



Government of Bombay
EDUCATION AND INDUSTRIES DEPARTMENT

Report of the Industrial and
Technical Secondary Education
Committee, Bombay Province



BOMBAY

PRINTED AT THE GOVERNMENT CENTRAL PRESS

Obtainable from the Superintendent, Government Printing and Stationery,
Bombay, or through the High Commissioner for India, India House,
Aldwych, London, W.C.2, or through any recognized Bookseller

[Price—Annas 15 or 1s. 7d.]

1949

Sir,

We beg to submit to the Government of Bombay the enclosed Report of the Industrial and Technical Secondary Education Committee, which we have prepared as a result of the investigations and enquiries which we made during the period June 1947 to March 1949.

We remain,
Sir,
Yours faithfully.

P. N. JOSHI, — *Chairman.*

V. D. GHATE, — *Member.*

R. U. PATEL, — „

G. R. PARANJPE, — „

S. S. DESNAVI, — „

G. S. PARAMASIVAYYA, — „

S. P. OGALE, — „

C. E. KRISHNAMURTI—
Secretary.

To

The Joint Secretary to the Government of Bombay,
Education and Industries Department,
Bombay Castle, BOMBAY.

492

CONSTITUTION OF THE COMMITTEE.

1. P. N. Joshi, Esq. ... M.Sc. (Tech.); F.R.I.C., *Chairman.*
Principal, V. J. Tech.
Institute, Bombay.
2. V. D. Ghate, Esq. ... M.A., B.T., T.D. (London), *Member.*
Deputy Director of Public
Instruction, Poona.
3. R. U. Patel, Esq. ... B.Sc. (London), Deputy *Member.*
Director of Industries,
Bombay.
4. Prof. G. R. Paranjape ... I.E.S. (Retd.), F.N.I., O.B.E., *Member.*
Now Chairman, S.S.C.E.
Board, Poona.
5. G. S. Paramasivayya, Esq. M.Sc., A.I.R.E., Principal, *Member.*
Lingaraj College, Belgaum.
6. S. S. Desnavi, Esq. ... B.Sc., B.T., Joint Principal *Member.*
and Secretary, The
Mahomed Haji Saboo
Siddik Institution, Byculla,
Bombay.
7. S. P. Ogale, Esq. ... Managing Director, Messrs. *Member.*
Ogale Glass Works, Ltd.,
Ogalewadi, Dist. Satara.
8. B. K. Muzumdar, Esq. M.A., General Manager, *Member.*
The Arvind Mills Ltd.,
Ahmedabad.
9. C. E. Krishnamurti, Esq. B.A., T.D., L.M.E., Lecturer, *Secretary.*
V. J. Tech. Institute,
Bombay.

CONTENTS.

	PAGE
CHAPTER I. Historical	1
CHAPTER II. Introductory	9
CHAPTER III. The prospective growth of Industry and the needs of the Province for Technical Education	14
CHAPTER IV. The Educational Background ...	49
CHAPTER V. Technical and Industrial Education at the Secondary Stage	61
CHAPTER VI. Trade Schools	93
CHAPTER VII. Part-time Education	104
CHAPTER VIII. The Training, Recruitment and Conditions of Service of Teachers	110
CHAPTER IX. Co-operation with Industry	119
CHAPTER X. Vocational Guidance and Selection ...	126
CHAPTER XI. Medium of Instruction	132
CHAPTER XII. Technical and Industrial Education Surveys.	134
CHAPTER XIII. Finance	141
CHAPTER XIV. Summary and Recommendations ...	148

TABLES.

Table 1. Chapter 3. Factories in the Bombay Province registered under Section 2 (j) of the Factories Act. (1946)	30
Table 2. Chapter 3. Average number of workers employed in the Factories under Table 1. (1946)	36
Table 3. Chapter 3. Factories in the Bombay Province notified under Section 5(1) & (2) of the Factories Act. (1946)	38
Table 4. Chapter 3. Average number of workers employed per day in the Factories under Table 3. (1946)	42
Table 5. Chapter 3. Distribution of Factories according to number of workers. (Bombay Province). (1946)	44
Table 6. Chapter 3. Growth of Population and Industries in the Bombay Province	45
Table 7. Chapter 3. Location of new Industries as recommended by the Provincial Industries Committee, Bombay	46
Table 8. Chapter 4. Distribution of Boys and Girls in the various Schools and Colleges in the Bombay Province	60
Plan 1. Chapter 5. General Plan of Education of the Committee	64

CONTENTS.

