. Normally all the students will be required to join a workshop for two years to qualify for a degree. Only those students who have a very special aptitude may obtain their degree by the better means of research and works training.

The College, like the Faraday House College of London, should work in close association with a number of works, factories and mills into which students should be admitted for practical training and from which it should receive periodical reports concerning their progress.

(d) *Buildings and equipment.*—The proposed College should occupy a position as central as possible in the areas crowded by the mills and workshops of the city. Having regard to the cost of land in Bombay and the tendency for the expansion of residential areas in a northerly direction, we consider that a site near Matunga, served both by the G. I. P. and the B. B. and C. I. Railways, would be the most suitable. We understand that the area in Ambarnath is being reserved for factory sites under the Bombay Development Scheme and is likely to become the main industrial centre in course of time. If this is so, the location of the college in that area may lead to a substantial saving in the cost of land to be acquired.

The initial total outlay required for its establishment may be as high as Rs. 43 lakhs, exclusive of the hostel accommodation, as the following rough estimate will show :—

	Rs.
Buildings	12,00,000
Land	5,00,000
Power plant	2,00,000
Strength of materials and hydraulic laboratory	2,00,000
Equipment of mechanical laboratory and workshops.	3,00,000
Equipment of electrical workshops	2,00,000
Equipment of chemical workshops	3,00,000
Equipment of textile workshops	3,00,000
General equipment, furniture and lighting, exclusive of requirements of hostel and quarters	4,00,000
Library	2,00,000
Residential quarters for staff and hostels	3,00,000
Contingencies	2,00,000
Total	43,00,000

It will be seen that a large portion of the cost is for provision of plant for workshops. In practice all this amount will not be found necessary at once and a good beginning can be made with the sum of Rs 30 lakhs provided for in estimates given at the end of this chapter.

The yearly charges for the maintenance of buildings and equipment will be roughly Rs 75,000, as under :—

	Rs
Water, power, light, repairs and maintenance of buildings, workshops and quarters	30,000
Library and reading room ...	10,000
Office requirements, stationery and printing ...	5,000
Workshop stores, replacement of implements and apparatus ...	10,000
Chemical department stores and supplies	20,000
Total ..	<u>75,000</u>

(e) *Staff.*—The principal items in the annual recurring expenditure will be as under :—

<i>Staff.</i>	Rs
1 Principal at Rs. 2,000 to Rs 3,000, and 4 Professors at Rs 1,500 each per month	1,02,000
3 Professors or Assistant Professors at Rs. 1,000 per month; one for mathematics, one for economics, and an Assistant Professor for applied chemistry	36,000
1 Assistant Professor for commercial subjects, 1 Chief Lecturer for languages, and 1 Chief Lecturer for civil and sanitary engineering at Rs. 750 per month each	27,000
15 Lecturers at Rs. 500 per month each	90,000
15 Demonstrators at Rs 200 per month each	36,000
10 Laboratory and workshop attendants at Rs. 100 and 15 at Rs 50 per month each	21,000
1 Secretary to Principal and Board of Management at Rs 500 per month	6,000
1 Librarian at Rs 500 per month	6,000
Chief clerk, clerks, stenographers, account staff and attendants	24,240
Total ...	<u>3,48,240</u>

As regards staff, too much stress cannot be laid upon the necessity of obtaining the services of the very best men available for each subject. The selection of eminent men from Europe and America as professors in each branch of the subjects taught will ensure the prestige and atmosphere essential for the success of the institution. We would emphasise that in the selection, particularly of the principal, the utmost care should be taken to see that he is a man of capacity and enthusiasm. He should be on probation for a term of three years before he is confirmed.

(f) *Abstract of annual recurring charges—*

	Rs
(1) Staff	3,48,240
(2) Maintenance	75,000
(3) Miscellaneous expenses, including insurance, travelling expenses, provident fund, etc.	26,760
Total ...	<u>4,50,000</u>

Receipts from fees are not considered, as the expenditure on scholarships and bursaries may be met from them. The annual charges will thus be not more than Rs. 4,50,000 when the College is fully developed. For the first ten years they will not exceed Rs. 4,00,000, the amount provided for in the estimates.

(g) *An alternative proposal.*—In order to reduce the initial expenditure and avoid delay, we would urge on the attention of Government the consideration of an alternative proposal, namely, to start the new institution in conjunction with the Royal Institute of Science recently opened in Bombay. This college has taken nearly ten years to come into existence and we understand that, so far, not much progress has been made in carrying out the research work which was one of the main purposes of its foundation. As industrial research will be one of the main features of the work of the College of Technology as well as of the Royal Institute of Science, the combination of these two institutions will be a very desirable move. We would go further and say that as research work is extremely unlikely to prove successful unless the investigators are drawn from a large and brilliant body of students interested in the practical application of the discoveries of science to industry, the proposed combination will be mutually advantageous and is likely in a far more efficacious manner to promote the objects of both. The Royal Institute of Science has a fine building which is capable, without difficulty or further expense, of accommodating 400 additional students, and space will be available for the equipment of the requisite laboratory and workshops. Precautions can easily be taken to see that the practical work of the College of Technology will not prove a source of annoyance to the neighbourhood. We neither apprehend nor anticipate any difficulty on this account. We recommend, therefore, for the earnest consideration of Government, the amalgamation of the Royal Institute of Science with the proposed College of Technology, the joint institution being named the "Royal Institute of Science and Technology." For a precedent as regards the designation, we have the "Imperial College of Science and Technology", South Kensington, London. If this proposal meets with approval, there will be a very considerable reduction in expenditure, both capital and recurring, from the very outset.

(h) *Committee for the new College.*—We are strongly of opinion that as the College is the apex of our scheme, there should be no going back on this essential proposal. As a necessary preliminary we would suggest the early appointment by Government of a Committee, which might later develop into a managing body for the College, to examine the following questions and formulate constructive proposals relative thereto :—

- (1) the relation of the College to the Bombay University;
- (2) the subjects and courses to be taught, regard being had to the industrial requirements of the Presidency;
- (3) the qualifications and age limit for admission to the College;
- (4) the methods to be adopted for providing the necessary practical training,
- (5) the staff required for the formation of the College; and
- (6) the general scope of instruction and other measures required for maintaining a high standard of proficiency.

47 It will be necessary for the University of Bombay to establish a Faculty of Technology. It has been suggested that pending the establishment of the new College, students trained in mechanical and electrical engineering in the College of Engineering, Poona, those trained in applied chemistry and textiles in the Victoria Jubilee Technical Institute, Bombay, and also students of applied chemistry in the Institute of Science, Bangalore, may be admitted, as a special case, to the examinations for this new degree of technology. If this suggestion is accepted, special higher courses will have to be drawn up in the subjects selected and care taken to see that a satisfactory standard is maintained both in the character of the instruction given in the institutions named as well as in the examinations for the degree.

48 The College of Engineering at Poona gives courses at present in civil engineering and mechanical engineering. Out of about 250 candidates seeking admission to the civil engineering branch each year, of whom 100 candidates belong to places outside the Bombay Presidency, some 60 are actually admitted. We have had the advantage of hearing the views of the Principal who is in favour of an expansion which would provide for the admission of 100 pupils every year in the first instance and 150 later. At present 10 candidates are admitted to the mechanical engineering course annually. Omitting the present year, the total number of candidates who have graduated in mechanical engineering since the degree was created has been only 14 up to date. There is a course for an electrical engineering degree recognised in the University Calendar, but the subject is not taught in the college because it is considered—we think erroneously—that there is no demand in the country for electrical engineers.

We strongly recommend that the number of students in the civil engineering branch should be increased to 100 at once, and to 150 as soon as circumstances permit.

Considering the demand there is for architectural buildings in Bombay alone, it is time that a degree in architecture was instituted. We understand that a proposal for this degree has been approved but its execution is delayed for want of funds.

The value of graduates passing out of the mechanical engineering branch would be distinctly increased, if Government arrange for facilities for their practical training in Railway Workshops and by private firms. The lack of these facilities is likely to have an adverse effect on the popularity of this course.

The course for the degree in electrical engineering which was recommended so far back as 1907 is now overdue, and should be started in the Poona College. The commencement of the course need not be delayed till the completion of the new college at Bombay. As the necessary equipment and part of the staff for giving instruction in mechanical and electrical engineering is available, the College should continue to prepare candidates for the University degree examinations in these subjects for five or six years more, until the College of Technology in Bombay is properly established and in full operation. When it is found that the new college is fully meeting the demands of industries, the question of abolishing the courses in Poona may be considered. The total number of pupils on the rolls of the college at any one time at present is about 175 and the actual annual expenditure is about Rs. 1,42,000. We consider that an additional expenditure of at least Rs. 1,00,000 should be sanctioned to meet the cost of the expansion proposed.

49 Provision should be made for industrial research in the new College of Technology. As all teaching of the highest order must be accompanied by research, every professor of the college should be associated with research in some form, if he is deemed fit to be retained on the staff.

Graduates who show talent for research should be selected and given scholarships and fellowships. Post-graduate work and research work must be carried on in as many departments as possible, and with the help of manufacturers, industrial fellowships should be created for the solution of current manufacturing problems and the investigation of new subjects and materials. The young men engaged in the researches should, whenever their work results in any notable practical achievement, receive a substantial reward. A sum of Rs. 1,00,000 is included for industrial research in connection with the proposed College of Technology. Perhaps, pending the starting of the new college, it might be possible to commence work on industrial research in the Royal Institute of Science.

50 We fully endorse the views of the majority in paragraph 40, sub-paragraph 4, of their report, about the unsatisfactory character of the present system of fixing the maximum number of scholarships. We agree with them that

Training in foreign countries.

the correct procedure is to offer a fixed number of these annually. As a large number of experts will be required even as professors and officials, we would urge that a couple of dozen picked men be deputed yearly for receiving training in foreign institutions for the next five years.

After the College of Technology comes into working order, two classes of students will have to be sent abroad from among the students trained in the college, one set to carry on research and the other to acquire practice in factories in England and foreign countries. The former will go to any institution in the world where they can best continue research work in the subject in which they are interested. The latter should be given facilities for undergoing practical training in works, special arrangements being made for such training with the manufacturers from whom purchases are made for Government.

51 The preparation of correct detailed estimates is neither possible nor desirable at this stage. We have already stated that the essential requirements of the scheme will be satisfactorily met, if, for the present, provision is made for a capital outlay of Rs 30 lakhs for buildings and equipment for institutions of the University grade.

Similarly, a provision of Rs. 4 lakhs towards recurring charges for the new college will in our opinion be sufficient for the present. The total additional recurring expenditure on institutions and arrangements for promoting education of the University grade will be as under :—

	Rs	lakhs
(1) New College of Technology ...	4	
(2) Expansion of the College of Engineering, Poona ...	1	
(3) Provision for research ...	1	
(4) Foreign deputations of students... ..	1	
Total ...	7	

We may add that proposals for the new College of Technology have met with support from nearly all the members of the Committee.

CHAPTER V.

TECHNICAL INSTITUTES.

52 The institutions next lower to those of the University grade will be Technical Institutes or what in some countries are known as "Higher Technical Schools". The subjects chosen for practical training may be the same as in the University course but the preliminary qualifications demanded and the standard of training aimed at in the theory of the subjects may be distinctly lower. These institutions will suit the large class of students who have not had a liberal education but are nevertheless able to imbibe practical knowledge or develop executive ability of a high order.

The institutions will impart a thorough practical training in the subjects chosen for instruction together with just sufficient theoretical knowledge deemed essential for such practical training.

The young men trained in these institutions should be fit on completion of their training to start life as assistants to experts, managers and superintendents in organised industries. Some of the best men among them may be expected to come up to the level of the University men; but the average graduate of the institute should be able to serve as a chieftain or shop foreman and execute the designs of the University men.

53. The courses of study in a Technical Institute should be selected from the following :—

Mechanical engineering,
 Electrical engineering,
 Applied chemistry,
 Spinning, weaving and dyeing,
 Architecture and building construction,

Sanitary engineering,
 Leather manufacture,
 Ceramics,
 Printing

Marine engineering, mining and metallurgy may be added later.

The standard of instruction in pure science and mathematics should be above the matriculation standard and special attention should be given to two subjects in particular, namely, (1) English composition and correspondence and (2) shop and business accountancy. The training may be on the "sandwich" system, say, a fortnight on works, another fortnight at the institute, alternately. The tutors, of whom there should be, if possible, a double set, may follow the students to the works. In this connection reference is invited to the proposals on the "sandwich" system in a note by our colleague Lieut.-Colonel G. H. Willis, C I E., R E., printed as Appendix E.

There is a special reason why the "sandwich" system of alternate college courses and workshop experience should be encouraged in India. As at present there is a prejudice against school-trained men, the students should get used to the drudgery side of the factory system while at school. Many students who in their school days are accustomed to refined ways and enjoy long vacations turn away in disgust when they find they have to put in 8 to 10 hours' continuous work and are confronted for the first time with the hard realities of factory employment. They should therefore acquire the habit of concentrated work before they leave school.

The length of the course at present is three to four years. As only two years will be available for class work, that is, for the study of the theory of the subjects, the vacations should be correspondingly reduced. Vacations are given to diminish the strain of intensive mental work on the student but, as under the "sandwich" system, he will have practical work half the time, long Christmas and summer vacations will not be necessary.

Persons who have matriculated or passed the School Leaving Certificate examination should be ordinarily eligible for admission. Admissions may be permitted also by an entrance examination in which the practical ability of the candidate is tested. No boy under 16 years of age should be admitted.

Additional classes and courses. 54 The following classes or courses will be required at the Institute:—

(1) *Apprentices Diploma Course*.—A separate course of evening classes, extending over five years, may be established to enable apprentices and others who have to work for a living to obtain, by attending evening classes, a course of instruction. The subjects taught will be the same as those studied by the regular day students who complete their course in four years.

The candidates may be admitted after passing an entrance examination. The classes may be held on, say, three evenings in the week, about two hours each evening. There should be annual examinations and at the end of the fifth year, the student may be subjected to a final examination and, on passing it, may be presented with a diploma.

The apprentice who has the capacity in him will be able to get the same diploma, as the regular day students, by a slower and more laborious course. In this way it will be made possible for every student who is a wage-earner between, say, 17 and 22 years of age, to go through the full Institute course prescribed.

(2) *Normal Training Classes*.—Teachers for the middle and lower grade schools should be trained in the Technical Institute. Special provision should be made for this class of training side by side with the regular courses. Funds will be required to provide special additional teachers for normal training and to grant scholarships to students preparing to be teachers. The money required for this purpose should be met from the special grants under the head "Training of Teachers" included in the statement of yearly expenditure (*vide* paragraph 125)

(3) *Evening Lectures for Manufacturers.*—Evening classes should be held for an hour or two in which either the professors of the institute or private professional men might give weekly or bi-weekly lectures to men engaged in industries and industrial occupations. The organization of such lectures, for instance, in connection with the textile industry in Bombay or Ahmedabad, if highly practical, would be much appreciated. Every professor and teacher should take part in such lectures if only because they bring him into contact with men engaged in business and enable him to maintain close touch with the wants and difficulties experienced in industries and manufactures.

(4) *Special Courses.*—When the local Advisory Committee of the Institute desires to give instruction in any industry or craft of special economic value to the locality and the funds necessary to provide the teaching staff are forthcoming, the Committee should be free to establish classes forthwith for the purpose. This will enable students to receive the instruction specially desired for any new industry in which the public may find immediate profit.

(5) *Separate Classes for Training Artisans.*—A very large amount of building work is done in the country and special provision is necessary for training builders and architects, builders to construct houses, offices and shops, and architects to design and decorate them, to satisfy the needs of utility, beauty and comfort. Classes for training artisans, masons, carpenters, blacksmiths, painters, etc., in the highest grades of their craft should be held as appendages to the Institute.

The Institute should be also a training institution for preparing organizers and supervisors of handloom industry. There should be separate classes for these, and half their time should be given for theory and half for practical work. There should also be short night courses for subjects such as mechanical drawing and applied mathematics, to train up draftsmen, estimators, etc.

55 The Victoria Jubilee Technical Institute has been the central technological institute for the Presidency hitherto and numbers of students have been attending the institution from all parts of India. A full account of the working of this institution is given in paragraphs 43 to 45 of the Majority Report.

The Institute at present provides five courses of instruction:—

- Sanitary engineering and plumbing.
- Textile manufacture (spinning and weaving sections).
- Technical and applied chemistry
- Mechanical engineering
- Electrical engineering

The third course dealing with applied chemistry requires to be expanded to include such industries as tanning and manufacture of soaps, sugar and glass. The important courses are, however, those of mechanical engineering and electrical engineering. The Industrial Commission did not regard the work done in the Institute for mechanical engineers as quite satisfactory. And we are agreed that changes are required to secure a higher standard in both courses. We note that out of 121 students admitted last year two were graduates, and 45 had passed the Intermediate or First Year's examination; but we do not consider that the raising of the minimum qualification was desirable. It is the introduction of improved methods of teaching, such as the "sandwich" system, which should be looked to for the raising of the standard. When these changes are in operation we are confident that the value of diploma-holders will be greatly raised.

The total number of students attending the institute at present is about 300. Usually about two-thirds of the applicants are refused admission, the actual number admitted annually being about 120. The buildings, equipment

and staff should be sufficiently enlarged to provide for training double this number within the next three years, or earlier if possible

The number of subjects or courses should be increased after the survey of industrial occupations in Bombay referred to in Chapter III, or at least after an enquiry by a committee of leading business men and expert officials as to the industries and trades in which there is or will soon be a demand for experts and skilled workers

56. It is proposed to start classes of the Technical Institute grade in Karachi in conjunction with the Engineering School attached to the Dayaram Jethmal Sind College to give instruction in mechanical and electrical engineering, and technology. The industries in which instruction is to be given may be selected after consulting the leading business men of Sind

There is a railway workshop at Karachi and a number of private workshops, and even small shipbuilding yards. Karachi is a rising port with plenty of room for expansion and its industrial activities are bound to develop rapidly with the construction of the Sukkur Barrage and the direct railway to Delhi.

It is proposed to make provision for training about 100 students for the present. Eventually the institution may be constituted into a separate independent Technical Institute. If additional funds are available from local sources, a separate institute might be established from the start and the Engineering School absorbed in the Institute.

57. The workshops and laboratories attached to the Victoria Jubilee Technical Institute should be model institutions of their kind. The following description of the shops and laboratories attached to the New Central Technical School in Toronto (Dominion of Canada) will illustrate the great range of industrial interests and of industrial life to be kept in view in developing a Central Provincial Technical Institute, especially when the Institute is a centre of other smaller educational establishments. A complete equipment of this character will help Middle and Lower Industrial Schools to prepare for themselves models on a smaller scale.—

“The building trades loom up large in a survey of the industrial life of the City (Toronto). Consequently, the school contains 12 large shops, the smallest, 50 feet long and 30 feet wide, presenting the practical work of building construction. Carpenters, masons, bricklayers, cement-workers, plasterers, plumbers, steam-fitters, electricians, painters, decorators and cabinet-makers are all provided for in these shops.

“In addition, there is a great construction room, 80 feet long, 36 feet wide and 30 feet high, where the school will erect modern buildings, two at one time, with students' labour under the direction of teachers of building construction. The plans will be drawn in the classes of architecture, and the work of estimating, drawing tender forms and tendering will all form class exercises and furnish material for practical instruction.

“A machine shop, nearly 60 feet square, equipped with engine and precision lathes of the highest grade, a forge room with 20 forges, and a foundry with a cupola of one ton capacity, furnish opportunity for the instruction of metal workers.

“The work in clay products is represented in two large shops, one for the teaching of bricklaying and the moulding of brick, tile and terracotta and the other for the kilns used in burning these, and the art pottery.

“The decorating trades are recognised in the plaster and plaster decoration shops, the painting and wood-finishing shops, and the designing, decorating and paper hanging rooms.

“The engineering trades are represented in the steam and gas engine laboratory, the dynamo and motor laboratory, the applied mecha-

shops and testing laboratory and the great power rooms, which provide for the heating, lighting and ventilating the building, and for the distribution of power to the shops and laboratories.

" The chemical industries are presented in seven great laboratories, admirably equipped for the purpose. Metallurgical processes, photographic and lithographic arts, electro-plating and other electro-chemical industries, dyeing, tanning and soap manufacture, and many other related applications of chemistry are provided for in these rooms

" Architecture, machine drawing and machine design are taught in eight large, perfectly lighted drafting rooms accommodating 300 students at one time. Samples of building materials and details of construction work, models and measuring tools, and pictures of great architectural types are abundantly provided and are kept constantly before students. A blue-print room, with a rapid printing machine and ironer, makes possible the teaching of large classes interested in the same problem.

" Art in its many industrial phases is given a large place in the school. Nine large rooms are assigned to this work, all suitably equipped for advanced as well as for elementary work. Freehand drawing, industrial design, illustration, clay modelling, sculpture, the manufacture of jewellery, pottery and stained glass, wood-carving and china painting, painting with oils and water colours, are all represented under the most favourable conditions.

" A floor space, 110 feet by 30 feet, is given to a composing room and the equipment of these affords not only opportunity of doing the best work in the instruction of young printers but enables the school to do work of high grade in its own publications."*

We have quoted the Toronto example at some length because we are anxious that the workshops and laboratories at the Victoria Jubilee Technical Institute at Bombay should serve as a model and help to inspire institutions of all lower grades in the Presidency.

58 The workshops and laboratories attached to the Institute should have sections set apart to serve also as an Experimental and Demonstration Stations. In these stations, new ideas and inventions should be tested and actual manufacture carried on as far as possible under commercial conditions in some of the industries, practised in the neighbourhood, or for which raw materials are available in the locality. To these stations manufacturers may go to study the latest methods and processes of an industry and students may resort to receive short intensive courses of training likely to help them to secure employment on completion of such training.

Experimental industrial stations of this character may be attached to Middle Industrial Schools, one in Ahmedabad, another in Hubli and a third one in Poona or Sholapur. Local manufacturers and business men should be induced to form themselves into Committees, provide part of the funds needed and otherwise encourage the development of these stations. In this way the men engaged in giving instruction in workshops and laboratories and the manufacturers will be enabled to join hands to solve their industrial problems by mutual aid.

59. When the improvements suggested above both in equipment and standard of instruction are carried out, the young men trained at the Institutes will be more efficient and in greater demand. The "sandwich" system will automatically weed out young men not temperamentally fitted for practical careers. The additional number of students for whom provision should be made for the present in the two institutions together will come to 400. The capital outlay for buildings and equipment for this number is estimated at Rs 15 lakhs.

Provision is made for an addition of Rs. 2 lakhs to the recurring expenditure of the Victoria Jubilee Technical Institute and for Rs 75,000 for the new course to be established in Karachi

A moderate provision of Rs 1,25,000 is made for making a beginning with Industrial Experimental and Demonstration Stations in the Presidency. Where possible, the local manufacturers should be induced to subsidise them by voluntary contributions

The total recurring yearly expenditure on all these institutions is estimated at Rs 4 lakhs. More money can be most usefully spent and should be collected locally, if possible.

CHAPTER VI.

MIDDLE INDUSTRIAL SCHOOLS.

60 Next to institutions of the Technical Institute grade, come the Middle Industrial Schools, the primary aim of which will be to train skilled craftsmen to practise their trades, or to carry on minor or cottage industries. The difference between instruction in a Technical Institute and that in Middle and Lower Industrial Schools is that the latter are of a lower standard but teach complete trades and equip students to enable them to practise their trades or occupations independently. The students of the Technical Institutes on the other hand will be training themselves to service in an organised industry. Middle and Lower Industrial Schools cater for the artisan class and should teach mainly handicrafts and cottage industries, such as handloom weaving, furniture making, carving, boot and shoe-making, metal work, etc., for which there is considerable scope in the country.

The agricultural population of the Presidency is not fully occupied for five or six months in the year and, having regard to the climate and the agricultural situation, handicrafts and cottage industries are the most appropriate means of filling the cultivator's time profitably in the intervals of unemployment. This suits Indian conditions better and will help to create small industries as in France and Japan.

With the systematic training they receive, the students who pass from these schools will be able to adapt themselves, with very little additional practical experience, to fill minor technical and trade positions in organised industries also.

The ultimate aim is to locate one school of this type at the headquarters of each district and in every important industrial city. They may be known as "District and City Industrial Schools" to distinguish them from Lower Industrial Schools which may be appropriately designated "Town and Taluka Industrial Schools".

61 Candidates for admission to full day courses should have completed 13 years of age. The minimum general education required shall be that represented by III standard Anglo-vernacular or VII standard vernacular.

The conditions should be flexible in the beginning. Whenever a body of 10 to 20 persons apply for instruction in a particular subject or group of subjects, the school committee should be ready to accommodate them. The school should make itself useful to the people in the neighbourhood in every way in its power.

Instruction may be imparted both in English and the vernacular or in exceptional cases in the vernacular only. In the former case English composition and correspondence should be one of the compulsory subjects of study.

62 Amongst institutions of the Middle and Lower Industrial School grades, mention must be made of Apprentice Schools. The subject is dealt with in detail in the Majority Report, paragraphs 69 to 83, with which we generally agree. These are part-time schools intended to give general education, and instruction in

theory and practical demonstration, to persons already employed in factories. Where the factory is a large one, the school may be attached to it. In the case of such schools we are of opinion that the time spent by the apprentices in the classes for theoretical instruction should be within the workshop hours, and should be as early in the day as possible when the apprentices are still fresh and not fatigued by work. Such schools are attached to the G I P and the B B. and C I Railway Workshops in Bombay (*vide* short notes printed as Appendices A and B to the Majority Report) and have been found to be useful. As the Industrial Commission pointed out, the railway workshop with the technical school alongside provides an almost ideal course of training which has been developed more in other parts of India than in the Bombay Presidency. With the goodwill of employers there is no reason why the system should not be extended to other large engineering establishments.

The usefulness of such schools is considerably circumscribed by the inability of most of the workmen to take advantage of the instruction owing to their illiteracy but, as far as they go, they have proved a success and we would recommend their adoption wherever possible.

Special courses of instruction may be given to apprentices from factories in their 14th, 15th and 16th years to encourage continuation studies. These courses should in our opinion be made compulsory up to 16 in cities like Bombay, Ahmedabad and Sholapur. The instruction given may be six hours a week, either two mornings of three hours each, or one full morning and afternoon.

63. The Middle Industrial School may associate itself with large industrial establishments to give instruction on the Co-operative System. industrial establishments to give instruction on the co-operative system

The courses may be given in day time, the pupils being divided into two batches, one batch will be at school for a week or a fortnight while the other is at the factory. In this way the pupil will be able to earn half the wages, get the benefit of industrial training as well, and be qualifying himself all the time for higher occupations and wages.

64. A complete list should be prepared and maintained of the subjects Courses of Study. in which instruction may be given in the Middle Industrial Schools. The Advisory Committee in each locality may select, under expert advice, the subjects most useful to the neighbourhood in addition to any local industries in which instruction may be especially demanded.

An Industrial Survey should be undertaken, at intervals, of the principal industries and occupations in the neighbourhood, and statistics maintained of the volume and value of the products manufactured and the number of persons employed in them.

The following subjects, which are not to be considered exhaustive, may be included in the list :—

- | | | | |
|----|---|----|--|
| 1 | Carpentry, joinery and cabinet-making. | 12 | Surveying and mapping. |
| 2 | Pattern-making | 13 | Art and design. |
| 3 | General woodwork. | 14 | Modelling |
| 4 | Wood-carving | 15 | Plumbing and sanitary engineering. |
| 5 | Mechanical drawing and machine design. | 16 | Printing |
| 6 | Machine-shop practice and forge work | 17 | Basketry. |
| 7 | Power machine operating | 18 | Elementary pottery |
| 8 | Sheet metal work | 19 | Photography and lithography. |
| 9 | Electricity | 20 | Spinning, weaving, designing and dyeing. |
| 10 | Motor mechanics. | 21 | Ceramics. |
| 11 | Building construction and architectural drawing | 22 | Furniture manufacture. |
| | | 23 | Leather manufacture. |

The list should be supplemented by other industries and occupations peculiar to each local area.

There will be, in addition, the usual general subjects, such as English composition and correspondence, accounts, science, mathematics, drawing, elements of co-operation, civic duty, etc. Roughly speaking about one-quarter of the time of the pupils will be given to these general subjects, the remaining three-quarters being devoted to practical industrial studies and work, which will be the soul and centre of instruction.

Ordinarily the course should be three years but in particular localities or for special reasons, it may be extended to four years to enable the pupil to get a foothold in the industry or occupation selected by him

Our scheme would be incomplete did it fail to provide for the training of teachers for the Lower Industrial Schools and Mass Industrial Classes and Courses, and of sub-overseers and maistries required by Local Boards, Municipalities, public corporations, owners of property, etc.

65 The aim should be, as stated above, to have one Middle Industrial School in every district and in every important industrial centre. As an immediate step four fully equipped schools may be started in the first year in the Presidency proper, and one at Karachi. In five to ten years' time the number of such schools should be increased to the total we have estimated for, namely, twelve, for which we are confident there will be sufficient demand. Each of these schools should accommodate at least 100 students at first, increasing eventually to about 250. Some of these will be located in populous or important industrial centres like Bombay, Ahmedabad, Sholapur, Poona, Hubli, Karachi, Hyderabad and Sukkur, and the rest distributed regionally with due regard to the population to be served. The advantages of these schools when started should be widely made known by hand bills and posters throughout the district and special care should be taken that the courses of study are such as to provide recruits to industries and occupations in the neighbourhood of the school. The success of the schools will depend upon their training men for whom there will always be demand.

The cost of the 12 schools or of providing training for 3,000 pupils will be roughly Rs 5 lakhs to be reached in five to ten years. A sum of at least three lakhs should be expended on this type of school within the next three years.

In addition to this, the capital outlay needed for buildings and equipment is estimated at Rs 10 lakhs. It will be necessary at the outset to locate the schools in hired buildings, or in cheap sheds, so as not to postpone the benefits of training while the buildings are under construction.

66. Every Industrial School should conduct evening classes for the convenience of adults and for the continuation education of young persons who are obliged to work for a living. As already observed, wherever possible, employers should be compelled by law, as in advanced countries, to allow pupils below 16 to attend a school during day time, at least one day in the week, instead of in the night.

Under the Fisher Act in England, young persons are required to attend a continuation school or class up to the age of 16. Six years after the passing of the Act this age will be extended to 18.

Every instructor should take part in teaching at least one evening in the week as it will give him an opportunity of coming in touch with the difficulties of the artisans and the actual realities of industrial life.

Other supplementary classes, held night or day, may be attached to Middle Industrial Schools when necessary for the sake of economy of equipment and supervision

67. Usually every Middle Industrial School should have a local Committee of Management consisting of representatives of the local Municipal Council and the leading employers and business men connected with the local industries. This Committee will work in close co-operation with the local officers connected with industries and industrial education. After the schools are properly started, the officers should periodically inspect them and advise the Committee concerned but the responsibility for the administration and development of each school should be left to the local Committee.

68. The workshops and laboratory attached to the Middle Industrial School should be a small model of an Experimental and Demonstration Station already described. It should afford facilities for testing new processes and giving complete practical training in one or more minor industries or trades.

All technical schools should have suitable museums attached to them. Such museums should be stocked with every variety of available raw material in the locality together with particulars of quantities, rates, etc. In the case of existing industries there should be samples showing the different stages in the manufacture, and the finished products. Small industrial laboratories similar to those in the large experimental stations should be attached to district schools wherever possible. Where the school undertakes orders for articles like furniture, regular showrooms should be maintained exhibiting what the school can supply. Such museums and showrooms will serve to attract the attention of the public.

Existing Schools of this grade. 69 The existing schools of this grade are :—

- (1) Workshop classes at the College of Engineering, Poona.
- (2) Engineering classes at the Dayaram Jethmal Sind College, Karachi.
- (3) Sir J. J. School of Art at Bombay.
- (4) Ranchhodlal Chhotalal Technical Institute at Ahmedabad.

Of these, (1) and (2) teach mainly civil engineering and prepare sub-overseers for the Public Works Department. They are successful as far as they go; but we understand that recently they have ceased to attract a sufficient number of boys for want of prospects.

The School of Art in Bombay has a draftsman's course at present. The scope of this course should in our opinion be extended and classes for surveying and other civil engineering subjects added.

70 The Ranchhodlal Chhotalal Technical Institute, Ahmedabad, founded by the generosity of the late Mr Madhwal Ranchhodlal, was opened in 1910. The subjects taught are mechanical engineering, and cotton spinning and weaving; and the duration of each course is three years. The minimum age of admission is 15 years; and the candidate for admission must have passed vernacular standard VI or Anglo-vernacular standard III.

In paragraphs 54 to 58 the Majority Report discusses the working of this school and concludes with the following observations :—

“ We consider that the working and results of this institute have been unsatisfactory and that, while this is the state of “ middle ” industrial instruction in the second most important industrial city of the province, it is useless to contemplate extending it from 50 to 3,000 students, in areas where industries are undeveloped at an annual cost of five lakhs of rupees.”

The careers of past students, as detailed in paragraph 55 of the Majority Report compare, in our opinion, very favourably with those of young men with corresponding education in other walks of life. It is not the practical experience alone that raises their market value; the training in this school

which enables them to get a Boiler Act Certificate has much to do with it. The school serves a distinct purpose, and cannot be said to "have been a failure from every point of view."

The school can doubtless be improved. For instance, it can be placed more in touch with the employers of labour by the appointment of a local committee, and in other ways suggested in this report. It ought to train boys for the Boiler Act examination, at least as long the certificate is necessary. It ought to teach motor engineering, and also electric wiring for which there is considerable demand. The Principal told us that he wanted a sizing machine for the textile branch. There are no vernacular text books. The school is not known to have been of much use to the local match, soap or candle factories. These facts show that the quality of education imparted is capable of improvement, but not that the type of school would fail to attract more students, if run on approved lines.

Considering that a very large number of teachers have to be trained, and that there are 28 districts and 8 industrial cities, we do not think that the provision for 3,000 pupils in Middle Industrial Schools is at all excessive. The provision takes into account Apprentice Schools or Classes of the Middle School grade required. It is not alleged that students from the Poona Engineering College or the Victoria Jubilee Technical Institute have proved failures. The number of pupils seeking entrance into these institutions is always in excess of actual admissions. If the Middle Industrial Schools are properly organised, equipped, and conducted according to the special local needs, we do not see why it should be difficult to attract 3,000 pupils to them, or even more, in the next five or ten years.

CHAPTER VII.

LOWER INDUSTRIAL SCHOOLS

71. The Lower Industrial School will be a replica of the Middle Industrial School. The age of admission for the regular day scholars will be the same but the qualifications for admission and the standard of instruction will be lower. These schools are suggested to meet the case of the large number of boys whose general education will not extend beyond the IV standard primary.

For classes in which regular industries or handicrafts are taught, the age of admission should, as far as possible, be not less than 13 years and the preliminary qualification should be general education not lower than IV standard primary. As a rule the conditions of admission to a school of this grade should not be too rigid. Every one who can benefit by the instruction given in the institution should be admitted.

The object of a Lower Industrial School is to train skilled workmen and artisans for the various industries and industrial occupations. Equipped with such training, a workman will be able to improve the quality and speed of his work and earn a higher wage than his untrained fellow-workmen. The men trained in these schools should be able to start life as journeymen, or as assistants to men trained in Middle Industrial Schools, and become master-workmen themselves ultimately.

72. As we go lower in the scale of technical and industrial education we require a vast army of workmen for productive industries and trades to supply the needs of the population. The industries which can be most profitably practised in each locality should be specifically determined and taught in these schools.

As the figures relating to production will be a test of the progress of the locality in industries and industrial education, statistics should be maintained of the various industries and occupations practised in the area served by the institution.

A textile school should be maintained wherever there is a large cotton spinning and weaving mill. Instruction should be given primarily in indus-

tries and occupations which are most in demand by the large mass of the population in the neighbourhood. Nearly all the industries and occupations given in paragraph 64 under Middle Industrial Schools may be taught also in Lower Industrial Schools; only the standard of instruction will be more elementary.

There will be a great demand for training in the following occupations:—

(1) Building industries, such as masonry, brick-laying, plastering, wood-work, plumbing, carriage-building, metal work;

(2) Blacksmithing, boot and shoe-making, furniture-making, printing, dyeing, weaving, tailoring, pottery, etc.

These schools should teach one or more specific industries or handicrafts complete, so that the pupils as soon as they leave the school might find ready employment. The instruction should include the theoretical foundations of a trade as well as all the practical processes in the transformation of the raw material to the finished product.

The curriculum should include also, wherever possible, elementary mensuration with the accurate use of the foot-rule, a thorough grounding in simple arithmetic and some simple dimensional drawing. The proper use of suitable tools and their upkeep in efficient working order could best be imparted by means of skilled artificers demonstrating in actual practice in the villages throughout the Presidency. A trial of the value of these demonstrations should first be made in selected localities.

73. The instruction will be entirely in the vernacular, or the language of the majority of the boys of the school.

74. The holding of supplementary courses and classes as required in the neighbourhood should be part of the organization of the Lower Industrial Schools.

Persons engaged in industries or in wage-earning occupations should be induced to attend evening classes at these schools. The duration may be a minimum of three evenings of two hours each, or day classes may be held one full day in a week for the benefit of wage-earners. Continuation Schools in Japan work daily from 6-30 to 9 p.m., except on Saturdays.

The teachers will have the advantage of being in touch with industries if they took part in instructing pupils of this class.

These schools should provide continuation education to every one in the area who desires it. Gradually social pressure should be exercised to induce every boy between 13 and 18 to avail himself of such training.

75. Provision should be made in the same school for continuation courses in which young persons in their 12th and 13th years may be given prevocational training. The training will be educational in character and not vocational. It will be an extension of the vernacular general education with an industrial bias. Perhaps 75 per cent. of the work will be general and 25 per cent. vocational. We have already recommended that such training should be made compulsory as soon as possible in cities like Bombay, Ahmedabad and Sholapur.

As each pupil spends a minimum of about six hours per week in these classes, the same set of instructors can teach a large number of pupils.

76. The total number of residential areas classed as towns in the Bombay Presidency is 200. It is proposed to start Lower Industrial Schools in one hundred of these towns.

Each school should be able to accommodate about 100 pupils and there should be provision for about 10,000 pupils in all. Taking the expenses of one of these schools at Rs 7,000, the total cost will amount to Rs 7 lakhs.

A workshop should be attached to each Lower Industrial School, the size depending on the number of handicrafts and industries taught.

Provision is made in the estimates for a capital outlay of Rs 10 lakhs for buildings and equipment. The school and workshop may be of plain design and cheap construction and, till new buildings are constructed, they might be located in hired buildings. Additional funds should be secured locally wherever possible.

77. The first thing to think of in this connection is to train instructors for these schools. In the ordinary course they will be trained in a Middle Industrial School and for special appointments in a Technical Institute. As a large number has to be trained, a few special training schools will be needed at the start.

As in Germany, the instructors may be trained from two classes of persons; (1) from primary school teachers who may be given short industrial courses for the purpose, and (2) from master workmen engaged in industries who may be given short courses in methods of teaching.

78. We would recommend that a Provincial Committee be appointed to prepare text books in the vernaculars as speedily as may be feasible. The Committee should consist of three or four experts in technical education who evince enthusiasm for this work. As stated in another connection, we consider that English technical terms should continue to be used in all such text books.

79. Each Lower Industrial School should have a local Committee of Management composed of employers and business men engaged in the principal occupations of the locality. This Committee should be permitted to select groups of subjects for instruction in the school the selection being based strictly on the needs of the local industries and the temperament and aptitudes of the people.

Technical journals suited to this class of pupils should be subscribed for and arrangements made to translate articles for the benefit of the pupils of the Middle and Lower Industrial Schools.

The local School Committee should spread a knowledge of the value of industrial education and training and carry on propaganda to make the work of the school popular. It should encourage the attendance of pupils who are able to attend part-time, serve as an employment bureau, collect funds, hold exhibitions of local products and endeavour in every way to make the school of the utmost value to industries and occupations in the neighbourhood.

80. There are at present 28 schools for males which may be said to come under this class and which have not been a success in the past. This seems to be due to the present system of instruction under which a few processes, especially in carpentry, black-smithing, etc., are taught which lead to nowhere. The addition of a few cultural subjects to the curricula might enhance their usefulness. Some life should be put into these schools by bringing them into closer touch with industries and occupations and by arranging for employment for the passed pupils. A list of students passing out should be maintained and the students encouraged to keep in touch with the school and to look up to the staff for help in solving difficulties and doubts in the practice of their trade or profession. Instruction should be given in a complete trade or handicraft so that the student may not feel lost when he leaves school and has to depend on his own acquired skill for self-support.

81. Under this head may also be considered the Reay Art Workshops attached to the Sir J. J. School of Art, Bombay. This institution has classes in carpet-making, wood-carving, metal work, jewellery and stone-carving. The entrance qualification is usually the III standard vernacular, and the

pupils are mostly quite young boys. Two hours are allotted daily to drawing and four hours to practical work. The full course lasts three years; but the boys generally leave after about eighteen months and proceed to their trade. That these classes supply, in the circumstances, a want is shown by the fact that the pupils all belong to castes practising the crafts for which the classes cater with the exception of the carpet-weaving class. In the special circumstances the boys get their semi-technical education at a very early age before working at their trade, and some practical work must be given in conjunction with the instruction in drawing; but we are inclined to think that part of this time could be better spent in advancing the ordinary education of most of the pupils.

CHAPTER VIII.

SUPPLEMENTARY CLASSES AND COURSES

82 So far, we have dealt with regular schools for technical and industrial education. Such schools will in the nature of things be limited to urban areas and for a long time to come the education imparted in them must be necessarily confined to a very small percentage of the population.

It is impossible to have rigid curricula applicable to all the varied conditions of urban and rural life. The instruction to be given in the supplementary classes and courses will be of a very elementary character, and it is intended to train skilled and semi-skilled workmen, and artisans of the lower grades. Short courses, however imperfect, on essential general subjects, or special subjects of local interest will be needed in localities where the demand for the regular schools is small, or where the contribution required to maintain a regular school is beyond the resources of the local community.

83 Where the Compulsory Education Act is in force, children will leave school usually at the end of the 11th year after passing the IV standard primary but the great majority of children of school-going age have no opportunities of receiving any general education at all. To both these classes some degree of vocational training, however imperfect it may be, in their thirteenth, fourteenth and fifteenth years, will be a great boon in improving their working capacity and earning power. Such training may be provided in "Mass Industrial Classes" to be started both in urban and rural areas.

The hours of attendance may be left to the good sense of the people of the locality. Six hours a week is the usual minimum period, but the children should be induced to attend longer hours where they can, particularly in seasons in which employment is slack. In rural areas the seasons in which continuation classes are held may be regulated by the occupations of the people. Till compulsion is enforced by law, attendance should be maintained as far as possible by exercising social pressure.