	PAGE
Table 9. Chapter 5. Technical and Vocational Institutions in the Bombay Province offering the approved courses of the Board of Technical and Industrial Training with suggested modifications ...	76
Table 9(a). Chapter 5. Serial number of the courses of the Board of Technical and Industrial Training, available at different stages of general education ...	86
Table 10. Chapter 5. Progress of Technical Education in India. (1921-1943) ...	87
Table 11. Chapter 5. Number of Vocational Institutions in India and the number of Students on Roll. (1947) ...	89
Table 12. Chapter 5. Location of Institutions and the courses of study suitable at each, as recommended by the Committee ...	90
Table 13. Chapter 8. Scales of Pay of Staff in the Institutions under the Board of Technical and Industrial Training, B. P. ...	110
Table 14. Chapter 8. Recommended Scales of Pay for Teaching and other Staff of Vocational Institutions for places outside Bombay City. ...	117

APPENDICES.

Appendix A. Questionnaire—A ...	168
Appendix B. Questionnaire—B ...	171
Appendix C. List of Individuals and other Bodies who responded to Questionnaires—A and/or B ...	172
Appendix D. Centres visited and meetings held with dates. ...	176
Appendix E. List of Part-time Courses for Men, Girls and Women, proposed by the Committee ...	182
Appendix F. Capital and Recurring costs of different Units in an "ARTS and INDUSTRIES CENTRE." ...	184
Appendix G. Technical High School. Estimate of Costs, —Recurring and Non-recurring ...	189
Appendix H. List of Equipment with Costs of Different Units in a Mechanical Engineering Workshop ...	193
Appendix I. List of Equipment with Costs for Automobile Workshop ...	196
Appendix J. List of Equipment for some Trade Courses ...	197
Appendix K. Suggested Floor Areas for different types of Workrooms ...	202
Appendix L. Bibliography ...	203

REPORT OF THE INDUSTRIAL AND TECHNICAL SECONDARY EDUCATION COMMITTEE, BOMBAY PROVINCE.

CHAPTER I.

HISTORICAL.

EARLY BEGINNINGS.

1. 1. The question of providing technical education in India has engaged the attention of the Government of India and the authorities in England since the middle of the 19th century. The Court of Directors of the East India Company in the historical despatch on education of 1854 asked the Government in India to consider how useful and practical knowledge might be imparted to the great mass of people in India. No action was however taken in India to carry out the wishes of the Directors. When however mining, manufacturing and other industrial enterprises began to be established in the country, the lack of technically trained personnel for such undertakings soon became evident. It is interesting to note that the necessity of promoting technical education was first pointed out as far back as 1880 by the Indian Famine Commission. The Education Commission of 1884 drew attention to the one sidedness of the system of secondary education and recommended a bifurcation of the curriculum in high schools, one course leading to the University and the other of a more practical nature to commercial and non-literary pursuits. In 1886 the Government of India issued a *memorandum* of technical education supporting the Education Commission's recommendations to add a "modern side" to the existing literary schools and attach to them a technical branch which was to be an integral part of the provincial educational System.

COLLEGE OF ENGINEERING POONA.

1. 2. The early stages in the development of science and technical education in India were closely associated with and conditioned by the needs of the Public Works and other Departments of the Government and the first Engineering Colleges of India, viz. Roorkee, Poona, Guindy and Sibpur, were established during the middle of the 19th century mainly to meet these needs. The Poona Engineering Class and Mechanical School, the nucleus from which the College of Engineering was later developed, was opened in 1854, its aim being to provide suitable instruction for subordinate officers of the Public Works Department. 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. In July 1863 Sir Cowasji Jehangir Readymoney presented a sum of Rs. 50,000 to Government and a college was established which was affiliated to the University of Bombay in 1866. In 1872 the University course for Licentiate of Civil Engineering was remodelled and architecture and mechanical engineering were added to the number of optional subjects. Classes in agriculture and forestry were also provided until separate arrangements were made

elsewhere for instruction in these subjects. The engineering courses were revised in 1909 to conform with the requirements of the newly created degree of Bachelor of Engineering and they also provided for the special training of mechanical engineers. In 1911 it was decided to make a separate provision for the course leading to the degree of Bachelor of Science and the College then assumed its present designation. The degree course in mechanical engineering was started in 1914 and the course in electrical engineering in 1932. The college now offers degree courses in civil, mechanical, electrical, and communication engineering and in metallurgy. It also offers diploma courses in civil, mechanical and electrical engineering, and provides short term courses for the training of civil maistries.

GOVERNMENT OF BOMBAY RESOLUTION, 1856.

1. 3. As early as 1824 an engineering class was in existence in Bombay. But its subsequent history is obscure. A class for training engineers was opened in Elphinstone Institute in 1844, but for want of suitable candidates for admission, the class was broken up at the end of the year 1847. The Government of Bombay gave very serious consideration to the memorandum from the Government of India referred to above and Lord Reay, the then Governor, 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 the technical education in the Presidency and setting forth the main lines upon which the Bombay Government were prepared to take action. This Resolution focused the attention of the Government on 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.

V. J. TECHNICAL INSTITUTE.

1. 4. The proposals of the Government embodied in the above resolution coupled with a number of other events which took place in the eighteen eighties led to the foundation of a Technical Institution in Bombay. A fund raised to commemorate the beneficent administration of the Marquis of Ripon was earmarked for the establishment of an institution of technical education in Bombay. About two years later a Royal Jubilee Fund was started in Bombay to commemorate the fifty years' reign of Queen Victoria and the Bombay Municipal Corporation set apart a sum of Rs. 80,000

for a permanent memorial of the fund. Sir Dinshaw Manokjee Petit made a generous endowment of Rs. 3,00,000 and Lord Reay readily responded to the proposal for the establishment of a technical institute by promising an annual Government grant. All these factors led to the foundation of the Victoria Jubilee Technical Institute in Bombay.

REPORTS OF SIR E. C. BUCK.

1. 5. The first attempt to introduce handwork in the educational curriculum of the primary schools was made by the Government of India when they deputed Sir. E. C. Buck in 1895-96 to discuss with the Provincial Governments a number of problems including that of practical education in primary schools. It was realised that the impact of the factory system and the literary type of education imparted in the schools were having an adverse effect on the home industry as the children of craftsmen who received their education in the above schools were rapidly forgetting how to use their hands in the various occupations once practiced in their homes. The system of practical education then advocated was intended to meet this problem and generally 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 school-masters with sufficient rapidity. It is interesting to note that after having made a tour of many industrial and technical schools, Sir E. C. Buck was the first to recommend in 1901 a standardization of the nomenclature of schools and the courses followed by them. He also recommended that technical education be placed under the Control and direction of a separate department.

THE SIMLA EDUCATIONAL CONFERENCE OF 1901.

1. 6. At the beginning of the present century it was realised that measures taken in the Educational Department during the previous fifteen years had been quite inadequate to meet the needs of the country and a growing recognition of the necessity for a greater diversity of occupations to absorb and engage the energies of the ever increasing numbers of the educated classes. Lord Curzon accordingly summoned in Simla in 1901 an Educational Conference which reviewed the situation and recommended drastic reforms in the methods of higher education with a view to rendering them more effective and practical. 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. The Government of India

generally agreed with the conclusions of the Conference and especially with the recommendation that industrial schools should be devised to encourage local industries and trades; that the best type is the local trade or crafts schools; that they should be organised on educational and not on economic considerations; and that in moffusil areas they should be devoted to the study and development of single indigenous products; that in towns they should deal with manufactures, education for several industries there being located in one building and that only those pupils should be admitted who intended to practise the trade taught there. The chief outcome of the Simla Conference was however the institution of ten state foreign scholarships for study in subjects dealing with industrial science or research.