Rules should be framed under which it should be possible to start an Industrial Class of this character wherever, say, 10 to 20 young persons desire training in a particular course or subject. The leading men of the locality should form themselves into a Committee forthwith, engage an instructor or instructors and start the class. Since the instruction is given for a minimum of six hours a week, one travelling instructor or journeyman would be able to look after such classes in three or four villages. The classes may be started in villages or in wards of cities and towns, in connection with Primary or Lower Industrial Schools, or independently where such schools do not exist. Under the proposed Technical Education Act, Government should be required to bear a reasonable fixed percentage of the cost of each such class.

There should be a Taluka Committee constituted under the Act, or regulations framed under the Act, to which the Committee referred to, or students who want a class or course or their parents may apply.

For instruction in villages, peripatetic instructors may be employed with advantage. An attempt made a short time back to popularise the fly-shuttle loom by itinerant demonstrators is reported to have met with success in certain areas.

Unless provision is made to spread industrial education in some such form all over the country to enable young persons to acquire an industrial bias during years of adolescence and later, the effect of any new scheme of technical education on the masses of the population will be inappreciable.

84. Continued education may be given in the shape of short courses Courses of Study. like the following :—

(1) Correspondence and book-keeping, business discipline and habits of good workmanship.

(2) Knowledge of tools, simple machinery and labour saving appliances, commonly required in agriculture and industries

(3) Instruction in occupations, such as those of—

Carpenters,	Plumbers,
Blacksmiths,	Electricians,
Tinsmiths,	Printers,
Tailors,	Moulders,
Painters,	Potters,
Bricklayers,	Dairymen,
Weavers,	Washermen,
Shoe-makers,	Barbers, etc

(4) Short courses in a local cottage industry or in building trades.

Other subjects of local interest may be added as required and their choice left to the discretion of each local area after taking expert advice

The training for a vocation should be the chief object while lessons may be given also in general subjects as required

Supplementary classes may be attached to primary schools wherever possible to provide training in industries or in agriculture or commerce for all boys and girls who are obliged to work for a living before they are 16 or 18 years of age. The classes may be held either during day time or in the evenings. No preliminary qualifications for admission need be rigidly insisted on. The attendance may be a few hours a week, the minimum not to go below six hours. The classes may be started by employing one or two or a few extra teachers. The people of the locality should be at liberty to start these classes of their own accord, Government allowing the school building to be utilised outside working hours and also a contribution of at least half the cost under rules prepared for the purpose. A short course like one of the four mentioned may be given for a total period of 6 months during seasons when people are unemployed. In course of time as the value of this class of education comes to be appreciated and funds become available, these may be developed into regular Lower Industrial Schools working in close association with local primary schools and local industries.

85. A large number of young men are apt to forget what they learn soon after they leave the primary school. An arrangement under which they receive a few hours training weekly will confer lasting benefits on them

The responsibility of Government is to give the boy some education or practical value to him in after-life, after he completes his compulsory primary education in his 11th year. In the twelfth and thirteenth years, he should be induced to attend continuation classes to receive further general education with an industrial bias. From the fourteenth year upwards his training should be vocational or industrial. Till some such arrangement is enforced by law as in advanced countries, young men should be induced by social pressure and the force of public opinion to submit to this kind of training.

86. The village population is often unwilling or unable to spare the services of boys to enable them to attend a continuation class. In such cases, the American practice of co-operative courses, connecting school instruction with employment, may be given a trial. The student workers may be made to work in pairs in a sort of half-time apprenticeship. While one is in school, his alternative may be in employment. One boy may be at school one week and in employment in the following week. In this way each boy gives half his time in a fortnight to studies and the other half to field-labour or other employment, the school and the employments will have the same number of boys engaged in each at any given time.

Many a parent, who might be disinclined to spare the entire time of a boy, would be willing to allow him to give half his time to his studies, provided the other half is spent in helping him or in some occupation which gives him a wage.

87. It is proposed to provide classes for 7,000 young persons in urban areas and for 10,000 more in rural parts. A sum of Rs. 6 lakhs has been provided in the estimates as the provincial contribution towards their upkeep. A sum of Rs. 10 lakhs is provided towards contribution to the capital outlay on buildings.

88. It has been suggested that classes for industrial courses of the Lower and Middle Industrial School grade should be attached to the ordinary middle and high schools in areas in which regular Technical and Industrial Schools cannot be started either through lack of funds or insufficient demand. Such classes may sometimes be started to test the local demand, but they will always be welcome in towns where, in their absence, the public would go without any industrial education at all.

The existing school buildings, equipment and laboratories of the middle or high school may be utilised outside the regular school hours, if necessary; and workshops, with the requisite instructors, and technical training classes, with the necessary teaching staff, may be added as required.

The teachers of science, drawing, etc., employed in these schools, may, wherever possible, be temporarily utilised for lecturing to the industrial classes. These classes will be at best a makeshift but, even so, they should prove a valuable aid in the initial stages of the new scheme.

89. Men engaged in industrial pursuits and business may take short courses in subjects of special interest to themselves or to a local industry. These courses may be of any grade and for any occupation from that of a chemist, or manufacturer of University standing, down to a mason or carpenter in the village.

These short courses are intended to enable persons who lead a busy life and who have no time or inclination to pass the regular examinations to gain, through popular lectures, the information and knowledge they need.

The courses may extend from a few weeks to six months or a year. They may be attached to existing colleges and schools and the instruction may be entrusted, when outside experts are not available, to professors and teachers engaged in those institutions. The latter may be paid extra remuneration for their services.

90. Many of these short courses will be held in the evenings. Evening classes will be required for the benefit of persons, adolescent or adult, who are in employment or who are otherwise unable to attend regular day schools.

The attendance may be for a couple of hours in the evenings for some or all of the six days of the week

Evening classes may be provided in the neighbourhood of industrial establishments to enable young persons to become skilled workmen or, if they are already skilled, to attain yet higher skill to qualify themselves for responsible positions in their several industries.

91. It is suggested that the agency entrusted with the development of technical education in future should prepare and maintain types of all the various schools, classes, etc., mentioned above, as well as of any others similarly needed. The object of each school or course, the curriculum, preliminary qualifications for admission, period of instruction, scale of teachers to be engaged, probable cost, both initial and recurring, etc., should all be specifically laid down for each distinct type. There should be types to suit every variety of conditions and resources.

The public should be encouraged to adopt these types with necessary modifications. The local authorities or private bodies or individuals concerned should be free to choose the type best suited to their requirements. Provincial and other contributions towards the upkeep of the institutions, etc., should be regulated, as is done in countries like Japan and Canada, by an Act of the Legislature.

92. Before leaving this part of the subject we desire to associate ourselves with the proposals in paragraphs 65 to 68 of the Majority Report as regards the education of half-timers. We are of opinion that such education should be compulsory and free, that the employment of half-timers should be made contingent on the employer providing the necessary school accommodation and that employers should be encouraged by generous grants-in-aid to undertake such education themselves.

At the same time we wish to point out that these schools hardly come under "technical education." According to the report of the Director of Public Instruction, 1919-20 (paragraph 55), 2,800 pupils are already receiving education in such schools, the expenditure being debited to "primary education." Any further increase in the expenditure should be met from the same source.

CHAPTER IX.

INSTITUTIONS FOR GIRLS AND WOMEN

93. We would begin by calling attention to one very serious obstacle in the way of women's industrial education, namely, the amount of illiteracy. The total female population in the Presidency (exclusive of Indian States) in 1921 was 9,153,144 and of those only 224,878, or 2.0 per cent, were literate. Even this percentage, small as it is, disguises the infinitesimal progress that has been made among certain considerable sections of the people as the following table will show:—

Lack of Elementary Education a serious obstacle.

Religion.	Total female population	Number of literates.	Number of literates per 1,000
Hindus	7,144,175	184,461	19
Jains	94,780	11,617	123
Zoroastrians	89,947	26,921	674
Muslimans	1,691,445	21,059	12
Christians	112,999	28,441	262
Minor Religions	69,848	2,389	34

These facts emphasise the urgent need for the rapid expansion of elementary education for girls by making it compulsory.

94. In the present transition stage, the careers for women are not defined or standardised. Among the middle and higher classes there are very few who work for a living. The women of the poorer classes are ignorant and earn a living by the cheapest and most primitive form of manual labour; and since the introduction of the factory system, many women and girls are employed as factory labourers and half-timers.

Among the agricultural classes women help their men-folk in field labour and care of the cattle; and among artisan classes, in the practice of their vocations or handicrafts. This they do in addition to attending to household duties, such as care of children, cooking, washing, dairying, etc.

Many thoughtful people believe that under the present secondary school course, girls get just sufficient smattering of education to raise their self-importance without acquiring any real knowledge or training of value for practical life. It is a national loss at present that no systematic training in home work is given to girls of the middle classes.

An idea of the number of women engaged in the various industries in the Bombay Presidency may be formed from the table in paragraph 33. The field of employment for women has undergone considerable expansion in the West, particularly since the war. More and more women are qualifying themselves as doctors, chemists, designers, sales-women, secretaries, clerks, etc., while typists' work is becoming more and more exclusively a women's occupation. Thousands of women are employed in organised industries and even on engineering works.

In this country, however, elementary education has to be spread first. The social usages connected with early marriage, standard of living, etc., have to undergo changes before a demand is created for an extensive system of vocational education for women.

All such education for the present has to be on a voluntary basis. Home work, *i.e.*, house-keeping and home-making, is a subject in which girls of all classes should receive training. Girls of the higher classes should be trained in ordering, adjusting, artistic furnishing, and management of the house, and those of the middle and poorer classes in elementary domestic occupations, such as sewing, cooking, laundrying, house work, etc.

By teaching home work we will be preparing better homes, higher culture, better mothers capable of bringing up healthy and intelligent children. We will be making better citizens of women and thereby helping automatically to raise the standard of living.

95 The courses should include (1) cultural, (2) home work and (3) vocational or industrial subjects. The following is a list of subjects, which however should not be regarded as exhaustive, of the two latter classes:—

Courses of Study.

Home work subjects.

Cookery	Domestic science
House-management.	Hygiene
Cost of living	Home medicines.
Sewing.	Nursing.
Laundry.	Midwifery.
Child study	

Vocational or industrial subjects.

(Three to six months' courses.)

Field-work.	Bamboo-work.
Textiles	Dairying
Mat-making.	Knitting.
Rope-making.	Painting
Lace-making	Weaving.
Embroidery.	Lacquer-work.
Basketry.	Domestic service.
Rattan-work.	

A complete list should be maintained, by the agency responsible for the development of technical and industrial education, of all the subjects in which organised instruction should be imparted. For each standard or class, a group of subjects may be prepared by selection from the list, suited to local circumstances. It cannot be too strongly emphasised that home work should form an essential training in all grades of women's institutions.

96 For some time to come few women are likely to seek technical education of the University grade to qualify for industrial careers and no special women's college of this grade will be needed. Those who want education of the University standard will attend the regular men's colleges. The only change needed to accommodate them will be the addition to the courses of study of a few special optional courses suited to the needs and aptitudes of women.

Technical Education of University grade.

97. To meet the wants of the girls and women population under present-classes of institutions. day conditions, the following classes of institutions are proposed :—

(1) *Higher Industrial and Art School*—We recommend the starting of one school of this grade in Bombay or in Poona to give training in industries, particularly in higher art industries, but chiefly for training teachers in home work and industrial subjects. The admission should be restricted to women who have obtained their full School Leaving Certificate, whether of the type accepted by the University or the alternative type hereinafter suggested.

The highest standard of instruction obtainable will be given in the subjects already mentioned. Other subjects of an industrial character will be added as required, such as drawing, designing and estimating, photography, upholstery, etc.

(2) *Middle Industrial Schools*.—Three schools of this type are proposed, one in Karachi and two in two other selected cities in the Presidency proper, chiefly with the object of training women teachers in home work and industrial subjects for the lower grade girls' schools. The subjects will be similar to those in higher industrial and art schools, though the standard aimed at will be lower.

(3) *Mass Industrial Classes*.—A large number of classes should be started wherever required, independently of any existing school, for giving girls and women courses of instruction of three to six months' duration at a time in house work, such as cooking, washing, sewing, dairying, hygiene, etc., or in a handicraft or minor industry.

A very large number of adult women of the poorer and labouring classes and also widows from the middle classes, who are thrown on their own resources, will be able by attending these classes to increase their earnings by acquiring some skill in an industry or occupation.

Classes should be provided in existing educational institutions for girls and women—

- (1) to give instruction in house-keeping, for houseowners,
- (2) to train house-workers and house-helpers,
- (3) to give industrial training for those who intend to engage themselves in an industry or a wage-earning occupation.

It will not be possible to start regular Lower Industrial Schools for girls and women on account of the cost. It will be easier to cover a bigger area by creating an industrial or home work branch in existing girls' schools wherever the need may be felt. To middle class girls and women who are not compelled to work a living, instruction in home work may be given, to all others, instruction in a vocation or industry together with the elements of house-keeping.

The branches or classes will be open part-time. The attendance will be voluntary. A woman who may be engaged in domestic work may be able to snatch a couple of hours or so for attending these classes, but in the present state of society it is too much to expect that any large number of women would be able to devote their whole time to school work.

Most of these classes and courses—even those attached to primary schools—will be utilised by girls and women who are 14 years of age or more. Girls of tenderer years are not likely to benefit by the regular vocational courses.

98. Anglo-vernacular schools should be able to help in and consolidate this work. The Committee are aware that for the type of girl found in the Anglo-vernacular school a course which leads to a University entrance examination has had a certain attraction; on the other hand, the percentage of girls who complete the course successfully is very small. Such a course is unquestionably necessary in order to provide teachers, doctors, etc., and to meet the demands of the cultured classes. It cannot, however, be denied that a course complete in itself and calculated to turn out a girl with some general culture and at the same time a training that will make her an intelligent and competent manager of her household would be of greater benefit to the majority. It is, therefore, recommended that special encouragement should be given to all schools desirous of undertaking a new secondary course in which the medium of instruction and examination would be the vernacular, English being taught as a subject, and in which home work and the domestic arts would figure prominently. In other words, the ordinary secondary schools may be divided into two sections, one section for women who are aspiring to become University graduates and the other, the larger section, for those who want only general culture with a knowledge of domestic economy and home work. A special School Leaving Certificate at the end of the course could be arranged for.

99. The following is a rough estimate of the cost of the institutions and classes proposed:—

	Rs. lakhs
<i>Girls' and Women's Education.</i>	
Technical High School in Bombay, 150 pupils	1 05
Middle Schools (3 schools with 200 pupils each), total 600 pupils	1 20
Lower Schools, 1,200 pupils	1 00
Supplementary Schools for Girls (both urban and rural), 3,100 pupils	1 50
Women's Mass Industrial Classes (both urban and rural), 4,000 pupils	1 25
Total	6 00

Private enterprise in this direction will need to be liberally subsidised for some years. The Seva Sadan in Poona which is a purely indigenous institution is being helped by Government in this way.

The management should be entrusted more and more to local Advisory Committees of women wherever possible.

Propaganda should be encouraged to spread sound ideas as to the character and quality of vocational education to be imparted to girls and women and to make such education popular.

100. The establishment of welfare centres in the neighbourhood of mills, if successfully inaugurated, might do much to improve the lot of the girls and women employed therein. These establishments might raise the

Associations for welfare work.

standard of living by inculcating habits of cleanliness, and teaching cooking or sewing and elementary hygiene. They would be helpful chiefly to the half-timer, but might attract and help adults also, if they provided them with facilities for cooking their own food under intelligent and sympathetic supervision, and helped them with the making of their clothes and the care of their young children. Efforts on these lines would be best made by voluntary agencies, and, where effective, would be deserving of public support. Such centres would not exclude women in the vicinity employed in small industries, but it might be possible to do more for some of them. All those engaged in earning a living by various forms of needlework, to mention one occupation only, would, no doubt, benefit greatly from skilled instruction and from organization which would assist in the disposal of their work. These organizations would be able to advise what was saleable and what was not, discourage misdirected efforts and demonstrate the commercial value of skilled handwork. Associations which undertook instruction would have few sources of income beyond endowments and subscriptions and would require liberal aid. Their sales departments should aim at being self-supporting, but would need loans to tide them over the early stages. Experiments on these lines have already been made with some success as in the case of the Seva Sadan at Poona, much good, it is thought, could be effected by encouraging such efforts.

101. In order that welfare work and women's industrial education may proceed as far as possible under the guidance of women themselves, we recommend that the formation of women's associations should be encouraged. Women's institutes have come into existence in Canada and Belgium and young women's associations are common in Japan, the primary object of these being to secure the social, economic and moral improvement of country life. The following account of the Women's Institutes in Belgium taken from a report made to the Board of Education in England will explain the object and working of one such class of organizations :—

“ The Women's Institute is an association of farmers' wives, daughters and sisters, who meet periodically for the following among other purposes : to hear lectures, read papers, and study books on professional subjects, *i.e.*, dairying, poultry-keeping, gardening and all the minor rural industries, on cooking, laundry work and dressmaking; on household sanitation, home hygiene and ambulance methods; on the choice and care of furniture and pictures; on the rearing and education of children; and on any other means for the improvements of country life. The institutes have also a recreative side, and attention is given to music and literary subjects ”

The women work in association with the State Agronomist, the peripatetic classes, and the local schools of domestic economy. Assistance is given by the Government, under certain regulations, and the members pay a small subscription, but as the conference and discussions are chiefly addressed by members, by teachers in State Institutions, and by others who give their services free, the expenses are not great. The report goes on to add :—

“ There can be no doubt that these institutes will exert an incalculable influence upon the social life of rural Belgium ”

Section III.—Organization, Cost, etc.

CHAPTER X.

ORGANIZATION AND ADMINISTRATION

102 Clause 6 of the terms of reference requires that provision should be made for the administration and supervision of the entire scheme proposed, and clause 5 invites suggestions for enlisting the co-operation of public and private institutions and agencies and of advisory committees of leading men in the professions, for promoting technical education and industrial training

103. In their Resolution No 1850, dated the 27th June 1913, Government have recognised the Victoria Jubilee Technical Institute as the Central Technological Institute for the Bombay Presidency and vested the control of the lesser technical institutions of the Presidency in a Committee of Direction composed as follows :—

1. The Director of Public Instruction.
2. The Chairman of the Board of the Victoria Jubilee Technical Institute.
- 3 & 4 Two members of the Victoria Jubilee Technical Institute.
5. The Principal of the College of Engineering
- 6 The Principal of the Victoria Jubilee Technical Institute.

The Director of Industries was added to this list later. This Committee regulates the courses and standard of instruction at the several schools, arranges for periodical inspection and examination, and recommends grants-in-aid to be paid to such schools. The Victoria Jubilee Technical Institute and the Committee of Direction for Technical Education thus supervise and control, in some measure, directly or indirectly, all the aided and state technical and industrial education given in the Presidency, except a special type of instruction and demonstration in cottage industries which is controlled by the Department of Industries. The Victoria Jubilee Technical Institute corresponds direct with Government in the Department of Education. The Committee of Direction is consulted not only by the Director of Public Instruction but also, on occasions, directly by Government

We consider that this Committee should make room for a more representative body, with a strong non-official majority, in keeping with the spirit and requirements of the times.

104 In future any organization that may be started to promote industrial education should be in close touch with the Department of Industries and the industrial activities of the people. These are inter-related and their work should be properly co-ordinated and brought under the control of one and the same organization. The Department of Education should be also brought into organic touch with the same.

105. We therefore recommend that there be brought into existence a Provincial Development Council, presided over by the Minister of Industries, for all development work connected with industries and industrial education. In order that this work may be carried on in close contact with the requirements of the public, the Council should have a strong non-official majority of persons associated with industries and industrial occupations. Close association with employers and business men will ensure that the training given is of the right type and that the products of the institutions will find ready employment. Representatives of the University, representatives of labour and the principal officials and experts of the Departments of Industries and Education should have seats on this Council.

106. The Development Council may meet about once a quarter but the ordinary work of control and direction may be left to a small Executive Committee, that is, a Sub-Committee of the Council, consisting of a Chairman and three members

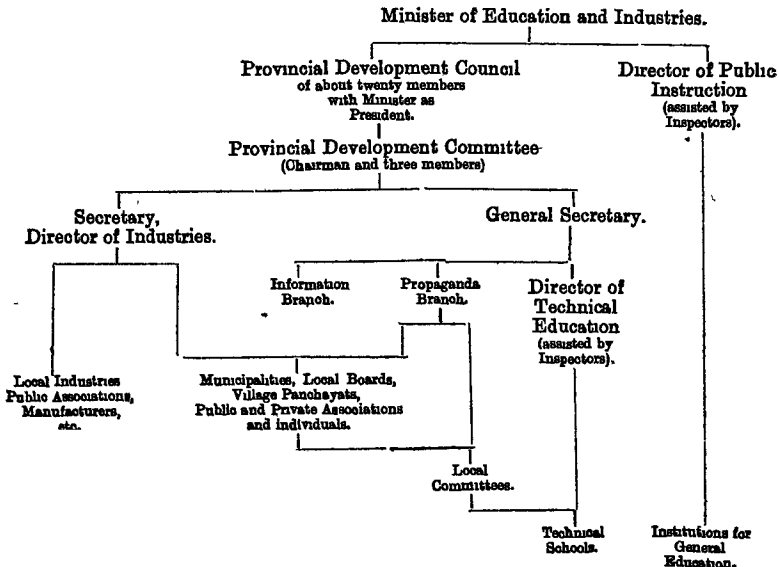
The work both of the Department of Industries and of the agency in charge of industrial education should be carried on under the direction of this Committee. The Director of Industries will act as Secretary to the Committee as regards the operations of his Department, which will keep him fully engaged. There should be a second or General Secretary to the Committee who will attend to the work of organising technical and industrial education and carry on propaganda and correspondence with public associations, Municipalities, Local Boards, etc., for furthering local needs, stimulating local effort and co-ordinating activities in respect of industries and industrial education. He will help to bring into closer relation the activities of Government Departments, public associations and agencies and private persons, but his chief work will consist in collecting and circulating up-to-date information and carrying on propaganda to educate the public as to the needs of the country in all these respects

Only men of known sympathy and enthusiasm should be employed as members of the Development Committee. There should be provision for replacing a member as soon as it becomes clear that he is unable, from whatever cause, to give sufficient time or attention to the work. For the first few years at least, the Members of this Committee should be paid a suitable fee or honorarium for performing these executive duties.

107. The organization and functions of the proposed Development Committee in relation to the three departments or agencies connected, respectively, with technical education, industries and general education are graphically illustrated by the following diagram :—

DIAGRAM I

Illustrating the proposed Organization.



108. There should be a Director or Superintendent of Technical and Industrial Education for the Presidency, with one Controlling and Inspecting Staff. Inspector for each Division and an Assistant Inspector or Supervisor for each District, as required.

109. Institutions of the Middle School grade and above under the direct control of Government should be maintained wholly from Provincial funds. Other local institutions will be maintained by municipal or local boards, public associations, private firms or individuals. It is to make suggestions to local authorities and private bodies and stimulate local initiative and effort that propaganda by the Development Committee will be needed. Ordinarily the Provincial Government should contribute at least one-half the cost in the case of institutions in municipal areas and three-fourths in local board areas.

110. At the outset, in the interests of economy the existing educational buildings and equipment should be utilised for the new scheme of education to the utmost extent possible. Classes should be held in rented buildings till funds are available and a sufficient number of new buildings are erected.

111. Close and cordial co-operation should be maintained and ensured between the new organization and the existing system of general education. Supplementary classes and courses attached to existing educational institutions should be primarily under the control of the Department of Education. But the curricula of studies and methods of instruction should be prepared in consultation with, and under the supervision of, the local officials of the Department of Technical and Industrial Education.

The same procedure should hold good in the case of supplementary classes and courses carried on under the auspices of Local Boards, Municipalities, private associations and individuals.

112. As far as possible, every institution imparting technical and industrial education, or group of such institutions in any local area, should be under the supervision of a local committee consisting of the local representatives of the Departments of Industries and Education as well as of business men, employers and labour. There should ordinarily be one such committee for a group of institutions in a city or town, but there may be more than one and, in special cases, an individual institution may require a special committee for itself.

Local committees will be needed for the highest as well as the smallest institutions of this class from the College of Engineering or Technology to a village practical training class. The constitution and rules of these committees should not be very rigid at the outset.

The committee will usually be advisory at first, but any committee may be entrusted with full executive control for a term of years under the rules of the Department, if the men who compose it should show sufficient capacity to administer efficiently the institutions in their charge. This control should lapse, unless renewed, every two or three years.

113. Very special measures are necessary to commence training teachers and inspectors at once. For this purpose liberal provision should be made for normal training classes in the Engineering College, Poona, the Victoria Jubilee Technical Institute and the new Technical Institutes and Middle Schools to be started under the present proposals. The provision should be based on the estimated requirements of the Presidency within the next five or ten years.

Liberal provision should be made also for expenditure in this respect and for accepting applications for training as they come in. Routine methods should be set aside for some time and every effort made to provide as large a number of teachers as possible. Special training schools should be established, as has been done in Germany, to supply this need either by giving elementary teachers short industrial courses and making them acquainted with factory operation, or by taking skilled workmen from the factories and giving them short courses in methods of teaching.

114 Persons who have had engineering and technical education and training in England, America and other foreign countries will be the most suitable persons to be employed in the work of instruction and direction. They will be best qualified to adapt foreign systems of education and modern requirements to the needs of the local population. First appointments should be made by inviting applications from qualified men by advertisement both in England and India. Special provision should be made to depute picked young men for receiving training in English and foreign institutions.

The whole success of the scheme would depend upon getting the right type of men to constitute the Provincial Development Committee in general, and for the office of the General Secretary in particular, and only men who have had experience of foreign countries and who have a genuine enthusiasm for spreading this class of education should be appointed.

115 It should be recognised that instructors in technical schools have to be paid salaries higher than those given to teachers in ordinary schools.

One way of keeping down cost under this head will be to allow professors and instructors to take up private work under reasonable restrictions at the discretion of the controlling authorities. This will also help them to be in touch with up-to-date practice in their respective subjects. The fees realised might be divided between the institution and the members of the staff employed on the work.

To enable them to enlarge their vision and to keep themselves informed of the latest developments in foreign educational institutions, selected professors and instructors should be given study leave, and other facilities in the shape of money grants, to enable them to visit foreign countries at regular intervals of five to seven years.

116. It is suggested that means should be found to secure employment for youths as soon as they are trained, at least in the early stages of the working of the scheme. Nothing will contribute more to the success of this class of education than the provision of an employment agency or bureau which keeps touch with employers and provides ready opportunities of employment to trained youths. Each school or institution may appoint a separate committee of its own for the purpose, consisting of instructors with the headmaster or superintendent as chairman. The committee will maintain a register of the careers of students and endeavour to find employment for as many of them as possible. Such committees or bureaus will have real work only for four or five years at the outset. After that period, with ordinary progress in industrial occupations, it may be confidently expected that the demand for trained men will overtake the supply and continue to remain so.

117 Reference has been made to the propaganda to be carried on by the Secretary to the Development Committee.

Every country studies foreign systems of education before choosing its own. The organizers of the new scheme should be in close and constant touch with developments in this respect in advanced countries.

Approved foreign practice and the advantages which have accrued from the pursuits of industries and industrial education should be brought home to the people by means of a journal maintained by the Committee and by

itinerant lecturers and circulation of leaflets and foreign periodicals on the subject. The officers of the department should frequently meet the people in conference to explain the facilities provided and stimulate effort on the part of the public.

The scheme of education in this country will continue to be defective if, in framing it, the latest developments in this respect in advanced countries are ignored. Ultimately it is bound to approximate to foreign systems, but if necessary precautions are taken from the outset, costly failures will be avoided.

118 We are strongly of opinion that Government should follow the example set by advanced countries and pass a Technical Education Act, through the Bombay Legislative Council, making provision for the scheme of technical education as finally approved by them. The more important recommendations in our scheme should be embodied in the new Act. The Act should provide that the annual expenditure should not fall below a fixed minimum figure and that the payment of grants-in-aid should follow automatically in the case of institutions started and maintained by Local Boards, Municipalities, public bodies and private individuals in accordance with approved regulations.

To give an idea of how this is attempted in other countries, a copy of the Technical Education Act of Canada, 1919, is printed as Appendix K.

We find that in Japan, technical education is regulated by an Imperial Ordinance. In England and Wales, matters connected with technical schools are arranged under Regulations of the Board of Education which are laid before Parliament. Technical education in Great Britain was consolidated and to a large extent organised by the Technical Institutions Act of 1889. The Fisher Act of 1918 has given a further impetus to technical education.

In the provinces of Canada, all art, industrial and technical schools and courses are established under Acts of the provincial legislatures. The latest legislative measure of this type is the "Vocational Education Act, 1921," in the Province of Ontario.

In the United States of America under the Smith-Hughes Act, Federal appropriations ultimately aggregating over 13 crores of rupees are made available for contribution to the various states, according to a fixed programme, during the ten years 1918 to 1927 for the promotion of vocational education in agriculture, in trades and industries, and in home economics, including the preparation of teachers.

The same Act* creates a Federal Board for Vocational Education. This Board consists of seven members, including the Secretaries of Agriculture, Commerce and Labour, and the United States Commissioner of Education, *ex-officio*, with three members appointed by the President and confirmed by the Senate, ultimately for a term of three years each. One of the appointed Members is a representative of the manufacturing and commercial interests, and the third of those of labour. The Board selects its own Chairman each year."

119 In this connection we desire to submit one important suggestion incidentally and that is, that until it is proposed to have a parallel Development Council, etc., for promoting agriculture, the Department of Agriculture might also be advantageously brought under the Minister who controls industries and technical education. Agriculture is the most important industry of the country and technical education for promoting agriculture is equally important. If the two great agencies of production, *viz.*, agriculture and industries, and the technical education needed for both are brought under one Minister and one Development Council, the entire responsibility for increasing production, the supervision of factories, farms and technical schools in the Presidency will be in the hands of one responsible Minister and

Agriculture and Agricultural Education.

* Report of the Commissioner of Education, Washington, 1918, pp. 20-21.

one semi-official public body. The heads of the three Departments, *viz*, Industries, Agriculture and Public Instruction, will serve on the same Development Council and co-operate with one another and with the leading business men in the common work of increasing the production of the country.

CHAPTER XI.

COMPLETE COST OF SCHEME AND STAGES OF DEVELOPMENT

120 Government have called for a comprehensive scheme of technical and industrial education adapted to the needs of this Presidency, but we have recognised from the outset that the chances of any such scheme materialising in the present state of Provincial finances depend on its extreme moderation. An expensive scheme, however beneficial to the country in the long run, might at this stage prove too costly even to be given a trial. On the other hand, a cheap one, to the acceptance of which no financial difficulties could be raised, might lead to its own failure, by its unsuitability and insufficiency. From the beginning, therefore, the financial limitations have been carefully borne in mind, and provision is made only for the barest necessities in framing the detailed proposals embodied in Section II of this report.

121 We calculate that approximately a total capital outlay of Rs. 98 lakhs will be required for the construction of buildings and the provision of equipment for the institutions and courses proposed in our report. Distributed by principal heads of the estimate, the cost will be as shown below :—

	Rs lakhs.
Institutions of University grade	30 00
Technical Institutes	15 00
Middle Industrial Schools	10 00
Lower Industrial Schools	10 00
Supplementary Classes and Courses	10 00
Institutions for Girls and Women	15 00
Training of Teachers (special provision)	5 00
Supervision, direction, propaganda, etc.	3 00
Total	98 00

To keep down the cost, we would recommend that the buildings should be as plain as possible. Structures with any pretensions to architecture, besides being costly, will take more time to build. In order that education may not be delayed while the new buildings are getting ready, a start should be made in private rented buildings wherever obtainable. The buildings themselves should be pushed through expeditiously and the whole of the provision of Rs. 98 lakhs expended in five or six years.

122 The recurring expenditure, proposed under the same eight heads of the estimate in five to ten years from the commencement of the scheme, is given below together with the approximate number of additional pupils who will receive training when the scheme is in complete operation :—

	Number of additional pupils.	Rs lakhs.
Institutions of University grade	550	7
Technical Institutes, etc	400	4
Middle Industrial Schools	3,000	5
Lower Industrial Schools	10,000	7

	Number of additional pupils.	Probable cost. Rs. lakhs.
Supplementary Classes and Courses	17,000	6
Institutions for Girls and Women	9,050	6
Training of Teachers (special provision)	...	3
Supervision, direction, propaganda, etc.	...	3
	<hr/> 40,000	<hr/> 41

The number of boys under training in industrial schools and engineering institutions in 1920-21 was 2,301, or roughly 1 per 10,000 of the population. If our scheme materialises, this number for both boys and girls will be increased to 42,301, or in the ratio of 21 per 10,000

We have assumed that the increased outlay proposed for the education of half-timers and for manual training in Middle Schools will be met from the grants for general education and have made no provision for it in our estimates

We have already suggested that Government should incur all the expenditure on institutions of and above the grade of Middle Industrial Schools, and that for institutions, classes or courses of lower grades, the Municipalities, Local Boards, manufacturers and business associations and individuals should be induced to contribute liberally. At the end of the term of 10 years mentioned, it should be possible to transfer a substantial proportion of expenditure on the latter class of institutions to the local authorities and the public

In order to make an effective start it is necessary that Government should incur the whole of the expenditure recommended and lead the movement till the public are able to realise the wisdom and benefits of expenditure on this form of education. After the Technical Education Act suggested by us is passed, regulations should be framed for sanctioning grants in aid of institutions started by local authorities and private individuals. In the early years of such enterprises, quite 50 to 75 per cent. of the entire cost should be guaranteed for a term of years.

The expenditure in 1920-21 on technical and industrial schools, etc., was Rs. 7,72,000, of which a sum of Rs. 5,25,000 was incurred from Provincial revenues. The total yearly outlay on the scheme will rise to Rs. 49 lakhs at the end of 10 years and the share of this to be borne by the Provincial revenues will probably not exceed Rs. 32 lakhs.

The Provincial expenditure on general education which was Rs. 74,80,000 in 1915 rose to Rs. 1,49,10,000 in 1920-21; while within the same period the expenditure on technical education increased from Rs. 3,65,000 to Rs. 5,25,000. Considering, in view of world competition, the importance of technical education and industrial training to the people at the present time, an addition of Rs. 32 lakhs to be reached in five to ten years' time cannot but be regarded as an extremely moderate provision.

123 The Committee has been asked by Government to indicate in its Final Report the definite stages according to which the whole programme laid down by the Committee should be worked out. In our opinion, absolutely the first step to take will be the appointment of the Development Council and Committee, with a competent General Secretary, a Provincial Superintendent for Technical and Industrial Education and an expert staff. The very first duty of this agency will be to elaborate the further details of this scheme. Only persons who have considerable knowledge and enthusiasm for this class of work should constitute this agency. The immediate principal requirements are buildings, equipment and staff, and unless there is continuity of policy and enthusiasm in the controlling body, unnecessary delays may take place in the erection of buildings or provision of equipment and staff.

If the capital outlay necessary is forthcoming, buildings can be provided as fast as the Development Committee is able to formulate detailed plans. In our opinion the outlay on buildings should not be less than Rs 15 lakhs per annum from the second year of the commencement of the scheme. The first year will be spent in preparing designs with the help of expert agency.

Perhaps the largest and most important preliminary will be the training and supply of teachers. For this purpose we consider that the larger institutions should be set to work full speed. The College of Technology should be started at once; the College of Engineering at Poona and the Victoria Jubilee Technical Institute at Bombay should both be extended to the utmost limits permissible to admit the additional number of students for whom we have made provision. A large number of picked students should be deputed for training in English and foreign Universities and Engineering and Technological Colleges. Even if only a few of these turn out brilliant successes, the Presidency will have secured the class of men needed to give an impetus to technical education. If the training is commenced at once, a very useful step will have been taken in advance. Some of these students will be available as Assistant Professors and teachers in five or six years' time.

We consider that a sum of Rs 10 lakhs should be expended in the next official year, *i e.*, 1922-1923, Rs 15 lakhs in the following year, and Rs 26·5 lakhs in 1924-1925.

Distributed by main heads of our rough estimate, the figures will stand as follows:—

	First year, 1922-23.	Second year, 1923-24.	Third year, 1924-25
	Rs. lakhs	Rs lakhs.	Rs. lakhs
Institutions of University grade	20	20	50
Technical Institutes	10	15	25
Middle Industrial Schools ..	10	10	30
Lower Industrial Schools	0·5	10	40
Supplementary Classes and Courses	05	20	30
Institutions for Girls and Women	05	20	30
Training of Teachers (special provision)	30	30	30
Supervision, direction and propa- ganda	15	25	30
Total addition to present expenditure ...	100	150	265

The Development Committee and staff should prepare types of industrial schools and classes with syllabuses and estimates of cost for local authorities and committees to choose from. In this work we consider the services of local Public Works Engineers and of Europe trained technological experts will be invaluable and should be sought out and utilised.

124 We have seen that an additional yearly outlay of Rs. 265 lakhs will be required at the end of three years and of Rs 41 lakhs in five, or at any rate before the end of ten years; besides a separate lump sum capital outlay of Rs. 98 lakhs for buildings and equipment in the same period. The initial outlay in the first two years will be comparatively heavy, because sufficient money has not been spent on this class of education in the recent past. If Government and the public make it worth their while, mechanical engineers and technological experts might be induced to start private colleges and schools of their own as a business proposition. Institutions like the Victoria Jubilee Technical Institute and the Ranchhodlal Chhotalal Technical Institute owe their origin to the public spirit of the mercantile community inspired by Government, and we have no doubt, once the public are awakened to the advantages of this training, Local Boards and Municipalities will willingly bear a share of the financial burden.

If, as we fear, it be found that the outlay needed in the first ten years cannot be met from current revenues, we consider that rather than allow education itself to be retarded, a Provincial development loan should be raised for the purpose. The loan may be repayable in equal instalments of sinking fund and interest charges in about 30 years. The Bombay Presidency has already made a good start in industries without proper technical aid. An expenditure on industrial training on the scale recommended is urgently needed and is sure to give an impetus to industries and prove an investment of great value in the future economic interests of this Presidency.

125. The financial provision recommended in our Interim Report has in the bulk, met with the unanimous support of the Members of the Committee and, as the abstract of cost which accompanied that report represents a summary of the proposals discussed in this Chapter, we feel we cannot do better than reproduce it here (with slight verbal alterations) in its entirety:—

No.	Main Heads	Approximate number of pupils (additional provision)	Additional expenditure to be reached in 5 to 10 years		Additional expenditure to be reached in 8 years.	Capital outlay on buildings and equipment.
			By item	Total.		
1	2	3	4	5	6	7
			Rs. Lakhs.	Rs. Lakhs.	Rs. Lakhs.	Rs. Lakhs.
I	Institutions of University grade—					
	(1) Improvements to College of Engineering, Poona	150	1-00			
	(2) College of Technology	400	4-00			
	(3) Provision for research ... ..	...	1-00			
	(4) Foreign deputation of students ... ..	...	1-00	7-00	5-00	80-00
II	Technical Institutes—					
	(1) Improvements to V. J. Technical Institute	800	2-0			
	(2) Classes of Technical Institute grade for Sind (to begin with mechanical and electrical engineering)	100	0-75			
	(3) Industrial Experimental and Demonstration Stations ... ..	...	1-25	4-00	2-50	15-00
III	Middle Industrial Schools— including Apprentice Schools (12 Schools and 8,000 pupils)	8,000	5-00	5-00	3-00	10-00
IV	Lower Industrial Schools— including Apprentice Schools (100 Schools and 10,000 pupils)	10,000	7-00	7-00	4-00	10-00
V	Supplementary Classes and Courses— (urban 7,000, rural 10,000; or a total of 17,000)	17,000	6-00	6-00	3-00	10-00
VI	Institutions for Girls and Women—					
	Technical High School in Bombay	150	1-05			
	Secondary Schools (3 schools with 200 pupils each)	600	1-20			
	Primary Schools	1,200	1-00			
	Supplementary Schools for Girls (both urban and rural)	8,100	1-60			
	Adult Women's Industrial Classes (both urban and rural)	4,000	1-25	6-00	3-00	15-00
VII	Training of Teachers (special provision) ... ..	...	3-00	3-00	3-00	5-00
VIII	Supervision, direction, propaganda, etc. ... ..	...	...	3-00	3-00	3-00
	Total	40,000	..	41-00	26-50	98-00
	Present expenditure (approximate) ... ..	..	..	3-00	3-00	..
	Total, including present expenditure ... ..	..	..	49-00	24-50	98-00

We are strongly of opinion that the expenditure—both capital and recurring—shown under the various heads should, if our scheme is to be given a fair trial, be incurred in full, and within the limits of time indicated against them.

CHAPTER XII.

GENERAL EDUCATION IN RELATION TO TECHNICAL AND INDUSTRIAL EDUCATION

Qualification for Admission to Industrial Schools. 126 The existing grades of education are divisible into five stages:—

- (1) Lower primary, standards I—IV
- (2) Upper primary, standards V—VII
- (3) Anglo-vernacular middle, standards I—III.
- (4) Anglo-vernacular high, standards IV—VII
- (5) University

Existing lower grade industrial schools either take boys who have completed the lower primary stage, or demand some lower or even no educational qualification. They are compelled to adapt their rules to the circumstances of the people around them, and the prescription of a general hard and fast regulation is undesirable. At the same time as a boy cannot before 12 profit materially from trade instruction, and he should have passed the IV primary standard at that age, it should be recognised as an aim in the future that the minimum qualification for admission to a Lower Industrial School should be raised, wherever possible to the completion of IV standard primary.

As regards supplementary classes and short courses, we consider that there should be as few restrictions against admission as possible and that any person who feels he can benefit himself by attending a course should be permitted to do so.

Ordinarily no attempts should be made to give industrial training to boys who have not completed 13 years of age. In the case of wage-earners a continuation school course should intervene between the time, if any, in which they complete the lower primary course and until they reach the age of 13. This continuation course may consist of further cultural education besides drawing and manual training.

Recruits for the day classes of Middle Industrial Schools should have passed the Higher primary course, standards V—VII, or the middle Anglo-vernacular course, standard III. The instruction given in these schools will be mainly in the vernacular, although English may be one of the subjects the study of which should be made compulsory.

Boys who desire to enter the Technical Institute should complete the Anglo-vernacular high school course, standards IV—VII, preferably on the "modern side" as suggested in the sequel.

The minimum qualification for entrance to a Technological College will be the Intermediate Examination of the University.