THE ATKINSON—DAWSON COMMITTEE OF 1912.

1.7. A committee consisting of Lieutenant Colonel E. H. de V. Atkinson, R. E., and Mr. T. S. Dawson, Principal of the Victoria Jubilee Technical Institute, Bombay, was appointed by the Government of India to investigate the question of bringing technical institutes into closer touch with industry for their practical training. They reported that there were wide opportunities for employment of technically trained personnel in the Province of Bombay and in order that a person with technical training may be useful to the industry it was necessary for him to have an apprenticeship for a year or two. While recommending this they also pointed out the difficulty of obtaining such apprenticeship in the works. They recommended the establishment in suitable centres of afternoon classes for textile jobbers and maistries for theoretical and practical instructions in the regional language. Their special recommendation was that the minor technical institutions should be placed under the control of one central technical institution in each Province in which such institutions existed.

COMMITTEE OF DIRECTION FOR TECHNICAL EDUCATION IN BOMBAY.

1.8. 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 systematic organisation of technical education in the Presidency. The proposals of the Board were examined by a committee appointed by the Government and were then approved by the Government generally and the Institute was recognized as the Central Technological Institute of the Bombay Presidency under the Government of Bombay Resolution No. 1850—E. D. dated the 27th June 1913. The Committee of Direction for Technical Education was constituted as 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 of the Institute and was in a position to benefit by its special knowledge and experience and to procure whenever needed the advice and assistance of the staff of the Victoria Jubilee Technical Institute.

The control of technical and industrial education in the Province was vested in this Committee. When the Committee assumed control there were about 22 technical and industrial schools in the province. These have steadily increased and there are now about 105 technical and industrial schools. The facilities for development of technical education below the collegiate stage has however not kept pace with the development which has occurred in the higher technological and engineering education. During the last two years five new Colleges have been opened in addition to the only Engineering College in the Province. The establishment of the University Department of Chemical Technology has also provided facilities for post-graduate training and research in various branches of Chemical Technology. Considering however that the technically trained persons are required in far larger numbers in the lower ranks, the growth of institutions to cater for these and the number of students attending such institutions seems to us to be quite inadequate.

INDUSTRIAL COMMISSION.

1.9. The first comprehensive attempt to review the subject of technical education on an all India basis was made by the Industrial Commission whose report was published in 1918. They stated in their report (*vide* page 3) :—

“ Throughout the nineteenth century, the policy of Government was controlled by the doctrine of *laissezfaire* in commercial and industrial matters, and its efforts to develop the material resources of the country were largely limited to the provision of improved methods of transport and construction of irrigation works. Except in Bombay, the introduction of modern methods of manufacture was almost entirely confined to the European community. The opportunities for gaining experience were not easy for Indians to come by, and there was no attempt at technical training for industries until nearly the end of the century, and then only on an inadequate scale. The non-existence of suitable education to qualify Indians for posts requiring industrial or technical knowledge was met by the importation of men from Europe, who supervised and trained illiterate Indian labour in the mills and factories that were started. From this class of labour it was impossible to obtain the higher type of artisan capable of supervisory work. The more advanced Indian thinkers began at last to appreciate the dangers and difficulties of the position. The system of technical education which had grown up on the Continent of Europe had already attracted the attention of manufacturers in Great Britain and it was natural that a demand should be made in India for Government to provide similar facilities. Even when the necessity for action began to be perceived clearly by Government, the magnitude of the problem was hardly appreciated; it was by no means sufficiently recognized that technical education is by itself incapable of creating industries.”

The Industrial Commission also pointed out that whereas many of their recommendations regarding technical and industrial education were such as should be carried out by the Provincial Governments, it was necessary ultimately, if not in the immediate future, to provide India with educational institutions of a more advanced character which no single Province could support or fill with students, yet which each Province would need to a greater or less extent. They recommended that as soon as their recommendations, which were to be implemented by the Provincial Governments, had time to develop their full effectiveness, it would be advisable to proceed further and establish colleges of the very highest grade under the direct control of the Central Government.

VISVESVARAYA COMMITTEE, 1921.

1.10. Recognizing the necessity for a wide extension of technical education and industrial training, the Government of Bombay appointed in their Resolution No. 923-E.D., dated the 17th February 1921 a committee under the Chairmanship of Sir M. Visvesvaraya including a strong non-official element representing important employers of labour both European and Indian to draw a comprehensive scheme of technical and industrial education for the Bombay Province. The Committee submitted a majority and minority report and some of the recommendations of this Committee have been given effect to by the Government. A special reference may be made in this behalf to the establishment of part-time courses for apprentices under the Government Apprentice Scheme and the formation of a joint Directorate of Technical Education.

ABBOTT AND WOOD REPORT, 1936.

1.11. In 1936 the Government of India invited Messrs. A. Abbott, formerly H. M. Chief Inspector of Technical Schools, and S. H. Wood, Director of Intelligence, Board of Education, England, to advise on certain problems of educational reorganization, and particularly on problems of vocational education. They published a report on vocational education in India. Messrs. Abbott and Wood who were both liberal British educationists, declared with sound good sense:—

“We regard the reform of content of general education as being even more important than a re-organisation of the frame work of educational reform.”

They felt that it was idle to expect the younger generation to make a contribution to the good life of their country unless as individuals they were offered satisfying personal and social experiences in the school; that concentration on literacy and the consideration of literacy as the primary aim of education was a mistake. “Conning books, learning by heart and chanting in unison, have their legitimate place in the discipline of learning but they do not by themselves constitute an education for young children.” Regarding vocational education they

declared that it should not be considered to be on a lower plane than literary education, since the full purpose of education was to develop the whole powers of the mind, body and spirit. General and vocational education, they stated, were not essentially different branches but the earlier and later phases of a continuous process. They also very pertinently pointed out that the prevalent notion that vocational education was good for those who could not do well in the academic education was entirely wrong as no country could develop its trade and industry through the work of second rate men. Finally they gave a word of caution by stating that the provision of technical and vocational education alone would not lead to rapid development of industries as the latter depended upon many other factors. Altogether the Abbott-Wood report gave a good lead to the educationists in devising a new educational policy.

THE WARDHA SCHEME, 1937.

1.12. As a result of the assumption of responsibilities of Government by the Congress Ministries in seven Provinces an All-India National Education Conference was convened at Wardha under the Presidentship of Mahatma Gandhi. This conference appointed the Zakir Hussein Committee whose report submitted in December 1937, has come to be known as "The Wardha Scheme." In 1938 and 1939 most of the Provinces including Bombay then under Congress Government set up experimental schools and training institutions for teachers on 'Wardha' lines.

RAO BAHADUR K. G. JOSHI COMMITTEE.

1.13. The Government of Bombay under the first Congress Ministry appointed a committee under the chairmanship of Rao Bahadur K. G. Joshi to consider the report of the Zakir Hussein Committee and report to Government as to what changes would be necessary for the recognition of primary and secondary education in the light of the reports of Abbott and Wood and the Zakir Hussein Committee and the introduction of vocational education in the schools. The Committee's report could not be fully implemented. Two recommendations of the report have however been given a trial. A number of Government High Schools have been converted into Vocational High Schools with provision for instruction in Agriculture, Technology and Commerce from the IV Standard onwards leading to a special School Leaving Certificate Examination. Experiments are also being conducted regarding the possibility of imparting elementary education through a basic craft or purposeful activity.

SARGENT COMMITTEE REPORT, 1940.

1.14. Not much thought appears to have been given in this country for the training of low grade personnel which really forms the bulk of the employees in almost all industrial and business concerns until the Second World War created an urgent demand for technical personnel of all grades.

The Central Government appointed a Technical Training Inquiry Committee in 1940 under the chairmanship of Mr. John Sargent, Educational Commissioner with the Government of India. Reference has been made to some of the observations and conclusions of this Committee in appropriate context.

THE FIRST AND SECOND WARDHA SUB-COMMITTEES.