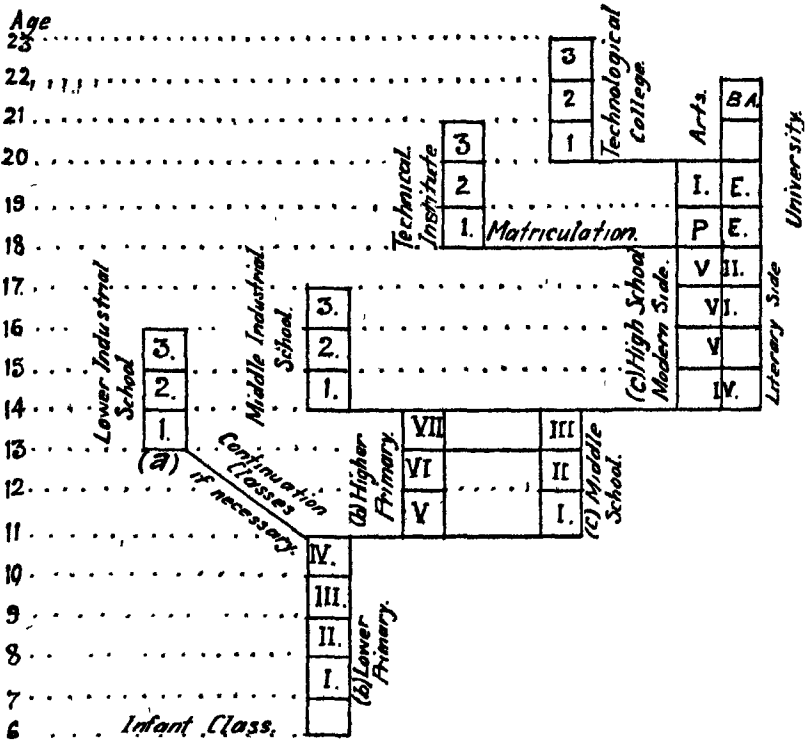
127. The accompanying diagram represents graphically the different stages at which pupils leave general education in order to begin the various courses of technical and industrial education.

Diagram showing relation between the various institutions and courses.

It should be remarked that in any complete scheme of vocational education, parallel courses in agriculture and commerce should also find a place. Their consideration is, however, omitted on the present occasion.

Diagram II

Relation between General and Technical Education.



- (a) Minimum age of admission 18.
- (b) Vernacular.
- (c) Anglo-Vernacular.

Notes—

- (a) On completing the Lower Primary course, a pupil may enter the Higher Primary course in the Vernacular or Middle School course, Anglo-vernacular.
- (b) On completing the minimum age of admission, namely, 18 years, the pupil may enter the Middle Industrial School if he has passed either of these higher courses. If he has not gone beyond IV Standard Primary, he can only enter the Lower Industrial School.
- (c) In the High School course there will be two sides: (1) Literary and (2) Modern, in the latter of which Science will predominate.
- (d) On passing the Matriculation, the pupil may enter either the University or a Technical Institute. For admission to the Technical Institute, a special entrance examination may be accepted as an alternative to Matriculation.
- (e) On passing the Intermediate Examination, the pupil may enter the Technological College to obtain a Degree in Technology, or continue the Arts Course and obtain an Arts Degree.
- (f) A pupil who has passed through the Middle Industrial school or the Technical Institute course should on passing the necessary tests in cultural subjects be allowed to join the next higher technical course.

128 The Industrial Commission of 1916-1918 in their report have

Defects in General Education. — very aptly said —

“ The influence of environment on the Indian schoolboy of the better classes is probably more important than hereditary tendencies, and the sooner he is brought in contact with constructive activities and taught to use both hand and eye, the more readily will he respond to the measures which may be devised to counteract the sedentary tendencies of the home life ”

In another place the report observes —

“ A factor which has tended in the past to delay the progress of Indian industrial development has been the ignorance and conservatism of the uneducated workman ” “ Reluctance to use their hands on the part of boys of the better classes and ignorance and conservatism on the part of the workman have contributed towards the backward condition of our industries During the last few years attempts have been made to reduce the illiteracy in the masses, but they have not gone far enough ”

In yet another place the same report says .—

“ The spread of education among the artisan classes tended to bring manual labour into contempt and the sons of artisans, educated beyond the primary stage, showed a distinct tendency to forsake their father's calling in favour of clerical work, but we think that this view must be due to the wrong system of education which has been made available The present system of general education has many beneficial tendencies, but it has also its drawbacks It has limited the equipment of the sons of better class parents mainly to literary or non-productive professions, has produced a distaste for manual labour among classes used to it, and has failed to touch the ignorant and conservative masses Modifications are necessary to give it a practical turn; and concurrently, by propaganda and otherwise, the advantages of vocational education should be brought home to the public ”

129 It has been pointed out already that no edifice of technical education can be reared except on a broad foundation of elementary education and no great expansion of such education can be looked for except by compulsion

Improvement of Primary Education.

The standard of technical and industrial training, which a pupil can take and profit by, largely depends on his previous general education

We consider that in the primary course, great stress should be laid on drawing which should be taught, even in the rural areas, up to the age of 14 Provision should be made also in primary schools for instruction in experimental science, modelling, nature-study, manual training, prevocational work, including household science, to give the child a vocational bias The education of the child in the 12th and 13th years should be cultural, not vocational

The present elementary curriculum should be better adapted to the needs and environment of the rural population Many a villager is at present reluctant to send his son to school from the belief that the school will make him dissatisfied with his father's occupation Those who are in charge of the education of the masses have, therefore, a responsibility for providing education in the way most suitable for the recipients and their guardians

A further question for consideration is the number of boys who relapse into illiteracy The Committee would suggest as a remedy the provision of continuation schools or classes as required and the dissemination of cheap literature among the masses The subjects dealt with in that literature should be of general interest and treated in a way that will be comprehensible to the public which it is intended to reach

The Educational Department has a syllabus, which, though far from perfect (the revision, for example, of the courses in drawing and arithmetic

is an urgent requirement), includes Kindergarten occupations, drawing and nature study in the early stages and elementary science in the later. Nature study comprises gardening, and the whole syllabus in the earlier years is practical. We understand that the Department has also in operation a very extensive scheme for improving and increasing the supply of trained teachers who can teach this course in its entirety. In addition, teachers are trained to instruct in clay-modelling and paper-sloyd at most of the training colleges, and in wood-sloyd at three of these colleges. It is understood, however, that the general introduction of wood-sloyd in the higher standards of primary schools has been delayed for want of funds. While agreeing that for the elder boys wood-sloyd constitutes an admirable means of imparting manual training, we realise that with other claims on public money its universal introduction, at any rate into rural primary schools, cannot be hoped for in the near future, and we would ask whether it could not be possible to arrange for other forms of handwork which would not entail large expenditure on additional buildings and costly apparatus. One of our colleagues, Mr K. R. Kanitkar, has suggested certain occupations which he considers would bring the school more into touch with village life and in which the teacher could obtain instruction locally. It certainly does not seem to be beyond the range of practicability to arrange for instruction in local cottage industries along with general education in the higher standards of rural primary schools, and possibly also in towns.

130 The training of the hand and eye or what is known as "manual training" has a particular value in the biological function of education. In the Anglo-vernacular school, instruction should be given on the modern side in (1) drawing, (2) carpentry and carving, (3) elementary chemistry and physics and (4) elements of commerce and agriculture.

In the 12th and 13th years the boy should be encouraged to practise in a workshop, in carpentry and other manual work, just to remove his dislike to manual labour.

The advantages of wood-sloyd for manual training are so great that we consider that it should be introduced into all Government middle schools (or high schools to which these are attached) at a very early date. We understand that a scheme for providing this at a capital cost of about 3 lakhs and a recurring expense of about Rs 8,000 was approved by Government in 1914, and a beginning was actually made in training teachers by borrowing an expert from the Mysore State. The scheme was, however, subsequently abandoned for want of funds during the war. We consider that the instruction of manual training in schools is now long over-due, and strongly recommend that this should be introduced in all Government high schools very early. Its introduction in the higher primary classes in the near future should be kept in view, and Municipalities and other local bodies should be liberally helped for this purpose.

131 It is the opinion of this Committee that there should be two secondary syllabuses. One, as at present, should lead to a school leaving examination, qualifying for the University; the other for a School Leaving Certificate which would be accepted by business firms and institutions like the Victoria Jubilee Technical Institute. Students passing the final examination on the modern side should be admitted into the science courses of the University and on passing the Intermediate Examination should be eligible for admission to the courses for the Degrees in Technology and Engineering. The curriculum would exclude a classical language and add a variety of optional subjects, such as work in wood, work in metal, elementary mechanics, mechanical drawing, shorthand-writing, book-keeping, etc. Some attention should be given to civics and discipline. Mathematics, English and elementary science would be common to both the courses, but it is desirable that the mathematics of the new course should be practical. Schools might teach one or both of these courses according to local requirements. In industrial centres there might be an opening for a strong industrial bias. This

course would be specially suitable for boys likely to enter works at 14 or 15, but need not debar others from admission to a high school. Those who successfully completed the high school stage would be able to embark upon more advanced technical instruction with a mathematical and scientific equipment, and an acquaintance with practical work that should be of great value in their future training. At the same time it is realised that it would be a mistake, for the present at any rate, to confine admission to those who have completed the practical course. Existing classes in engineering, textiles, etc., have received promising recruits from those who have matriculated under the present high school course and will doubtless continue to do so. From the Matriculation to the Intermediate stage two parallel courses are recommended, one literary and the other mainly scientific, leading to higher University courses in medicine, engineering, agriculture, technology and pure science.

Before closing this part of the subject, we desire to state that if the proposed three years' course in the College of Technology is to come up to the European standard, the basal science training for the Previous Examination and Intermediate Examination should be higher.

132 To sum up, we are of opinion that—

- (1) Great stress should be laid on instruction in drawing in rural schools;
- (2) The rural schools should be improved by the introduction of manual training suited to village conditions, and the dissemination of cheap literature;
- (3) Wood-sloyd should be introduced into all Government middle schools at once, and into higher primary schools as funds permit;
- (4) There should be a "modern side" in the high schools, and two courses, one literary and the other scientific, in the first two years of the University.

CHAPTER XIII.

CONCLUSION

133 Compulsory education is not yet begun in this Presidency and when begun it will extend only to the age of 11. The absence of compulsory primary education places the people of this Presidency under special disabilities in respect of the spread of technical and industrial education among them. In most countries of Europe and America, elementary education is compulsory up to the age of 14. Between 14 and 16, and in some countries up to 18, part-time attendance at a vocational school is also compulsory. This attendance is usually binding for 6 to 10 hours a week, and employers are required by law to allow the workers to put in the same during day time.

134 The measures which seem practicable at the present moment and which the Government and the people should endeavour to render popular in this Presidency are—

- (1) Compulsory education up to the age of 11.
- (2) Part-time general education with a vocational or industrial bias in the 12th and 13th years.
- (3) Part-time vocational or industrial education from the 14th to the 18th year.

In the case of boys who begin their education late, this last part-time vocational or industrial education might extend beyond the 18th year. From the 17th or 18th year, the character of the education for the boy will be nearly the same as in other advanced countries. It is only in the lower grades that the special disadvantages of illiteracy have to be met by special measures.

Since compulsion is not possible, compliance on the part of the pupils and their parents should be encouraged by persuading employers to give

higher rates of pay to workers possessing higher educational qualifications, by giving facilities to such as attend schools, by public award of prizes and by social pressure as far as possible

We have suggested the starting of Lower Industrial Schools to meet the case of the large number of boys whose general education will not extend beyond the IV standard primary. We have suggested Mass Industrial Classes to give the still larger body of illiterate persons an opportunity of acquiring business habits and some measure, however small, of skill or capacity, in an occupation, handicraft or cottage industry.

135 In every city, there will be at least one Middle Industrial School and one Lower Industrial School with apprenticeship and evening classes and supplementary classes
Equality of Opportunity.

In rural areas which can afford them, Lower Industrial Schools will be provided; and in their absence, supplementary classes or mass industrial classes.

Our scheme will provide opportunities of training for all classes of people. The youths of the higher and middle classes who have the necessary capacity and preliminary training can study in the Technical Institute or in the College of Technology. The less favoured classes may go to the Middle Industrial and Lower Industrial Schools. The masses have opportunities of attending short courses specially prepared to suit their circumstances.

Short courses and lectures, for special seasons or times of the year, can be instituted as required from time to time in all these institutions to help to increase the knowledge and skill of men of all grades from a journeyman assistant to a captain of industry.

As regards girls and women, we would chiefly cater for two classes—(1) middle class women attending a full-time course and (2) women of the poorer classes who by circumstances are compelled to work for a living. To the former we propose to give sound training in home work and domestic economy by providing parallel courses in those subjects in the existing girls' schools themselves. To the latter we propose to give training in handwork or in some industry or gainful occupation.

In this way we are providing, in the scheme, opportunities of industrial education to every individual according to his means, mental capacity, aptitude and temperament.

136 The College of Technology and the College of Engineering will train technical experts and captains of industry. The Technical Institute through its day courses will train managers, superintendents, and other executive officials. The night classes of the same Institute will train foremen, chargemen, etc. The

Middle Industrial School through its day classes will train persons who, with further practical experience, will become foremen, chargemen, etc. The continuation classes in the same school will train skilled workmen. The day classes in the Lower Industrial Schools will train men who with some practical experience will become skilled workmen but of a type lower than those trained in the Middle Industrial Schools. The continuation classes in Lower Industrial Schools will train intelligent handy men.

The Middle Industrial Schools will provide recruits for handicrafts and produce "small masters" who would own and work a cottage industry. Both full-time and part-time classes in the Lower Industrial Schools will produce mechanics, artisans, journeymen assistants, etc.

137 It may perhaps be of interest if we explain here briefly how our Application of scheme to proposals, if accepted, will apply to the City of Bombay City. Bombay.

Up to the 11th year, boys will undergo general education under the Compulsory Education Act. We are strongly of opinion that in industrial centres like Bombay, Ahmedabad and Sholapur, part-time education of a *pre-vocational* character should be made compulsory in the case of workers in factories in their 12th and 13th years for a minimum period of six hours a

week; and in the 14th, 15th and 16th years similar part-time education of a vocational character should be compulsory for the same minimum period

Till the close of the 13th year, the education of the boy or girl will be mainly cultural, and should be provided for by the Educational Department. Quite 75 per cent of the school time in the 12th and 13th year should be given to cultural education, *namely*, reading, writing, elementary arithmetic, drawing, civics, hygiene, etc. In the 14th, 15th and 16th years, boys who are required to work for a living should attend continuation classes in a Lower Industrial School or in an Apprenticeship School for at least six hours a week during day time.

Boys who have passed the III standard Anglo-vernacular and are engaged in a definite industrial occupation should be compelled until they complete their 16th year to attend a Middle Industrial School, or continuation classes of that grade in an Apprentice School, for three years, two mornings a week, to undergo a regular continuation course. A boy should be admitted only to the particular course which teaches the industry in which he is actually employed and this for Bombay City will be the textile industry mainly.

Out of the large number of pupils of the continuation classes and Middle Industrial Schools, a small percentage of ambitious youths, after their compulsory period of training in the 16th year is over, are likely to equip themselves for voluntary attendance in night classes of the Technical Institute. In this Institute, a regular continuous 5-year course (two hours a night and three days a week) has been already recommended by us for such youths. The best youths should be admitted by selection after putting them through an entrance examination specially suited to their standard of attainments.

Those with an aptitude for skilled workmanship will have been given a chance to acquire skill in their trade and become intelligent units of their community. The most ambitious youths will have been provided with an avenue to rise almost to the top of their profession, their progress being only limited by their basal equipment. Thus the poorest boy, who is compelled to earn his living from the tender age of 12, may, by compulsory attendance at a Continuation School till his 16th year and voluntary attendance thereafter at night classes of the Technical Institute till his 21st year, rise in his profession almost as well as his more fortunate brother who can afford time and money to join the profession by a more leisurely process of secondary school training and then full-time diploma day course at the Technical Institute.

The above represents the provision for boys and men who are compelled for any reason whatsoever to earn while they learn. For men who have the time, means and capacity to attend a full time day course, ample provision has been made in the shape of institutions from the Lower Industrial Schools to the College of Technology, described in the previous chapters.

Provision has also been made for special day and night courses and classes for manufacturers and others actually engaged in the industries, at all the institutions.

The application of the scheme to Bombay, Ahmedabad and Sholapur as described above will help to change the whole tone of the cotton mill industry. A large body of skilled men, jobbers, assistant weaving and spinning masters, full masters and managers will be provided for the industry and the employers will have a highly trained army of men to choose from. With better skilled men and above all better and more intelligent citizens, there will be much larger and better production, both total and individual. The worker will be taught civics, ethics, social and personal hygiene, in addition to his own trade or industry, and this is bound to make him more tractable and more useful to his employer. His health will improve, his individual production will rise, and the vicious circle of low production, low wages, low standard of living and poor health will be, if not broken, at least greatly weakened, and in course of time may disappear altogether.

138 We attach much importance to the proposals made under "Organization and Administration" in Chapter X and to the preparation of a development programme, for the first 10 years, to be ratified by a Technical Education Act passed through the local Legislative

Why a Programme and a Technical Education Act are necessary.

Council If Government make provision, for the necessary funds and the working out of the programme, in a legislative measure, the scheme will be binding on all concerned and its success will be independent of vicissitudes of policy and personnel which will be inevitable in the years to come.

In support of this view, we desire to invite attention to what has been done in recent years in the same field in the Dominion of Canada. A Royal Commission on Industrial Training and Technical Education was appointed in that Dominion in 1910 and after three years of investigation, in the course of which the Commission visited various educational institutions in Europe and the United States of America, submitted its report in 1913. The Commission recommended that a sum of \$3,000,000 (approximately Rs 90 lakhs) should be provided annually, for a period of ten years by the Parliament of Canada, for allotment to the provinces to supplement the provision made by the latter for promoting technical education and industrial training. In the year 1912-13, a Dominion Act known as "The Agricultural Instruction Act" authorising the payment in the aggregate of 10 million dollars for the advancement of *agricultural instruction* in the provinces for a period of ten years was assented to by the Parliament of Canada.

Again, the Technical Education Act of 1919 (printed as Appendix K) sanctions an appropriation of sums aggregating 10 million dollars (Rs. 300 lakhs) *according to a fixed programme* for a period of ten years 1920 to 1929, for the purpose of assisting and promoting technical education in Canada. It must be remembered that Canada has a population of 8 million as against 20 million we have in the Bombay Presidency. As each of the Canadian provinces has to spend at least an equal amount, the total expenditure is very large and the measure has greatly helped to rouse a spirit of emulation and local initiative in the country side.

Further, article 9 of the Act specifies as follows :—

"The Minister shall make an annual report on or before the thirty-first day of March on the work done under the provisions of this Act, containing such information and particulars as the Governor in Council may prescribe and shall include in such report the reports made by the several provinces on the work done in each province for the promotion of technical education and the expenditure connected therewith, and such report shall be submitted to Houses of Parliament by the Minister within fifteen days after the presentation of the report, if Parliament is then sitting, and, if not, then within fifteen days after the opening of the next session of Parliament."

139 The report of the Royal Commission referred to also makes the following recommendations :—

"That financial support should be provided by public authorities and by individuals, corporations, and associations who are directly concerned and who would be likely to profit by the results to be obtained.

"That the relative measure of support should be in some equitable proportion to the interest in the results, and the ability to pay, of the four possible classes of contributors, *viz.*, (a) the individuals, corporations and associations, (b) the local community such as town, city or country, (c) the province and (d) the Dominion.

"It is important to adopt a plan which will secure the largest degree of *public confidence* and maintain the largest measure of *public interest and co-operation*.

"It is important to adopt a plan which will *preserve provincial control*, encourage *local initiative* and develop *local responsibility*.

"It is important that there should be a *large number of persons* representing *Manufacturing Industries, Trades, Commerce, Transportation, Agriculture, Forestry, Mining, Fisheries, House-keeping and Education, ready to take the initiative* in local undertakings and *able to co-operate* in making effective, application to the needs of localities of financial grants and any other assistance. In the opinion of the Com-

mission, a policy which would be applied wholly or mainly by directive authority from headquarters, leaving to local centres little initiative or responsibility, would not accomplish much for a long time

" It is important that there should be in each province a *Central Body or Authority*, which could bring to bear on all proposals from local centres the wide knowledge and practical experience of *capable men and women* familiar with education and with industrial, agricultural and house-keeping problems. Such a Central Body would be able to supply information for the guidance of Local Authorities at the beginning of their work, and to furnish advisory assistance through experts of high ability. Through the meetings and discussions of such a Central Body the permanent officials charged with the administration would be kept in touch with public opinion as to the particular needs of localities, as to the *suitability and acceptability* of schemes proposed, and as to the practicability of having such schemes supported and carried out. The Central Body would also serve the purpose of a clearing house through which an intimate knowledge of the results from experience in one locality would be made available to other communities"*

We consider that these recommendations apply with necessary changes to the conditions of the Bombay Presidency and we commend them for the favourable consideration of Government

140. In the initial stages of the scheme it would be an advantage if a couple of officers were deputed to England, Europe, America and Japan to study their institutions on the spot, collect information and furnish suggestions to the Development Committee. But none of the other measures recommended should be delayed on that account. Frequent visits to foreign educational institutions by local experts, professors and inspectors will help in the maintenance of a forward policy and a progressive spirit in the local institutions. In connection with the creation and development of the Municipal College of Technology, Manchester, which at present is perhaps the foremost technological institution in Great Britain, a committee of enquiry and several individual officers visited the Continent of Europe and the United States of America, on various occasions, for the purpose of studying the chief technological institutions and their arrangements and equipment. Similar measures cannot fail to infuse life into the educational policy and institutions in this Presidency

141. There is a widespread feeling as to the necessity of sending Indian youths and Indian scientists to England, America, Japan and other countries for receiving up-to-date training in mechanical and industrial arts, and for getting into touch with the latest devices and inventions in such arts. This training requires no local preparation and is easily arranged for by providing the necessary funds.

The feeling in the country in this respect was effectively voiced by Mr. N. M. Samarth, M.L.A., in the Indian Legislative Assembly in February 1922, when he moved a resolution, recommending that "not less than six lakhs of rupees be set apart every year from the Central revenues to provide for education and training abroad of Indian and Anglo-Indian youths in the ship-building, ship-engineering, oceanography, wireless telegraphy, gunnery and other modern weapons of warfare, industrial chemistry in all its branches, theoretical and practical mining and metallurgy, geological surveying, hydro-electric engineering and the application of electricity to agriculture, making and canning fruit preserves, condensed milk products, and concentrated foods, cottage industries, organisation and working of distributive co-operative stores and producers' co-operative unions and such other subjects as the Assembly from time to time deem essential for the needs of India"

*The italics are in all cases reproduced from the original.

142 'A policy and scheme of development should, we think, be determined on, on the basis of this report, and embodied, as already recommended, in a Technical Education Act.

We consider that Government should provide the necessary organization and funds for a term of ten years, at least at the commencement, in order to make an effective start and give an impetus to technical and industrial education. Gradually this responsibility may be shifted to local bodies, manufacturers' associations and private individuals

The Presidency should make a serious effort to provide itself with the expert staff and skilled workers needed for her industries. The College of Technology we regard as absolutely indispensable. The larger institutions should give the lead to the smaller ones. A beginning should be made in the cities at the top and, from there, industrial life and practices should filter down and permeate the remotest parts of the Presidency.

With the aid of suitable propaganda, local interest should be roused; and all the various grades of educational institutions we have recommended should form living agencies, imbued with the idea that they are there to serve the public, and become centres of industrial aspiration and advancement.

M VISVESVARAYA

*K R GOBBOLE.

G. N. GOKHALE

K R. KANITKAR.

'A M. MASANI.

-- APILRAM H. VAKIL.

20th March 1922

Note by Dewan Bahadur K R Godbole, M C E , M L C

I sign the Minority Report subject to the following remarks.

2. The complete scheme outlined in the Report involves a capital outlay of Rs. 98 lakhs on buildings and equipment to be reached in ten years, and an additional recurring expenditure of Rs. 34½ lakhs to be reached in three years, which has to be expanded in the succeeding seven years to Rs. 41 lakhs. These figures may be exceeded in the actual carrying out of the scheme.

3. As a member of the Provincial Legislature, I have some knowledge of the financial conditions of the Bombay Presidency. There are no funds available in the budget of 1922-1923 for the expansion of technical and industrial education, and in succeeding years the amounts available for this purpose are likely to be very limited, especially on account of the incessant demands that are being rightly put forward for the immediate expansion of primary education in the urban and rural areas of the Presidency.

4. As regards raising loans for the expansion of technical and industrial education, the prospects do not seem to be hopeful. The Bombay Government propose raising a loan of about ten crores of rupees during next year for the Bombay Development Department and for the execution of certain irrigation, forest and other public works. Loans for similar purposes will also be necessary in future years. There is little chance, therefore, of loans, with sinking funds attached, being sanctioned for educational purposes which are not likely to bring any direct revenue.

5. The question is, what should be done under the above circumstances for the carrying out of the scheme set forth in the report. I think the scheme should be kept steadily in view as a goal to be attained. The small additional allotments that are likely to be available for the expansion of technical and industrial education after 1922-1923 should, in the meantime, be utilised in carrying out the following proposals of the Minority Report—

(a) Appointment of the Director or Superintendent of Technical and Industrial Education for the Presidency (paragraph 108)

(b) Expansion of the College of Engineering to admit 100 students annually in place of the present number of 60. The Advisory Committee of the College are considering the questions of cost (paragraph 48)

(c) The formation of the "Royal Institute of Science and Technology" by the expansion of the "Royal Institute of Science" recently opened in Bombay [paragraph 46 (g)].

(d) Expansion of the "Victoria Jubilee Technical Institute in Bombay" (paragraph 55).

(e) Establishment of "Middle Industrial Schools" at Ahmedabad, Sholapur, Hubli and Karachi. When these are started and working satisfactorily, similar schools to be started at Poona, Hyderabad (or Sukkur) in Sind, Surat, and Bijapur (or Gadag) (Chapter VI).

(f) Establishment of about forty "Lower Industrial Schools" at suitable places in the Presidency, including the improvement of the present 28 so-called technical schools (Chapter VII). This means the improvement of 28 existing schools and the establishment of 12 additional ones.

(g) Establishment of from 6 to 8 "Apprentice Type Industrial Schools" in Bombay, Dapur, Ahmedabad, Sholapur, Karachi (or Sukkur) and Hubli.

(h) Establishment of 5 "Institutions for giving industrial education to girls and women" at Bombay, Poona, Belgaum (or Dharwar), Ahmedabad (or Surat) and Karachi (or Hyderabad), (Chapter IX).

The above is not a very large programme and ought to be within the financial capabilities of the Presidency in the near future. I have given a general skeleton. The details will be worked out by the Director or Superintendent of Technical and Industrial Education under the advice of the "Provincial Development Council" (paragraph 105).

K. R. GODBOLE.

APPENDIX C.

TECHNICAL AND INDUSTRIAL EDUCATION COMMITTEE.

INTERIM REPORT.

(Submitted on 3rd October 1921.)

This Committee was constituted in Government Resolution No. 973, dated the 17th February 1921, with instructions to enquire into the present equipment of the Bombay Presidency respecting technical and industrial education and to draw up a comprehensive scheme to meet its future needs.

Our terms of reference require the submission of proposals to supply technical education needed by organizers and experts to fill leading executive positions in business, to supply a class of technical assistants, superintendents, also foremen, etc., for subordinate positions, and to train the rank and file of workers for the various industries and industrial occupations of the Presidency.

Our final report is in the course of preparation and, as we understand that an early expression of our views is desired, we have the honour to present this Interim Report giving a brief summary of our leading conclusions and recommendations.

I

2. *Institutions of University Grade.*—For the highest class of training in Civil Engineering we recommend that the present College of Engineering in Poona should be enlarged and improved so as to accommodate at least 300 students, and allow of an immediate increase in yearly admissions from 60 to 100.

We recommend the starting of a new College of Technology in the vicinity of industries in the City of Bombay to give instruction in mechanical and electrical engineering and technology. With a view to reducing the expense we are also submitting an alternative proposal for the amalgamation of the Royal Institute of Science, which has not yet commenced working, with the proposed College of Technology.

We consider that adequate provision should be made for research in the new college by necessary equipment, by the appointment of separate professors for the purpose and by instituting liberal scholarships to attract students of talent for the post-graduate courses. A sufficient number of scholarships should be awarded to picked University graduates to study advanced courses of engineering and technology in the United Kingdom and other foreign countries.

The courses of instruction should include mechanical engineering, electrical engineering, applied chemistry and textile engineering.

The Research Bureau when fully developed should keep in touch with similar institutions in all parts of the world and constitute a clearing house for industrial problems.

3. *Technical Institutes.*—The object of these institutes is to give the highest practical training in mechanical and electrical engineering and technology without demanding from the students knowledge of theory of a high standard. This class of instruction will be much in demand by candidates who have either no special aptitude for theoretical studies or who have had no opportunities for such studies in early life though possessing practical ability and executive talent of a high order.

It is proposed to help the Committee of the Victoria Jubilee Technical Institute to raise that institution to a higher standard and to increase the present accommodation from 300 to 600 students.

We consider that classes or courses should be opened in connection with the Engineering School in Karachi to provide education of the technical institute grade to students in Sind.

The subjects taught will be the same as in colleges of the University grade, but the standard of general culture, mathematics and science required will be much lower. The highest practical training possible will be given compatible with the comparatively lower general culture and equipment of the students.

Experimental and Demonstration Stations.—We also recommend that 2 or 3 experimental and demonstration stations may be started in selected centres in close association with technical and industrial schools of, or above, the middle grade. These institutions should carry on actual manufacture and demonstration in some half a dozen industries in each centre, so that manufacturers may go to them to learn the latest methods and processes of manufacture and the students to receive a short intensive course of training in any particular industry for which they may desire to qualify themselves.

4. *Middle Industrial Schools.*—The object of these schools is to give the training they need to persons who intend to manage and administer minor industries or to qualify as assistant

foremen or hold subordinate technical positions in organised industries. In addition to these, teachers for schools of the lower grades and Supplementary Courses will be also trained at these institutions, special courses being added to the curricula as required.

For the training of foremen and chargemen in organised industries we recommend the establishment of Apprentice Schools attached to large workshops and factories.

Middle Industrial Schools may be established in cities and headquarter towns of districts and may be called City or District Industrial Schools as distinguished from Town or Taluka Schools, which will be industrial schools of the lower grade.

These may be of two varieties, namely, (1) technical schools in which the instruction given will be a basal preparation for industries, and (2) special industrial schools for instruction in the theoretical and practical work of particular trades.

It would be desirable to have one such school for every district, but from considerations of expense we have decided to recommend for the present the establishment of 12 schools only, each capable of accommodating about 250 pupils. Some of these schools will be located in industrial centres and others distributed regionally in proportion to population.

The estimated annual cost of the twelve schools will be about Rs. 5 lakhs.

The candidates for admission to the course should be not less than 14 years of age, and should have passed the III standard Anglo-vernacular or VII standard vernacular.

The prestige of the Middle Industrial School should be maintained by the character and efficiency of the training given which should be such as to secure employment for the student as soon as he completes his course.

In Industrial Schools of both grades, instruction and training will be given, in addition to general subjects such as languages, mathematics and science, in mechanics, mechanical drawing, smithy, fitter's work, carpentry; in special trades such as tailoring, furniture making, photography, printing, boot and shoe making, etc., and in manufacturing industries such as metal work, weaving, dyeing, pottery, painting and designing, building design and construction.

5 *Lower Industrial Schools.*—As in the case of middle schools, these schools may also be of two varieties, namely, (1) technical schools and (2) special industrial schools. For organised industries, instruction will be usually given in Apprentice Schools.

The boys who enter these schools should be at least 14 years of age and should have passed the primary IV standard. For boys who have passed the primary IV standard but have not attained 14 years, the courses given will be prevocational.

There should be a great variety in the subjects taught. A list of all courses and subjects likely to be required should be maintained and each locality permitted to choose, under expert advice, a group of subjects suited to the requirements of local industries and the temperament and aptitudes of the people.

It is proposed to start 100 schools of this class at an aggregate outlay of Rs. 7 lakhs.

6. *Supplementary Classes or Courses.*—Supplementary classes or courses may be associated with any existing educational institution, preferably one giving instruction in technical or industrial subjects. These courses should be associated with Colleges, Technical Institutes and Middle Industrial Schools so that persons engaged in practical pursuits may be enabled to go through short intensive courses of training in the trade or occupation in which they are interested. The bulk of the supplementary classes should be associated with Lower Industrial Schools and primary or elementary grade schools maintained by the Department of Education. Supplementary classes started with the last-mentioned lower grade schools will include short courses in (1) correspondence and book-keeping, business discipline and training in good workmanship; (2) knowledge of tools, simple machines and labour saving appliances commonly required in agriculture and industries; (3) training in specific occupations and crafts; and (4) instruction in selected cottage industries.

Lists of all subjects in which instruction will be needed be maintained as also types of courses and classes suited to particular conditions. Each local Committee might choose the type of class or group of subjects suited to its needs and environment. No single type will suit every case.

As a rule, no restrictions as to age or qualifications for admission should be insisted on, the object being to make a beginning in equipping the population with the elements of industrial education and efficiency, without the cramping formalities which under present conditions operate as a bar to such equipment.

It is proposed to provide training by means of these classes (or schools) for 7,000 persons in urban areas and 10,000 in rural areas at a combined outlay of Rs. 6 lakhs.

7. *Girls' and Women's Education.*—Women who desire to graduate in Technological courses of the University grade will be required to obtain their training in Colleges alongside with men

It is proposed to start a Technical High School for women in Bombay, three Middle Schools for girls and women in three selected centres and a dozen schools of the lower grade distributed over the Presidency.

For the present the bulk of the education given will be in supplementary schools and women's industrial classes to be started in conjunction with existing educational institutions and lower industrial schools for girls

The most elementary need of the day is to give opportunities to adult women of the lower middle and poorer classes to equip themselves with a knowledge of some industry or occupation to enable them to obtain skilled employment and earn higher wages. This education has to be given in short courses and where possible by the co-operative method

The subjects which will naturally figure most prominently in the curricula of all grades of education for girls and women are home economics and the arts and crafts associated with home work.

The number for whom provision is made in regular schools is about 2,000 and in supplementary classes 7,000, and the estimated expenditure is Rs. 3 25 and Rs 2 75 lakhs, respectively.

II

8 *Recurring Expenditure.*—A statement is attached (*vide* App I) giving particulars of the various institutions proposed. It gives a complete estimate of cost from which the following figures are abstracted :—

Main Heads.	Additional outlay proposed in 5 to 10 years, from commencement of scheme.	Additional expenditure to be reached in 3 years
	Lakhs. Rs	Lakhs Rs
Institutions of University grade	7·00	5 00
Technical Institutes	4 00	2 50
Middle Industrial Schools (and classes)	5 00	3 00
Lower Industrial Schools	7 00	4 00
Supplementary classes (or schools)	6 00	3 00
Women's and Girls' Education	6 00	3 00
Training of Teachers (special provision)	3 00	3 00
Supervision, direction, propaganda, etc.	3 00	3 00
	41 00	26 50
Present expenditure (approximate)	7 00	7 00
Total including present expenditure	48 00	33 50

9. The actual expenditure under technical and industrial education in 1919-1920 was Rs. 6,70,000, the share from Provincial revenues being Rs. 4,70,000. The additional expenditure now recommended is approximately Rs 27 lakhs in 3 years and 41 lakhs in five to ten years from date and the totals will be Rs. 34 and 48 lakhs, respectively

If Local Boards, Municipalities, manufacturers' associations and philanthropic public bodies and individuals shoulder their share of the burden, the actual inclusive cost to Government at the end of 10 years will be roughly two-thirds of the above total expenditure, or Rs 32 lakhs only.

10. *Capital Expenditure*—The capital outlay required for buildings and equipment will be roughly Rs. 98 lakhs, as under :—

	Rs
	Lakhs.
Institutions of University grade	30 00
Technical Institutes	15 00
Middle Industrial Schools	10 00
Lower Industrial Schools	10 00
Supplementary Schools and Classes	10 00
Women's and Girls' Education	15 00
Training of Teachers (special provision)	5 00
Supervision, direction, propaganda, etc.	3 00
	<u>98 00</u>

As this outlay cannot be postponed or spread over a long period without detriment to the progress of the scheme, we recommend that, in the event of other sources failing, it should be met from a Provincial loan repayable in 30 years, provision being made to the necessary extent from current revenues for meeting the charge on interest and sinking fund. We understand that a similar development loan is being floated by the Government of the United Provinces.

11. We are of opinion that Government should ordinarily be prepared to maintain institutions of and above the grade of Middle Industrial Schools from Provincial revenues and that for institutions and courses of lower grades, Municipalities and Local Boards should bear part of the cost. If public bodies or philanthropic citizens come forward to start institutions of this class, Government should ordinarily provide half the cost, both capital and recurring.

In order to make an effective beginning, Government would do well to incur all the expenditure, even on schools of the lower grades, from Provincial funds until the public realises the importance and advantages of the new system of education. Later on, the grants may be gradually reduced to one-half in the case of Municipalities and to three-fourths in the case of Local Board areas. Schools and classes may be allowed to be started at once on obtaining an assurance that the local bodies concerned are willing to pay their share in three to five years' time.

12. *A Programme and an Industrial Education Act.*—In order that the spread of this class of education may not be interrupted for want of money or accidental circumstances in any particular year, we consider that a policy and programme should be laid down for 10 years in advance. Provision should be made for the requisite expenditure for that period and a minimum amount fixed, below which the actual expenditure should not be allowed to fall in any year of the decennium.

We are also of opinion that the more important recommendations in our scheme including the ten-year programme and outlay referred to should be embodied in an Act of the Local Legislature.

III

13. At the age of 14, students may enter lower industrial schools if their general education is only up to the IV vernacular standard; or Middle Industrial Schools if they have studied up to III standard Anglo-vernacular or VII standard vernacular.

Our scheme takes no account of boys and girls under 11 years of age. Between 11 and 14, they may go through prevocational courses provided in lower industrial schools where suitable training will be given to qualify for admission to Middle Industrial Schools.

Candidates for admission to Technical Institutes should have passed the School Leaving Certificate Examination or the Matriculation Examination. Candidates who have passed through the Middle Industrial Schools will be also eligible for admission.

We consider that in the prosecution of our scheme, the illiteracy of the masses will be one of the chief obstacles to contend with and the immediate extension of compulsory primary education will be a valuable aid to the promotion of technical and industrial education. No edifice of technical education can be reared except on a broad foundation of elementary education. As one way of assuring this we propose that education should be made compulsory on all half-timers and that their employment should be contingent upon the provision of suitable school accommodation by the employers, the instruction being provided by the State.

14. Imparting a practical bias to the whole educational system is another very important matter. We recommend that provision for manual training be made in all Government High Schools at an early date, and that other local and private bodies be liberally helped for this purpose. We would further suggest the introduction of the modern side into our High Schools by inducing large majorities of students to take up manual training and sciences as an alternative to classical languages and other subjects.

15. In any comprehensive scheme of education, vocational education should include industries, agriculture and commerce. Although the two latter subjects are outside the scope of this report, we consider it of the highest importance that steps should be taken to draw up schemes to provide the people of this Presidency with parallel courses of instruction in agriculture and commerce at as early a date as may be feasible.

IV

16. In view of the changed world conditions and the necessity of preparing for the anticipated industrial development in the near future, the Committee is of opinion that the time has arrived for the adoption of bold measures and the initiation of a comprehensive scheme of technical and industrial education for this Presidency.

Our arrangement of the institutions proposed into suitable grades and classes closely follows the existing systems in countries like Canada and Japan which have successfully developed industries in recent years. Their example serves the purpose of an industrially backward country like India better than that of more highly advanced countries like England or Germany which have built up their prosperity on old foundations.

We have made provision for 15,900 pupils in regular colleges and schools at an estimated yearly outlay of Rs. 26 25 lakhs. The number for whom provision is made in supplementary schools, in which the bulk of the instruction given will be of an elementary character, will be 24,100 pupils and the outlay on them Rs. 8 75 lakhs. This is in addition to the existing number (2,100) and outlay (Rs. 7 lakhs).

17. It is difficult to obtain precise corresponding figures from other countries, but such figures as are available more than justify a scheme of the scope and character we have proposed. In England, for instance, more than 140 persons out of every 10,000 were attending technical schools and classes in 1914 before the war. In the province of Ontario in Canada, the corresponding number in 1919-1920 was 100 per 10,000. In the Bombay Presidency, the existing technical and industrial schools accommodate roughly one person for every 10,000 of population and, if our present proposals materialise, this will be increased to 20 per 10,000 perhaps at the end of ten years.

18. At every stage, we have kept in view the imperative need of placing severe limits to the expenditure. The present total annual expenditure on education in the Presidency is about Rs. 235 lakhs of which the contribution of the Provincial Government is about Rs. 182 lakhs. The additional expenditure now proposed for technical and industrial education will amount to Rs. 48 lakhs at the end of ten years or, if, as explained in paragraph 9 *ante*, the share debitable to Provincial revenues only is taken into account, Rs. 32 lakhs.

To emphasise the necessity for spending liberally under this head, it may be relevant to quote the opinion of Dr H. A. L. Fisher, M.P., the present Minister of Education in Great Britain. "We were told," says the Minister, "to economise in our expenditure and food-stuffs. I suggest that we should economise in the human capital of the country, our most precious possession which we have too long neglected. The capital of the country lies not in cash and gold but in the brains and bodies of the people."

19. We consider that, if our scheme is approved, an expert in this class of education, who is also something of an enthusiast, should be selected forthwith to work as a Director and Organiser and begin preparations to put the scheme in hand. Next to financial sanction to the expenditure, the measures which demand the earliest attention will be the selection of professors and the training of teachers, construction of buildings and provision of laboratory and workshop equipment. Local advisory boards or committees will be needed to keep the institutions and classes proposed in close touch with the trades.

In our opinion the expert Director should work under, or in close association with, a Central Provincial Council or Committee. We have not yet been able to arrive at a satisfactory decision among ourselves regarding the constitution and functions of this Central Council or Committee, nor have we decided in what manner manufacturers, business men and representatives of the University, etc., should be associated with expert officials for the promotion of industries and industrial education. Some of the members favour a Central Advisory Committee with consultative functions and others a Provincial Development Council and Committee with powers of control and direction. On this and allied questions, we expect to be able to submit more precise recommendations in our final report.

M. VISVESVARAYA.
K. R. GODBOLE.
G. N. GOKHALE.
K. R. KANITKAR.
A. M. MASANI,
KAPILRAM H. VAKIL.

The following members sign the Interim Report subject to the views expressed in the appended supplementary statement.