1.15. The Central Advisory Board of Education, which had been abolished for a few years on the recommendation of the Inchcape Retrenchment Committee, was revived and reconstituted in 1935. The Board lost no time in turning its attention to the important developments that has taken place since 1937. Hardly had the Wardha Scheme seen the light of day when the Central Advisory Board appointed a sub-committee to examine the scheme of educational reconstruction incorporated in the Wardha Scheme and to consider this in the light of Abbott-Wood Report. The Honourable Mr. B. G. Kher, the Premier and Education Minister of Bombay Province was the Chairman of the sub-committee and its members included Dr. Zakir Hussein, Rajkumari Amrit Kaur, Dr. Shyamaprasad Mukerjee and Pandit R. S. Shukla. During the deliberations of this committee certain issues emerged (such as co-ordination of 'basic' with higher education, the ways and means of finance etc.) which in the opinion of the Board required further examination. The Board therefore appointed another committee also under the Chairmanship of the Honourable Mr. B.G. Kher.

THE REPORT OF THE CENTRAL ADVISORY BOARD, 1944.

1.16. The Board accepted the conclusions and recommendations of the Second Wardha Education Committee except the one relating to the extent of the liability of the Centre to bear the financial burden. It is important to remember that the conclusions of the above two committees which among their members included six provincial ministers of education and some prominent educationists, have received the most careful attention from the Central Advisory Board when they formulated their recommendations in their report on "Post War Educational Development in India," (popularly known as the Sargent Report). This report has rightly been acclaimed as the most comprehensive plan as yet conceived for the whole country. In fact, if one goes through the various documents on the basis of which the Board have formulated their recommendations, one can hardly escape the conclusion that it would have been very difficult to devise any method by which a more thorough shifting of evidence, data and material could have been achieved. Among all the pages of the Board's committee's reports those pertaining to technical education are full of valuable and constructive ideas and this has naturally led to a critical examination of the Board's proposals by persons and institutions interested in Technical Education. Among these may be mentioned prominently "The Post War Education and Training of Engineering Personnel—A Plan for India" by Mr. C. E. Preston and "Technical Education in India in the Post War Period"—Report of the sub-committee of the Institution of engineers, (India).

CHAPTER II.

INTRODUCTORY.

APPOINTMENT OF THE COMMITTEE.

2.1. The Industrial and Technical Secondary Education Committee was appointed by the Government of Bombay in the Education and Industries Department under Resolution No. 7653 dated the 1st May 1947. The Resolution states:—

“Industrial and Technical Education in the Province of Bombay needs considerable expansion and also co-ordination. It is also necessary to plan ahead in this respect in relation to the expansion of primary education. The Report of the Central Advisory Board of Education in respect of technical education provides a broad outline for future planning in this sphere. Government has already accepted proposal of the Dalal Committee to establish a Second Engineering College at Ahmedabad.”

CONSTITUTION OF THE COMMITTEE.

2.2. The Committee was composed of the following members:—

1. P. N. Joshi, Esq., M.Sc. (Tech.), F.R.I.C.,
Principal V. J. T. Institute, Bombay.
(CHAIRMAN).
2. V. D. Ghate, Esq., M.A., B.T., T.D. (London),
Dy. Director of Public Instruction, Poona.
3. R. U. Patel, Esq., B.Sc. (London),
Dy. Director of Industries, Bombay.
4. Prof. G. R. Paranjape, I.E.S. (Retired), F.N.I., O.B.E.,
Now Chairman, S. S. C. E. Board, Poona.
5. G. S. Paramasivya, Esq., M.Sc., A.I.R.E.,
Principal, Lingaraj College, Belgaum.
6. S. S. Desnavi, Esq., B.Sc., B.T.,
Jt. Principal and Secretary,
The Mahomed Haji Saboo Siddik Institution,
Bombay.
7. S. P. Ogale, Esq.,
Managing Director,
M/s. Ogale Glass Works Ltd.,
Ogalewadi (District—Satara).
8. B. K. Muzumdar, Esq., M.A.,
General Manager,
The Arvind Mills Ltd., Ahmedabad.

Mr. C. E. Krishnamurti, B.A., T.D., L.M.E., Lecturer, V. J. Technical Institute, Bombay, was appointed Secretary to the Committee.

TERMS OF REFERENCE OF THE COMMITTEE.

2.3. The Terms of Reference of the Committee were to examine and make recommendations on:—

(1) the pace and nature of progress in technical, industrial and vocational training in the Province below the collegiate stage bearing in mind particularly :

(a) the prospective needs of the Province,

(b) the increasing requirements of industrial and technical education consequent on the expansion of primary education ;

(2) the locations of the institutions that may be necessary and the courses of study suitable at each ;

(3) the extent and method of financing the scheme of industrial and technical education and in particular the field for Government and private efforts and the methods of grant-in-aid to private institutions ;

(4) methods of recruitment and terms of remuneration of the staff for the institutions ;

(5) desirability of carrying out surveys to determine the needs of industries in the way of technical personnel ; and

(6) establishment of Local Advisory Committees.

2.4. The work of the Committee commenced on the 15th of May 1947 after the Secretary to the Committee took charge of his appointment. After informal discussions among the members it was decided to obtain information and opinion relating to the terms of reference as follows :—

(a) by issuing a general questionnaire to a large number of individuals connected particularly with technical education and training ; to private and public educational institutions and societies ; to recognised associations or committees connected with industry or education and to individuals connected with organised industry ;

(b) by sending out another questionnaire to technical institutions in this Province for information relating to the institutions under specific heads ;

(c) by recording oral evidence of a number of individuals actively engaged in industry or otherwise interested in technical education ;

(d) by visiting selected industrial centres and educational institutions ;

(e) by individual and collective discussions with the employers, employees, teachers and their associations.

QUESTIONNAIRE.

2.5. The draft of the questionnaire (*vide* Appendix-A) was approved at the first meeting of the Committee held on the 3rd of July 1947. Over 400 copies of the questionnaire were sent to individuals, institutions, associations, societies and commercial and industrial establishments ;

140 of which were sent to persons connected with education or engaged in industry; 100 to educational institutions and officers of educational department; 40 to private and public educational societies; 50 to engineering, commercial and industrial associations and 120 to engineering and industrial establishments. It will be seen from Appendix-C that we had a good response to the questionnaire and we thank all those persons, institutions, and associations who have taken the trouble to send in their replies to our questionnaire.

CLARIFICATION OF TERMS OF REFERENCE.

2.6. A list of meetings held and centres visited is given in Appendix D. It will be seen that some of these meetings were for deliberations of the Committee and others for recording evidence and for discussion and informal exchange of views with teachers, industrialists, technical staff in the industrial establishments, members of governing bodies of local institutions and representatives of labour associations. At the first meeting the terms of reference were discussed in detail in order to explore their scope and content. The phrase "below the collegiate stage" in the terms of reference was capable of more than one interpretation. According to our interpretation by technical education below the collegiate stage is meant such education as is below the professional level and which concerns the training of technicians rather than professional engineers and technologists. A technician in Electrical Engineering has been defined as "one who is qualified by specialised technical education and intensive practical training to carry out responsible work involving the making of decisions in accordance with established practice while under the general direction of professional engineers" and the professional electrical engineer is defined as "one who by virtue of his general and technical education, practical training and subsequent experience is fitted to undertake work requiring a high degree of personal responsibility in one or more of the branches of electrical engineering."* In the U. S. A. on the other hand, technical education less than the college grade is understood to mean trade or industrial education which is less than the professional grade, but which is more a trade training rather than a college training. It is intended to prepare the pupil directly for wage earning pursuits. The introduction of technical subjects or handwork in the high schools in this Province has not been done with the object of preparing pupils for particular occupations but to offer alternative facilities to cater for various aptitudes and inclinations. In view of these different interpretations of the phrase "below the collegiate stage", it was decided to get it clarified from Government. The Government's directive regarding the scope of the Committee's work is contained in the Government's reply dated the 16th September, 1947, the relevant part of which is re-produced below:—

" . . . I am directed to state that the intention of Government underlying the appointment of the Committee was that the Committee

*Vide page 7, The practical Training of Professional Electrical Engineers—The Institution of the Electrical Engineers, July 1947.

should consider the question of planning more industrial and technical schools and to make recommendations to Government in the matter. The diploma courses at the V. J. T. Institute, the R. C. Technical Institute and other institutions are definitely of higher type than the secondary stage of education and should therefore be treated as outside the terms of reference of the Committee. The Committee should however, consider and offer remarks on such cognate matters as pertain to certificate and diploma courses with a view to their better fitting into the general scheme of technical education."