R. D. BELL.
LESLIE FLATT.
JOSEPH A. KAY.
F. W. MARRS.
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APPENDIX I.
TECHNICAL AND INDUSTRIAL EDUCATION.
Abstract of Cost of entire Scheme.

No	Main Heads.	Approximate number of pupils (additional provision)	Additional expenditure to be reached in 5 to 10 years.		Additional expenditure to be reached in 8 years.	Capital outlay on buildings and equipment	Remarks.
			By item.	Total.			
1	2	3	4	5	6	7	8
			Rs. Lakhs.	Rs. Lakhs.	Rs. Lakhs.	Rs. Lakhs.	
I	Institutions of University grade— (1) Improvements to College of Engineering, Poona ... (2) College of Technology ... (3) Provision for Research ... (4) Foreign deputation of students ...	160 400	1.00 4.00 1.00 1.00	7.00	5.00	80.00	
II	Technical Institutes— (1) Improvements to V. J. Technical Institute ... (2) Class of Technical Institute grade for Sind (to begin with mechanical and electrical engineering) ... (3) Industrial Experimental and Demonstration Stations ...	800 100	2.0 0.75 1.25	4.00	2.50	15.00	
III	Middle Industrial Schools— including Apprentice Schools (12 Schools and 8,000 pupils)	3,000		5.00	8.00	10.00	
IV	Lower Industrial Schools— including Apprentice Schools (100 Schools and 10,000 pupils)	10,000		7.00	4.00	10.00	
V	Supplementary Schools and Classes— (Urban 7,000, Rural 10,000, or a total of 17,000)	17,000	6.00	6.00	8.00	10.00	
VI	Women's and Girls' Education— Technical High School in Bombay Middle Schools (8 Schools with 200 pupils each) Lower Schools Supplementary Schools for Girls (both urban and rural) Adult Women's Industrial Classes (both urban and rural)	150 600 1,200 3,100 4,080	1.05 1.20 1.00 1.50 1.25	6.00	8.00	15.00	
VII	Training of Teachers (special provision)		3.00	8.00	3.00	5.00	
VIII	Supervision, direction, propaganda, etc.—			3.00	8.00	5.00	
	Total	40,000		41.00	26.50	98.00	
	Present expenditure (approximate)			7.00	7.00		
	Total including present expenditure	40,000		48.00	33.50	98.00	

SUPPLEMENTARY STATEMENT

The signatories of this Supplementary Statement agree with the view that a strong effort must be made to raise the standard of all grades of technical and industrial education in the Bombay Presidency, and to extend technical and industrial education as rapidly as industrial and economic conditions permit. In this statement they desire to draw the attention of Government to the necessity of reaching a decision regarding the principles on which technical education should be organised. They desire further to express their views regarding the limits placed in practice on the extension of technical and industrial education by the actual industrial and economic conditions of the province.

2 The main principle for which the signatories to this statement contend may be stated as follows. The practical training of boys, youths and young men should be given, whenever possible, in workshops and factories under arrangements analogous to the so-called apprenticeship system. In their opinion, the skilled workman can as a rule be efficiently trained in his handicraft only in commercial workshops or by master craftsmen working on their own account. The school or class room should be reserved for the teaching of theory and practical demonstration. Therefore, no attempt should be made to replace the training of skilled artisans in workshops, factories and under master craftsmen by a training in workshops attached to technical and industrial schools. The signatories realise the difficulties in the way of improving and extending the facilities for practical training in private workshops and factories, but they consider, in the first place, that these difficulties are not insurmountable and, in the second place, that the alternative offered by workshops attached to colleges and schools is not a sound solution of the problem.

3 The signatories, who include all the members of the Committee engaged in the administration or management of industrial factories, believe that the view expressed in the preceding paragraph represents the emphatic opinion of every employer of labour.

4. The whole character of technical and industrial education must depend on whether Government support this view or the view taken in the Interim Report that young men can receive an adequate manipulative training in workshops attached to technical and industrial schools so as to enable them to take their place in industry as skilled artisans, foremen, chargemen and supervisors.

5. While the signatories strongly recommend as one of the best types of technical education the institution of apprentice schools attached to large workshops and factories, they dissociate themselves from the view expressed in paragraph 4 (2) that foremen and chargemen for organised industries can be automatically produced by this training alone.

6 The signatories have no fears that, for a great many years to come, young men who have received a suitable technical education of a lower grade than the University standard will find any difficulty in obtaining employment as skilled artisans, foremen, chargemen and supervisors, provided that they are well qualified in other necessary respects. Their view is, however, that the possibilities of extending technical and industrial education as described in paragraphs 4, 5 and 6 of the Interim Report have been greatly over-estimated. These paragraphs relate to (a) middle industrial schools, (b) lower industrial schools, and (c) supplementary classes or courses and provide for a total of 30,000 pupils at a total cost of 18 lakhs of rupees. The signatories agree that the expenditure contemplated should be incurred as rapidly as circumstances permit for the improvement and extension of technical and industrial education. But in the first place, they consider that the sum of 18 lakhs is insufficient to provide an efficient technical education for so many as 30,000 pupils, and, secondly, they are confident that this number cannot, in existing circumstances, be reached within a space of ten years. These circumstances may be briefly summarised as (1) the backward industrial condition of rural areas and small towns and (2) the general lack of a suitable primary education.

7. On this point the opinions of the signatories are supported by the experience gained of the working of the existing institutions. The framers of the Interim Report in estimating a demand for technical education for 30,000 pupils have omitted to take account of the failures already incurred or to suggest methods of overcoming existing practical difficulties. In paragraph 4 they advocate a type of school and an entrance qualification which are exemplified in the Ranchhodlal Chhototal Technical Institute, Ahmedabad. This institute has been a failure from every point of view, although it is situated in the second most important industrial city of the province. Nevertheless, the Interim Report suggests that at an annual cost of five lakhs, twelve such schools can be successfully established for the education of 3,000 pupils. The signatories do not regard as a practical solution of the problem the mere suggestion that "the prestige of these schools should be maintained by the character and efficiency of the training given which should be such as to secure employment for the student as soon as he completes his course." The lesson which the signatories draw from Ahmedabad and other places where technical schools now exist is that, so long as existing industrial and economic conditions

continue and until public opinion of all kinds is aroused to the value of technical education, progress must be slow. Even the most efficient of the industrial schools have failed to attract more than a mere fraction of the 250 pupils which it is proposed to accommodate in each of the proposed schools described in paragraph 4. It is admitted on all hands that the pupils who at present seek a technical education are of a poor type and that the products of existing schools do not command the same wages as men who obtain a training under industrial conditions, even though they have received no theoretical education. The signatories desire, therefore, to warn Government that while they agree to an ultimate annual expenditure of 18 lakhs of rupees on schools and classes for the lower grades of technical and industrial education, they think actual conditions will render progress slow and that it will be necessary to experiment in many directions before successful types of schools can be standardised. Apart from all other considerations they think it most unlikely that the present poorly paid and inefficient teaching staff can be augmented and their efficiency increased so that within ten years they will be giving a really valuable technical education to ten or twelve times the present number of students.

8. Regarding subsidiary proposals to the main scheme of technical and industrial education, the signatories prefer to express no opinion on the proposed loan suggested in paragraph 10 (2), as they doubt whether the financing of technical and industrial education can be rigidly separated from the other financial obligations and operations of Government. They also withhold their opinion on the Industrial Education Act proposed in paragraph 12 (2). Further, they prefer to offer no opinion on the proposals for agricultural and commercial education mentioned in paragraph 15 as these are outside the terms of reference.

9. The signatories hope to develop their views more fully in the final report, but take this opportunity of emphasising the great necessity of extending primary education amongst the artisan classes (paragraph 13 (4)) and the desirability of introducing modern side in the high schools (paragraph 14).

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APPENDIX D.

Statistical return of Colleges and Schools for Technical and Industrial Training for the year 1919-1920.

Name of Institution or Class.	Average monthly Number.	Number who passed a recognised final examination	Expenditure from Provincial Revenues.	Total expenditure.	Annual cost of educating each pupil
			Rs	Rs.	Rs. a p
Professional College.					
<i>Government.</i>					
College of Engineering, Poona	179	5	1,16,478	1,41,777	792 0 0
School of Art.					
<i>Government</i>					
Sir J. J. School of Art, Bombay	360		73,039	84,854	235 11 0
Engineering and Surveying Schools.					
<i>Asided.</i>					
Engineering Class, D. J. Sind College, Karachi ..	24	10	2,900	7,829	326 3 0
Technical and Industrial Schools.					
FOR MALES					
<i>Government.</i>					
Reay Art Workshops, Bombay	112	10	20,515	20,811	185 13 0
College of Engineering Workshops, Poona	131	40	9,911	13,464	102 12 0
R. C. Technical Institute, Ahmedabad ..	61	22	17,004	21,002	344 4 0
<i>Local Board</i>					
Technical School, Satara ..	96	5	1,571	7,201	72 14 0
Technical School, Dhulia	32	13	2,091	5,993	187 4 0
School of Industry, Ratnagiri.	162	2	7,276	13,128	81 0 0
<i>Municipal.</i>					
Victoria Jubilee Municipal Technical School, Poona ..	27	6	1,471	4,609	170 11 0
Robertson School of Industry, Pandharpur	29	4	1,025	2,950	101 11 0
Fardunji S. Parekh School of Art, Surat	34	4	4,000	9,225	307 0 0
Technical School, Jacobabad ..	31	1	1,165	3,824	112 8 0
<i>Asided.</i>					
David Sassoon Industrial and Reformatory Institution, Matunga ..	218		54,274	74,190	340 5 0
Victoria Jubilee Technical Institute, By-culla	269	79	1,25,000	1,80,600	671 6 0
D. C. M. Industrial School, Parel	52		1,235	3,242	62 7 0
A. M. Industrial School for the Blind, Bombay	40		715	4,287	107 3 0
D. N. Poor Boys' Seminary, Bombay	27		381	1,074	39 12 0
Sir D. M. Petit Industrial School, Sirur	66	4	1,862	4,740	28 9 0
M. V. E. Society's Industrial School, Baramatti ..	11			400	36 6 0
D. C. M. Tailoring Class, Poona ..	57		437	921	16 2 0
D. C. M. Carpentry Class, Poona	42		320	1,111	26 7 1
A. M. Industrial School, Sholapur	19		372	1,327	69 13 0
S. P. G. Mission Industrial School, Ahmednagar	36		1,416	1,961	60 0 0
Sir D. M. Petit Industrial School, Ahmednagar	66	2	3,103	10,544	159 12 0
Weaving Department of Sir D. M. Petit Industrial School, Nagar	11	2		7,077	643 6 0
Salvation Army Industrial School, Ahmednagar	48		487	1,634	38 3 0
M. E. Mission Industrial School, Nadiad	50	4	1,784	12,148	242 0 0
I. P. Mission Industrial School, Borsad	21	2	986	2,836	149 0 0
Mahajan Home Industrial School, Surat	72		655	1,791	27 0 0
V. J. Technical Institute, Sukkur	31	4	2,256	7,279	234 12 0
<i>Unaided.</i>					
J. N. Petit Parsi Orphanage, Parel ..	35			4,253	120 10 0
Manual Art Society's Industrial School, Poona	10			2,348	234 12 0
Industrial School, Hyderabad..	25		Figures not supplied.		

Name of Institution or Class.	Average monthly Number	Number who passed a recognised final examination	Expenditure from Provincial Revenue.	Total expenditure.	Annual cost of educating each pupil
FOR FEMALES.					
<i>Aided</i>					
A. M. Girls' Sewing Class, Byculla	122		300	2,072	16 15 0
Work Room Classes of the Seva Sadan, Poona	120		1,548	6,645	55 6 0
Salvation Army Girls' Industrial School, Satara	40		452	1,992	49 13 0
S. P. G. M. Girls' Lace School, Nagar	88		1,000	5,933	66 0 0
A. M. Girls' Lace School, Ahmednagar	49		200	1,623	33 2 0
Z. B. and M. M. Embroidery Class, Manmad	28		690	4,830	172 8 0
S. A. Mission Industrial Class, Ahmedabad	44		345	1,430	32 0 0
Matibhai Chellaram Narishala, Karachi	11		360	1,189	99 1 0
C. E. Z. Lady Widows' Industrial Class, Karachi	22		2,000	4,993	226 15 0
Lakshmi Shala attached to Lalwanji Lane School, Hyderabad	8		500	707	88 6 0
C. E. Z. Lady Widows' Industrial Class, Sukkur	28		1,300	1,966	75 10 0
<i>Unaided</i>					
Narishala, Hyderabad	40	Figures not supplied by		the Manager	of the School.
Total Technical and Industrial Schools for Males	1,921	204	2,61,111	4,26,170	221 14 0
Total Technical and Industrial Schools for Females	800	..	3,715	33,780	55 10 0
Total Colleges and Schools for Technical and Industrial Training	3,084	219	4,62,243	6,94,010	226 1 0

APPENDIX E.

NOTE BY MAJOR G. H. WILLIS, R.E.

PRELIMINARY.

1. To foster industrial development in a Presidency with a dwindling, or at best a stationary, population where labour is already in defect can only be achieved in two ways, *viz.* :—by encouraging immigration or by increasing the efficiency of the existing labour. It may be assumed that the Committee is not called on to suggest any *modus operandi* for the first alternative and that it should therefore confine its enquiries wholly to the second.

2. In the endeavour to increase efficiency it would be *optimistic* to expect that, by the most lavish expenditure on the best devised plan, more headway could be achieved than the replacement of three men by two within ten years, ultimately arriving at an increased efficiency of 100 per cent in some twenty years, since all improvement must be looked for in the better training of future recruits to the army of labour.

3. In other words no immediate industrial expansion is possible since new industries can only start by robbing established industries of their labour, resulting in an unhealthy competition in wages paid for what will remain an unsatisfactory article.

4. Further, should new industries arise under Government encouragement or otherwise, they will tend to retard real advancement, in that with the competition thus brought about there will be a further draft on immature and therefore inefficient labour. Consequently those who should be the material to receive the moulding which is the object of the schemes hereinafter set forth will be enticed from the pupillary status by the comparatively high wage which they can command for their partly skilled or even wholly unskilled services.

5. Two important factors in the general situation are now for consideration, the absence of compulsory education and the low minimum age for work in factories. These two factors allow parents of the labouring classes to exploit their children's earning capacity so early that the children are debarred from reaching that stage of mental development which permits of their profiting by education designed to improve their working faculties and their ultimate earning powers.

6. It is therefore plain that, whatever scheme or schemes may be formulated for the improvement of labour to enable an extension and development of industry to take place, a heavy handicap exists which can only be removed by legislation imposing compulsory education and a much higher minimum factory age coupled with rigid enforcement of that legislation.

7. Let it be accepted then that for the present all endeavour must be directed to an improvement of existing material, and that in so doing the greed of parents must be combated. This at once points to some scheme or schemes by which the parent shall be put to no expense either directly or indirectly by curtailment of the child's earning capacity.

TRAINING OF ARTISANS.

8. While the example of other countries in the matter of technical education is of undoubted value for reference, yet since in all cases compulsory education and a reasonably high age for entering factories obtain in those countries their methods as a whole are not only unsuitable but are impossible of adoption. The recruitment would be so small at first and would increase almost certainly at so slow a rate that the provision of facilities on the scales and on the lines found suitable in other countries would be sheer waste.

9. But in most countries it has been found satisfactory to develop and encourage part-time education alongside part—or half—time factory work, and it appears to be on these lines that technical education for the artisan class should be developed in the Presidency. Until such time as the earliest age for employment in factories is raised to fourteen years, the half-timers should be encouraged to attend by the absence of fees and by inducements in the shape of small increases of pay by employers to those who profit by the education to the improvement of their efficiency. At these schools the three R's, drawing and English should be the main subjects, and the schools should be in no sense technical schools though the methods of treatment of the subject might with advantage be more utilitarian than is usual, questions arising in and out of the daily work of the students being utilized in order that the desired bias should be given. The object of this education should be clearly and unmistakably the development of the mental equipment to allow a certain selected few to proceed profitably to technical schools at or about the age of fourteen years.

10. Now it may be at once conceded that of the great majority of those passing through the elementary non-vocational school outlined above but few will rise or will be required to rise to anything beyond the status of a skilled artisan; and it might be fairly argued that they

can attain an equal mechanical skill by work at their trade without any literary training at all. Up to a point, and in certain trades, this is undoubtedly true, but it is only fair and, for the ultimate improvement of industry, it is essential that all should have an opportunity of proving capacity, if it exists in them. And at the same time any, even the smallest, amount of mind training is likely to react favourably on their work so that the education will not have been entirely wasted even in the case of those who fail to show any capacity for further training.

TRAINING OF CHARGEMEN AND SHOP FOREMEN.

11. Having then reached the age of fourteen or fifteen, after three or four years' part-time utilitarian schooling, the time has come for a rigid elimination of those who will benefit neither themselves nor industry as a whole by further training of a vocational nature, designed to fit those who undergo it for ultimate employment, first as chargemen and finally as foremen in the engineering trades and for equivalent positions in other trades. This will mean a selection of possibly some five per cent. only of those passing through the prevocational schools, the remainder continuing, outside the scope of the schemes here formulated, to work at their trades depending on their own assiduity and aptitude for any improvement in their skill and monetary worth.

12. This assumed number of five per cent. then has to be catered for, and it still appears that the part-time school or apprentice school is the only practical solution, but now, that is after the age of fourteen or fifteen, the school alters in character. It is vocational. In other words while theory is taught it is strongly tinged by application to the actual trades the pupils are engaged on in the factories or workshops. He is taught not only the why and wherefore of what he learns at the workbench but also to think out for himself problems which may come to him later on, and to apply theory, not necessarily advanced but none the less useful, to practical everyday work so that he may become not only himself the better workman but may in due course direct those who shall work under him intelligently and to their advantage.

13. The actual syllabus of a vocational school must vary according to the nature of the factory or works to which it is attached, and to formulate the syllabus is properly the work of the educationists advised by those responsible for the works or factory. It is the province of the latter to lay down their actual requirements in the matter of the attainments of their chargemen and shop foremen. The educationists can then devise courses to provide that the students, or a fair proportion of them, shall reach the desired standard modifying these courses from time to time as found necessary in the light of experience, and further and most important fitting the school course accurately to the actual work on which the student is engaged in the works at any particular time.

14. Four years is the least duration of study in the part-time vocational apprentice school which is likely to be of real lasting benefit to the student and to the ultimate profit of the enlightened millowner or works proprietor who is content to pay at perhaps rather more than their present value a small proportion of his hands and to recoup himself in the end by increased efficiency and output.

15. It is not suggested that at the end of the four years the product of the apprentice school will be fitted for immediate appointment to some comparatively highly paid post. It will then depend on his own good work and the use to which he puts the training he has had whether he fits himself for the posts of chargeman, and ultimately foreman, or their equivalents either in the works in which he has served his apprenticeship or elsewhere, or becomes merely stereotyped as a skilled workman. It will depend largely on whether he develops the faculty for controlling men. This cannot too often be impressed on the students as, in India, it is unfortunately a fixed delusion among so many of the semi-educated classes that when the education of the school is finished all has been learnt that is necessary, whereas the fact is that at that point they have only learnt to learn.

16. As a connecting link between these technically trained apprentices and the more highly educated college and workshop trained men who form the next category to be considered it may be confidently hoped that as in England and elsewhere some small percentage of the former may demonstrate the fact that they are so much the more capable than the others that they are fitted for and will benefit by college training. Every endeavour should be made to open the way to these few by liberal scholarships or some other method to take the college course.

17. With education arranged on these lines it becomes possible for the poorest artisan's son, if he has it in him, to obtain suitable training to fit him eventually for the higher positions on the technical side of industry.

TECHNICAL COLLEGES.

18. Thus far the means for increasing the supply and efficiency of skilled labour has been considered only, and it has intentionally been given the first place as being the most important in the industrial development of the Province. The time has now come to consider the supply of the directional staff, this being next in importance. The recruits for this staff must have

received a good grounding in general education with special attention to English and mathematics to enable them to study with ease in the necessary vocational textbooks which their technical training requires, and some facility in dimensional drawing is highly desirable. The elements of physics and chemistry taken towards the end of their non-vocational schooling will provide a useful, and probably welcome, variety in the curriculum. Other languages than English are unnecessary and inadvisable as the time required for them would be much more usefully employed in English.

19 To reach the stage of general education necessary a boy will have to be at least 16 years of age, and it is not generally held advisable that the vocational training should begin at a later age than 18. Seventeen years then is the mean age at which true technical education should begin. This with a four years course will mean that the technical education, so far as the college is concerned, will be completed at twenty-one. Four years is the least time that can be considered adequate for training by whatsoever system the training is given, *i.e.*, whether by workshop apprenticeship followed by college courses, or *vice versa*, or by the "sandwich" system of alternate college courses and workshop experience. In the case of many, five years will be required, but those who cannot qualify in five years should not be allowed to continue.

20 Assuming then an average age at entry of seventeen years and a course of four years at college, it is now necessary to decide on which system the education should be imparted. There is a strong general tendency in other countries to adopt the sandwich system of alternate college courses and workshop experience. This seems to be the more evidently fitted for adoption in India in order to combat effectively the strong disinclination among the more intellectual classes to take off the coat and apply oneself to the manual practice essential to a complete knowledge of the processes and methods involved in any industry. By a judicious alternation of theory and practice it is possible that this disinclination may be greatly diminished with the best of results. The sandwich system of training is therefore very strongly recommended for adoption. Against the two other systems it is to be urged that the first, in which apprenticeship precedes college training, is likely to be very unsatisfactory in that a considerable time will have elapsed during which the faculty for booklearning has been lying dormant; and the second is open to the objection that, after a long course of college training with but little opportunity for practical application, the keenness necessary for an adequate practical training is likely to be seriously diminished.

21 Assuming further a working year of thirty-nine weeks, it is suggested merely as an example of the way the system is applied, that in the first year the first two terms, each of thirteen weeks, should be scholastic and the third would be spent in the works. The first and the third terms of the second and third years should be scholastic and the middle term spent in the works, while of the fourth year the first term should be spent in works and the final two terms in the college preparing for passing out. This gives, as a total, eight terms each of thirteen weeks in the college and four terms each of thirteen weeks in the shops, mill, dyeing or chemical factory or elsewhere with holidays amounting to thirteen weeks in each of the four years. Some such allocation of time appears to provide fully for the normal scholar both for his theoretical and practical training, and it has the advantage that accommodation is only necessary in the college at any one time for three quarters of the total number passing through. It is possible that experience will show more workshop time to be necessary and less collegiate instruction.

22. Since full provision is proposed in the first part of this note to be made for the supply of all necessary skilled labour, it is unfair to the country which will provide a considerable portion of the funds necessary for the maintenance of the college or colleges for the training of directional staff, that the product of the colleges should fall to the level of ordinary skilled labour. This is in effect what is happening with our colleges to-day and it should be guarded against in future by the most rigorous weeding out at the annual examinations both on the results of those examinations and on observation of the students especially during their workshop terms. There will certainly be a proportion which, while satisfying the examiners on booklearning side, will plainly reveal to the observant instructor in the workshop that they have no real aptitude for the profession they are studying for. It is important to avoid wasting accommodation and funds by eliminating these unsuitable candidates for the diploma.

RESEARCH WORK.

23. Given these two systems of technical education, the one, the apprentice system, with part-time literary instruction followed later for those qualified to profit thereby by part-time vocational training, and the other, the college training alternating with workshop, mill or factory training, it appears that all that is necessary for the present will have been done for the industrial advancement of the Province. It may however be found advisable to provide accommodation and equipment at the colleges for research work, but the funds for this should be provided by those who will benefit primarily thereby, *viz.*, the manufacturers. It is surely not too much to expect that from among our wealthy Indian manufacturers some at least will emulate those of other countries who, by munificent gifts of funds, have rendered available to the earnest student splendid equipment and accommodation therefor for valuable research work.

COTTAGE INDUSTRIES.

24. There remains now for consideration the encouragement and improvement of what are perhaps best termed cottage industries. These industries are those which can be carried on profitably and conveniently otherwise than in factories and works, for coping with the local demand. The products are usually rough but efficient for their purpose. As examples, carpentry, smithy work and rough domestic pottery may be cited. It is difficult to devise any suitable system whereby the practice of these industries may be improved since those whom it is desired to benefit must necessarily be very scattered. It seems probable that the best way to deal with these industries lies in imparting in the elementary education, which it is to be hoped will not long hence be universal and compulsory, a strongly utilitarian bias, at least in the case of those children whose natural calling will be the cottage industry.

25. To this end the curriculum should include elementary mensuration with the accurate use of the foot rule, a thorough grounding in simple arithmetic and some simple dimensional drawing. These if well taught should go far to improve matters. The proper use of suitable tools and their upkeep in efficient working order could best be imparted by means of skilled artificers demonstrating in actual practice in the villages throughout the province. It is probable that on these lines progress would be very slow owing to the conservatism of the Indian tradesman but no more satisfactory method suggests itself, and a trial of the value of these demonstrations might be made in selected localities. The present system of industrial schools has proved itself entirely useless, attracting the wrong classes and turning out a useless product at considerable cost.

ESTIMATES.

26. At this stage it is not possible to frame any reliable estimates for technical education in the Province as it is not and cannot be known to what extent the people will avail themselves of the facilities to be offered.

27. First, considering the cost of the education in college and workshop for those ultimately to qualify themselves for directional appointments, it may be assumed that the Victoria Jubilee Technical Institute will be converted to the purpose of providing the technical education on the lines indicated in paragraphs 18 *et seq.* above. Under that scheme the buildings will suffice for one-third more students than they are designed for, *i.e.*, a total of 666. Of the students now attending that institution a large number come from outside the Province, and the needs of this Presidency can be more fully met by limiting this immigration either arbitrarily, by prescribing a maximum number of students other than from Bombay or Sind, or by considerable higher fees for outsiders. Let it be assumed that the number of students from outside will be not more than one-quarter of the total in the future. We then have accommodation in the Institute for 500 students belonging to the Presidency.

28. The present cost per student is Rs. 580 a head annually, excluding payments by students. This is likely to be increased if more extended training is to be provided and it may be put tentatively at Rs. 700 a head, or, for students belonging to the Presidency, at a total of Rs. 3,50,000 per annum, keeping the fees payable by the students at the present day figure. This is an increase of Rs. 1,74,000 per annum over the present cost.

29. It is probable that some initial cost will be incurred in the provision of hostels for the students doing their works courses at mills, factories, etc. Since one-quarter of the students are thus to be accommodated we may assume as a rough figure Rs. 125 × 1,200 for the capital cost, without land, of these hostels. Land at Rs. 20 a square yard would double the cost, hence until sites and site values are determined it is not possible to suggest any figure for the actual initial cost to be incurred. Possibly preferential terms as regards land within mill or factory compounds might be conceded for patriotic reasons by enlightened owners.

30. When we turn to the apprentice system proposed for the recruitment of skilled labour, we are on even more difficult ground. In the first place we are confronted with the same ignorance as in the case of the colleges of the numbers to be provided for. Next there is the non-existence of any suitable trained teaching staff for the type of school contemplated. It will of course be only possible to establish these schools at centres where mills, factories and workshops exist to which the pupils can be apprenticed; but large industrial centres like Bombay and Ahmedabad will require several schools ultimately, if the pupils' time is not to be wasted in journeying between the works and the school. If, after owners have been consulted and have agreed to support this half-time apprentice system, it be decided to establish these schools, they might first be established to the number of half a dozen in Bombay and perhaps four in Ahmedabad each to accommodate 50 pupils, when the initial cost without land may be taken at some Rs. 25,000 for each school. Here again we may hope that patriotic owners may allow some preferential terms for land within works' boundaries.

31. The recurring costs for these schools may be taken at Rs. 150 per student per annum, or for the 500 pupils, for which it is suggested accommodation should be first provided (paragraph 30), a total of Rs. 75,000 per annum.

32. All these very meagre estimates provide nothing for the training of the necessary teaching staff, a very important and considerable item. They provide only for starting the system, given a supply of competent teachers. It is to be hoped that soon after the inception of the system an increasing demand for its advantages will arise to be met, both as regards initial and recurring expenditure, as Government is able to find the funds to do so.

33. Turning again to the provision of teaching staff it appears probable that a special training college or branch of an existing training college will be necessary, the latter being probably sufficient in the early days of the scheme. The present cost of training which may be put at the cost of a four years course at the V. J. Technical Institute will be Rs. 630 a head per annum. From teachers so trained it will be necessary to recruit inspectors for the schools to work under the Director of Public Instruction so as to ensure efficient teaching. Very frequent inspection by reliable qualified men is essential to the real success of the scheme.

34. Finally for the success of the demonstration method of improving cottage industries it will be necessary to recruit one or more tradesmen of each class and to train them thoroughly in modern methods and in the use and upkeep of their tools. They must also be selected with a view to their ability to impart their knowledge to others. They will have to be well paid, provided with a complete kit and liberally treated in the matter of travelling allowances to induce them to keep on the move, and they will have to work under a conscientious efficient inspector. They must also be to some extent literate in order that they keep the inspector informed through the post of their movements and may outline to him their daily work and progress. They will have to be provided with credentials to minor officials and village headmen that they may not be interfered with and may be given reasonable facilities to demonstrate to those willing to be taught. Here again the success of the scheme will depend almost entirely on adequate inspection and control of the demonstrators.

(Signed) G. H. WILLIS.

His Majesty's Mint,
Bombay, 20th June 1921.

APPENDIX F.

REPRESENTATION ON TECHNOLOGICAL EDUCATION OF
THE UNIVERSITY GRADE.

(Submitted by Mr. K. H. Vakil on behalf of the Indian Merchants' Chamber and Bureau.)

Bombay, 28th June 1921.

To

SIR M. VISVESVARAYA, K.C.I.E., B.A., L.C.E., M.I.C.E.,
Chairman, Technical and Industrial Education Committee,
Government of Bombay.

SIR,

I have the honour to submit herewith this special representation on higher technological education on behalf of the Indian Merchants Chamber and Bureau, whom I represent on your Committee.

Government have appointed this Committee to prepare a comprehensive scheme for technical and industrial education. The terms of reference include all classes of technical training—primary, secondary and University. The Committee is asked "to examine existing facilities for imparting higher education in mechanical engineering and technology and to suggest measures, including provision for research work needed to prepare leaders, organisers and experts, that is, persons qualified to fill leading executive positions in business." This reference evidently implies that Government have given consideration to the report of the Industrial Commission and accepted the recommendation that "it is urgently necessary to prepare for a higher technological training, which will provide the means whereby the physical science students of the colleges affiliated to the University may learn to apply their knowledge to industrial uses. and we anticipate that industrial expansion will justify the starting of departments of general technological chemistry. We regard it as certain that public opinion will demand that these colleges shall be connected with the local Universities and that the students shall be able to obtain University degrees. To this we think no serious objection can be raised."

The Industrial Commission could not have arrived at any other conclusion than this, and if it had been accepted all round in the spirit in which it was made, there would not have been any need for this special representation on behalf of my Chamber to this Committee. There appears however in certain quarters a predisposition to throttle by adverse criticism every attempt to create facilities for higher technological training. In a note* circulated to the members of this Committee with the terms of reference it is suggested that higher technological education should be subordinated for the present to other classes of technological education, mentioned in the terms of reference. It is argued "the persons here referred to must and usually do grow out of the class of individuals referred to in the second and third terms of reference, by their own efforts assisted by persons already occupying positions of influence in the business." That such an argument should be advanced against higher technical education is most surprising. There can be only one obvious conclusion to be drawn from the argument which has neither logic nor experience behind it to support its validity. No educationist could ever contend that persons of higher attainments "grow out" of a lower grade of training without the aid of further higher training. This principle of evolution does not apply to other branches of knowledge; if it did, there would be no justification for higher training in colleges for post-graduate and research work. This kind of argument, though it cannot be taken seriously into account in determining an important issue, is indicative of the feelings that prevail against higher technical education being imparted to Indians. We are justified in treating at length this subject, specially as we find that great stress is laid on the report of the Committee of Direction for Technological Education (1919-20), which concludes as follows:—

"The really important matter for immediate attention for the development of industries is the increase of the supply of skilled tradesmen, and that this increase will naturally be arrived at by the system of apprenticeship in works with classes. The demand for the product of a technical institute of University standing is insignificant compared with that for skilled tradesmen, and their interest should therefore for the present be subordinated to the production of tradesmen in every branch."

With regard to this conclusion, my Chamber feels that, as the Committee was not fully representative of Indian interests, it cannot accept this prejudiced conclusion and strongly deprecates some of the most amazing and damaging statements made by Mr. Dawson against the fitness and capacity of Indians for higher technical education. Mr. Dawson's arguments

*It has since been explained that the note here referred to was the opinion of one individual member and not of the whole Committee.

are nothing new. The same arguments were advanced as far back as the early eighties, when the question of remodelling the Poona Engineering College was under discussion. All the arguments advanced by Mr. Dawson are found in the masterly memorandum on Technical Education in India submitted by Mr. A. P. McDonnell (afterwards Lord McDonnell) in 1886. The bogey of literary education, of literary atmosphere and of better class families and their apathy towards manual work—all this has been discredited during the last forty years by the results obtained by Indians privileged to carry out works of responsibility under suitable conditions.

The subject of technical education was very carefully examined by the Industrial Commission and some of its conclusions have commended themselves to general acceptance on account of the sincerity and fairness of the Commissioners and the depth and soundness of their prevision. While this is not the place for a critical examination of their observations, my Chamber would still point out some of the salient features in refutation of the one-sided and prejudiced opinions expressed by certain parties against higher technical education for Indians. One of the stock arguments against Indians is that "boys of the really better class families do not take to technical education and many parents object to their sons doing so" This is a truism common to all nations. Even in England the technical talent is drawn from certain classes only. The Industrial Commission state "The supervising staff in a larger number of English industries is recruited entirely from one or other of two sources—from artisans who have worked their way up, obtaining the necessary theoretical knowledge by private study or in evening classes, or from young men who have some connection with the industry. . . It is very exceptional for a person unconnected with the industry to attempt to enter it." This is a peculiarity which Indians share with other nations. The difficulty of recruitment for industries was keenly felt by the Commissioners, who realised that unless special arrangements were made as outlined by them, it was difficult to make India independent of foreign technical assistance. The disadvantages of importing recruits from abroad were clearly pointed out by the Commissioners who remarked, "The continuance of conditions which force the industrialists of the country to import so many of their subordinate supervising staff is clearly most undesirable. They form a serious handicap to progress and militate against the ideal of an industrially self-sufficing India. Many men brought from foreign countries are found unsuitable on their arrival here, others take a dislike to the country, or develop indifferent health and are generally a source of anxiety to those responsible for bringing them out."

My Chamber is fully alive to the conditions under which recruitment of Indian technical talent is made. While it recognises certain shortcomings of Indians, it is convinced that the unsatisfactory and poor results cited against them were the natural sequence of conditions which are dissimilar to those prevailing in other countries.

In the majority of industrial undertakings in this country the technically trained Indians have to work against very adverse circumstances :

1. The boards of management in most of the large companies, the Port Trusts, the railways, docks, the engineering firms are composed of Europeans who are, naturally, in favour of the employment under them of European staff. Indians are thus continuously left out of responsible positions.

2. We see among the Civilians and other heads of Government Departments the same tendency towards the employment of Europeans to the exclusion of Indians though the latter are fit for the work.

3. A similar state of things unfortunately exists also in many big industrial concerns where the foreign experts at the head generally insist on the employment of more and more Europeans.

4. In cases where Indians were entrusted with responsibilities by agents or directors well disposed towards Indians, they had still to work under imported supervisory staff and consequently their work was not adequately recognised. Unfair and uncalled for criticism was passed on their work, and the conditions of the tenure of office were made so unpleasant that no self-respecting person could tolerate to continue under such circumstances.

5. The necessary condition for obtaining the best results from a worker is contentment and loyalty towards the master. If the worker is in any way dissatisfied or has any grievance, his efficiency suffers to a remarkable extent. In the case of Indians the causes of dissatisfaction and discontent have been numerous. They have not been treated liberally as regards the conditions of work, salary, promotions and bonuses.

6. Indians have not generally felt any security, consistent with their training and work, in the employments where the higher posts were closed to them, not because of their technical shortcomings, but because of the management's want of confidence in them. Want of security and rightful promotion, combined with want of opportunities to do work which may reflect credit on themselves, have disappointed many a promising career. Imported men, for no equitable reasons, have continued to boss over Indians of superior talent and better training.

These conditions continue to prevail in almost all the leading works in this country, where the better paid offices are held as a close preserve for foreigners.

7. The inadequacy of pay given to Indians has kept back men of the intelligent classes. The Commissioners have pointed out that difficulties arise in this Country from the fact that the educational attainments of the artisans are too low to fit them for such posts, while the stipends and prospects offered are not of a nature to induce the better educated classes to spend a number of years as workmen. The Commissioners further remark, "As regards salaries, we consider that the principle must be adhered to that equal proficiency must be equally remunerated"

My Chamber, therefore, strongly condemns the charges brought against the capacity and fitness of Indians for higher technological training and undertakings. Indians have been sinned against and maligned, and it is the considered opinion of my Chamber that to do justice to young Indians and to make India self-sufficient, the only course left open is to create a technological institution with a view to prepare leaders, supervisors, organisers and experts, thus preparing the way for filling all the leading executive positions in industries and commerce in this country by Indians. Once this is settled, my Chamber feels that the bogey of the insufficiency and inefficiency of Indians would soon disappear. For this reason, the following scheme for a technological institution, under the first term of reference, is framed for the consideration of your Committee. This scheme suggests the foundation of a Faculty of Technology in the Bombay University and in doing so, it relies mainly on the finding of the Industrial Commission in regard to the urgent necessity for a higher technological institute. The Industrial Commission has pointed out the necessity of drawing from the higher middle classes the recruits necessary to replace foreign imported men. It is true that up to now the class of Indians possessing intellectual qualifications higher than those of the rank of artisans and workmen have kept away from industrial careers, with the result that India has produced men of lower grade ability and capacity for the development of Indian industries. This deficiency my Chamber attributes to several root causes: (1) The Commission have laid considerable stress, and we fully agree with them, on the fact that there is no provision made so far for the middle classes. They remark "We consider it of great importance that the conditions of training should be such as the educated Indian youth will consider consistent with his sense of self-respect; for if this is not satisfied, we shall be depriving ourselves of the most promising field of recruitment." This lack of provision is responsible for the total dearth of men of outstanding ability and original work in textile, mechanical and chemical engineering—branches of engineering which have had a fairly long life in this country. If these branches had been strengthened from the beginning by the intellect of the middle classes, having the opportunities and facilities which obtain in other countries, India would have recorded results in engineering of which any nation could be proud.

(2) Lack of provision for the training of educated classes was not the only defect of our system. In India, as in other countries, education carries with it a certain recognised status in society. Each profession, carrying with it the dignity conferred by University recognitions has drawn towards it the best men from all classes of intelligentsia. Merely abusing Indian middle classes with hankering after University qualifications shows a pettiness of mind and an almost unpardonable lack of knowledge of human nature. When an occupation ceases to be purely mechanical or manual and is developed by the contributions of the mind, it rightly desires to run *pari passu* with other intellectual occupations and professions. The older Universities once recognised mathematics, law, literature and theoretical sciences as worthy of their recognition, and consequently the best brains of the country were drawn to these subjects. In more recent times, however, civil engineering, medicine, commerce and several branches of applied sciences were also duly recognised by Universities and degrees were conferred in these faculties without any distinction or reservation. The effect of this progressive and just measure was reflected in the advancement of many neglected subjects by diverting from the other over-stocked occupations men of promising ability, and in the great impetus given to applied sciences. That condition has not obtained in Indian Universities, with the deplorable result that our industries have been left to men of inferior calibre. The paucity of able men in technical careers is thus to be attributed not to any apathy of Indians towards industries, but to the indifference of our Universities. If, therefore, technical education is given a University recognition in Bombay, better class men who overstock legal, clerical and other professions would be diverted to the services of industries, and we would thus have a body of men, commanding the same status in society as other professions. Having once raised their status by academic recognition, there will be no need to look out for abler men from abroad. Professors at Cambridge, Oxford, Manchester, London and Leeds have all, from time to time, recognised the capacity of Indians for the highest type of education. Given equality of treatment and facilities and opportunities, Indians have proved equal and in some cases better than the best men imported from abroad.

(3) My Chamber does not admit that educated Indians are unwilling to submit to early hours and hard workshop training. In the textile industry, for instance, Indians do work early and late even in the highest ranks and do get through very arduous work. There may be instances of a few men not readily taking up hard manual work. Grave injustice has, however, been done to the general interest of Indians by such sweeping statements. Besides, higher technical

training is only concerned with certain classes of work and does not demand severe manual exertion. Indians have been subjected, for obvious reasons, to severe low grade manual work by unfriendly employers.

It may be stated with confidence that with the change in the times and the industrial conditions there are hardly any instances to prove that a properly trained Indian has refused to work under factory conditions. The Industrial Commission remarks "It has been objected that educated Indians will be unwilling to submit to the early hours and hard conditions of workshop training. This may, no doubt, have been the case in the past, but there are now numerous signs of a marked change in sentiment and we feel confident that, if facilities are provided, increasing use will be made of them. There are difficulties in the way, we admit; but they are not so great as is often supposed, and can be overcome." Technological institutions attached to the Universities where better class Indians are from the very start trained up in a suitable atmosphere will satisfy any remaining doubts regarding the difficulties in the way of Indians. They will thus remove the aspersions cast without any jurisdiction, by persons unfriendly to the interests of India, on the capacity of Indians.

(4) At the Indian Industrial Conference of 1915, at which Sir Dorab Tata presided, Dr. Harold Mann moved a resolution for the formation of a Technological Faculty in the important Indian Universities. This resolution was supported by the Honourable Mr. Lalubhai Samaldas and fully confirmed and passed by the Conference. Dr. Mann in moving the resolution pointed out that the time had come for the subject to be taken up on more liberal lines than had been the case in the past. He placed the case very strongly and pointed out that during his long connection with the Bombay University he had found that the idea was deeply rooted in the minds of Indians that culture was only obtainable by literary pursuits and that those who studied Technology belonged to a lower plane of civilization and culture. That has been the reason why able Indians have not seen their way to take up technical pursuits, and the remedy only lies in the University giving them the same place of recognition as that given to other professions, like Commerce, Civil Engineering, Agriculture, Law and Medicine.

Before the scheme is discussed it is necessary to examine the contention that there is not "sufficient demand" for the "product" of a technological institute in Bombay. This argument has been carried to such length and such importance is being attached to it, that my Chamber was painfully surprised to find that the consideration of the most important reference was likely to be shelved on the ground of "insufficient demand" for highly trained Indians in industries. My Chamber, however, would confine its attention, after due consideration, to the utility and potential value of a technological institute. There are hardly any records to show that statistical figures have brought into being such institutions. In the majority of cases the institutions owe their origin to the broad-minded and liberal provision of sincere educationists or well-wishers of the community. My Chamber would like to know whether there are any records that justified the creation of the Indian Institute of Science at Bangalore; whether there are any records or figures justifying the creation of almost all the first class colleges and technical institutions in Great Britain, Germany and America. To apply the vulgar term "demand" from economics to education is to mistake the meaning and object of higher education. The fact remains that of all places in India, Bombay is the largest centre of a number of industries. The fact also remains that there is a large number of imported men working in the city and that the industrial progress and requirements of the country have not come to a standstill, but are constantly growing in every direction. To prepare the highest type of men by creating facilities and to supply the present and future wants of a growing and important industrial community could be the only reason for the creation of a technological institute. One can never prejudice the necessity of an institution of this character by statistical figures, and sound common sense will always indicate that the recruitment of professions can never be regulated by the laws of supply and demand. It is erroneous, therefore, to attempt to determine this issue on statistical figures. To be frank, my Chamber clearly lays down the object for which it demands the creation of a technological institution, and that is to aim at stopping the importation into India of technical skill from abroad; and to take the earliest opportunities to make the country self-sufficient and independent and self-respecting in matters affecting our vital industrial interests. This conclusion, my Chamber fears, may go against the interests of certain privileged classes, whose sympathy it would be difficult to enrol in the interest of the higher Technological Institute for Indians.

OBJECT.

The object of the Institute should be as outlined in the first term of reference, viz., to train men with high qualifications in branches of applied sciences particularly with reference to those for which there are openings in this presidency. Besides the training of men to undertake responsible positions as organisers, experts, supervisors and leaders of industries, the Institute should be the training ground for men, who will be required as teachers under Classes B and C*. The two existing institutions should not form part of this faculty. The College of Engineering

* Vide statement at pages 159-161.

at Poona should specialise in the training of civil engineering only. This institution should be relieved of mechanical and electrical engineering. Its location may remain at Poona. The V. J. Technical Institute should be made the chief Institute under Class B without any change in the technological courses, as suggested by the Industrial Commission. This institution in the new surroundings at Matunga will be well located for the purposes for which it is mainly qualified. It will not be far from the great engineering workshops of the railways and the textile mills. Apprentices from these may preferably find it convenient to attend its classes. But my Chamber is strongly of opinion that no patch-work attempts should be made to convert it into a technical institute of a high order.

SUBJECTS.

In determining the subjects, due regard has been given to the existing industries of the Presidency. In certain cases, however, we feel justified in well considered anticipations. For instance, provision for calico printing has been made in the chemical section for special reasons. The different hydro-electric schemes near Bombay will provide a large volume of fresh water that is required in calico printing. Already one or two English companies have prospected for sites for calico printing works. Another subject under chemical section is electro-chemistry. Considerable work has been done at Koyna River and Tata Electro Chemicals, Ltd., have so advanced the project that we may confidently expect it to be in the near future one of the biggest centres in the world of electro-chemical and electro-metallurgical industries. Under this section also provision has been made for fermentation industries. Possibilities of cheap industrial alcohol are great in this Presidency, and attention to this fact was drawn in a special Parliamentary report. Under chemical section provision has also been made for photography and printing. Indian printing and process or lithographic work is so notoriously poor that unless attempts are made to develop this on systematic lines, one of the important branches of applied science is likely to remain neglected. In printing, photography and process work, the training that is obtained at present is very crude, hap-hazard and not on sound technical lines.

For these considerations the following chief departments should be constituted in the Institute—

- (1) Electrical Engineering
- (2) Mechanical Engineering
- (3) Applied Chemistry
- (4) Textile Industries
- (5) Plumbing and Sanitary Engineering

NUMBER OF STUDENTS.

The Institute should make provision for the following number of students on the assumption that each year nearly sixty to seventy per cent. of the students in each branch qualify for the degrees. It is assumed that the complete course in each subject is spread over three years and two more years are spent for post-graduate work:—

	Third year.	Second year	First year	Total
Electrical	15	20	30	65
Mechanical	20	25	40	85
Applied Chemistry	10	15	30	55
Textile	30	40	50	120
Sanitary and Plumbing	10	15	20	45
	85	115	170	370
Post-graduate and Research .. .. .	..	..	..	30
Total .. .. .	..	..	..	400

This institution would, therefore, turn out every year in all about 40 to 50 men trained in different subjects. The yearly admissions of fresh students need not exceed 65 to 70.

ADMISSION QUALIFICATIONS.

The candidate should be at least 18 years old and must pass the first year examination in arts. Besides this qualification the candidate must be submitted to an entrance examination in Elementary Science, Drawing and Mathematics to determine his fitness to undertake a technical course. If the student successfully passes through the courses and puts in two years more for post-graduate work qualifying him for the Master's degree he should be able to begin his profession at 23, which age can be considered neither very advanced nor young. Admission should not be restricted to the students of this Presidency but should be open to subjects of Indian States and other Presidencies. The object to be aimed at should be the training of the best material available in the country.

PRACTICAL WORK.

This work should be given in the second year of training in the works of the Institute and by arrangement with regular factories. The first year to be devoted to a general grounding in theory and mathematics with machine drawings and lectures in economics. This last subject has been recently added in the curriculum of advanced technical institutions in England. The third year may be spent in advanced study and specialisation and partly in workshops and laboratories over higher grades of practical work.

SPECIAL SUBJECTS.

In the third year each student should be made to take up an optional subject for specialisation in the branch selected by him. For instance, in Applied Chemistry, specialisation may be in one of the following subjects :

- (1) Textile chemistry; including sizing, bleaching, dyeing, printing and finishing
- (2) Sugar manufacture
- (3) Technology of oils, fats and waxes
- (4) Soaps, candle and glycerine
- (5) Photography and process work
- (6) Manufacture of heavy chemicals, acids and alkalies
- (7) Manufacture of pharmaceutical products
- (8) Chemistry of leather trades
- (9) Electro-chemistry
- (10) Fermentation industry
- (11) Wood distillation and tanning extracts

These are the industries typically suited for this Presidency, and provision should be made for them in the Institute.

FEES, SCHOLARSHIPS AND BURSARIES.

In all institutions of a specialised character, the fees do not cover the total expenses of the institutes. In Germany and England similar institutions are maintained mainly by public bodies. The fees to be charged should not be higher than those charged in Government Arts colleges and the Grant Medical College. The object should be to draw the best available material by inducements and concessions. A very large number of bursaries should be given to the students by way of inducement. Bursaries, exhibitions and scholarship holders should form nearly one-third of the total number of students and the fees received from the remaining part should be set off for the payment of these stipends. Post-graduate work must be fully paid and the scale of payment should be fairly high in order to keep better type of students from seeking their livelihood elsewhere. They should be made to feel that the payment they receive during the period of post-graduate study would be no less than what they would have received in factories and workshops.

The curriculum under different branches should be determined after a careful study of similar courses abroad and of Indian requirements, but this question should be left over till the scheme is fully matured.

BUILDINGS AND EQUIPMENTS.

The same considerations would apply for buildings, laboratories and workshops and their equipments. No estimate could be prepared till it is finally decided on what lines the Institute should work.

LOCATION AND SITE.

The best location for the Technological Institute in the Presidency would be Bombay itself, and the best site would be somewhere in the northern part of the island, either in Trombay, where Sir Chimanlal Setalvad had proposed to remove the Elphinstone College, or between Bandra and Andheri, where sufficient cheap land would be available for factories and workshops.

STAFF.

The success of this Institute will depend on the selection of the staff. A definite rule must be laid down, as has been done in first class English institutions, to enrol the services of the most eminent and topmost men available in each branch. * Second rate men not only ruin the reputation of an institution, but do a considerable harm by retarding the progress of higher education. Instances of selections of men of mediocre ability in this Presidency are not wanting. One of the best institutions, full of great potentiality, has been given a start with a staff of low grade ability and without having any status in academical circles acquired by their learning

and research. Such mistakes should not be repeated in the case of the proposed institute. Sufficient number of instances may be cited in which the influence of famous teachers has helped in the creation of the tradition and atmosphere necessary for higher education and research.

CONTROL.

The control of the Institute should be left in the hands of a body of Governors representing the University, trades and industries, the Educational Department and the Municipality. My Chamber does not believe that such an institute should be left in the hands of the Department of Industries, which, judging by the experience in the past so far, may continue to be staffed with men of inferior calibre, or indifferent sinecure hunters. *My Chamber is aware of the recommendation of the Industrial Commission that such an institution should be in the hands of the Director of Industries. But so long as the Directors of Industries remain non-technical men, drawn from the Civil Service, and are not Indians, my Chamber has no confidence in their capacity and fitness for the management of an important institution looking after the vital interests of the country.

ESTIMATE OF YEARLY EXPENSES.

A—Staff.

	Rs.
Principal at Rs. 1,500 per month	18,000
Professor of Electrical Engineering at Rs. 1,250 per month	15,000
Professor of Mechanical Engineering at Rs. 1,250 per month	15,000
Professor of Applied Chemistry at Rs. 1,250 per month	15,000
Professor of Textiles at Rs. 1,250 per month	15,000
Chief lecturer in Sanitary Plumbing and Engineering at Rs. 750 per month	9,000
15 lecturers at Rs. 500 per month, each	90,000
15 Demonstrators at Rs. 150 per month, each	27,000
10 Laboratory assistants and workshop attendants at Rs. 100 per month, each	12,000
15 Laboratory and workshop hamals at Rs. 50 per month, each	9,000
Chief clerk at Rs. 250 per month	3,000
6 Office clerks at Rs. 120 per month, each	8,640
Sepoys, Ramosees and Boys, total Rs. 400 per month	4,800
Accounts staff Rs. 400 per month	4,800
Total ..	2,46,240

B—Maintenance charges.

Water, power, light, etc.	2,500
Library and reading room	5,000
Office requirements, stationery and printing	5,000
Workshop stores, replacement of implements, etc.	2,500
Chemical department stores and supplies	20,000
Total ..	35,000

A .. 2,46,240

B .. 35,000

2,81,240

Add for contingencies .. 18,760

Grand Total Rs. .. 3,00,000

As the total number of students for whom provision is made in this technological institution is 400, the cost per student works out at Rs. 750. In the provisional statement submitted to the Committee, the cost per pupil works out at Rs. 792, against Rs. 750 as shown above.

My Chamber is therefore justified in recommending a total provision of Rs. 3,00,000 for the Technological Institute.

In conclusion, my Chamber again wishes to lay stress on the immediate necessity of providing at an early date a Technological Institute in Bombay affiliated to the Bombay University under the Faculty of Technology. In expressing this view, it has in mind the great and

* Note.—It has been pointed out that in paragraph 178 of its report the Indian Industrial Commission recommended that the expenditure of institutions of collegiate rank should be administered and their teaching controlled by joint boards, on which the Department of Industries, and the local University and employers should be represented. Paragraph 180 of the Report shows that the Commission proposed that only those institutions which are not of University rank should be placed under the control of the Director of Industries.

important industrial developments of the Presidency and the growing public opinion for replacing imported men by Indians. Industrial progress in Western countries, particularly in Germany, was the result mainly of the highest class of liberal technical education. Great stress was laid by the Technical Instruction Committee of Manchester in their report on the contribution of technical institutions to the progress of Germany. This Committee remarked "The technical schools were the root and base of the surprising industrial development of Germany and are the main contributors to this great economic result; it is no less certain that if we are to maintain our position as a great industrial community it must be by following and adopting the same methods"

The same liberal policy must be followed if India is to attain a pre-eminent position in the industrial world and that could only be done by means of a technological institution of University status, absorbing in the ranks of industry our ablest young men, who at present drift into non-productive professions. My Chamber, therefore, urges your Committee not to subordinate the consideration of higher technical education to the other lower grades of technical education and hopes that you will give it the first place of importance in your recommendations.

Yours truly,

(Signed) KAPILRAM H. VAKIL.

APPENDIX G.

NOTE BY MR. A. J. TURNER ON INDUSTRIAL AND TECHNICAL EDUCATION, BOMBAY.

Terms of Reference No. 1.—To examine the existing facilities for imparting higher education in Mechanical Engineering and Technology and to suggest measures, including provision for research work needed to prepare leaders, organisers and experts, that is, persons qualified to fill leading executive positions in business.

The persons here referred to must and usually do grow out of the class of individuals referred to in second and third terms of reference by their own efforts assisted by persons already occupying positions of influence in the business. In the evolution of these persons, commercial ability, spirit of enterprise, power to select men and the ability to dominate them by force of character are factors of considerable importance which, it is hardly likely any educational institution as such can supply to its students. These essentials of success, it may be readily admitted, can best be acquired in the actual practice of the profession or business with the assistance and guidance of its leaders. The higher education in mechanical engineering and technology which should serve as ground work for them, must needs be a very costly undertaking and since the number of such leading executive positions in business is by no means considerable, in fact since it is very limited, the interests of this class of persons may be conveniently subordinated for the present to the infinitely larger class of persons referred to in the succeeding terms of reference.

2. *Terms of Reference No. 2.*—To submit similar proposals for imparting industrial and technical education of the High School and Middle School grades, including laboratory practice, needed to train technical assistants, assistant managers, foremen, etc., that is, persons qualified to hold subordinate positions in large or factory industries or responsible positions in smaller ones.

3. At the outset it will be useful to note the existing industries of the country and the Presidency and the numbers engaged in them. Attached to this note is a summary* of the statistics of large industrial establishments, published in 1920 by order of the Government of India. It would appear that there are throughout the country about 4,300 such establishments giving employment to about 1,160,000 persons, the share of the Bombay Presidency being about 900 establishments with about 292,500 persons employed therein.

4. The range of industries covered by these establishments embraces work or processes connected with, *textiles* (cotton, jute, wool, silk, etc.), *minerals* (aluminium, coal, iron, steel, brass, copper, tin, lead, petroleum, etc.), *transport* (docks, railways, carriages, etc.), *food, drink and tobacco* (dairies, breweries, flour mills, biscuit factories, rice mills, sugar factories, distilleries, ice and aerated water factories, tobacco firms, etc.), *chemicals, dyes, etc.* (bone crushing mills, dyeworks, lace factories, oil factories, paints works, soap factories, etc.), *paper and printing* (book binding, paper mills, presses, etc.), *wood, stone and glass* (carpentry, cement works, coachbuilding and motor car repairs, furniture making, saw mills, stone works, tile works, lime works, glass factories, furniture workshops, etc.), *skin and hides* (leather works, tanneries, etc.), *miscellaneous*, that is, brush works, coopering, electrical engineering works, gas works, manure works, match factories, rope works, umbrella factories, etc., etc.

5. Besides these there are scattered throughout the length and breadth of the country numerous small establishments or shops such as those of village carpenters, blacksmiths, tinsmiths, furniture makers, carriage builders, potters, basket makers, weavers, stone cutters, coppersmiths, druggists, glassmakers, tile-makers, oil-extractors, rope-makers, etc., etc.

6. The essentially common educational need of the two divisions, which may be termed the urban and the rural or the machine work and hand work classes, embrace:—

(1) a competent knowledge of reading, writing and arithmetic; drawing; hand and eye training and some economic geography.

(2) workshop practice or practical training in carpentry and pattern-making; smiths work and turning, erecting and fitting, so far as the mechanical portion or processes of the business are concerned.

7. In the words of the Honourable Mr. J. G. Coverton, Director of Public Instruction *vide* paragraph 4 of his note dated 10th December 1920 "What is wanted is a simple and inexpensive scheme of manual training which teachers trained therein could apply easily in vernacular schools without entailing large expenditure on the authorities concerned for buildings and equipment and which at the same time should be in touch with the needs and conditions of the life of the people whose children attend the school. Such a scheme as I should hope for might fall in two parts. The first being distinguished as educational hand work and extending over the Infant's standard and first and second standard; the second beginning in standard III

* Not printed.

and covering two or three years. The first would include the usual kindergarten occupation, paper folding, clay modelling, cardboard work, etc. The second might be carried out in a graduated course through various media, e.g., cane (for basket work), clay (firebricks, pots, vessels etc.), wood (simple carpentry), stone and so forth. Drawing would be common to both parts but the drawing in the second part of the scheme should be closely related to the actual hand work and should involve practice in measurements and the application of simple scales."

8. The instruction provided in the Primary courses will thus be rendered more practical and better fitted for opening into technical careers. In the Infant's and standards I and II of the Primary School the education should comprise the three R's, elementary drawing and educational handwork, including the usual kindergarten occupations, paper folding, clay modelling, cardboard work, etc., and in standards III, IV and V, the three R's should be continued, together with lessons in geography and graduated courses of manual training through the media of cane, basket work, clay work, simple carpentry or wood work, stone work, etc., and drawing related to the actual handwork involving practice in measurements and the use of scales.

9. The first part of the common need having been thus provided, the accomplishment of the second should be attempted by apprenticing the learners or by sending them to a school provided with a training workshop where they should spend five years in carpentry and pattern making and should receive wages or stipends on a graduated scale. During this period the general education of the boys should be kept up by providing instruction in special classes attached to the workshops where they are apprenticed or in the training school itself in English, practical mathematics, drawing, economic geography and elementary science.

10. A selected number of the mechanics so prepared should then go the Central Technological Institute for advanced instruction in its mechanical engineering section to qualify themselves for the positions mentioned in the second of the Terms of Reference. The rank and file will remain as mechanics and will be adequately fitted to specialize in any industry requiring a fair grounding in practical mechanical work.

11. The number admitted each year to the mechanical engineering section of the Victoria Jubilee Technical Institute is now 30. It is proposed to raise it to 40 when the Institute has moved to Matunga. If the system of apprenticeship and practical education outlined above in paragraphs 7, 8 and 9 is adopted, it should not be difficult to provide this number from the successful candidates apprenticed to the Railway Workshops and other engineering establishments or undergoing training in the Practical Schools. The present course at the Institute will then have to be thoroughly revised and made much more advanced than it is now. It will be necessary to provide an instructional workshop attached to the Victoria Jubilee Technical Institute for mechanical engineering work. Such a workshop would be somewhat of an expensive character but there should be no doubt as to its value to industries worked by mechanical power. It could probably be made to secure a certain amount of return, but the fact must not be lost sight of that the primary object would be educational and not commercial. The instructional workshop here contemplated should be such as will enable a variety of accurate work to be turned out under ordinary workshop conditions.

12. This instructional workshop would have to be considerably more extensive if the Institute is to undertake the education of the boys rightly from the beginning, that is, commencing with the apprenticeship at say 12, which would have to be done if the local Railway workshop and factories do not find it convenient to join in the scheme with success. Provided sufficient funds both non-recurring and recurring are placed at the disposal of the Institute, its management might be relied upon to carry out the scheme satisfactorily.

13. As regards technology other than mechanical engineering, the Victoria Jubilee Technical Institute has already considered the development and extension of the scope of usefulness of its other departments, *viz.* —

the Textile,
the Electrical,
the Sanitary and Plumbing, and
the Chemical.

The Textile.—It is believed that with the change in the qualifications for admission, it will be possible to omit some of the preparatory work and devote fuller attention to the main subject and provide for more actual practice in spinning, weaving, dyeing, bleaching, finishing, etc., including the erection and fitting of textile machinery.

The Electrical.—It is considered that the field in electrical engineering will continue for some time to come, to be limited to wiring and the inspection of telegraph installations of railways or the electric lighting of factories and other premises as there does not appear to be much of constitutional electrical engineering in the Presidency.

Plumbing and Sanitary Engineering.—This department is deficient in its equipment of various types of sanitary fittings and appliances, but the deficiency will be largely if not altogether removed when the Institute is located in its new premises at Matunga.

The Chemical Section.—From the point of the development of industries worked by mechanical power or otherwise, this is at once a very useful and a very expensive section. The present equipment is incomplete and a large extension of it is needed to place it in a position to meet the demands for assistance that are likely to be made in the establishment and progress of industries in general.

14 The qualification for admission to these courses is equivalent to the Matriculation in English, arithmetic and algebra. The Entrance Examination of the Institute demands in addition some knowledge of drawing and chemistry. Drawing it is understood is now or will soon be a subject throughout the school course. Chemistry and physics should be provided for in the V, and VI and VII Anglo-Vernacular standards either as compulsory or optional subjects of examination.

15 Detailed lists of the additional equipment and staff required for the different departments of the Institute with a view to carry out a revised and enlarged syllabus of instruction are under preparation. They will be accompanied by rough estimates of cost. The list and estimates will be submitted shortly.

16 *Terms of Reference No 3*—To submit proposals for making provision for vocational schools, apprentice schools, continuation schools, etc., required for training skilled craftsmen and artisans for industries and industrial arts and for measures needed to spread among workmen and the masses generally a knowledge of the elements of modern business methods and discipline and of the use of tools, machinery and labour saving appliances.

17 In this connection it may be useful to note the industries of the Presidency and the principal centres thereof.

Bombay; the large industrial establishments of Bombay City comprise :—

dockyards, railway workshops, tramway workshops, mills, municipal workshops, port trust workshops, gas company's workshops, flour mills, engineering workshops, foundries, printing presses, saw mills, paper mills, ice factories, aerated water works, silk mills, woollen mills, tanneries, cycle and motor works, chemical works, coachbuilders, safes manufacturers, etc., etc.

Karachi has railway workshops, flour mills, ship-yard, bone crushing mills, iron works, municipal workshops, printing presses.

Ahmedabad, there are a number of mills, a few hosiery factories, oil mills, small iron works, a railway repairs shop and running shed, etc., etc.

Poona is a railway junction station with a paper mill, some printing presses, a metal work.

Belgaum has gunny factories, a distillery and one or two mills.

Dharwar, Gadag and Hubli in Dharwar have railway workshops and gunny factories and some mills.

Broach, Nadiad, Sholapur, Jalgaon, Amalner, Hyderabad, Satara and Dhulia have gunny factories and some of them have one or two mills.

Ahmednagar and Sukkur have railway workshops and gunny factories.

Lonavla, Dhond and Vramgam have some railway workshops

Surat is of same note.

18. Most of these places can boast of some so called industrial or technical schools which are nothing better than manual training schools teaching drawing and carpentry. In some places weaving is also taught. The remodelling of the Ahmedabad school and the Surat school should be undertaken with the view of providing instruction in carpentry and pattern-making, smithy and turning and fitting, and in weaving of quality and quantity suitable to the needs of the districts. On the engineering side they should follow the system noted in paragraph 9 of apprenticeship for five years, the weaving instruction need not extend to more than three years. At the other centres the existing schools should be developed, and where they do not exist new schools should be opened for instruction on similar lines unless it is possible to send the learners as stipendiary or paid apprentices to railway workshops or mills and factories.

Female Education.

19 *Terms of Reference No 4*—In this connection it might be suggested that a beginning might be made by offering liberal grants-in-aid to schools which undertake training in cookery, dress-making and other domestic arts.

20 *Terms of reference no. 5*—This has been partly answered in the previous paragraphs. Almost all the centres of industry have industrial or technical schools, so called. These are supervised by local committees on which are the Collector, the Executive Engineer and the

Educational Inspector. Closer touch between these committees and the central committee at Bombay, the Committee for the Direction of Technical Education, and the Director and Assistant Director of Industry is being established. This might be considered for the present sufficient.

21. Concrete proposals and estimates will have to be prepared in detail to be of practical use. If the lines are approved and laid down the preparation of the detailed proposals and estimates need not take long. The scheme should be supervised by the Bombay Committee, enlarged if necessary, who should formulate recommendations for expenditure, including grants-in-aid.

APPENDIX H.

SUMMARY OF EVIDENCE OF Mr. R. S. CREE-BROWN ON THE COLLEGE OF ENGINEERING, POONA.

Age of admission.—The Advisory Committee proposed in 1919 that if other Colleges with a three years' course and Intermediate Science as the qualification for admission decided upon 19 as the maximum age of admission, then for this College with a four years' course and First Year in Arts as the qualification, 18 should be the maximum age of admission. If other Colleges raised the age-limit to 20 the age for this College be 19. The Committee was favourable to this last arrangement on the ground that it gave an additional chance to students who for any reason had been delayed in their educational career. I consider 19 to be a suitable age for admission. The desire to fix a maximum is due to a general and, in my opinion, sound conviction among practical engineers that students should begin their practical work as early as possible. The present average age of admission for all classes in the College is 20.

A four years' course.—The Advisory Committee has recommended that the present three years' course be extended to four years both for the civil and mechanical engineering sides. I have found the present courses inadequate for the students. They join the College with no technical ideas and it takes a year to get them really interested in their subject.

Civil Engineering.—Usually about 250 candidates, of whom 100 do not belong to the Bombay Presidency, apply for admission each year to the Civil Engineering Branch. For several years admission has been confined to candidates from this Presidency. The Advisory Committee recommended in 1919 that the number to be admitted annually should be increased from 50 to 60. I am in favour of an expansion which would provide for the admission of 100 pupils each year in the first instance and 150 later, and I estimate the ultimate cost roughly at three times the present cost.

Stipends have been sanctioned for those who, after completing their studies at the College, are willing to undergo a course of practical training in the Public Works Department, but there have been no application for these stipends as graduates can secure employment at once on more favourable terms.

There are excellent prospects for civil engineers. Government assign one appointment as Apprentice Engineer and three appointments as Overseers annually to graduates in civil engineering. I believe that an Indian Civil Engineer in the first five years of employment receives a higher average salary than the average man of similar training and experience in the United Kingdom. There are many examples of Indian civil engineers attaining to high positions. Five out of six doing duty as Superintending Engineers in the Public Works Department are graduates of our College.

Mechanical Engineering.—The average annual number of candidates for admission since the institution of the course is 15 from the Bombay Presidency and 12 from elsewhere. In addition an average of 17 has applied for admission either to the civil engineering or the mechanical engineering classes. Those who offer for either branch almost invariably prefer the civil side and enter the mechanical side only as a last resort. Most, if not all, of the rejected candidates are men of little capacity whose chances of completing the course, had they been admitted, would have been very remote. The Advisory Committee proposed in 1919 that the number to be admitted annually should be increased from 10 to 12.

Government sanctioned stipends of Rs 30 per mensem to those who were willing to go into workshops for practical training after taking their degrees. As there were no applicants for these stipends, I was verbally authorised to offer Rs. 60 per mensem, with the result that five men applied for them. No stipend has yet been given, as the form of agreement has not been sanctioned.

The four years' course recommended includes a good deal of practical work in the College workshops, but satisfactory arrangements have not yet been made for the practical training of students in outside workshops. The Advisory Committee after a special enquiry reported in 1919 that opportunities for workshop training could be found for twelve men annually but that the sandwich system under which so many months in the year would be spent in shops and so many months in the College was a system difficult, if not impossible, of application locally. I am not convinced that this system is unworkable and believe that any prejudice which employers have evinced against it might be met by the introduction of parallel courses in such a way that employers would always have in their workshops the same number of students of the College. It is difficult to induce those who have completed their course to face two years' work in the shops. The Indian Industrial Commission, if I interpret their proposals rightly, recommended that four years in industrial workshops with part-time technical instruction, to be followed by technological training at a College, should replace the prevailing systems of College instruction and training.

I do not think that the College at present produces the best type of mechanical engineers. The reasons are that the present system of training is faulty and the average ability of the students is not satisfactory, civil engineering with its more certain prospects attracting the better men. With a four years' course and the sandwich system it would be possible to produce a superior man.

I see little advantage in transferring the Mechanical Engineering Branch to Bombay. The sandwich system can be worked equally well from Poona, and it is not difficult to bring students to Bombay and show them round engineering works. On the sandwich system, the students, during their College term, would see practically nothing of engineering works even if the College were in Bombay. Certainly not more than they see at present on the "engineering tours" which we conduct. I had experience of the sandwich system while a student and also of taking classes when employed in a workshop, and I am sure that the former system is much the better for the higher branches of technical education. The student should give his undivided attention to College work during the term and to workshop practice during his employment in the shops. If I receive any indication that works managers in Bombay are now willing to co-operate in introducing the sandwich system I shall be very glad to try to arrange for it. From other points of view I would oppose the transfer. For one thing a very elaborate and excellent laboratory has been established in the College with a view to instruction in mechanical engineering. Then again, the reaction of the mechanical course on the civil course is very useful. Those on the civil engineering side are inclined to regard themselves as not interested in anything mechanical or connected with machinery. That is a false idea which the presence of the mechanical course helps to rectify.

There has been no express demand from employers for mechanical engineers. The work of an Indian mechanical engineer who has taken a degree and has been trained in industrial work shops should be the same as that of the corresponding men in the United Kingdom, designing, workshop management, etc. Owing to the paucity of shops producing engineering manufactures the chief openings for such men would be on the railways and even there positions suitable for students with degrees are limited. So far as there is any demand for mechanical engineers, it is likely to be fully met by the present output of the College. The demand may increase when a number of graduates have gone through their workshop training and made good afterwards. Omitting the present year, 14 have graduated. Nothing is known of 6. Of the remaining 8, two are acting as Assistant Professors at Bangalore, one is on the waterworks at Bangalore, one has gone to England for practical training, two are taking a course in electrical engineering at the Bangalore Institute of Science, one is undergoing practical training in the G. I. P. Locomotive works, and one is employed by the Hyderabad State as an Assistant Mechanical Engineer.

Probationers' Class—There is no entrance examination of candidates who apply for admission to the College. All must have successfully completed the course prescribed by the University for the first year after Matriculation. Naturally some of these are good men, some mediocre, some poor. Dr. Allen some time ago, as a stepping stone to the four years' course, introduced the probationers' class. He took a number of men who were rather below the average and said to them "If you take a year's training in the workshop, I will undertake to admit you to the College next year." Thus the better man is admitted direct to the College, others go through a workshop training to make up any deficiency in theoretical attainments. The arrangement is not ideal.

Electrical Engineering—There is a course for a degree in electrical engineering in the University Calendar, but it has never been taught. If it can be shown that there is any demand for electrical engineers, I am prepared to recommend that the course be taught, but at present I do not think that there is any demand.

Sanitary Engineering—"Water supply and sanitary engineering" is one of the subjects in the course of civil engineering and I do not think that anything further is needed in this direction; but an additional course in sanitary engineering might be considered.

Applied Chemistry.—A grounding course in certain branches of applied chemistry might be arranged for and the finishing course taken in any new institution that might be started, but though the College has plenty of land, it has no building accommodation for the teaching of additional subjects.

Architecture.—It is an open question whether architecture should be taught at this College or at the School of Art, and I am not prepared to express a decided opinion, but I strongly object to any proposal to add one or two architectural subjects to the existing courses. The Public Works Department Reorganization Committee proposed that a certain amount of architectural knowledge should be given in the College, but the experiment has been tried and was not a success. I do not think that it is possible to make an architect by simply adding one part of the subject to an engineering course or by giving a few lectures in architecture.

Classes for Mechanical and Electrical Apprentices—The Advisory Committee in 1919 considered that the training of mechanical and electrical apprentices should not be continued at the College of Engineering, but should be taken over by the Department of Industries when that

Department started technical schools. For the present I would like to retain these classes for two reasons. In the first place they serve a useful purpose and there is nothing for the moment to take their place. In the second place, they justify a fairly large workshop which is of assistance to the College itself in training College students. The classes are primarily practical, but a certain amount of theoretical instruction is given. I think that the Industrial Commission were right in proposing that pupils of this type would be better trained in works if an efficient system of part-time theoretical instruction were arranged.

These apprentices are expected to complete their practical training in outside workshops to enable them to do so, stipends are provided and places are found for them in the Railways, the Royal Indian Marine Dockyard, the Port Trust, Bombay, and the Poona Electric Supply Co. I wish them to complete their training where a variety of work is available, but they tend to specialise and do not stay where they can get variety as there is so great a demand for them that they can often afford to ignore the stipends. As example of posts eventually secured by men of this type I quote the following: One is an Assistant to the Consulting Engineer in the Agricultural Department. Three have obtained the first class Boiler Act Certificate and are in charge of mills, a number have obtained second class Boiler Act Certificates and are in gunning factories, several are serving Government. One is a Superintendent of a technical school, and some are assistant engineers in mills and in the Tata works. In the last five years 118 applied for admission to the Mechanical Apprentices Classes and 101 were offered admission. As some drop out or do not turn up practically all the suitable applicants are admitted. 54 out of 92 applicants in five years were offered admission to the Electrical Apprentices Classes. 13 out of the total admitted to both classes in the last five years did not belong to the Bombay Presidency.

Sub-Overseers' Class—There is room for 40 candidates annually in this class. There is a keen demand for passed pupils who find employment at once. They are required by local bodies and I would be in favour of arrangements which would make it possible to admit more than 40. At present, however, this is not a practical necessity as the number of candidates for admission has been small for some years past. I could have admitted four times as many as applied during the last few years. During the war the number of candidates fell to 8, it was 12 at the end of the war, and there was a slight increase last year. The reason for the fall in numbers was the high wages paid by the Military Works Department to untrained supervisors who received them for the asking and did not feel inclined to go in for an expensive course. In view of the demand I am in favour of attracting men by scholarships, should this be necessary.

Testing Work—Government have been asked to permit the staff to undertake testing work in the College Laboratory, but the proposed scale of fees and the rates have not been sanctioned. A good deal of work is done gratuitously at present by members of the staff. Samples of lime and cement have been frequently submitted by the Public Works Department and the Military Works Service for test, also steel and local timbers by the latter. Work on the same lines has been done for the Tata Companies, and a special fuel was investigated for the Belapore Syndicate. We have also done numerous testing.

A Research Institute.—I cannot at present advise on the location of a Research Institute. It depends on the nature of the research. For electrical work I would prefer Poona.

Advisory Committee—The College has had an Advisory Committee for a number of years, but Government recently reconsidered the question and propose to alter the constitution and appoint a new Committee. The proposed new Advisory Committee will be in some respects an improvement on the old one. For one thing Indian opinion will be largely represented, and this was not so on the old Committee. I am not at all sure that the new Committee will be very much improved in other respects. I certainly think that the Principal of the College should be a member of the Committee.

APPENDIX J.

SUMMARY OF EVIDENCE OF MR. J. G. MEHTA, PRINCIPAL, RANCHHODLAL
CHHOTALAL TECHNICAL INSTITUTE, AHMEDABAD.

Number of candidates for admission and number of admissions—The number applying for admission and the number admitted during the last five years were as follows.—

Number of applicants.			Number of admissions.
1916	..	49	33
1917	.	59	38
1918	.	36	36
1919	..	36	36
1920	..	49	49

Three only of those admitted did not belong to the Bombay Presidency, but 27 applications had been received during the past year from boys residing outside the Presidency.

Number completing a full course.—About 36 per cent. of the total number admitted completed their course.

Decline in numbers—The numbers on the rolls on the 31st March 1919, 1920 and 1921 were 86, 53 and 55 respectively. 22 passed the final examination in 1919-1920, 16 were going up for this examination in 1921, and there would not be more than 14 in 1922, as there were only 14 in the second year class. The reasons for the decline in numbers were those given in his annual report, *viz.* :—

(a) Students joining this Institute are generally dull headed and being of poor calibre are unable to pick up the engineering mathematics and other technical subjects, and hence they leave off after a few weeks' or months' attendance.

(b) Many students are found to be very anxious to study at this Institute, but having no means to bear the cost of high living in a city like Ahmedabad under the present hard conditions they have to leave off.

(c) Some students are of very weak constitution resulting from poverty and bad food served in local hotels and when they undergo manual labour at this Institute they naturally get ill and weak and consequently have to give up the line.

(d) A few of the students have left the Institute owing to the Non-Co-operation agitation.

(e) The present situation has in my opinion caused among the public a tendency of 'get soon rich' by all-round commercial speculations and hence the present prevailing apathy of taking up manual labour of technical industries among students.

(f) Want of sizing machine and its equipment at this Institute, which are most important in weaving, does not attract required number of students in that section."

In reply to objections that as the Institute had never had a sizing machine it was difficult to believe that the want of this machine was responsible for a decline in numbers, that the Victoria Jubilee Technical Institute and the Manchester School of Technology had no sizing machine, that the theory of mixing was taught and it was unnecessary to give in the Institute extended practical experience in handling a mechanical thing, the witness replied that he had learned from conversation with weaving masters in Ahmedabad that very few students joined the Institute because there was no sizing machine, and, although students of higher institutions picked up sizing work very quickly, his students did not.

Adequacy of staff and accommodation.—The staff was not adequate. Both he and the engineering superintendent had too much to do, and an assistant was required in the drawing section. He wanted, in addition to a sizing machine, more weaving machinery. If these things were supplied, new buildings would be needed to accommodate them.

Quality of the pupils—The average age of those who joined was about 16 and their educational qualifications were those of a normal boy of 13. He could not take boys of such slender educational qualifications as far as he would like in theory, and he recommended that the standard of the entrance examination should be raised from Gujarati standard VI to Anglo-vernacular standard V. He admitted that this would create a different type of institute and that the proposal ignored the technical training of vernacular-knowing boys.

Although Ahmedabad was a great centre of the mill industry, very few masters, spinners and weavers sent their boys for technical education; the majority of the pupils came from outside Ahmedabad. If steps were taken to let those people who were themselves engaged in the mill industry see what the Institute could provide in the way of technical education, they might appreciate it better. That year, however, some three or four spinning and weaving masters had sent their sons.

Medium of instruction.—Instruction was given in Gujarati. That was a suitable medium because the jobbers in the workshops gave practical instruction and they could teach better in Gujarati. For lectures and explanation of theory he made Gujarati notes from English books. There was no recognised technical phraseology in Gujarati, and there were no Gujarati technical books that the students could read.

Practical Work.—In the Institute about three hours daily were given to practical work. Every year some 20 pupils were sent to the mills for half a vacation.

Demand for passed pupils.—It was true that some time ago there was difficulty in securing employment for passed pupils, but at present there was a demand for those trained in the Mechanical Engineering Branch, and Mr. Mangaldas of the Millowners' Association had promised to take every textile student who passed out. The mechanics were not confined to work in the mills. One who passed in 1918 was employed on a pumping station, one or two had installed engines and pumps for agricultural purposes. Another was working in a cement factory as an Assistant Engineer.

Salaries of passed pupils.—One first class engineer was earning Rs. 400 per mensem and a spinning master, who passed out in 1913, received a salary of Rs. 350 per mensem. The usual starting salary was Rs. 30 to Rs. 35. It was true that ordinary weavers often earned as much as Rs. 80 per mensem, but his boys would get similar pay when they had had sufficient practical experience. Of 9 mechanics who passed out in 1918 one was paid Rs. 125, one Rs. 110, one Rs. 75, one Rs. 65, two Rs. 60, one Rs. 45 and two Rs. 40.

Qualifications of teachers.—For a lecturer he would prefer a passed student of the Victoria Jubilee Technical Institute with at least five years' practical experience. For an assistant master in spinning, weaving or engineering he would like to have a passed student of the same institute with one or two years' practical experience.

Instruction of apprentices in mills.—The witness thought it would be possible to arrange to give in the Institute technical instruction to apprentices who were serving their time in the mills either in the morning or at such other time as employers would agree to.

Other branches suggested.—He was inclined to think that if courses in electrical engineering, dyeing and bleaching, and motor mechanics were taught, Gujarat could supply sufficient students to keep the enlarged school going. Most of the mills in Ahmedabad had started dyeing and bleaching works.

Advisory Committee.—There was no Advisory Committee to help the Institute to keep in touch with employers. The appointment of such a committee might do good.

APPENDIX K.

III. THE DOMINION OF CANADA TECHNICAL EDUCATION ACT OF 1919.

His Majesty, by and with the advice and consent of the Senate and House of Commons of Canada, enacts as follows :—

SHORT TITLE

1. This Act may be cited as The Technical Education Act.

DEFINITIONS

2. In this Act the expression—

(a) "Minister" means the Minister of Labour ;

(b) "Province" means and includes each of the provinces of Canada, but not the Northwest Territories of the Yukon Territory ,

(c) "Technical Education" means and includes any form of vocational, technical or industrial education or instruction, approved by agreement between the Minister and the Government of any province as being necessary or desirable to aid in promoting industry and the mechanical trades, and to increase the earning capacity, efficiency and productive power of those employed therein.

NOT TO APPLY TO ANY PROVINCE WHICH HAS NOT APPROVED OF ACT.

- 3 This Act shall not apply to any province until the Government thereof has by order in council signified its desire to take advantage thereof

AMOUNTS PAYABLE.

4. (1) For the purpose of promoting and assisting technical education in Canada the following sums, aggregating ten million dollars, shall be appropriated and paid out of the Consolidated Revenue Fund of Canada during each fiscal year for the period of ten years beginning with the year ending the thirty-first day of March, one thousand nine hundred and twenty, namely :—

(a) During the fiscal year ending the thirty-first day of March, one thousand nine hundred and twenty, the sum of seven hundred thousand dollars ,

(b) During the fiscal year ending thirty-first day of March, one thousand nine hundred and twenty-one, the sum of eight hundred thousand dollars ;

(c) During the fiscal year ending the thirty-first day of March, one thousand nine hundred and twenty-two, the sum of nine hundred thousand dollars ;

(d) During the fiscal year ending the thirty-first day of March, one thousand nine hundred and twenty-three, the sum of one million dollars.

(e) During the fiscal year ending the thirty-first day of March, one thousand nine hundred and twenty-four, the sum of one million one hundred thousand dollars , and the like sum of one million one hundred thousand dollars during each of the succeeding fiscal years until the expiration of the fiscal year ending the thirty-first day of March, one thousand nine hundred and twenty-nine.

GRANTS OF \$10,000 EACH YEAR, AND BALANCE PAYABLE QUARTERLY IN PROPORTION TO POPULATION OF PROVINCES.

(2) Such sums, subject to the conditions of this Act, shall be allotted and shall be paid quarterly as grants to the Governments of the several provinces as follows :—

(a) The sum of ten thousand dollars shall be paid in each year to the Government of each province ;

(b) The remainder of the appropriation for each year shall be allotted and paid to the Governments of the respective provinces in proportion to the population of the said provinces respectively as determined by the last federal decennial census.

GRANT NOT TO EXCEED AMOUNT SPENT BY PROVINCE.

5. (1) The grant payable to any province in any year shall not exceed the amount provided for each province by the next preceding section, nor shall it exceed an amount equivalent to that which the Provincial Government shall expend on technical education within such year.

EXPENDITURE BY PROVINCE FOR LAND, BUILDINGS AND EQUIPMENT OF INSTITUTION ESTABLISHED BEFORE APRIL, 1919, NOT TO BE TAKEN INTO ACCOUNT.

(2) In determining the grant payable to any province annually, no account shall be taken of any liability or expenditure incurred by the province for the acquiring of land, the erection or improvement of any buildings, or the supplying of furnishing or equipment for any technical education institution established in the province prior to the first day of April, one thousand nine hundred and nineteen.

TERMS UPON WHICH PAYMENTS WILL BE MADE.

6. The payment of the grants hereinbefore authorised shall be made subject to the following terms and conditions.—

(a) All payments shall be applied and used for technical education in the manner agreed upon by the Minister and the Government of each province; every such agreement shall be approved by the Governor in Council;

(b) No portion of any grant shall be used in whole or in part in meeting any liability or expenditure of any kind whatsoever incurred in any province prior to the first day of July, one thousand nine hundred and nineteen, for lands, buildings, furnishings, or equipment secured or provided for technical education purposes;

(c) Not more than twenty-five per centum of the annual grant payable to any province shall be applied for acquiring land, erecting, extending or improving buildings, or supplying furnishings and equipment;

(d) There shall be forwarded to the Minister annually, by each province taking advantage of the provisions of this Act, a report setting forth the work done in such province in promoting technical education, containing such details and information as may be prescribed by the Minister;

(e) Every province receiving a grant shall furnish the Minister with such evidence as he may require, to show that the grants paid hereunder are expended for technical education as provided by this Act.

APPOINTMENT OF STAFF.

7. Such officers and employers as may be required for carrying out the provisions of this Act shall be appointed under the provisions of the Civil Service Act, 1918.

**BALANCES UNEXPENDED TO BE CARRIED FORWARD BUT NOT MORE THAN 25 PER CENT.
OF GRANT WITHOUT CONSENT OF MINISTER.**

8. Any portion of any appropriation authorised under this Act which may remain unexpended at the expiration of any of the said fiscal years, shall be carried forward and remain available according to its apportionment for the purposes of this Act during any one or more of the succeeding years, provided that not more than twenty-five per centum of any appropriation shall be so carried forward and remain available without the approval of the Minister.

ANNUAL REPORT LAID BEFORE PARLIAMENT.

9. The Minister shall make an annual report on or before the thirty-first day of March on the work done, under the provisions of this Act, containing such information and particulars as the Governor in Council may prescribe, and shall include in such report the reports made by the several provinces on the work done in each province for the promotion of technical education and the expenditure connected therewith, and such report shall be submitted to both Houses of Parliament by the Minister within fifteen days after the presentation of the report, if Parliament is then sitting and, if not, then within fifteen days after the opening of the next session of Parliament.

APPENDIX L.

EXTRACTS FROM MINUTES OF PROCEEDINGS OF THE COMMITTEE.

I

1. The first meeting of the Committee was held on Monday the 7th March 1921

* * * * *

3. The Chairman in opening the proceedings said :—

“ Gentlemen,

According to the Government Resolution, the object for which this committee is appointed is to draw up a comprehensive scheme for technical and industrial education in this Presidency. We meet here to-day for the first time to consider the terms of reference, discuss preliminaries and arrange a programme of work

Although a comprehensive scheme has been called for, I gather that Government are not likely, assuming the scheme is accepted, to finance it in its entirety at once or for some time to come. Along with the scheme, they will require recommendations as to the order in which the various suggestions should be given effect to, so that whatever developments take place—whatever progress is made from year to year—may form part of a connected scheme and be furthering its intentions.

The first question that will occur to us at this meeting is—How long is this work likely to last? For it is necessary to start with a rough idea of its duration if only to determine the scale of our preparations. I understand Government would be glad if the Committee's report and scheme are submitted in about three months' time. If the members are likely to remain in Bombay through the hot weather and if no interruptions are expected, we may proceed with our investigations with a determination to complete the work within the period named.

The next important question perhaps is—How many witnesses are to be invited and what time we should give for collecting evidence and advice?

Then we have to consider—What municipal stations and institutions, if any, we, or a sub-committee of this committee, should visit to collect local information and local views?

Another question is—What steps should we take to collect information relative to the latest developments in technical and industrial education in the United Kingdom and other advanced countries in the limited time at our disposal? I learn that Mr. Marra was recently on special duty in England and has collected some valuable information concerning the lower grades of technical education in the United Kingdom. Unless the scheme which may be prepared by this committee takes into account the latest developments abroad, it is not likely to be acceptable; it will not stand the test of time.

We have also to consult the convenience of members and decide how often we can meet and at what hour it would be best to commence proceedings? I learn that for the present this room will be at our disposal between the hours 5 and 7 p.m.

If we are limited to three months and are pressed for time, it might be necessary to attempt a division of labour and appoint sub-committees to develop individual sections of our work.

Considering that the time at our disposal is so limited, it may not be desirable to attempt an elaborate investigation and go into first principles. It is for your consideration whether a different procedure may not be more suitable. If in the course of the preliminary discussions members bring up their own notes and suggestions, the committee as a whole might be able to pool the information and formulate a rough provisional scheme in outline, to get a start. Thereafter as the investigation proceeds, additions, omissions and alterations may be made, and obscure and doubtful points gradually cleared up, till the scheme reaches a stage when it might be acceptable to all or the great majority of the members of the committee.

Gentlemen, these are some of the points which strike me as requiring attention at the moment. Doubtless, members have many other useful suggestions to make. I will only add that it gives me much pleasure to welcome you to this first meeting of our committee.”

* * * * *

6. In the course of discussion requests were made for information under the following heads :—

(a) College of Engineering

(b) Engineering and technological institutions in the United Kingdom and other countries (Mr. Vakil promised to report whether information in the possession of Messrs. Tata Sons and Company, Limited, could be placed at the disposal of the Committee).

(c) Industrial schools.

(d) How past students of the Victoria Jubilee Technical Institute and of the College of Engineering (other than Civil Engineering students) were employed.

(e) The notes of Messrs. Cooverton and Dawson on technical and industrial education.

(f) Apprenticeship training as conducted by the G. I. P. and the B. B. and C. I. Railways (Messrs. Flatt and Page promised to provide notes on the subject).

7. Mr. Vakil was of opinion that gentlemen who have returned to India after taking courses in engineering and technology abroad might usefully be consulted. He promised to suggest names and to indicate what questions should, in his opinion, be put to them. He thought that the Committee should consider the question of a technological faculty in connection with the University and should be furnished with—

(a) Sir Alfred Hopkinson's remarks on technological training.

(b) An English Report on Continental Institutions, 1915.

(c) A Report on American Technological Institutions.

He promised to furnish the exact names of the reports mentioned in (b) and (c).

8. In connection with visits to institutions and places outside Bombay it was suggested that they should usually be made by sub-committees, and visits to the College of Engineering, the Ranchhodlal Chhotalal Technical Institute, Ahmedabad, the Schools of Art, Bombay, Dharwar and Karachi, were mentioned as desirable.

9. There was some discussion as to the possibility of research and technological work in the Royal Institute of Science. Mr. Masani pointed out that at present the Institute was intended to give instruction according to existing University courses.

10. During the discussion on the latter part of item 3 in the terms of reference, demonstration work in connection with the fly shuttle loom was mentioned as an example of what was being done.

11. During a discussion on item 4 in the terms of reference, certain members expressed doubts as to their competence to deal with the question.

II

The second meeting of the Committee was held on the 22nd March 1921.

* * * * *

2. The first item on the agenda discussed was the following :—

“Lines of enquiry to be followed in developing proposals under the terms of reference and the suggested classification of technical and industrial institutions, viz. :—

(1) institutions of the highest or University grade,

(2) technical high schools,

(3) intermediate high schools,

(4) lower grade technical and trade schools, including technical continuation schools, industrial or trade schools, artisan and apprenticeship schools or classes, adult schools and night schools,

(5) institutions or classes for manual and vocational training to be imparted along with primary and middle school education.”

Major Wills thought that the first step should be to find out what was the demand of people of various grades of training. In his opinion, the demand for people of the highest grade was small, whereas there was a very large demand for trained workmen of the lower grades, and he would prefer to deal with their training first. Messrs. Flatt, Roose and Marrs emphasized the necessity for dealing with the demand. Mr. Kamtkar urged the need for men of the highest training and objected to beginning with lower institutions as Major Wills had suggested. Mr. Turner said that the important point was to get on with the B Class as the A Class would come out of that. The classification was finally accepted on the understanding that it was to be used as a reference table and was not to be considered binding.

3. The following proposal was next discussed :—

“The number of students for whom provision should be made in each of these classes of institutions may be determined as far as possible, by a study of the figures for the United Kingdom and other advanced countries, giving :—

(a) percentage of school-going population engaged in each of the above grades of technical and industrial education,

(b) number per million of total population so engaged,

(c) percentage of expenditure on technical and industrial institutions to total expenditure on education.

“ Statistics of industries in the Bombay Presidency (approximate figures showing capital, production, number of persons employed, etc.) will also be useful for the purpose.”

Mr Turner read out the numbers of persons employed in the various groups of industries in the Bombay Presidency, which aggregated 292, 439.

Major Willis thought that the number provided for each class of institution should be determined by the demand and gave the following approximate figures.—

If the figures for labour are taken as 300,000, 100,000 of these would be skilled workmen. In addition there would be 2,500 foremen and 500 higher trained men.

The annual number of recruits required for Classes A, B, and C in his opinion would be—

Class A	.	..	..	25	
Class B	.	.	..	170	(effective life reckoned at 15 years).
Class C	.	.	..	7,500	(allowance being made for seasonal fluctuations).

Mr. Bell thought that figures for other countries might be compiled so far as possible. He also suggested that Mr Sedgwick should be asked to give advances Censu figures showing the number of managers, assistant managers, foremen, skilled labourers, unskilled labourers, classified according to trades, and this suggestion was agreed to *

4. It was decided that provision for the following technological subjects, in addition to civil engineering, was needed under Class A :—

- (a) mechanical engineering,
- (b) electrical engineering,
- (c) sanitary engineering,
- (d) applied chemistry, including textile chemistry and colour chemistry,
- (e) chemical engineering,
- (f) dyeing,
- (g) textile industries,
- (h) leather manufacture,
- (i) architecture,
- (j) statistics, economics and engineering administration, in part or whole, to be a subject of each course taken.

The Chairman proposed that training should be provided for 500 students under Class A and the members agreed to accept this figure on the understanding that it would be checked later.

5. The Victoria Jubilee Technical Institute, Bombay, was considered to approximate to Class B (technical high school). It was suggested that there should be four institutions of this type, one for Sind and one for each of the three Divisions, in addition to a large one in Bombay, which will be the Victoria Jubilee Technical Institute when enlarged, if it could be enlarged, to fulfil all the purposes of the scheme.

6. The Ranchhodlal Chhotalal Technical Institute, Ahmedabad, was considered to approximate to an institution of Class C type.

7. A list of subjects taught in institutions of other countries, corresponding to those of Classes B and C type, was to be prepared for the next meeting, so that selections could be made for schools of these types in the Bombay Presidency

8. Statistics were required as to the absorption in works of professional engineers (Class A) and the opinions of employers regarding them were considered necessary

9. It was decided that short extracts from evidence given before the Indian Industrial Commission should be prepared. The Chairman thought that it might be useful at this stage to form a rough idea of the number of witnesses to be invited to give evidence. Major Willis considered that the Committee should find out what the employer wanted. After further discussion Mr. Bell suggested that the Committee should deal with the Victoria Jubilee Technical Institute and the College of Engineering. Then a few employers who had taken men from these institutions might be consulted, after a list of witnesses and a questionnaire had been drawn up.

10. It was decided that the education of girls and women belonged to the 5th Class in the classification of institutions provisionally accepted.

* Information not yet available.

11. Major Willis drew attention to the opinion of the Committee of Direction for Technical Education that the existing Engineering College at Poona and the Victoria Jubilee Technical Institute at Bombay should be maintained in efficient working order, but beyond that no money should be expended for the present except on the production of the skilled tradesmen.

12. Major Willis pointed out that the Institution of Engineers (India), which was an incorporated society and was recently inaugurated by the Viceroy and to which most known engineers, Indian and European, of all branches throughout India belonged, had taken powers under its Articles of Association to advise, and, if called on to do so, to direct technical education on the engineering side on behalf of Governments or Local Bodies, and that His Excellency in his inaugural speech, and the Governor of Bengal in his speech at the annual dinner, had laid special stress on the extreme importance and usefulness of the Institution in their sphere. The Governor of Bengal assured the Institution that his Government at least would call upon and rely upon the Institution for their advice and direction as regards engineering education within his Province. Further it was understood that the Madras Government had the same intentions.

Major Willis considered that later on the Committee should get into touch with the Council of the Institution and find out whether the views of the Council had been formulated

III

1. The third meeting of the Committee was held on the 4th April 1921

* * * * *

2. The first subject considered was the outlines* of a comprehensive scheme for technical and industrial education, placed before the Committee as a basis for discussion.

Mr. Kantkar asked that the minimum educational qualifications might be prescribed for each class of institution and was informed that such qualifications had, as far as possible, been entered in the statement.

3. The annual expenditure of Rs. 4 20 lakhs for institutions of class B was considered. Mr. Peterson thought the estimate far too low having regard to the number of subjects and the number of students to be provided for

In the course of discussion it was pointed out—

(a) that the question of cost must be based on the number of students to be provided for, and that these numbers had not been decided upon,

(b) that approximately half the students in the Victoria Jubilee Technical Institute come from outside the province,

(c) that it should be ascertained why the only existing school of the intermediate technical school type failed to satisfy either parent or employer, before provision for any large number of students in intermediate technical schools should be considered.

Mr. Bell proposed that consideration of the outlines of the comprehensive scheme should be postponed until the College of Engineering, the Victoria Jubilee Technical Institute, and the Ranchhodlal Chhotatal Technical Institute, Ahmedabad, had been dealt with. Major Willis seconded the proposal. After further discussion it was accepted

4. The College of Engineering was next considered. It was decided that the Principal of the College should be invited to give evidence before the next meeting, and that he should be requested to come prepared with answers to the following questions, in respect of the courses in mechanical and electrical engineering:—

(1) what is the annual number of candidates for admission?

(2) what number of candidates is actually admitted annually, and what percentage of these belong to this Presidency?

(3) what percentage of those admitted complete their courses successfully?

(4) what has happened to those who have passed out after completing their courses?

(5) what demand is there from employers for expansion?

5. Mr. Turner then furnished information regarding the Victoria Jubilee Technical Institute.

The total strength of the Institute was 330. One hundred to one hundred and ten were admitted annually from amongst 300 applicants 40 per cent. of those admitted belonged to the Presidency. Candidates were admitted on the results of an entrance examination in order of merit. If the number of admissions were increased by 30, the Institute could take all suitable candidates, even without excluding those who apply from other Presidencies.

There were five departments, or courses of instruction, *viz*, mechanical engineering, electrical engineering, textile manufacture (spinning and weaving sections), technical and applied chemistry, sanitary engineering and plumbing.

The 50 to 60 students who completed their courses annually might be divided up as follows:—

Mechanical engineering	15
Electrical engineering	25
Textile manufacture	8
Technical and applied chemistry	6
Sanitary engineering and plumbing	6
	60

Of textile manufacture there are two sections, spinning and weaving, each occupying two years. The figure given is for those who have completed the four years' course. Mr Turner could not give detailed information regarding the careers of those who passed out, but assured the Committee that there was always a demand for good men, and that the majority secured reasonably good employment. There was a standing order for two good chemists a year, and he had then applications for four or five chemists. Textile men easily obtained employment. The number of electrical men exceeded the demand. The majority of them were employed on railways. The salaries of spinners and weavers who left in two given years ranged from Rs. 75 to 250. In his opinion there was no scope for highly trained electrical engineers and more theory was taught than was necessary in existing conditions. Men who have passed out of the Institute were employed chiefly in wiring, telephone and telegraph work, and armature winding.

In answer to the question how far the Institute failed to meet the demand for training for existing industries, *e.g.*, dyeing, Mr Turner replied that he thought the department of dyeing, when developed according to a scheme which was being put into operation, would meet all demands.

6 During consideration of the Electrical Engineering Branch of the Victoria Jubilee Technical Institute, Mr. Peterson remarked that it was waste of time to train higher class men as the Victoria Jubilee Technical Institute was doing, there being no likelihood of electrical manufactures being established. Technical education suitable for Bombay, *e.g.*, textile manufacture, dyeing, etc., should be developed instead.

Mr. Vakil denied the lack of demand for higher class men and asserted that men with foreign education were engaged as Indian institutions were not taken seriously. Mr. Flatt took exception to this statement as constituting an unfair criticism of employers. He added that the reason the Indian was not taken was that he was lacking in practical knowledge and was not prepared to undergo years of preliminary training.

Mr. Peterson suggested that arrangements should be made with companies for training men for particular positions in works.

Mr. Bell emphasized the need for turning out what the employers wanted. He referred to the success of the state technical scholars trained for textile industries and the comparative failure of technical scholars in other subjects. The reason given for the success of the textile man was that he started in the midst of the industry and had a good grounding at the Victoria Jubilee Technical Institute and practical experience as an assistant, before he went to England. In this way the man the employer wanted was turned out.

Mr. Flatt said that he had 2 or 3 men from the Poona College working satisfactorily, but the common trouble was that the educated Indian did not offer as an apprentice and a start with technical education often unfitted him for practical work.

Mr. Vakil thought that this state of things was changing and promised to quote references in support of his statement from the report of the Indian Industrial Commission.

7. It was decided that the causes of the failure of the Ranchhodlal Chhotatal Technical Institute should be investigated, that the Principal should be invited to give evidence at the next meeting and that question similar to those suggested for the Principal of the College of Engineering should be put.

8. The number of students to be provided for in Class B institutions was then considered, as also the question whether a technical high school was required in Sind, and one in each of the three Divisions, besides an enlarged Victoria Jubilee Technical Institute in Bombay, *i.e.*, a total provision for 2,500 students in all or an output of 600 a year. It was pointed out that many men would be wanted as teachers for the expected development of industry. Major Willis was of opinion that no possible employment could be found for so large a number. Mr. Page thought it would be sounder and more economical if mechanical and electrical engineers of Grade B were trained in industrial works and received part-time technical training.

The question whether a technical High School for Sind should be provided in the scheme was put to the vote. A majority were of opinion that no institution of this type was needed in Sind. It was also considered that no such institutions were required in the Presidency proper outside Bombay.

It was generally agreed that for the particular grade of work in the five branches at present taught at the Victoria Jubilee Technical Institute that Institute, developed as it would be in the new buildings so as to accommodate 500, would meet the needs of students from all India.

It was provisionally decided that accommodation should be made available for 25 students in ceramics at the Schools of Art and for 50 students in leather manufacture and that on the whole provision for 600 students should be made.

*Provisional Statement showing Institutions, etc., needed for a Comprehensive Scheme of Technical and Industrial Education
in the Bombay Presidency. (Intended as a basis for discussion.)*

Class of Institution.	Designation.	Object of Study	Courses of Study.	Age of Admission, and Entrance Qualification.	Length of Course.	Approximate Estimates.			Remarks.
						Number of pupils to be provided for.	Cost per pupil. Rs.	Total cost in lakhs. Rs.	
A	Institutions of University grade Improvements to College of Engineering, Poona. New College of Technology.	To give the highest standard of training both in theory and practice in the technological subjects selected.	Mechanical engineering Electrical engineering Architecture. Applied chemistry including dyeing and colour chemistry. Textile engineering Leather manufacture	Minimum 17 or 18. After passing the Previous Examination	Three years normal One or two more years for Post-Graduate students	500 + 200 (Present number in College of Engineering).	700	4 80	(1) College of Engineering, Poona, to be improved (2) A new College of Technology to be started in Salsette close to industries
B	Technical schools. high	To give a high standard of theoretical training and advanced courses of instruction of a thoroughly practical character in the subjects selected. (More thorough practice though less of general culture than in the University grade is intended) To provide also short courses for men actually engaged in industrial occupations.	Mechanical engineering Electrical engineering Building construction and architecture. Textile engineering Applied chemistry including dyeing. Leather. Textiles Ceramics	Minimum 16 or 17 After Matriculation	Three years normal to be extended as required in the case of Post-Graduate students	600	400	2 40	The Victoria Jubilee Technical Institute to be enlarged and improved.
C	Intermediate technical schools.	To prepare assistant managers, foremen and skilled workmen for mechanical, scientific and constructional occupations. To provide also short courses for men engaged in business	Mechanical drawing and design Metal work Carpentry Building design and construction. Spinning, weaving, designing and dyeing. Ceramics. Furniture manufacture. Leather manufacture. Photography. Printing Other special trades	Minimum 14 After completing Middle School Course.	Three years to be extended in particular cases to give a thorough practical training in an industry or occupation.	4,000	150	6 00	On an average, one school in each of the 26 districts in the Presidency

Class of Institution.	Designation.	Object of Study	Courses of Study.	Age of Admission, and Entrance Qualification.	Length of Course.	Approximate Estimates.			Remarks.
						Number of pupils to be provided for	Cost per pupil. Rs.	Total cost in lakhs Rs.	
D	Pre-vocational, vocational and continuation schools and classes.	To prepare artisans and skilled workmen To train wage-earners so as to increase their skill or knowledge in the works on which they are engaged or to rise to positions of responsibility.	Carpentry, wood carving, carriage building, fitter's work, metal work, masonry, weaving, dyeing, tailoring, Boot and shoemaking. Printing. (Courses of studies to be selected according to environment, i.e., the character of industries and occupations in the neighbourhood.)	Any age above 11 or 12 Qualifications demanded will vary according to circumstances.	Two to three years. In some cases as short as 6 months.	25,000	50	12 50	Some institutions to be located in industrial centres where most needed To provide on an average, one school for every town in the Presidency.
E	Institutions for Girls and Women.	To impart training similar to that given to male scholars, with modifications suited to the aptitudes of women	Necessary additions and omissions will be made in the courses provided for male students in institution of classes A, B, C and D above Subjects such as photography, embroidery, knitting, lace-making, millinery and home economics will be added.	Minimum age 11 years Varying according to grade of Institution.	Same as for male scholars of corresponding grades.	6,000 of all classes	100	6.00	
	Special provision for training teachers.							1.50	This is to grant scholarships and afford other facilities to boys and girls qualifying for the position of teachers.
	Encouragement of industrial Research.	To encourage research by grants to private associations, by employing at least 2 professors on Research work in the proposed college of Technology, and by giving scholarships to students sent up to the Research Institute, Bangalore, and abroad.						1.50	

Class of Institution.	Designation.	Object of study.	Courses of Study.	Age of Admission, and Entrance Qualifications	Length of Course.	Approximate Estimates,			Remarks.
						Number of pupils to be provided for	Cost per pupil. Rs.	Total cost in lakhs. Rs	
	Industrial Experimental Stations.	To help industries by carrying out tests and experiments in both mechanical and chemical industries						1.00	To start two such experimental stations for a beginning
	State Scholarships for Technological studies in England and Foreign Countries.							1.00	
	Supervising and Direction Establishment.							1.20	
Total						38,300		38.00	
Deduct contributions from District and Municipal Boards, Associations, etc							7.00	31.00	
Also deduct expenditure on existing institutions							6.00		
Total recurring expenditure								25.00	

Buildings and Equipment. Buildings to be plain and cheap. At the rate of Rs 5 lakhs per annum, roughly Rs. 25 lakhs to be expended within the next 5 years.

Note to accompany Provisional Statement.

According to 1921 Census, the population of the Presidency proper is 16,005,170 and Sindh 3,278,493, the total for the Bombay Presidency as a whole being 19,338,586

Taking a proportion of 15 per cent., the population of school age will number about 2,900,000 of whom only about 900,000 are attending educational institutions at present.

Provision is made in the new scheme for training about 36,000 persons. The bulk of this number, roughly 30,000, will receive training as artisans or craftsmen in the lowest class of continuation and industrial schools and classes.

No provision is made for training any of the population engaged in agricultural or rural industries.

2. The present yearly expenditure on Education in the Bombay Presidency amounts to about 230 lakhs.

The present expenditure on Technical and Industrial Education is about Rs. 6 lakhs. It is proposed to increase this by Rs. 15 lakhs at once and by Rs. 25 lakhs at the end of five years. This is exclusive of buildings and equipment which will cost about Rs 25 lakhs more in the first five years.

3. The College of Engineering, Poona, may be enlarged to accommodate about double the present number of students.

A new College of Technology may be started in Salsette, close to industrial centres in the City of Bombay.

The Victoria Jubilee Technical Institute may be improved and enlarged to accommodate double the present number of students.

When the scheme is in full working order, every district in the Presidency will have at least one school of Intermediate grade and every town with a population of 5,000 or more, a Continuation or Vocational School.

Technical and industrial instruction will be provided liberally in industrial centres and there will also be a regional distribution of such instruction throughout the Presidency

IV

1. The fourth meeting of the Committee was held on Monday, the 18th April 1921.

* * * * *

3. The Principal of the College of Engineering, Poona, and the Principal of the Ranchhodlal Chhotatal Technical School, Ahmedabad, were examined as witnesses* after which the meeting ended.

V

1. The fifth meeting of the Committee was held on Tuesday, the 19th April 1921.

* * * * *

2. Dewan Bahadur Godbole asked permission to put questions to the representatives of the G. I. P. and the B. B. and C. I. Railways regarding apprentice training in their workshops, but after ascertaining the sense of the meeting, it was agreed that the examination of these gentlemen should be postponed to the next meeting.

* * * * *

5. Members were reminded that the notice covering the meeting stated that it would greatly facilitate discussion if they came prepared with their own figures to substitute for those tentatively entered in the two statements circulated with the agenda for the second meeting. They were asked to give at least provisional figures under each head as they might pave the way to early decisions.

Mr. Bell raised the point that members in being asked to provide their own figures were expected to accept the principle that technical and industrial education should be provided on the lines laid down in the statement classifying institutions, whereas the manner in which this education should be given had not been discussed. Evidence taken on the previous day had shown that, in the only university grade institution at which technical education was given at present, men were *not* in demand. The committee also had evidence that for one reason or another the education given at the Ranchhodlal Chhotatal Technical Institute was not fulfilling its

*Summaries of their evidence are printed as Appendices H and J

object. It was necessary, before going further, to discover why this education had not been a success

Further there seemed to be a certain amount of opinion formed already amongst members in favour of technical education being given by a part-time system to those who were being trained in industrial works. He suggested, therefore, that a short enquiry might be made as to what could be done in that line. Before Class D could be usefully considered a good deal of explanation was necessary as there were whole groups of different kinds of schools, primary technical schools being lumped together with continuation schools and, he thought, night schools. Apparently the minimum starting age had been taken at 11 or 12 and he was prepared to join issue straightway with any one who maintained that technical or industrial education could be given to a boy of 11 or 12 in this country

In reply the Chairman pointed out that a variety of institutions had been grouped in Class D and all that was meant was that in none of them was the age of admission to be below 11 or 12. The group included institutions or classes for all ages, children, adolescents and adults. The chief characteristic of the group was that the scholars started with general education of the primary grade and sometimes they lacked even that. The group included apprentice schools, continuation and adult schools, with day or evening classes, lower grade technical schools, and supplementary courses. Schools of these types were found in Great Britain, Japan and Germany.

Mr. Bell held that many of these schools on the continent which were described as industrial schools were merely teaching what might be called "modern" education, *i.e.*, chemistry, physics, mechanical drawing, workshop practice, etc., and that they were not for boys of 11 or 12.

The Chairman pointed out from a statement* provisionally circulated to members that the continuation or vocational schools where the accepted minimum age of admission was 12 years existed in other countries.

Major Willis stated that he could not give any figures whatever at this date for the draft scheme, and, as no other members were willing to suggest figures, Mr. Marrs was asked to put forward his proposals for institutions of the lowest grade

6. Mr. Marrs stated that he had classified the institutions but did not intend to make definite proposals. He merely wished to provide a basis for discussion which might lead to agreement on certain questions, namely, whether for certain industries continued primary education was necessary before technical education could be effectively attempted, whether in organised industries the best form of technical training was that given in conjunction with practical training in workshops and factories, and whether institutional training should be confined to local crafts. With this object in view he had included in his note continuation schools for boys of 11 or 12 to 14 or 15, these schools to continue the general education of the boy with an industrial bias, part-time apprentice schools for those in works who had completed a course in continuation or secondary schools, part-time apprentice schools for boys of a lower standard with some educational qualifications, and institutions which would give a training in local crafts, together with primary education, either as separate institutions or as primary schools with workshop practice and a curtailed course of general education. He had not contemplated part-time continuation schools of the type he had in view, but thought that in existing circumstances they might possibly be found necessary. Such schools, whether whole or part-time, were suitable mainly for large industrial centres. The instruction given in them might include practical arithmetic, a little practical science, mechanical drawing, some English, possibly industrial geography, work in wood or metal, or both, and a good deal of physical training. Some inducement would be necessary to make boys attend them, and this might be provided by arrangement with employers.

7. During the discussion that followed the Chairman pressed for some conclusions on the questions under debate and for suggestions as to the number of pupils to be provided for in each class of institution. He stated that Government wanted a comprehensive scheme and provision had to be made for the grades of institutions which obtained in other countries and for such numbers of pupils in those institutions as would be in accordance with what was general in other countries, after making due allowance for the existing inadequacy of primary education. If the Committee's scheme was not a comprehensive scheme providing for arrangements similar to those existing in other countries, the scheme would not be considered up to date, and might not be acceptable either to Government or the public.

Mr. Flatt urged that the Committee could only put forward such figures as it could justify, and Major Willis was of opinion that before discussing classes of schools and numbers of pupils the Committee should try to agree on some broad principle as to the general lines that industrial education ought to take.

*Not printed.

The following points were mentioned as important by various members :—

- (a) the necessity for extension of primary education and improvement of its quality ;
- (b) the desirability of amending the Factory Act so as to raise the lowest limit of age at which boys could be employed ;
- (c) the lack of evidence that there was any demand on the part of the people for institutions of the types mentioned in Class D ;
- (d) the unsatisfactory and costly nature of the practical training in existing industrial schools ,
- (e) the need of an effective controlling agency for whatever scheme of industrial education was established ;
- (f) the difficulty of obtaining suitable instructors for industrial schools.

8. The Chairman then enquired whether any member wished to make alternative proposals and asked for suggestions as to what subjects should be brought up for discussion at the next meeting.

Mr Bell stated that local millowners, and spinning and weaving masters, seemed to attach little importance to the Ahmedabad Technical School and suggested that part-time schools for apprentices conducted by arrangement with employers had apparent advantages that justified further investigation and discussion.

Major Willis and Mr. Flatt gave some facts relating to a school of this type in Calcutta. Apprentices were sent to the school for 2½ hours on three days a week for technical instruction. The average attendance was 60 to 70. Employers were keen on the scheme and supported it not only by sending their apprentices, but by handsome contributions. Though the classes were held in the evening the boys who attended them were not tired, as they were given half holidays on school days. Messrs. Page and Flatt pointed out that part-time technical instruction was given to apprentices in the B. B. and C. I. and the G. I. P. Railways and Mr. Bell said that the Manager of the Mazagaon Docks had been thinking of introducing a similar scheme, and the Manager of Messrs. Devji Canji had stated that he would have no objection to his boys receiving instruction in mechanical drawing in workshop hours if Government provided a teacher. He further suggested that the Secretary might see a few employers in Bombay, *eg.*, the Director, R I M, the Manager of the Mazagaon Dockyards, Messrs Richardson and Cruddas, Messrs Alcock Ashdown and Company, Messrs. Wimbridge and Company, Messrs. John Roberts and Company, and Messrs. Powell and Company, and find out their views on the introduction of technical education into workshops

It was eventually decided that the points raised in Mr. Marrs' note* should be discussed at the next meeting. Major Willis offered the suggestion that he, in collaboration with one or two members, might work out a rough scheme and place it before the Committee.

The Chairman replied that he would be pleased if any member would draw up his own scheme either on the whole question before the Committee or any sections of it and send it on for consideration. His idea was that later on witnesses should be called, that their evidence should be weighed and that the Committee might possibly arrive at definite conclusions about the month of July.

9. During the discussion Mr. Vakil informed the Committee that he was in agreement with the views of the Indian Industrial Commission as regards institutions comprised under Classes A and B and added that he was compiling a detailed statement on Class A education which he hoped to send in in a few days' time. He quoted statements in the Commission's report in support of his contention that Indians were capable, both in point of ability and temperament, of holding responsible positions in industries as engineers, etc., an opinion which he thought was not held by certain members of the Committee. Major Willis in reply said that the only statement made in regard to Indians trained as engineers was that the majority wanted to sit down and watch others work and were averse to removing their coats. Dewan Bahadur Godbole thought that conditions were changing. He had seen several young men taking their coats off and working.

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VI

The sixth meeting of the Committee was held on Monday, the 2nd of May 1921.

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4. The first item on the agenda which next came up for discussion was :—

“ To consider the training to be given in, and other particulars of, institutions of Class D, more especially the pre-vocational and vocational training of artisans.”

A note prepared by Mr. Marrs had been circulated previously to form a basis for discussion.

Mr. Marrs in explanation of this note stated that the G I P. Railway had found it possible to give technical instruction to five only of the 983 Indian apprentices at Parel and Matunga, that 963 of these made no pretence to any literary attainments, that Messrs. Richardson and Cruddas could aim at so low a literary qualification as the fourth vernacular standard for machinist apprentices only, and that Messrs. Powell and Company, and Messrs. John Roberts and Company demanded no standard of literary knowledge from their workpeople. It thus appeared that workshops were avoided by those who possessed any effective education, and that instruction for the bulk of the artisan apprentice class could not go much further than the three R.'s, drawing, and practical demonstrations. Such instruction would constitute one grade of apprentice school. In order to attract to industrial workshops boys who had passed the fourth vernacular standard, and with the object of continuing their general education, until they became of suitable age for apprenticeship, up to a point at which technical instruction proper could be given, he suggested for large industrial centres a continuation or supplementary school which would have a course framed so as to give general instruction with an industrial bias and to create an interest in industrial work. The subjects to be taught were matters of detail, but they should probably include practical arithmetic, geometrical drawing, practical science, industrial geography, and work in wood or metal. English, if added, would assist in popularising this type of school. No fees should be charged, at any rate to sons of craftsmen. There were numbers of boys who joined Anglo-vernacular schools and paid fees who had little or no prospect of passing beyond the middle school stage. Such boys would receive a more appropriate education in a school of this type.

There was considerable discussion about the continuation or supplementary schools. Doubts were expressed whether they would attract boys, or, if they did, whether the products of these schools would enter workshops as apprentices, whether employers, other than the railways, would pay higher wages to those who had passed through these schools than to those who had little or no education, whether English should be taught, and whether it would be possible, by instruction in English begun in a supplementary school and continued in an apprentice school, for a boy to attain such proficiency in English as would enable him to acquire the technical knowledge necessary if he were to rise above the rank of an ordinary skilled workman. As regards the value placed on education by employers it was pointed out that the best employers preferred better educated boys, and Mr. Page stated that his foremen were all of opinion that even boys whose education had not advanced beyond the fourth vernacular standard were of much greater value than illiterate boys.

5. The Chairman in drawing attention to all the proposals in the note attached to the agenda, which included pre-vocational schools, apprentice schools of two grades, industrial schools and classes in vernacular schools for instruction in local crafts, added that the provision of supplementary classes, *s e.*, evening classes, day classes and adult classes, and the question whether the existing industrial schools could be improved and developed were also matters of consideration.

The Committee then proceeded to discuss existing industrial schools. There was a general feeling that they were insufficient and mention was made of the difficulty experienced in inducing pupils to attend. Several members expressed their concurrence in the view of the Industrial Commission that they were altogether unsatisfactory if employed to train artisans for organised industries. Figures were given to show that a large percentage of boys who joined these schools left before completing their courses. Two members pressed for a decision as to whether these schools should be maintained or not. Some appeared to be in favour of improving and developing them, others urged that something should be done to link up education with workshops. Finally, the Committee was asked whether it desired further discussion of institutions of Class D or whether it was prepared to decide at once and proceed to pass resolutions.

6. Mr. Bell said that he understood the object of the discussion was to get recommendations from the Committee in order to obtain an approximate estimate of the number of pupils to be provided for and the cost per pupil. 25,000 had been suggested as the number of pupils for Class D and this figure was apparently based on the idea of providing a school for every town of more than 5,000 inhabitants. A great majority of the inhabitants of the smaller towns were connected with agriculture, and there were usually few industrial workers, beyond a carpenter or two, to support an industrial school. The Chairman explained that 25,000 represented the proposed attendance in institutions of all kinds of the lowest grade, continuation schools, apprentice schools, evening classes, etc., in which the preliminary general education demanded was not higher than the vernacular primary grade. The figure took into account persons undergoing every variety of instruction of this grade including men in employment who attended training classes or a few hours a week to improve their wage-earning capacity. In his opinion, apart from regular industrial employment proper, skilled workmen were wanted for agricultural industries, building trades and public works. In other countries ordinary industrial schools

had proved efficient and the men trained were in great demand. Here also the people should be given the opportunity of understanding the benefits of technical instruction. There were 300,000 labourers employed in industries in the Presidency, of whom 100,000 should be skilled labourers. Taking these facts into consideration, he had proposed that the total attendance should be 25,000 so as to obtain an annual output of 8,000 trained hands. If the figure was considered excessive, the Committee was at liberty to reduce it.

In order to bring to a point the discussion that followed Mr. Bell proposed that the number to be provided for in Class D should be 8,000. Mr. Flatt seconded the proposal.

Mr. Page moved as an amendment that the figures should be 1,500. Mr. Roose seconded this amendment.

Mr. Masani moved as an amendment that the figure should be 10,000, to be reached in ten years. Mr. Kanitkar seconded this amendment.

Major Willis moved as an amendment that instead of fixing definite numbers certain centres should be determined and requisite staff suggested, and on that rough estimates should be drawn up. Mr. Vakil seconded this amendment.

A majority being in favour of Major Willis's amendment, it was put to the vote as a substantive proposition and carried, 10 voting for and 2 against.

MR. MARRS'S NOTE.

Class D.

1. Continuation school, full-time, ages 11—14 or 15, for boys who have passed at least vernacular standard IV.

This type of school would give general education, with an industrial bias in vernacular, practical mathematics, practical science, industrial geography, technical drawing, English (optional or otherwise), physical training, and work in wood or metal or both.

Such schools, if successful and if followed up by instruction in apprentice classes, should provide men who would eventually become foremen. They would be useful chiefly for boys of decent average intelligence and could be started only in the neighbourhood of organised industries. Those who did not make a success of the ordinary subjects might be allowed to drop one or two of them and do more manual work.

2. Part-time school (possibly of an intermediate school standard) for apprentices who have passed through a continuation school, *by arrangement with employers only*. Language would be a difficulty.

3. Part-time schools for lower grade apprentices with some educational qualifications, giving instruction in practical mathematics, science, technical drawing, etc., *by arrangement with employers only*.

4. Industrial schools giving instruction in local crafts, along with general education and drawing. No educational qualifications to be demanded. Whole or part-time.

5. Vernacular standards V, VI, and VII or standards VI and VII of selected primary schools might have a curtailed course which would admit of instruction in local crafts.

VII

1. The seventh meeting of the Committee was held on Monday the 20th June 1921.

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2. The Chairman in opening the proceedings said that they met there that day after a recess of six weeks. Till the 2nd May when they last met, six meetings in all had been held and those meetings were spent in the discussion of preliminaries. Till then no decisions of any importance had been reached under any of the principal heads of the enquiry. He, however, thought some of the members had utilized the recess in studying the matter further and they would within the next few days have an opportunity of welcoming fresh suggestions.

His own view was that they should work from the general to the particular and that on some of the larger questions they should start with assumptions suggested by experience as most reasonable in the present circumstances of the country. For example, they should soon form an opinion as to what would be a reasonable annual outlay on technical and industrial education to recommend for the future. They knew that about Rs. 250 lakhs was the total expenditure on education at the present time and only about 6 lakhs were spent on the class of education with which the Committee was concerned. The different types of institutions required and the number of scholars in each type would have to be determined also in the same way.

If members frankly stated their views, it would greatly facilitate the Committee's work. On points on which the majority were agreed, they would go on developing details, on points on which there was much divergence of opinion they might frame issues for further investigation, and, in regard to important questions of principle or policy where they needed guidance, they might, if necessary, make a reference to Government.

The speaker then gave some details of the provision made for technical and industrial education in more advanced countries like the United Kingdom, Germany, Canada, the United States of America, and Japan, and added that there was enough material to guide them in framing a scheme of their own based on recent developments in those countries. Each important question might be decided both in the light of what was being done abroad and with special reference to local conditions.

He thought that it was desirable that the Committee should visit Ahmedabad and Poona; Ahmedabad, because it was the second largest industrial centre, and Poona, because the premier technical college of the Presidency was located in that city. Sub-Committees might visit other centres like Karachi, Sholapur, Hubli and Dharwar.

(Dewan Bahadur Godbole suggested in addition Nagpur and Calcutta and the Chairman agreed if such was the desire of the Committee.)

Further evidence had to be collected from employers, experts, educationists, etc. If members should be good enough to freely state their views either at the meeting or by furnishing written statements on the points raised it would help them to formulate decisions for the approval of the Committee as a whole.

As regards the duration of their work he hoped that the Committee would adhere to its original intention to complete its report by about the end of September. An estimate was due from them to Government of the duration of the Committee's work and the total cost of the Committee's operations. That formed one of the items on the agenda before them.

Government had called for a comprehensive scheme. In his opinion the scheme propounded should, if carried out, not only pave the way to prepare experts and skilled workmen for industries and industrial occupations, but also help to remove from the University and other educational institutions the reproach that they trained youths too exclusively for the clerical and literary occupations. The scheme had to satisfy the Government and the public in these respects.

Before concluding he wished to state quite frankly that if the majority of the members held views which did not coincide with his own, he considered it binding on him as Chairman to give effect to the recommendations of the majority in so far as it lay in his power to do so.

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4. Mr. Marrs then drew attention to a resolution passed at the previous meeting in which it was decided that, instead of fixing a definite number of pupils to be trained in industrial institutions certain centres should be determined and rough estimates drawn up on that basis. It was accordingly agreed to discuss the centres at which institutions of Class D should be started. Considerations mentioned to which importance should be attached in deciding centres were—

- (1) a population of at least 10,000 except when there were special reasons for starting or continuing an industrial institution in a smaller centre;
- (2) the presence of existing institutions and the question of their continuance and development;
- (3) industrial conditions in the neighbourhood of centres under discussion.

Mr. Page also suggested that the Committee should obtain the opinion of representative employers of labour as to whether they preferred boys trained in institutions referred to as Class D or they would rather have the practical training given in workshops.

Mr. Roose thought that the Committee should get away from the idea of giving exclusively practical instruction in these schools and advocated a good modern education with manual training. Dewan Bahadur Godbole was of opinion that in each district there should be a school which gave trade instruction. Another member expressed the view that trade instruction as given in existing institutions of Class D was often wrong in scheme and idea and could in the case of organised industries, be better given in workshops.

5. To bring the discussion to a point the Chairman pressed for consideration of centres at which institutions of Class D, which included part-time and apprentice schools, could be established. The following places were mentioned—

Southern Division

Hubli, Bijapur, Hotgi, Ratnagiri.

Northern Division.

Broach, Ahmedabad, Kaira, Bulsar, Viramgam, Surat, Anand, Nadiad, Thana, Kalyan.

Central Division.

Sholapur, Poona, Lonavia, Bhusawal, Igatpur, Satara, Ahmednagar, Dhulia.

Sind

Sukkur, Hyderabad, Shikarpur, Jacobabad, Larkana.

6. Mr. Masani proposed that every town with a population of 10,000 or more should have an institution of Class D, and Mr. Kanitkar seconded the proposition. Dewan Bahadur Godbole proposed as an amendment that every centre having a population of 10,000 or more should have some kind of technical school, provided the industrial conditions were suitable, and Mr. Page seconded the amendment which was accepted by Mr. Masani.

After discussion as to the type of education to be given in these institutions, Mr. Page explained that if these schools were to turn out skilled artisans, he was opposed to the amendment. In his opinion pupils should be given prevocational training so that, when they went into shops, they would be better able to undertake the training provided there. Major Willis and Mr. Flatt stated that skilled craftsmen could not be trained in schools, Mr. Turner put it to the meeting that before the amendment was put to the vote, the Committee should decide what type of education was proposed to be given in the institutions contemplated, as he did not believe in teaching trades in school at all. He moved as a further amendment that—

“The question of the type of education to be given in these schools should be determined, that is, whether elementary education should be given along with prevocational work, or whether these schools should attempt to train skilled craftsmen.”

This amendment was seconded by Mr. Marrs.

7. After prolonged discussion in the course of which the Chairman pointed out that the issues were confused, that several varieties of institutions were contemplated under Class D, and that, if members committed themselves to Mr. Turner's amendment, one or more varieties would have to be omitted, it was finally agreed not to put the amendment to the vote until further time had been given for discussion.

8. It was agreed that a note prepared by Major Willis should be circulated and brought up for discussion at the next meeting. Mr. Vakil also promised to furnish a note on Class A institutions.

VIII

1. The eighth meeting of the Committee was held on Monday 4th July 1921.

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3. The Committee then considered Mr. Masani's proposal—

“that every centre having a population of 10,000 or more should have some kind of technical school, provided the industrial conditions are suitable”

and Mr. Turner's amendment—

“that the question of the type of education to be given in these schools should be determined, *i. e.*, whether elementary education should be given along with pre-vocational work, or whether these schools should attempt to train skilled craftsmen.”

After discussion, during which Mr. Flatt moved and Mr. Turner seconded a proposal that the lowest grade of institution should be considered first, and the consideration of institutions of Class A should be deferred until all the lower grades had been considered, it was decided that the meeting should deal first with the note* prepared by Major Willis.

4. Major Willis opened the discussion with the following remarks —

“I hope you have all been able to run through the note which I put before you, and I would like to ask your indulgence while I make a few remarks by way of opening what I hope will be a very full and frank discussion of what I had the temerity to put before you. It may be said by some that I have arrived at very definite conclusions in my note which is before you, that such conclusions are premature. It has been suggested, for instance, that it is necessary for the Committee or deputations of the Committee to visit various places, and to interview various people. I submit that no useful purpose will be served by this as we are a very representative Committee. I therefore submit that we are as a

Committee capable now, after our discussions of the last seven meetings—which have ranged over very wide ground, returning very much over the same track they started on—we are now in a position to put our views down on paper and that is what I endeavoured to do in drafting this note. I claim we have all the necessary data before us to enable us to come to useful general decisions—general decisions I say advisedly—as details cannot be laid down by us. It is impossible to lay down any details until we know that the scheme we may put forward is going to be taken up by the public. (The Chairman pointed out that Government had asked for detailed estimates, but Major Willis thought that was not possible.)

“ I want to make it quite clear that this note is not in any way an answer to or overlaps the very valuable note which Mr. Vakil has placed before the Committee. I deal with the subject from the elementary side whereas Mr. Vakil takes on the University side, and our notes are complementary parts of the same general machinery of technical education. There have been some slight mistakes in the note due to clerical errors. I shall ask our Chairman at the end of the discussion to allow me to reply generally, so far as I am able, to points raised by various Members, and if I find that the discussion points that way, I shall also ask leave to move a substantive resolution based on the note and the discussion.”

Dewan Bahadur Godbole then urged that it was necessary to lay down some standard of education for admission to the lowest grade school mentioned in Major Willis's note and that separate provision should be made for the illiterate. Major Willis explained that this portion of his note referred to half-timers, who would be admitted to works without consideration of their educational attainments and dealt with in the works-school in accordance with their knowledge and capacity. It was his opinion that all children should be given a chance of some education. Dewan Bahadur Godbole also referred to paragraph 9 of the note as he was in doubt as to the fate of 95 per cent of the apprentices, for whom no technical education was proposed. Major Willis explained that the figure 95 per cent was only an estimate of the number unlikely to profit by further education. His proposal meant that at the age of 14 boys should go through an elementary test and that those found fit for further training should be trained for posts as chergemen, foremen, and in exceptional cases for still higher positions. Those eliminated would become skilled craftsmen.

Mr. Bell gave the following account of what he proposed to do at the Dapuri Workshops —

“ No half-timer will be allowed unless he has passed the second standard. During the period he works as a half-timer (which now is 9 to 14 and is going to be made 12 to 15) he will work 5 to 6 hours in the factory and attend school in addition so that by the time he becomes a full-timer he will have passed the 4th standard. That will be the minimum standard for apprenticeship. Apprentices will work in the shop and will be given some additional tuition in the evenings.”

The Technical College mentioned in the note was then discussed. Major Willis stated that he had in mind an institution of the type of the Victoria Jubilee Technical Institute thoroughly reorganized, with a four or five years' course, and that the qualifications for admission to this institution should be a good grounding in general education including English, mathematics, drawing and possibly the elements of physics and chemistry. Dewan Bahadur Godbole pointed out that it would be a very exceptional half-timer who could eventually proceed to a College of this kind.

The “ sandwich ” system for college pupils was considered and it appeared to be the general sense of the meeting that some form of the sandwich system should be introduced.

Dewan Bahadur Godbole raised the question of cottage industries and asked whether the existing industrial schools, which had proved failures, could not be replaced by Government workshops in every Division or District where artisans could be trained for rural areas. Mr. Bell said that Indian public opinion was against industries run by Government and added that the Public Works Department Reorganisation Committee had condemned the Dapuri works simply because they were Government workshops. Mr. Turner objected to industrial schools scattered all over the province as very few of those who attended were children of artisans and they attracted only those who wanted a cheap Anglo-vernacular education.

Peripatetic instructors were discussed and Mr. Bell alluded to an attempt made to popularise the fly-shuttle loom by itinerant demonstrators. They had met with success in certain areas.

Mr. Kanitkar expressed the opinion that full-timers on works should be given an opportunity of obtaining general education.

Mr. Power referred to the tendency among youths in training to leave before their training was complete, and Mr. Peterson said that the education advocated by Major Willis should be made compulsory and free.

Mr. Flatt thought Major Willis's note tended to create water-tight compartments of a University course as entirely separate from the practical side of it. He thought this tendency should be avoided. They were also asked in the terms of reference to treat the question of chargemen and foremen. They were not people who could be picked up anywhere. The point Major Willis made in paragraph 15 of his note, where he said "it will depend largely upon whether a man develops power of controlling men" required to be very carefully emphasised.

Mr. Page thought that the employers would not be willing to give time for general education during apprenticeship. There was no room for both Major Willis's College and Mr. Vakil's University course. The two seemed to cover the training of men of the same position.

IX

1. The ninth meeting of the Committee was held on Tuesday the 5th July 1921.

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2. The discussion on the note submitted by Major Willis was resumed. Major Willis, in reply to the various points raised, repeated his conviction that some schooling—even if it was of an 'elementary nature—was better than none. With regard to Professor Kanitkar's suggestion about the possibility of the artisan bettering himself in night schools, he thought that was not possible until the number of hours of work were restricted. He thoroughly agreed with Mr. Peterson that general education of half-timers should be made compulsory; but did not think it was practical at that time. Although he wished to impress upon them the importance of the workshops, he did not agree with Messrs. Page and Flatt that there was no room for an institution of the type suggested by Mr. Vakil. The man who makes a special study of subjects from the point of view of their physical and chemical properties was as necessary as the man who studied the mechanical properties. It is the former who will direct the latter's energy into new avenues and will also help him in getting through and improving generally his own processes. In suggesting schools for Bombay and Ahmedabad his idea was that these schools must be located in the vicinity of the mills where the boys are working. He again drew attention to the very great difficulty of getting suitable teachers, and thought that the first efforts of Government should be directed to the solution of that problem.

He then formally moved a resolution to the effect that the scheme originally placed before them be abandoned, and that the final report of the Committee be based on his note and that of Mr. Vakil.

Professor Kanitkar thought that the two notes on which it was proposed to base the final report did not cover all the terms of reference. Mr. Bell also thought that the resolution was too definite and accepting it at that stage would be too much of a commitment. Mr. Peterson agreed that there were still other points to be discussed. After some discussion Major Willis withdrew his resolution in favour of the following which was proposed by Mr. Bell and seconded by Mr. Peterson and unanimously accepted—

"That the Committee approves generally of the principles laid down in paragraphs 1—17 of Major Willis's note for the primary and technical education of half-timers and apprentices in large workshops and factories."

3. The Committee then passed on to the discussion of Mr. Vakil's note*. Mr. Vakil in introducing his note pointed out that though he was in accord with most of what was written in his note, that was really a representation from the Indian Merchant's Chamber and Bureau, who had sent him to the Committee. The need for higher technological institutions had been felt and keenly discussed even in 1915, when the Industrial Conference, at the instance of Dr. Mann passed a resolution that the time was ripe for the introduction of such institutions. The Industrial Commission had given full importance to this subject; and his Chamber only wished to re-emphasise the point. If they accepted the general idea, a sub-committee could draw up a detailed scheme. He specially wished to refute the idea that such institutions ought to follow in the wake of industries. He thought there was sufficient evidence to prove that in the case of Germany at least, the schools were the root and branch of their industrial development and the greatest contributaries to the great economic results that have followed. There the industrial development had followed in the wake of the higher technological institutions. He wished the Committee not to miss that particular point.

Mr. Bell pointed out that the Industrial Commission never made recommendation that institutions of University standing should be in the hands of the Director of Industries; and so the criticism in paragraph 18 was ill-founded and that the language unnecessarily strong. Mr. Flatt objected to certain statements on page 133, and Mr. Marrs similarly objected to certain sentences on pages 138 and 139. After some discussion it was agreed that the Committee had nothing to do with Mr. Vakil's reasoning and the Committee was not the place to go into the correctness or otherwise of the statements made. They were only concerned with the proposal

* Vide Appendix F.

for starting a technological institute as outlined by Mr. Vakil; and it was decided to confine the discussion to the proposal.

Mr. Masani thought that the number of subjects proposed was too large for one institute; and that several institutes would be necessary. Mr. Turner raised the question as to whether this would be a Provincial or an Imperial institute and gave his opinion that sugar-manufacture should be added. Dewan Bahadur Godbole did not think there would be any advantage in removing the Mechanical Engineering Branch from the Poona College to Bombay. Professor Kamitkar agreed with him in this, but thought that the present College needed to be better equipped.

As other members expressed their opinion that they have not had sufficient time to go into the whole question, it was decided that Mr. Vakil should reply to the points raised that day, and that further discussions should be resumed at the next meeting.

Mr. Vakil in reply expressed his regret for the mistake pointed out by Mr. Bell. As regards the language used in his paper, he explained that his Chamber, whose opinions he was voicing, had no intention whatever of hurting the feelings of any of his colleagues, but at the same time they thought that the time had come when they ought to say exactly what they thought on these questions. He wrote like that because he wished that the question should be discussed without any reservation and hoped that all members would take it in that spirit. He thought there was justification for the statements objected to by Messrs. Flatt and Marrs.

As regards Mr. Masani's objection he pointed out that in many foreign technological institutes they taught a greater number of subjects. He did not suggest that the institutions should start fully equipped with Professors for all the subjects from the very beginning. He suggested a programme which should be followed as necessity arose. He explained to Mr. Turner that although the institution would be Provincial, admission would be open to students from all parts of India, as was the case in other foreign institutions. He pointed out to Dewan Bahadur Godbole that they had greater facilities for teaching mechanical engineering in Bombay where they had so many industries. His estimates were only tentative, more detailed estimates could be prepared if they accepted the scheme generally.

4. The Chairman in winding up the proceedings expressed satisfaction at the progress made and appealed to members to bring forward in rapid succession specific proposals and suggestions in the same spirit in regard to the remaining terms of reference.

X

1. The tenth meeting of the Committee was held on Monday the 18th July 1921

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2. The Chairman announced that Government had appointed Mr. G. N. Gokhale as the Secretary of the Committee in place of Mr. F. W. Marrs, who had been appointed Assistant Director of Public Instruction and so was unable to give his whole time to the work of the Committee. The following Resolution was then passed unanimously:—

“That the Committee desire to place on record their high appreciation of the services of Mr. F. W. Marrs during the four months he has been Secretary to this Committee.”

3. Precedence was next given to the consideration of a communication from Government, requesting that the report of the Committee be submitted by the end of September at the latest so as to enable Government to make the requisite provision in next year's budget. Some of the members considered that as there were experts on the Committee it was not necessary to examine any more witnesses or to visit industrial schools in the mofussil and that the framing of the report might be expedited by omitting these measures from their programme and distributing the work remaining to be done among Sub-Committees. After some discussion it was decided to send a reply assuring Government that every endeavour would be made to comply with their wishes.

4. The discussion on the note by Mr. K. H. Vakil was then resumed. The Chairman here invited attention to the following remark* in Mr. Vakil's note:—

“In a note circulated to the Members of this Committee with the terms of reference it is suggested that higher technological education should be subordinated for the present to other classes of technological education mentioned in the terms of reference.”

He explained that the remark quoted was the private opinion of one of the Members and was not authorised by either the Committee or himself.

In reply to Major Willis, Mr. Vakil explained that he had made provision for 170 students in the first year class, although fresh admissions would be only 65 to 70, to allow for the number who might fail to pass the test at the end of the year, and have to take the course again.

With regard to the standard of admission to the Institute, he pointed out that the most important point was the age at which the student would be ready to enter the works. That was taken at 21 to 23 in England. In Germany it was 25 to 26, while in Japan it was above 26. Mr. Vakil submitted that the Indian had a shorter life and owing to different social conditions he had greater responsibilities at an earlier age, and so he proposed that the age of admission may be fixed at 23 for Indians. The standard of admission should be settled accordingly. After some discussion it was decided that this question should be left for the consideration of the sub-committee in the first instance.

Major Willis thought that the three years' course proposed for mechanical engineering was too short and without additional workshop practice was not of much use. He pointed out that in Mr. Vakil's scheme no provision had been made for capital expenditure, which would be very heavy, considering that they expected to have to spend 20 lakhs for moving the V. J. Technical Institute to the new site at Matunga. He thought there was no place for a course in plumbing and sanitary engineering in a Technological College.

Mr. Roose was of opinion that for electrical engineering a course of five years was necessary.

Mr. Bell thought that even if they accepted the principle of providing technological education, they need not have a separate Technological College. They might send students to foreign countries or to other places within India itself like Bangalore to receive training in particular subjects. They might even give grants to such outside institutions on condition that they trained a certain number of students from the Bombay Presidency.

Mr. Turner remarked that many of the subjects proposed by Mr. Vakil were already being taught at the Victoria Jubilee Technical Institute. He was unable to understand what could be gained by taking up the same subject in another institute. His trouble was that the standard of students who joined their courses was rather low. If they got better material they could even reduce the course in chemistry at the Victoria Jubilee Technical Institute to three years and be able to turn out better men.

Mr. Peterson agreed with Mr. Bell that Government might send out students to suitable existing institutions and mentioned the proposed Jamshedpur Institute for Mining as one which will benefit Bombay. He pointed out that experts could not be procured on the salary of Rs. 1,250 suggested by Mr. Vakil. They would cost at least Rs. 2,000.

Mr. Masani stated that plumbing and sanitary engineering were taught at the Manchester Institute of Technology. He thought that the subjects which are already taught at the Victoria Jubilee Technical Institute should be left there and the teaching improved. They might start another college for teaching higher standards. He agreed with Mr. Peterson that Rs. 1,250 was too low a salary for experts.

Mr. Page thought that in view of the time that would be required to start a new College and the expense it would involve they should not start a new college.

The Chairman thought that a Sub-Committee might investigate and submit recommendations on all aspects of technical education of the University grade under the following four heads :—

- (1) The improvement of the Engineering College at Poona
- (2) The establishment of a new Technological College at Bombay.
- (3) Provision for research work.
- (4) Foreign scholarships

At this stage Mr. Kamthkar moved a substantive proposition, namely, that the Committee approve of the establishment of a new Technological College and that the University be requested to create a Faculty of Technology. The majority of Members were unwilling to commit themselves to the recommendation for starting a new College. After some discussion and in view of the fact that Government wished that the report should be submitted early, the following Resolution was proposed by Mr. Bell, seconded by Mr. Marrs and passed unanimously :—

“That suitable provision be made for technological education of the University grade and recognised by the University ; and the question of means of providing it be left for the consideration of a Sub-Committee.”

5. The Committee then decided to meet on the following day to constitute Sub-Committees for framing the detailed scheme and report.

XI

1. The eleventh meeting of the Committee was held on Tuesday, the 19th July 1921.

* * * * *

3. The Members were then consulted as to whether they wished to take up Mr. Masani's proposal on the agenda or proceed to the formation of the Sub-Committees at once. As the

sense of the meeting was that the formation of the Sub-Committees was more important, that question was taken up first.

Mr Peterson proposed that three Sub-Committees should be formed, the first to deal with University education, the second with the education of the working classes and the third with all remaining questions

Mr Kanitkar thought that only two Sub-Committees should be appointed, one to deal with University and general education and the other with that of mill-hands and artisans.

The Chairman pointed out that it might be necessary to apportion work to the different Sub-Committees according to the terms of reference appended to the Government Resolution

Mr. Bell thought that the question of the "Traming of girls and women" should be left to be referred to another Committee competent to deal with it.

Mr Masani did not agree that this Committee was not competent to deal with that question. He thought all that was needed was to lay down general principles and policy, the details could be worked out in consultation with women

4. The sense of the meeting was that there should be three Sub-Committees. The question of the personnel of the Sub-Committees as well as the procedure to be followed by them was discussed and the following Resolution unanimously recorded —

(1) That three Sub-Committees be formed as under to draw up definite schemes and proposals with regard to the several terms of reference mentioned in Government Resolution, No. 973, dated the 17th February 1921 —

"I—Sub-Committee on subjects connected with technical and industrial education of the University grade (*vide* clause 1 of the terms of reference)

Members.

J. C. K. Peterson, Esq, C I E,
K H Vakil, Esq, M Sc,
A M Masani, Esq, M A, B Sc,
Leshe Flatt, Esq, A.M I C E, A M I Mech E.

II.—Sub-Committee on subjects connected with technical and industrial education of the secondary and lower grades (*vide* clause 2 and first part of clause 3 of the terms of reference) .—

Members

R. D Bell, Esq, C I E,
A J Turner, Esq., B Sc,
F. J Page, Esq., M.I Mech E

III.—Sub-Committee to deal with all remaining terms of reference (*vide* part of clause 3 and clauses 4 to 6 of the terms of reference) —

Members.

The Chairman,
F W. Marrs, Esq., M A,
Professor K. R. Kanitkar, M A., B.Sc.

(2) That each Sub-Committee be requested to submit a draft report in such a form as to constitute, when ready, a section or sections of the final report of the Committee

(3) That each Sub-Committee shall elect its own Chairman, who will act as convener and be responsible for the submission of the report on due date.

(4) That the reports be forwarded to the Secretary of the Committee by the 15th of August at latest.

(5) That the next meeting of the Committee be held on the 22nd and 23rd August to consider the reports submitted by the Sub-Committees."

5. Mr. Masani desired to withdraw the proposal, item 2 on the agenda, in view of the fact that a Sub-Committee would take up the question and this was allowed. Mr. Turner's amendment was consequently dropped.

8. In view of the need that had arisen for the early submission of the report, the Committee definitely decided not to take any steps in the matter of collecting further evidence or of visits to the principal industrial centres in the Presidency.

Item 2 of the Agenda was :—

Resumption of the discussion of the following proposal moved by Mr. Masani and seconded by Mr. Kanitkar at the meeting on 20th June last :—

"That every centre having a population of 10,000 or more should have some kind of technical school, provided the industrial conditions were suitable."

and the following amendment proposed by Mr. Turner and seconded by Mr. Marra :—

"It be first decided what type of education is to be imparted in the schools proposed for the development of industries before settling the question as to how many should be opened and where they should be started."

XII

1. The twelfth meeting of the Committee was held on Monday, the 22nd August 1921.

* * * * *

2. The Chairman announced that Government had appointed Mr. G. N. Gokhale, Secretary of the Committee, to be also a Member.

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4. The Chairman informed the Committee that some very valuable books on the subject of technical and industrial education, amongst which was an Act on industrial education, had been received from Ontario, Canada. A copy of the report of the Royal Commission of 1913 on Technical and Industrial Education in Canada had also been received. Members wishing to see the books were requested to communicate with the Secretary.

5. The Committee then passed on to the discussion of the reports of the three Sub-Committees appointed on 19th July. It had been suggested that one day might be usefully spent in informal discussion, but this was considered unnecessary and the Committee proceeded to discuss and record decisions.

6. Dewan Bahadur Godbole asked if it was not possible to get the required statistics from the latest census figures; the Secretary replied that he was trying to do that.

7. The Committee then decided to consider first the report of the Second Sub-Committee dealing with technical education of the lower grades.

Mr. Kanitkar thought the report should be split into three parts, (a) half-timers and apprentices, (b) cottage industries and trade schools and (c) pre-vocational schools. Dewan Bahadur Godbole was in favour of this being done and considered a separate chapter for apprentices necessary. Mr. Masani thought that the proposals for half-timers should go in the chapter on "Relation to General Education". Mr. Bell stated that the report was already properly arranged but he had no objection to the first five paragraphs being separated from the rest. He did not think that any division on the lines suggested by Mr. Kanitkar would be advisable. After some discussion it was decided to leave the Second Sub-Committee's report as it was and to call it "Technical and Industrial Education—Lower than University Grade".

8. Mr. Bell pointed out that the fundamental principle on which their proposals for the training of apprentices were based was that stated in paragraph 6, *viz.*, that practical training was possible only in commercial workshops and not in a school. Mr. Power pointed out that it was not so in all cases. He gave as an instance watchmaking for which there were schools in Switzerland which sent out finished watch-makers after four or five years' training in the school only. The Chairman considered that the latest expert opinion on the subject such as that expressed in the report of the Royal Commission of Canada did not support Mr. Bell's view. Mr. Bell pointed out that their remarks referred to training for organised industries only. He further explained that they had considered that question very thoroughly in the Sub-Committee, and that in their scheme there was room for other schools. If they did not go into these matters in greater detail it was only because they did not feel competent to make any definite suggestions.

Dewan Bahadur Godbole approved of the suggested remodelling of the present industrial schools as pre-vocational schools, and thought it necessary considerably to multiply the number of such schools in rural areas. He further considered that some special facilities should be given for boys passing out of these schools to enter large workshops as apprentices. The Chairman observed that the Sub-Committee's report had made no provision for the rural population for whom no expenditure was proposed. Government had asked them for a comprehensive scheme and if they omitted the rural areas which form four-fifths of the population they would be limiting the usefulness of their proposals to a very small percentage of the population. Mr. Vakil agreed with the Chairman in this, and pointed out that the population in large towns, for whom they had provided apprentice schools, was largely migratory in character and the schools would benefit only a small proportion of even the town population. He thought the scheme very inadequate.

9. Mr. Kay objected to the employers being compelled to provide school accommodation and being made to pay part of the cost of the education of half-timers, as proposed in paragraph 3. After some discussion it was decided by a majority that the responsibility for providing school accommodation should be retained but that the employers should not be compelled to pay part of the cost. It was decided that the fourth sentence should be redrafted as follows.—

“ We see however no objection to the employment of half-timers being made contingent upon suitable school accommodation being provided by the employers, when the half-timers exceed a prescribed number, say, 20 ”

The next sentence about cost was dropped.

10 Some further verbal changes were made in paragraph 6

XIII

1. The thirteenth meeting of the Committee was held on Tuesday, the 23rd August 1921.

2. The discussion of the report of the Second Sub-Committee on “ Technical and Industrial Education—Lower than University Grade ” was continued Dewan Bahadur Godbole repeated his conviction that the present industrial schools should be remodelled as prevocational schools and considerably increased in number. Mr. Bell had no objection to including this suggestion in the report, and it was agreed that the necessary addition should be made

Mr. Marrs pointed out that the qualification for admission to the Ranchhodlal Chhotalal Technical Institute at Ahmedabad was already III standard Anglo-vernacular, although boys who had passed the VI standard vernacular were also admitted. He proposed that this should be raised to V standard Anglo-vernacular for the present, and ultimately to the VII standard. This was approved.

Mr. Masani thought that most of the places mentioned in paragraph 19, where apprentice schools were recommended, were all on the Poona side, and suggested that Bulsar should be added to the list, as that town had a workshop. Mr. Page explained that the workshop at Bulsar was a very small one. Mr. Vakil recommended that Surat and Rajkot should be added as most of the carpenters at Bombay came from Kathiawar. Mr. Bell pointed out that there was already one industrial school at Surat. It was decided that as the list in paragraph 19 was not exhaustive, no addition to it should be made at that stage.

Mr. Kantkar agreed with the first part, but considered that provision for 300 was too small. The whole report of the second Sub-Committee in his opinion had touched many points but was lacking in definiteness. He remarked that no definite proposals had been made for urban areas. There were many students in high schools willing to go through industrial courses and such courses or classes ought to be attached to those schools. He gave the instance of the Technical School at Poona which was not well attended only because it was in an out-of-the-way place and not attached to some high school.

3. The question of control discussed in paragraphs 12 to 19 was raised here but as that question was again to come up before the Committee in the report of the third Sub-Committee, it was decided to hold over its consideration for the time being.

Mr. Bell explained that he had sent a copy of their recommendations about the School of Art to the Principal of that School and the Principal had pointed out that the Sub-Committee's remarks that the boys left as soon as they had acquired some facility in drawing because they practically exhausted the possibilities of the teaching there provided were not quite true. The Principal thought the reason was poverty and scholarships were the only remedy. Mr. Marrs thought that the failure to keep the boys was mainly due to the fact that the classes did not help the boys to connect good design with the manual art, as they ought to. Mr. Bell did not think it was so, as the boys in the various classes were really sons of persons following the professions.

Mr. Vakil gave his opinion that in preparing text books in vernaculars the English technical terms for which there were no equivalents in vernaculars should be retained, and no attempts should be made to coin new words as was proposed in Baroda. Mr. Masani pointed out that words derived from Sanskrit appealed to students better than English words. The Committee agreed with Mr. Vakil.

Mr. Vakil thought that a knowledge of dyeing (cotton, wool and silk) was very important to the carpet weaver, and that arrangements should be made to give this in carpet-weaving centres. Mr. Bell pointed out that this was already mentioned but agreed to make it more definite.

Mr. Vakil suggested that a carpet-weaving school be opened at Surat as that industry flourished considerably at the place. This was not accepted.

Mr. Vakil further pointed out that 70 per cent. of the imported dyes were used in the villages by small professional dyers (*Rangaris*) and that there was a great need of teaching these people the proper way of using the dyes. This proposal was accepted.

4. The general principles having been thus discussed, the Committee thought that they could give their opinion on the whole scheme better if Mr. Bell gave them an abstract showing the number of students they proposed to provide for and the expenditure they considered necessary. After some discussion the following rough abstract was agreed upon as representing the views of the second Sub-Committee :—

Item.	Present.		Proposed.	
	Number.	Expenditure.	Number	Expenditure.
		Rs		Rs
Half-timers	2,300	34,500	4,000	1,20,000
Apprentices	<i>Nil</i>	<i>Nil</i>	420	42,000
Cottage Industries	very few.	20,000	6,000	3,00,000
Prevocational Schools	350	40,000	1,590	2,50,000
	2,650	94,500	11,920	7,12,000

The proposals of the Sub-Committee were then put to the vote and the following resolution was passed; eleven members voted for the resolution, Messrs. Gokhale and Kantkar voted against, and the remaining members including Dewan Bahadur Godbole abstained from voting :—

“ That the report of the second Sub-Committee be accepted with changes already approved and subject to the question of control being considered later.”

Mr. Bell was authorised to make any verbal alterations that members might suggest as long as they were not against the general principles

5. The Committee then passed on to the discussion of the report of the first Sub-Committee. Mr. Peterson explained that their Sub-Committee had approved of the report unanimously, and that they had no further suggestions to make.

Mr. Power expressed his approval of the report.

Mr. Page thought that if the entrance to the Victoria Jubilee Technical Institute was raised to Inter Arts that institution would supply the leaders and that there was no room for a separate college as far as mechanical and electrical engineering were concerned. Foremen could, in his opinion, be trained only in workshops and not in schools. Mr. Bell pointed out that the new college would take some time to come into being. As the Victoria Jubilee Technical Institute would improve their standard at once by raising the entrance, the question could as well be left for settlement later. There was no harm in approving of the College.

Mr. Turner pointed out that the Royal Institute of Science was situated away from the mills, and in proposing its conversion the first Sub-Committee were contradicting themselves. He thought that it was wrong to appoint a Principal for the new college before the subjects to be taught were decided

Mr. Marrs explained that a course in architecture had already been approved of but could not be undertaken for want of funds. He suggested that the course should be started soon. He pointed out that there was no instruction in electrical engineering at the Engineering College at all. He thought it should be definitely stated whether mechanical engineering should be retained at Poona. The Committee was of opinion that it should be abolished after the new college is started. It was agreed that courses in architecture should be recommended.

Mr. Roose had no remarks to make.

Major Willis considered the estimates too low. He thought too much had been made about a degree in mechanical engineering.

Mr. Gokhale suggested that marine engineering should be included but the Committee did not approve of it. He further wished to propose some changes in the civil engineering courses but it was decided that the subject was not included in the terms of reference of the Committee.

The following resolution was then passed, thirteen voting for it and Major Willis against it :—

“ That the report of the first Sub-Committee be approved, with slight alterations already accepted.”

Mr. Vakil further moved the following resolution which was put to the vote and lost :—

“As the proposed College of Technology will provide higher technological education not only to the students of this presidency, but to students coming from all parts of India, this Committee recommends to the Bombay Government to make a representation to the Imperial Government for a contribution to the initial cost of the College of Technology and also to its recurring expenses.”

XIV

1. The fourteenth meeting of the Committee was held on Monday the 29th August 1921.

2. Mr. Vakil read extracts from the report of the Adult Education Committee appointed by the British Ministry of Reconstruction, issued in 1919, which went to show that the system of long apprenticeship was a survival from mediæval times.

Mr. Flatt observed that the portions read out had very little bearing on the conditions in India. Primary education was so much lower here than in other civilised countries that conditions could not be compared to those in countries like England and Germany.

The Chairman remarked that in Japan, Germany and other countries, the conditions were as described in the Adult Education Committee's Report. In India, too, so far as the literate population was concerned the position was similar to that of the other countries referred to. They must send up proposals in accordance with the systems approved in advanced countries, otherwise they would be making costly blunders or retard technical education. So far as factories were concerned the apprenticeship system was all right. But what about the industrial education of young persons who did not go to factories and who did not begin life as wage-earners? The Sub-Committees had made no provision for them. There was evidence on every side that there was demand for trained men, but even assuming it did not exist he thought training should precede the demand.

Mr. Page thought that the conditions of manufacture were such that young men could obtain all the training they needed in the workshops. Apprenticeship system if it had been superseded in England it had not been to any appreciable extent. The shops referred to in the Adult Education Committee's Report had no counterpart in this country. Until they had them, apprenticeship was the only course left.

Mr. Peterson suggested that they should concentrate their attention on the industries which flourished in this province.

3. The discussion on the second Sub-Committee's report was then re-opened. Mr. Turner suggested that the report should mention Lord Reay's connection with the Allahabad Conference which led to the establishment of the Victoria Jubilee Technical Institute. At present that Institute admitted 120 new students every year and was compelled to refuse admission to nearly two-thirds of the applicants. When it is removed to Matunga and enlarged it would be able to admit more than 150 a year. If they admitted all the applicants, the staff would have to be greatly strengthened; and the expenditure should be raised roughly by 50 per cent. With reference to a suggestion made by Dewan Bahadur Godbole that the Committee should recommend that more students should be admitted by the Institute, Mr. Turner observed that such a recommendation could not be made as the Institute was not subject to this or any other Committee. It had a peculiar constitution of its own and was directly responsible to the Secretary of State. It was not subordinate to the Director of Public Instruction nor to the Educational Department of Government. As to curriculum they are only interested in seeing that a good standard is maintained. The Chairman observed that it seemed to him that as a matter of fact the Bombay Government was the supreme authority in that respect.

4. The Committee then considered the Chapter headed “Supplementary Institutions,” drafted by the Third Sub-Committee.

With reference to the suggestion made in paragraph 2 of the Chapter to attach industrial training classes to High and Middle Schools, the Chairman explained that the idea was to open such classes at those centres only which had no separate technical schools. When a regular technical or industrial school is opened at a centre the training classes attached to High and Middle Schools would be closed. The arrangement was a makeshift but what were they to do till funds were available?

5. At Mr. Page's suggestion the word “vocational” in paragraph 3, sentence 1, was altered to “pre-vocational.” All training up to the age of 14 was to be “pre-vocational” and not “vocational.” The Committee altered the expression “a vocational bias” occurring in sub-paragraph 2 of the same paragraph to “an industrial bias” as vocation meant a definite kind of training.

6. Mr. Vakil suggested that in the list of subjects to be taught in supplementary institutions—paragraph 4 of the Chapter—“commercial geography” should be added. The chairman pointed out that in addition to the subjects mentioned in paragraph 4 there would be supplementary subjects and commercial geography would probably be included among them. Mr. Peterson suggested the addition of laundry work to the list given in paragraph 4 (3).

Mr. Vakil suggested the addition of "spinning and weaving"; Mr. Flatt preferred to omit them. At Mr. Turner's suggestion "plumbers" were dropped from the list as elementary plumbing as practised in the country could well be classed under "tin-smithing". A proposal to include "book-binders" was thrown out, but it was decided to add "shoe-making" to the list.

Mr. Turner thought that the evening classes proposed in paragraph 4 and the suggestion to hold them for two hours a week as a minimum would be of no use. The Chairman observed that it would be better to give a few hours of such training rather than have nothing. Dewan Bahadur Godbole suggested that the classes may be held on Sundays and holidays. At Mr. Page's suggestion the expression in paragraph 4 "to improve their skill in manual work" was altered to "to improve their knowledge of manual work."

7. Mr. Page stated that the American Co-operative Courses referred to in paragraph 5 were of University standard, whereas the Committee proposed them here for villages. Mr. Marrs said they were for High Schools. Mr. Kantkar thought it quite possible that in villages also advantage might be taken of them. Mr. Turner observed that these half-time courses had been tried, for example, at the Grant Medical College and had failed. Dewan Bahadur Godbole stated that the arrangement should answer well for primary education in villages.

Mr. Flatt suggested that the last sub-paragraph of paragraph 7 may read as follows:—

"Evening classes may be provided in the neighbourhood of industrial establishment to enable young men to improve the knowledge of their trade and qualify themselves for responsible positions in their several industries."

Mr. Page stated that evening technical classes were not in favour anywhere. He would prefer day schools. In England the former were generally reported against as undesired. He asked the Committee to express the opinion that technical classes should be held during working hours whenever possible, evening classes being held only as a last resort. Mr. Turner stated that they were an absolute failure at the Victoria Jubilee Technical Institute as nobody was willing to attend. Mr. Godbole's experience was that there was a distaste for work in the evening with tools after eight hours' work during daytime. Mr. Masani stated that in Baroda boys learned drawing in evening classes.

8. The Chapter entitled "Supplementary Institutions" was then approved by the Committee, only one member, Mr. Marrs, voting against the proposal.

9. The Chapter on "Technical Education for Girls and Women" was then discussed. The Chairman was of opinion that very little was done in India for the technical education of women. Mr. Masani stated that in Baroda they taught domestic science and domestic economy. An American lady expert was appointed for a period of three years to teach elementary domestic science, cooking, dress-making, hygiene, etc. The Chairman stated that the Committee would have to add further details to make the Chapter complete. Girls' High Schools, at least 2 or 3 secondary schools, and supplementary schools similar to those for men would be required. House-keeping, domestic economy, etc. should be taught in addition to industrial subjects. Girls should be given a variety of subjects to choose from. The High Schools should teach photography, needle work, embroidery, etc. Government had called for details and the Committee, he thought, should do their best to supply them. In villages instruction might be given in cooking, care of domestic animals, farm work and village industries generally.

10. The opening sentence of the Chapter stated "The Committee have had neither the time nor opportunity of considering this question in all its bearings." If that was the case Mr. Flatt was for giving up the Chapter altogether. Mr. Peterson was unable to offer any suggestion as he knew very little of the home life in India. It was his opinion that if Government had money they should first spend it on general education, the standard of which was so low. Till then training women in industrial schools would be of no use at all.

11. The words "had had, for reasons which need not be dilated upon, an embarrassing attraction" in paragraph 5, sentence 3, were altered to "had had a great attraction".

At Mr. Bell's suggestion it was decided to alter the opening sentence of paragraph 3 of the Chapter to "Except for a little instruction in domestic economy there has been nothing which can be possibly described as technical education for girls and women". Mr. Marrs pointed out that domestic economy could not be classed under technical education; needle-work came under that head.

The Chapter was then passed by the Committee with the verbal alterations already noted. Seven members voted in favour; Messrs. Marrs and Turner did not vote.

12. The Committee then passed on to the discussion of the Chapters headed "Organization and Administration" and "Relation to General Education", which the Chairman said were very important. Mr. Bell remarked that the proposal made in paragraph 13 of the former Chapter to place the Department of Agriculture under the Minister who controlled industries and technical education was outside the Committee's sphere. Mr. Marrs observed that one advantage of placing the portfolio of technical education under the Industries Department was that that Department could ascertain the sort of training really required. Some of the schools could however be left with the Educational Department.

Mr. Turner pointed out that the second Sub-Committee recommended that technical education should be under the control of the Committee of Direction and that the latter should be enlarged by the addition of the representatives of the two railways and five firms of employers in the Presidency. The Director of Industries was an *ex-officio* member of the Committee and in that way he would be connected with the doings of the technical schools. At present the so-called industrial and pre-vocational schools are under two controlling bodies, namely, the Department of Public Instruction, controlling general education, and the Committee of Direction, controlling technical teaching. If the Committee of Direction was enlarged as proposed by the second Sub-Committee to bring it more in touch with the industrial schools, there was no reason why it should not be carried further. It could then take the place of the proposed Development Council.

13. The constitution of the Provincial Development Council referred to in paragraph 2 was then discussed. Mr. Masani was in favour of leaving the administrative control with the Educational Department which had the general control of schools. It would be desirable to have an advisory council such as that referred to in paragraph 8 consisting of representatives of labour employers to assist the Minister of Education.

Mr. Bell said that the Advisory Committee referred to in paragraph 8 was for the whole of the Presidency. They must make provision for local committees. There was an advisory committee for the Industries Department whose work should in no way be affected by the proposed advisory committee on technical education. No body in which non-official opinion was represented should deal jointly with industries and technical education. There should be an Inspector of Technical Education who should be under the control of the Committee of Direction proposed by the second Sub-Committee. The constitution and powers of that Committee should be considered. The Committee must decide—

(1) whether it must be like the advisory committee of the Director of Industries or different?

(2) whether it would have control over funds provided by Government?

(3) whether it should correspond with Government direct or through the Director of Public Instruction or the head of another Department?

The question was whether the Committee was to be purely advisory or to have executive powers. So long as the power of the purse remained with Government, and Government were sure not to abdicate it, the Committee was bound to be advisory only. In practice they could not go further.

After some discussion the Committee decided to recommend the appointment of a Deputy Director of Public Instruction, instead of an Inspector, to be in charge of technical education, with headquarters at Bombay. He should be a technically trained man. It was decided that the Advisory Committee should be constituted as follows—

- The Principal of the proposed Technological Institute,
- A representative of the Bombay University,
- The Principal, the Chairman, and one member of the Board of Trustees of the Victoria Jubilee Technical Institute,
- A representative of the Bombay Port Trust,
- A representative of each of the two Railways,
- A representative of the Millowners' Association,
- The Director of Public Instruction,
- The Director of Industries,
- Representatives of five employing firms,
- A representative of the R. I. M. Dockyard,

The Deputy Director of Public Instruction was to be secretary to the Committee but not a member. On Mr. Bell's suggestion it was to be left to Government to select a Chairman from time to time from among the three officers, namely, the Chairman of the Victoria Jubilee Technical Institute, the Director of Public Instruction and the Director of Industries.

With reference to paragraph 9 Mr. Vakil observed that the question regarding the training of teachers should be left to the College of Technology. At Mr. Bell's suggestion paragraph 13 was omitted.

14. The Chapters on "Organization and Administration" and "Relation to General Education" were then passed, subject to the alterations in the former Chapter made by the Committee, two members, Dewan Bahadur Godbole and Mr. Vakil, voting against.

15. On the Chairman suggesting that a Sub-Committee be appointed to draft the final report on the lines approved by the majority of the Committee, Mr. Bell observed that unless the report so drafted had an Indian backing it would be labour wasted. He desired to know on what points the majority disagreed. The chairman stated that in the first place the Committee had not come to any decision regarding (1) the number of pupils for whom the provision should be made and (2) the expenditure, and had not followed any comprehensive system like those in use in other countries. The Committee had abundant opportunities of discussing the minority scheme during the first three months of their work but the majority had so far declined to be guided by any existing practice outside India. He thought they should do in India what other countries had done outside and not attempt to evolve a separate system in an arbitrary manner.

Here Mr. Vakil read out a statement* giving details and the cost of the scheme favoured by the minority. Upon the members present asking for more detailed information, the Chairman promised to place the same before the Committee at its next meeting.

XV

1. The fifteenth meeting of the Committee was held on Tuesday the 6th September 1921.

2. The Chairman stated that, as arranged at the close of the last meeting, a statement* giving particulars of an alternative scheme, such as classes and number of institutions, their cost number of pupils, etc., had been circulated to the Members. An explanatory note† on the scheme, which could not be prepared in time to be posted, was laid on the table. He reminded the members present of the fact that Government had called for their report by the end of September and requested that that essential obligation should be borne in mind in all their discussions. Mr. Peterson took it that the members did not want notes of dissent on the report. If that attitude was adopted, it was useless to have a committee. A Committee was a matter of compromise. There did not seem to be any great difference between the two schemes. It was a question of numbers and that meant money. Their scheme was intended to be the nucleus of a comprehensive scheme. He proposed that the Committee should go through each item and see how far they were prepared to agree. Mr. Peterson's suggestions met with general approval.

3. With reference to item I (1) "Improvements to College of Engineering, Poona," Mr. Marrs observed that Government had already approved of the establishment of courses in Architecture. Two grades of education were proposed to be started at the Bombay School of Art. Mr. Kantkar explained that the expenditure was intended for extending the College as well as for improving the teaching. Messrs. Peterson and Flatt thought that civil engineering was outside the reference made to the Committee. The Chairman explained that it was intended to admit to the College nearly 100 fresh students every year instead of 60 as at present. It was decided to allow the provision to stand.

With reference to item I (4) "Foreign Deputation of Students," Mr. Bell explained that he had already proposed to Government that they should send two students abroad every year instead of maintaining a total of four as at present; and although that meant a total annual cost of Rs. 30,000, his proposal was not sanctioned. It was decided to retain the provision of rupees one lakh suggested.

4. With reference to item II (1) "Improvement to the Victoria Jubilee Technical Institute", Mr. Turner was of opinion that if the number of students was to be increased to 500 as suggested, the amount of rupees one lakh and a half proposed for recurring charges was too small. The existing staff was undermanned. The Committee thereupon agreed to suggest an increase of the amount to 2 lakhs. Mr. Turner pointed out that the total capital expenditure of Rs. 10 lakhs on technical high schools (item II) was too low to admit of their being properly equipped especially if mechanical and electrical workshops were to be opened. He proposed that the new technical high school for Sind be dropped as there was at present not much demand for it and students from Sind and even more distant places were always ready to come down to Bombay for education. The Committee was however of opinion that as Karachi was a flourishing port and had large private workshops, it was desirable to open either a separate school or classes in Sind for the benefit of students who could not afford to come down to Bombay.

Mr. Turner was of opinion that the first thing to do was to improve the Victoria Jubilee Technical Institute and then funds permitting other schools might be started. The Chairman explained that it was intended to teach mechanical and electrical engineering at the Sind school, and textiles also, if possible. The cost would be at the same rate per pupil as that at the Victoria Jubilee Technical Institute.

In regard to item II (3) "Industrial Experimental Stations", the Chairman explained that those were for minor cottage industries, not for large organised industries. In the ordinary course, manufacturers and students had no access to such industries. Mr. Bell thought it was not for Government to lose money in experiments, which should be left to private enterprise.

* Printed at page 183.

† Printed at pages 183-186.

From paragraph 14 of the memorandum of explanation placed on the table it appeared that these were intended to be demonstration stations as well. Messrs. Page and Roose thought that the proposal to establish experimental stations was really a matter for the Department of Industries and not of technical education. The Committee decided to alter the wording to "Experimental and Demonstration Stations," and resolved that "Provision of Rs 1 25 lakhs should be made for expenditure on the establishment and maintenance of Experimental and Demonstration Stations in the budget estimates for Technical Education, the amount being handed over to the Director of Industries for the execution of the work."

5. The Committee then passed on to item III "Secondary Industrial Schools". A doubt was expressed by some members whether the 3,000 pupils for whom education was proposed would be forthcoming. Mr. Bell stated that in Ahmedabad, which was the largest centre outside Bombay more than 125 pupils would not come forward. In paragraph 2 (2) of the memorandum of explanation it was asserted that one of the two fundamental assumptions on which the proposals of the majority appeared to be based was that "if technical education is to be given, a workshop is the proper and only place where this can be done". Mr. Bell said that Sub-Committee No. 2 never contemplated that there should be no technical education in schools. Adverting to paragraph 4 of the memorandum he added that the Sub-Committee proposed to educate only 420 apprentices because according to the figures supplied by the Railways it was not likely that a large number would come forward for the present. The Chairman expressed the view that if the character and objects of the education were properly explained to the public by propaganda, a large number would crowd into these institutions. Mr. Turner said that actual workshops training should be given in workshops and demonstration lessons in schools; this would lessen the expense.

The proposed capital expenditure of Rs. 10 lakhs on Secondary Industrial Schools, Mr. Turner pointed out, was inadequate. He understood the Secondary Schools to be something like the Ranchhodlal Chhotlal Technical Institute at Ahmedabad and the plant in that school was worth 3 to 5 lakhs, the Chairman explained that the idea was to do as much as they could do within that money and make a humble beginning. It was decided to retain the provision of Rs. 10 lakhs, capital, and Rs 5 lakhs, recurring. The Committee resolved that the difference of opinions regarding the number of pupils to be educated in the schools should be brought out in the report to be submitted to Government.

6. With reference to items IV and V regarding "Primary Industrial and Rural Schools and Classes", the Chairman explained that in these all kinds of education of the primary grade prevocational, vocational, trade, apprentice, etc., would be imparted. Cottage industries and apprentice classes came under both the primary and secondary grade courses. Mr. Page pointed out that there appeared to be a misunderstanding in the minds of some members that several of them were against technical education. It was not that at all; their object was the best way of spending the money. He doubted the wisdom of adopting a system of wide spread technical education by which they would be sending out disappointed men. Their provision for 420 pupils in apprentice schools for a total of 300,000 labourers would not appear very small if they remembered that not more than 10 to 20 per cent. of the lot were artisans. The Chairman remarked that they had 900,000 students in the existing schools and colleges in the Presidency the bulk of whom were being trained for literary and clerical employment and asked whether it was not better to divert at least a few thousand of these to technical pursuits, even assuming all would not obtain employment.

Mr. Vakil stated that the methods of their workers were crude and wasteful; they wanted better trained men; and therefore the general standard of craftsmanship should be raised. Mr. Bell was doubtful whether that could be done in the money the Committee proposed to spend. Mr. Page observed that Mr. Vakil's remarks regarding ordinary workmen might perhaps be applicable to villages but not to Bombay. Workmen here had as much manipulative skill as workmen in England, although their output was one-fourth to one-fifth of the latter; what they lacked was technical knowledge. Our aim should be to combine the highest manipulative skill, which can be obtained under business conditions, with the best theoretical knowledge possible.

The Committee accepted the figures of expenditure under heads IV and V and decided to bring out, in the final report, the difference of views regarding the number of pupils to be taught and the scope of the work of the primary schools.

7. Regarding item No. VI "Girls' and Women's Education," Mr. Peterson observed that there was no great difference in the Committee on that subject. The Chairman explained that the idea was to open 2 or 3 Secondary Schools at important centres and a number of Primary Schools at various places in the Presidency. Mr. Bell was in favour of calling them "Industrial Classes" instead of "technical schools". The item was passed by the Committee.

8. Concerning item VII "Training Teachers Special Provision," Mr. Peterson considered the provision of Rs. 3 lakhs, capital, and 3 lakhs, recurring, too low. Mr. Page asked how that money was to be spent whether in training schools and classes or in giving scholarships? The

Chairman stated that the money would be spent mainly on Normal Classes in the higher schools to train teachers for lower ones. Part of it might be expended on scholarships; the points would have to be elaborated.

Item VII was then approved.

9. At this stage the Chairman suggested that as it seemed evident that the final report could not be submitted to Government by the end of September as called for by them, the Committee should submit to Government an *Interim* Report which should give the cost of the scheme proposed by the Committee, so that Government may be in a position to provide funds in the coming year's budget estimates. The Committee's final report might go a month later.

10. It was resolved—

(1) that the cost of the scheme, both capital and recurring, vide Statement I attached, as revised at the meeting, be generally approved,

(2) that as the final report would not be ready in time, an *Interim* Report be submitted to Government before the end of the month,

(3) that the Committee meet again on the 19th September at 5 p. m. to consider the *Interim* Report.

(4) that a sub-committee consisting of—

- (1) the Chairman,
- (2) Mr. Bell,
- (3) Mr. Page and
- (4) the Secretary

be appointed to draft a Final Report for submission to Government as early as possible.

11. Mr. Vakil then explained his scheme by which he thought the money required for technical education could be raised. He said that every year 12 million Bengal maunds of salt were consumed in India. The present duty was Rs. 1-4-0 per maund and the cost of production was only 3 annas, making a total of Rs. 1-7-0 per maund. People profiteered so much that even the wholesale market price of the article was above Rs. 2-4-0. His proposal was that by levying a provincial surtax of Re. 0-12-0 per maund the cost price should be increased to Rs. 2-3-0. He proposed at the same time that salt should be made a Government monopoly and Government should open depôts in various places and control the rate. If this was done Mr. Vakil thought that the rate the consumer had to pay could be kept down to the present rate even with the surtax, and that would bring in nearly Rs. 90 lakhs into the coffers of Government. Mr. Bell pointed out that a very strong objection to such a tax was that it fell too heavily on the poorest people. After some discussion it was decided to drop the suggestion.

TECHNICAL AND INDUSTRIAL EDUCATION.

ABSTRACT OF COST OF ENTIRE SCHEME.

Statement referred to in paragraph 2 of the Minutes of the XV Meeting.

1	Main Heads.	Approximate number of pupils (additional provision)	Additional expenditure to be reached in 5 to 10 years.		Additional expenditure to be reached in 3 years.	Capital outlay on buildings and equipment.	Remarks.
			By item.	Total.			
	2	3	4	5	6	7	8
			Rs lakhs.	Rs lakhs.	Rs lakhs.	Rs lakhs.	
I	<i>Institutions of University Grade—</i>						
	(1) Improvements to College of Engineering, Poona	150	1 00				
	(2) College of Technology	400	4 00				
	(3) Provision for research		1 00				
	(4) Foreign deputation of students		1 00	7 00	5 00	30 00	
II	<i>Technical High Schools—</i>						
	(1) Improvements to Victoria Jubilee Technical Institute	300	2 0				
	(2) New Technical High School for Sind (to begin with mechanical and electrical engineering)	100	0 75				
	(3) Industrial Experimental and Demonstration Stations.		1 25	4 00	2 50	15 00	
III	<i>Secondary Industrial Schools—</i>						
	Including Apprentice Schools (12 Schools and 5,000 pupils)	3,000		5 00	3 00	10 00	
IV	<i>Primary Industrial Schools—</i>						
	Including Apprentice Schools (100 Schools and 10,000 pupils)	10,000		7 00	4 00	10 00	
V	<i>Supplementary Schools and Classes—</i>						
	(Urban 7,000, rural 10,000; or a total of 17,000)	17,000	6 00	6 00	3 00	10 00	
VI	<i>Women's and Girls' Education—</i>						
	Technical High Schools in Bombay	150	1 05				
	Secondary Schools (3 schools with 200 pupils each)	600	1 20				
	Primary Schools	1,200	1 00				
	Supplementary Schools for girls (both urban and rural)	3,100	1 50				
	Adult Women's Industrial Classes (both urban and rural)	4,000	1 25	6 00	3 00	15 00	
VII	<i>Training Teachers—Special provision</i>		3 00	3 00	3 00	5 00	
VIII	<i>Supervision, direction, propaganda, etc.</i>			3 00	3 00	3 00	
		40,000		41 00	26 50	98 00	
	Present expenditure (approximate)			7 00	7 00		
	Total, including present expenditure	40,000		48 00	33 50	98 00	

AN EXPLANATORY NOTE TO ACCOMPANY THE ABSTRACT OF COST.

The general framework of the proposals framed by the majority does not follow that of any existing system in any other country. It is professedly designed for the special conditions of this Presidency and its chief defects are its inadequacy and lack of definiteness.

2. The proposals of the majority appear to be based on the following fundamental assumptions—

(1) That no heroic attempts at technical education are called for because there is no demand for such education.

(2) If technical education is to be given, a workshop is the proper and only place where this can be done.

Some members join issue with the majority, on both these points. Even assuming that the supply should come after the demand, they do not admit that the demand is small, and they are also of opinion that by a properly conducted system of education and propaganda we can create the demand. Other countries, notably Germany and Japan, have done this; and this Presidency ought to do the same.

3. The scheme does not divide the system of instruction proposed into regular grades or classes—as is the case with general education at present. In the words of Sir A. P. (afterwards Lord) Macdonnell, “if our Industrial Schools are to lead to any practical good, they must be an integral part of the Provincial educational system. The District Industrial School must be a department of the District High School, all the prestige which attaches to the High School must attach to it, and so on with all other Industrial Schools in their various degrees.”

The number of pupils to be trained in any class where a class is mentioned is not clearly defined. In cases in which it is so defined, a striking feature is its utter inadequacy.

4. The scheme lays special emphasis on a system of apprenticeship training but this can apply only to wage earners employed in large manufacturing establishments.

Apprentice schools are quite suited for persons already employed in industries or for younger members of their families but even in this case it is proposed to train only 420 apprentices. Considering that nearly 300,000 are employed in factory industries, the provision seems wholly inadequate.

5. Even these apprentice schools on which the majority lay so much stress are limited to a few centres. Under the scheme, the urban population has to be content only with prevocational schools.

Obviously, there is no provision for training the rural population at all, except the indefinite reference to cottage industries. If nothing is done for the rural population, 80 per cent. of the total population of the Presidency will be placed outside the scheme.

6. It is proposed to provide training in cottage industries, but here too there is no definite statement as to what industries and what number of persons will be brought under the dominion of training, what staff will be employed or what expenditure incurred for the purpose.

7. It is proposed to treat the existing industrial schools as prevocational schools instead of as regular *industrial day schools* which they really are, and improving the character of their education.

The majority report seems to have no faith in industrial schools as such. This seems a serious departure from existing practice in foreign countries as well as in the Presidency.

8. The Members representing the majority have frequently expressed the view that provision for technical education was not necessary till demand arose. In the opinion of some of the remaining Members, training and preparation should precede the development of industries. Such development is now the avowed policy of Government.

9. Government have called for a comprehensive scheme.

The scheme put forward is not definite enough to give confidence that it will lead to the result desired under the terms of reference.

No specific sum is mentioned for expenditure which has any relation either to the country's requirements or to the present expenditure on general education.

10. The scheme should specify the classes of education desired, the number to be trained in each, the total annual expenditure and the capital outlay for buildings and equipment.

It should be able to divert from clerical and literary employment into industrial and vocational careers an appreciable section of the school-going population.

For the scheme to be regarded as all comprehensive the training should be distributed among the whole population and in all parts of the Presidency.

Technical High Schools

11. Under this head, it is suggested that provision be made for doubling the number of students in the Victoria Jubilee Technical Institute and raising the standard of instruction to the High School grade.

A few classes of the High School standard should be opened also in connection with the Engineering School at Karachi. Students from Sind will find it difficult to travel all the way to, and reside in, Bombay for such education.

Secondary and Primary Industrial Schools.

12. All technical and industrial education below the Technical High School standard, should be in two grades, namely, (1) primary and (2) secondary.

Secondary Industrial Schools may be located in big cities and district headquarters towns. They may be also called District Industrial Schools.

Admission should be for young men of 14 years of age and over, who have passed the middle school course.

Primary Industrial Schools are likewise intended for boys of 14 years and over, whose education is not higher than the IVth standard in elementary education. These will be suitable for boys in towns and talukas. They may be called Town Industrial Schools to distinguish them from District or Secondary Industrial Schools. The same Primary Schools should also provide prevocational courses for boys who have not attained the age of 14.

13. The aim should be to establish at least one Secondary School in every city and district headquarters town and one Primary School in each taluka headquarters town.

There will be considerable difficulty in finding funds and teachers. In the case of cities and towns for which provision for day schools is not possible, it is proposed to make a beginning by starting supplementary classes or courses till circumstances are favourable for establishing regular Day Schools.

Industrial Experimental Stations.

14. These should be established in two or three centres and actual manufacture should be carried on in about half a dozen industries suited to each locality. In such stations, manufacturers should be able to learn the latest processes, and students passed out of technical institutions go through a short course of training in the industries for which they desire to qualify themselves.

15. An Abstract of Cost already circulated expresses in figures the scope of an alternative scheme which may form a basis for discussion

XVI

1. The sixteenth meeting of the Committee was held on Tuesday, the 20th September 1921.

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2. * * * * * The Chairman * * * * * read a letter from Mr. K. H. Vakil in which that gentleman observed that as he was leaving India on the 10th September he would not be able to attend future meetings, and desired to authorise the Chairman, with whom he had discussed matters fully, to affix his signature to the report when ready. The Chairman added that he thought Members appreciated the constructive work done by Mr. K. H. Vakil especially in regard to the Chapter on "Technical Education of the University Grade." They were also indebted to Mr. Turner for useful information and notes bearing on the history of technical education in this Presidency which would be of value for the Final Report.

3. Members then proceeded to discuss the draft of the Interim Report, copies of which had been placed on the table. Copies of a note* on the same furnished by Mr. Bell were also placed on the table.

At the outset, Mr. Page observed that one of the difficulties which they would meet with in the draft Interim Report was that it was hardly the summation of the proceedings which had taken place. It took one view only and all the ideas put forward by the Committee were left out. At the last meeting the statement attached to the Interim Report was accepted as representing the money value of the scheme, but not as regards the number of pupils to be taught. Mr. Flatt in endorsing this view pointed out that the proposals incorporated in the Interim Report for the improvement of the College of Engineering, Poona, were absolutely contrary to what they had previously agreed upon in the 1st Sub-Committee's report and suggested their omission.

Mr. Page observed that civil engineering was outside the scope of the Committee's enquiry, that they had not devoted sufficient attention to it and that in view of improvements to be made in the V. J. Technical Institute it was undesirable to submit proposals for mechanical and electrical engineering at Poona. The Chairman stated that in other countries, civil engineering as well as commerce and agriculture were regarded as subjects falling under technical and industrial education, that the Committee had had Mr. Cree-Brown's evidence before them that mechanical and electrical engineering would cease to be taught in Poona when the College of Technology was started in Bombay and that the Committee had changed its policy when it accepted the statement at the last meeting. Dewan Bahadur Godbole and Mr. Kanitkar were for retaining the proposals for the improvement of the College of Engineering.

4. Mr. Bell's note was then discussed. The designation "Technical High Schools" used in the draft Interim Report was altered to "Technical Institutes" and that of "Secondary Industrial Schools" to "Technical and Industrial Schools".

In the draft report it was proposed that the candidates for admission to the Secondary Industrial Schools should have passed the III standard Anglo-vernacular. Mr. Marris pointed out that in the 2nd Sub-Committee's report a higher standard was proposed and he was of opinion that the medium of instruction should be English and not vernacular.

Mr. Turner was of opinion that in Primary Industrial Schools English can be taught alongside the "prevocational" courses; in Secondary or Vocational Schools the standard of English must approximate on the side of the High School.

Mr. Kanitkar pointed out that the tendency in the University was to give instruction in the vernaculars up to the School Leaving Certificate Examination.

* Vide pages 186-187.

5. Mr. Page proposed an addition to the Interim Report, after paragraph 3 of the draft, on the lines indicated in a note* produced by him bringing out the differences of opinion amongst the members on matters of principle. The Chairman, Dewan Bahadur Godbole and Mr. Kanitkar were not in favour of accepting Mr. Page's suggestion on the ground that the proposed addition did not fit in with the draft and that it would confuse the lay public if the report went before them. The Chairman suggested that the note may be added to the report as a supplementary note and signed by the members who approved of it.

In view of the difficulty of incorporating in the Interim Report the two views held by members of the Committee several members suggested that only the abstract of cost already approved might be submitted to Government before the end of September and a full and final report might follow later. The Chairman stated that the Committee had already decided to submit an Interim Report and that Government had desired that the report should give a fairly full idea of what was proposed. Such a report had been already promised to Government on the authority of the Committee and it would be a pity to change again.

NOTE BY MR. BELL ON THE DRAFT INTERIM REPORT.

For convenience of reference, I have numbered the sub-paragraphs of each paragraph.

Paragraph 2 (4).—Omit the words "and other subjects of value as a means of industrial training." This clause is too vague and the list of subjects previously given is sufficiently extensive without its addition.

Paragraphs 3, 4 and 5.—I think that opposition which might be avoided will be raised by the nomenclature of Technical High Schools, Secondary Industrial Schools and Primary Industrial Schools. Under the new scheme the Victoria Jubilee Technical Institute will become a Technical High School, while actually it is at present recognised as the Central Technological Institute of the Presidency. I do not know on what grounds an institution like the Victoria Jubilee Technical Institute is described as a Technical High School. It does not provide a course alternative to ordinary high schools, but requires a preliminary high school education for entrants. I think a nomenclature more suitable to the conditions of this Presidency would be—

- (1) Technical Colleges or Institutes ;
- (2) Technical Schools ;
- (3) Industrial Schools.

Paragraphs 4 and 5, Secondary and Primary Industrial Schools.—The defect of these two paragraphs to my mind is the entire omission to take account of past failures and to suggest methods of overcoming practical difficulties. The Ranchhodlal Chhotalal Technical Institute at Ahmedabad is typical of the proposed Secondary Industrial School. This institute has been a failure from every point of view, although it is situated in the second most important industrial city in the Presidency. Government are perfectly aware of this and we must explain how the additional schools of this type which the Committee proposes to establish will not be similar failures. I think the lesson to be derived from Ahmedabad and other places where technical schools now exist is that we must emphasise the fact that until public opinion of all kinds is aroused to the value of technical education, progress must be slow, *e. g.*, neither the mill-owners of Ahmedabad nor the managers nor the weaving and spinning masters obtain the full benefits possible from an institute like the R. C. Technical Institute. Here is a practical difficulty which receives no recognition. Again, how are we to explain to Government the fact that the efficient technical school at Dhulia attracts few pupils? The scheme of Secondary Industrial Schools assumes that each of 12 schools will accommodate 250 pupils. How are these to be attracted in circumstances similar to those of Dhulia where a few enlightened public men have striven hard to educate public opinion? In paragraph 4 (8) it is stated that the prestige of the District Industrial School should be maintained by the character and efficient training given which should be such as to secure employment for the student as soon as he completes his course. I entirely agree with this, but how is the result to be achieved? As concrete cases, what is proposed to be done to bring the technical schools at Poona and Surat up to the standard desired and to fill each of them with 250 pupils?

Paragraphs 4 (5) and (6), 5 (4) and 6 (4).—I agree that technical and industrial education should be extended and improved so that ultimately 5—7—6 lakhs of rupees will be expended. I do not accept the suggestion that it is practicable to do this within even ten years by the establishment of 12 secondary industrial schools for 3,000 pupils. In paragraph 4 (7) the recommendation for the standard of admission to secondary industrial schools corresponds to the practice followed at Ahmedabad where it has been found that it is difficult to give technical education to students who have not been educated beyond the III standard Anglo-vernacular. I think the only course to follow is to experiment in as many directions as possible. What is chiefly wanted for the assistance of Government are recommendations designed to

* Vide pages 187-188.

overcome the known existing defects in technical education and the known existing difficulties in the way of securing (a) an efficient teaching staff, and (b) increased numbers of suitable students. I do not think that suggestions such as those made in paragraph 5 (3) and paragraph 6 (1) and (2) go any distance towards assisting Government to solve these difficulties.

To put the matter in another way, we must, in view of the very poor demand at present for technical education, explain to Government how it will be possible to attract 30,000 students to Secondary Industrial Schools, Primary Industrial Schools and Supplementary Schools and Classes. Personally, I believe it cannot be done in the next ten years. I agree, however, to the sum of Rs. 18 lakhs annual expenditure to which it is proposed to work up to increase the facilities for technical education and improve its efficiency as fast as efficient teachers can be obtained and students attracted to the courses.

Paragraph 9 (2).—There is no indication that local boards, municipalities, manufacturers' associations and philanthropic public bodies and individuals are going to shoulder a large share of the burden of technical education, and I think that this fact should be frankly recognised and stated.

Paragraph 10 (2).—I think that this sub-paragraph should be entirely omitted. The financing of any Government scheme cannot possibly be divorced from the other financial operations of Government.

Paragraph 12 (1).—The first sentence suggests that want of money is an accidental circumstance; on the other hand, it is an economic condition from which there is usually no royal road of escape. It is no use stipulating that expenditure must not fall below a minimum amount, if this minimum amount cannot be spared from the provincial revenues.

Paragraph 12 (2).—In the absence of reasons for recommending that the scheme of technical education should be embodied in an Act of the local Legislature, I suggest that this sub-paragraph as well as the previous one should be entirely omitted.

Paragraph 13 (4).—The case for primary education is not put strongly enough. Primary education is not merely a valuable aid to technical and industrial education but is absolutely essential to the promotion of the latter.

Paragraph 14.—I heartily agree to the proposal for introducing manual training into Government high schools but not necessarily at the expense of sacrificing history. The latter point is, however, a detail.

Paragraph 15 should be omitted as entirely outside the scope of the report.

Paragraph 16.—Some of the comparisons are misleading. In sub-paragraph (2) it is stated that an advanced country like England does not serve as an example in technical education, but in paragraph 17 a comparison is made with England. It is not pointed out in making this comparison in paragraph 17 that there is a great difference in the conditions of literacy and that India is primarily an agricultural country. The latter fact is of fundamental importance.

Paragraph 18.—I think sub-paragraph (1) should be omitted, as I do not think it practicable to reach the maximum amount of expenditure contemplated even at the end of ten years.

Paragraph 19 (1).—I do not like the phrase "training of Professors", and suggest that it would be better to write "the selection of Professors and the training of teachers".

NOTE BY MR PAGE.

There has been a considerable difference of opinion revealed as to the scope of technical schools below University grade and the purposes which it is desirable they should fulfil. Some members are of opinion that such schools should be equipped with complete workshops and that the product will be young men with both a technical and manipulative training which will enable them to make their place in industry as artisans or supervisors. Other members including all those engaged in the administration or management of industrial factories are strongly of opinion that as a general rule it is desirable that the practical side of the workers training should be carried out in the factory or workshop under industrial conditions. The training given at technical schools should be confined to such theoretical teaching as will be of assistance to the worker in his trade and to simple manual training which should include care of and use of hand tools and demonstration.

The members who favour the latter policy are influenced by the following among other reasons.—

(1) The productive efficiency of the individual worker in India is low and consequently the country is poor. It is, therefore, very desirable that workers shall become producing units as early as possible without detriment to physical or mental development.

(2) The edifice of technical education that it is possible to build on the foundation of primary education possessed by the average worker is so small that a one or two years part time course of 4 hours a week would in most cases be more than adequate.

(3) It is desirable that a boy should receive his general education before the age at which he commences full time work and the theoretical education given subsequently should be related to his vocation. This would not prevent fuller general education being obtained by exceptional boys outside the hours of regular employment.

It is obviously undesirable that Government should legislate for providing a general elementary education to boys over 14 by withdrawing them from productive callings when this same education could have been given more economically at an earlier age and with no detriment to the boys.

(4) There are a number of institutions existing which have as their object the training of artisans. All the evidence placed before the Committee with one or two possible exceptions has been that these institutions have failed, and in most cases lamentably failed, to attain their objective.

Most do not attract the right type of boy and the product is not able at completion of course to command the same wages as those of same age trained under industrial conditions.

It would therefore seem very necessary to make a success of the existing institutions before proceeding with their multiplication.

It is true that those recommending a large increase in the existing type of institution lay stress on the necessity for their improvement, but no definite suggestions are made as to how this desirable result is to be attained.

While agreeing that a bold policy in regard to the extension of technical education should be favoured we consider it very necessary that the causes of failure of existing institutions should be taken into account and that no large extension should be made until a method of avoiding past failures which offers some reasonable ground of success in the future be put forward.

(5) It is the opinion of these members that stress should be laid on the following paragraph in the Second Sub-committee's report cited below:—

“As a preliminary we desire emphatically to record our opinion that the practical training of boys and youths should whenever possible be given in workshops and factories under arrangements analogous to the apprentice system and that the attempt to train skilled artisans for organised industries in schools of the kind hitherto known in this Presidency as technical or industrial schools should not be made.”

In our opinion the skilled workman can be efficiently trained in his handicraft only in commercial workshops or by master craftsmen working on their account. The school or class room should be reserved for the teaching of theory and practical demonstration.

XVII

1. The seventeenth meeting of the Committee was held on Wednesday, the 21st September 1921.

2. The Chairman read a letter from Mr. Peterson forwarding a copy of a prospectus issued by the Tata Iron and Steel Company, Limited, in regard to the Jamshedpur Technical Institute and suggesting that the Committee might, in their Final Report to Government, recommend a grant towards the capital and recurring costs of the Institute asking in return that the Institute should reserve some seats for students from the Bombay Presidency.

As there was no mining industry in this Province and as the Institute, which was proposed for teaching mining and metallurgy, lay outside the limits of the Bombay Presidency, Major Willis, Dewan Bahadur Godbole and Mr. Flatt doubted whether the Government of Bombay would be justified in assisting it. The students trained there would hardly come back to Bombay. It was decided to circulate Mr. Peterson's letter.

3. With reference to the discussion which took place at the previous day's meeting on the draft Interim Report the Chairman read a note* written by him regarding the correct procedure to be followed and the form in which the Committee's report should be submitted to Government. Major Willis thought the report could be redrafted with the additions and alterations suggested by Messrs. Bell and Page in their notes. Another alternative was to report to Government that the Committee as constituted could not come to a decision. Mr. Turner suggested that seeing that the Committee was agreed on a large number of points, the report might indicate those. They were agreed about the total expenditure proposed although they considered the number of pupils provided for to be excessive. The majority thought that practical training could be given in factories and workshops only.

Mr. Page said that all members of the Committee agreed to the statement, provided the number of students was omitted. There was no difference regarding technical education of the University grade, but there were differences regarding Technical and Industrial Schools. He wished that everybody's views should be embodied in the report.

* *Vide* page 189.

Mr. Flatt was of opinion that it was impossible to embody the varying views in an Interim Report and proposed, Mr. Roose seconding.—

“That, while regretting its inability to fulfill the promise contained in minute No. 10 of the meeting held on September 6th, particularly since it is understood that Government desire an early indication of the lines which the Final Report will take, this Committee agrees that the prolonged and inconclusive discussion at the last meeting has proved the impossibility to embody satisfactorily its recommendations in the abridged form of Interim Report.”

4. A suggestion made by Mr Bell to submit to Government for decision the various points at issue was not accepted. Mr Bell then proposed —

“That the Interim Report as drafted may be sent to Government with an appendix embodying Mr. Page's note and giving the views of the majority on questions of principle contained in paragraphs 3 to 6 of the draft, which according to their views contravened the following fundamental principles:—

- (a) technical education cannot be developed in advance of industries;
- (b) skilled artisans cannot be trained in workshops attached to Technical and Industrial Schools; and
- (c) as a further practical point progress must be slow until existing institutions are placed on a satisfactory basis.”

Mr. Flatt thought that it would make the Interim Report a minority report with a majority minute of dissent and would not give a fair representation of what the final report will be. He however withdrew his proposal. Mr. Roose thought that in the Final Report matters might be re-adjusted.

Mr. Bell's proposal was accepted and it was finally arranged that sub-committee no. 2 should draft the appendix which would include points regarding the loan and legislation referred to in the draft Interim Report.

NOTE BY THE CHAIRMAN.

Discussions at the meeting yesterday afternoon were discursive and barren of results. We seem to be going back to the positions that existed before 29th August.

2. It would be possible to embody nearly half of Mr. Bell's suggestions into the draft Interim Report without making the scheme unintelligible. Mr. Page and other Members have further changes to make. It is not possible to bring all these into the draft without making the report altogether unmeaning.

3. I would therefore suggest that a separate Interim Report of 11 or 12 pages be prepared by the leading Members who represent the majority to accompany the statement which has already been approved, the minority being free to submit a separate Report of their own. If the majority so wish, the statement also may be changed to suit their views.

I make this suggestion with equal candour because it is impossible to incorporate both sets of ideas into a connected whole. Our reports have to be read by the public and they have to be cogent and consistent.

4. On the authority of the Committee we reported to Government that the full report will be in their hands by 30th September. Till 29th August we were getting on all right in the direction of a majority report, but the policy and course of work was changed on that day at the suggestion of the majority. To-day we are as far as ever from the completion of the Final Report. We recently decided to submit an *Interim* Report before the end of this month. Even that now seems impossible unless a decision is reached to-day.

5. In these circumstances the best course for the majority seems to be to prepare within the next two or three days a separate *Interim* Report. The Secretary (if well) and myself will meet Members and give every assistance in our power.

I would appeal to Members to follow this course and relieve the present tension.

XVIII

The eighteenth meeting of the Committee was held on Monday, the 3rd October 1921, at 5 p.m.

* * * * *

2. Letters were read from Dewan Bahadur Godbole, Mr. Kanitkar and Mr. Gokhale, expressing their inability to attend the meeting and authorising the Secretary to affix their signature to the Interim Report. A letter received from Mr. Marrs expressing his inability to attend and authorising the Secretary to place his signature on the Supplementary Statement was also read.

3. The draft Interim Report was then considered. At Mr. Peterson's suggestion, the following sentence occurring at the end of sub-paragraph 1, paragraph 2—"Institutions of University grade" was dropped :—

"The improvements should include a raising of the present standard and additions to the courses of instruction."

At the same member's suggestion, the references in sub-paragraph 4 of the same paragraph to "building construction and architecture", "leather" and "ceramics" were deleted. The terms used in the draft Report and Supplementary Statement, namely, "Technical and Industrial Schools" and "Primary Industrial Schools" were altered respectively to "Middle Industrial Schools" and "Lower Industrial Schools". A few other minor changes were also made in the Report.

4. Some members present having expressed a wish to sign the Supplementary Statement without signing the Interim Report, Mr. Bell observed that the latter could be more accurately described as a minute of dissent; that there was nothing inconsistent in signing both the Report and Statement and that he himself was prepared to sign both the documents.

The Chairman was of opinion that the Supplementary Statement was a negative document and that it could not be signed unless the Report was also signed.

It was decided that the signatures of those members who did not sign the Supplementary Statement should be placed first and that those of the members signing the Supplementary Statement should follow with a remark added to the report as below :—

"The following members sign the Interim Report subject to the views expressed in the appended Supplementary Statement."

5. The meeting then discussed the time and arrangements required for drafting the final report.

Mr. Bell suggested that the chapter on University education, regarding which there were no differences amongst members, might be unanimous and the other chapters might be drafted as alternative chapters which could be signed by either party.

Mr. Page pointed out that the report of Sub-Committee No 2 contained the opinion of those who signed it and he understood that it had been accepted by the Committee as a whole, this should go to Government as the Committee's report and if the minority did not agree with it, they must draft their own report.

It was finally decided that the minority should draft their own report, wherever they differed from the majority, and bring it up for discussion at the next meeting of the Committee which was fixed for Monday the 7th November 1921.

XIX

The nineteenth meeting of the Committee was held on Monday the 12th December 1921.

2. In opening the proceedings, the Chairman observed that more than two months had passed since they had last met, the detailed views of the minority which the majority desired to know at the previous meeting were embodied in the form of a draft Final Report placed that day before the meeting, and there had been difficulties and delay, but they were unavoidable. The Final Report was an amplification of the Interim Report. He reminded the Committee that the report had to be submitted as quickly as possible and by doing this they would be meeting the wishes of Government. The points of difference among Members had been set forth in the Supplementary Statement appended by the Majority to the Interim Report. There was also a Rejoinder by the Minority to that statement, a draft of which was placed before the Members. There were two courses open to the Committee, (1) to follow the procedure they adopted in the case of the Interim Report and to accept the draft placed before them as the Final Report to which all the members may affix their signature, adding a supplementary statement, if necessary, to indicate the differences of opinions where any existed; or (2) to compile a separate Majority Report and to treat the one now before them as a Minority Report. He hoped it might be possible to minimise differences by discussion and to submit as unanimous a report as possible.

He mentioned that Messrs. Peterson and Platt, both of whom had taken an active part in the work of the Committee, had left for England and it was desirable to bring the work of the Committee to a close without further delay.

* * * * *

3. Copies of a letter from Mr. Bell dated 10th December 1921, in which he raised the following questions, were also placed before the meeting :—

(1) Whether the Interim Report and the supplementary note should be published in addition to the Final Report.

(2) Whether either one or both of these documents should take the form of a report with a minute or minutes of dissent or supplementary notes, and whether rejoinders should be permitted to minutes of dissent or supplementary notes, and if so, how far this process should be permitted to go.

**TECHNICAL AND INDUSTRIAL EDUCATION IN THE BOMBAY
PRESIDENCY.**

FINAL REPORT OF THE COMMITTEE APPOINTED BY THE
GOVERNMENT OF BOMBAY (1921-22).

E R R A T A .

Page	Paragraph	Line	
55	3	1	For "to" read "the"
69	35	4	For "the other" read "other"
70	36	8	Insert "up to 1½" after the word "principle"
72	43	3	For "they" read "the industries"
72	43	21	Delete "already"
77	48	3%	For "is" read "are"
79	54 (2)	1	Delete "the"
81	56	7-8	For the first sentence of the sub-paragraph read "There are a railway workshop at Karachi, a number of private workshops and small ship building yards"
82	58	3	Add comma after "industry"
82	59	3	For "Institutes" read "Institute"
83	62	1	Delete "the"
84		2	For "the factory" read "a factory" and for "the school" read "a school"
85		13	Delete "the"
89	79	10	Delete "the"
92	89	4	For "manufacturer" read "a manufacturer"
92	89	5	For "carpenter" read "a carpenter"
93	91	8	Substitute "Types should be evolved" for "There should be types"
95	97	40	For "to work a living" read "to work for a living" and add a semi-colon after the word "given"
96	96	10	For "turn out" read "equip"
99	106	11	For "who will attend" read "to attend"

(3) Whether in view of the financial difficulties of Government at the present time and the expenditure involved in printing, it is necessary that any Appendices should be printed with the Final Report.

4. The Committee then considered the draft of the Final Report before them. Mr. Bell observed that he saw no hope of reconciling the divergent views of the Members. He was unable to accept the draft before them and express differences of views in a supplementary statement. He was in favour of the majority writing an independent Report of their own. He accepted substantially the first four Chapters of the draft before them. Chapters V to VIII and X contained views which were against those expressed in the Supplementary Statement. He could not express an opinion on Chapter IX.

Mr. Page presumed that it was arranged at the last meeting that the minority would put forward their own views, that the majority would absorb from them as many points as possible, and for the rest leave the minority to write their report. As an instance he pointed out that it was proposed in the draft before them that as people in the villages had nothing to do for five to six months in the year, they should be taught some cottage industries during the slack season, such a suggestion, he thought, could be accepted by the Majority. The main head where they diverged was that artisans should be given manipulative skill in factories and not in workshops attached to schools. Mr. Page therefore expressed his desire to have alternate Chapters, wherever necessary.

5. At this stage Mr. Bell wanted to know if there were any members who were prepared to sign the draft as placed before them without any further changes and all the members present who formed the Minority in the Interim Report expressed their willingness to do so. In order to give the others, who formed the Majority, a chance to talk over amongst themselves and decide what course they should adopt, the Minority members withdrew from the meeting. On reassembling after some time it was arranged that the Majority should write their own report, incorporating portions from the minority Report with which they agreed and bring it before the Committee at a meeting to be held on Monday the 6th February 1922. The Minority would put in the draft framed by them, with any alterations required, as a separate independent report of their own. Mr. Bell on behalf of the Majority thanked the drafters of the Report placed before them for the trouble they had taken in writing it.

6. It was pointed out that it had already been decided by desire of the Majority, in reply to a Circular from the Secretary, that all the Appendices mentioned in the draft (with the exception of the Interim Report since added) should be printed with the Report. Mr. Bell wished to reopen the question mainly for reasons of economy.

Mr. Marrs moved the following resolution seconded by Major Willis :—

“ That the whole of the Appendices be omitted from the printed report, with the exception of No. D, headed “ Statistical Statement of Colleges and Schools connected with Technical and Industrial Education for the year 1919-1920 ”

The Chairman observed that the cost of printing the Appendices was inappreciable when compared to the money value of the time spent by the members in the work and the total expenditure incurred by Government on the Committee, and that it was important to publish the proceedings of the Committee as well as the notes written by the various Members for the information of the public. Even if the Majority were unwilling to include them as Appendices, there was nothing to prevent the Minority from printing them as part of their report. As the other members agreed with this opinion, Mr. Marrs' motion was not put to the vote.

XX

The twentieth Meeting of the Committee was held on Monday the 20th March 1922

2. In opening the proceedings the Chairman observed that they met again after more than three months. In that interval the Majority Report was prepared under the supervision of Mr. Bell and printed proofs of that Report were before them. They had met to sign the report. He expressed a hope that it would not be necessary to meet again.

* * * * *

4. Dewan Bahadur Godbole proposed that the new Technological College should be located near Ambarnath, in view of the fact that that area had been reserved for factory sites in the Bombay Development Scheme. He thought that Ambarnath would in time become the main industrial centre of Bombay and that it would be possible to get land very cheap at present. Mr. Vakil wished to have more information on the subject, but was not against considering the proposal. It was decided that in the Minority Report, Ambarnath may also be suggested as a likely site for the new College.

5. A letter from Lieut.-Colonel Willis was read in which he gave his opinion that the so-called "Majority Report" was the report of the Committee, and that the Minority Report should be treated as a note of dissent. Mr. Bell also raised other points as to whether the whole report should be published together in one volume or separately in two volumes and suggested certain changes in the arrangement of the appendices.

The Chairman remarked that they had followed the example of a previous report which was placed on the table and which he thought was on all fours with the present report and he considered that that precedent might be followed.

After some discussion it was agreed—

- (1) that the Final Report should be published in one volume consisting of the Majority Report with its Appendices placed first, followed by the Minority Report and its Appendices;
 - (2) that the Majority Report should be finally passed for the press by Mr. Bell, and
 - (3) that any Members who wished to make any verbal alterations in their notes or in the minutes should be allowed to do so in the course of the next day or two.
6. Mr. Page suggested that the heading of Appendix F should be changed so as to make it clear that it was a representation from the Indian Merchants' Chamber and Bureau.

7. The Majority and Minority Reports were then signed by the members present, Dewan Bahadur Godbole signing subject to remarks in a separate minute which he promised to send in.

8. The Proceedings of the Committee terminated with a vote of thanks to the Chairman after placing on record the Committee's appreciation of the services of the Secretary, the Assistant Secretary and the staff.