We have confined our scope of work in the light of the above clarification.

TOURS.

2.7. At the first meeting of the Committee the members expressed the view that a comprehensive and constructive report would not be possible unless they had a chance of getting first hand information about the existing position of technical education from institutions and individuals in the various parts of the Province. To make this possible the Committee felt that visits to selected places in the Province were necessary. The members felt that for making recommendations it was also essential for them to visit and see some prominent occupational institutions outside the Province. For these reasons a tour programme for the Committee was drawn up and the approval of the Government was obtained therefor, and the Committee visited the places listed in Appendix— D. During these visits we met several individuals and representatives of associations, and discussed with them problems pertaining to technical and industrial education. We are happy to record that during our visits to different centres we received valuable information and active co-operation from a number of individuals, associations of industrialists and employers, chambers of commerce, representatives of local bodies, associations of teachers in secondary schools and representatives of organised labour unions. It was possible for us to obtain the necessary local information and views of local individuals and associations during our stay on account of the active co-operation we received at the various centres. The thanks of the Committee are due to all those individuals, committees, associations and societies for their co-operation and help.

ACKNOWLEDGMENTS.

2.8. The re-organisation of technical and engineering education to meet the needs of the post-war development of the industry has engaged the attention of the educationists and professional institutions in this country and to a very much larger extent in Great Britain and in U. S. A. As a result of this a number of reports from professional institutions and committees specially appointed for making recommendations for particular branches of industry or engineering are now available and these have been of very great help to us

in our deliberations and in the preparation of this report. References have been made in the body of the report to publications from which we have quoted and a list of publications which have been generally of use to the committee has been appended. We also used terms which have now been generally accepted in the educational world and have wherever necessary indicated the authority for the use of the particular term and its connotation.

2.9. The Committee wishes to place on record its appreciation of the assistance which its Secretary Mr. C. E. Krishnamurti, gave from the commencement of the Committee's work. His wide and detailed knowledge regarding the working of the institutions under the Board of Technical and Industrial Training was of great help to the Committee, both in the conduct of inquiries and in the preparation of this report.

2.10. The report is divided into 14 Chapters to cover the terms of reference, although their order is not in sequence with the terms of reference. The matter has been arranged so as to have a certain amount of continuity. The paragraphs of the report have been assigned two numbers; the first indicating the chapter and the second the number of the paragraph.

CHAPTER III.

THE PROSPECTIVE GROWTH OF INDUSTRY AND THE NEEDS OF THE PROVINCE FOR TECHNICAL EDUCATION.

3.1. Our terms of reference require us to make recommendations on the pace and nature of progress in technical, industrial and vocational training in the Province, bearing in mind particularly the prospective needs of the Province. It is impossible to forecast with any degree of precision, the extent of industrial expansion in the Province and the form or forms it would take. It would largely depend upon the plan adopted by Government for post war reconstruction and development. It is however safe to assume that there will be sufficient industrialisation to create an urgent and growing need for facilities for technical education. We are fortunate, that after our committee was appointed, the reports of the various sub-committees appointed by the Provincial Industries Committee became available and it was possible for us to have some idea regarding the probable development and growth of the various industries in the Province such as, engineering, textiles, chemical manufacture, small-scale and cottage industries and miscellaneous industries. (*vide* Table No. 7). Increased facilities for technical education with adequate system of practical training will be required to produce all the skilled artisans, technicians, engineers, technologists, executives and research workers required for the development of the industries as envisaged in these reports. We give below a brief account of the chief industries of the Province and of their probable development.

ENGINEERING.

3.2. Engineering in all its aspects plays a vital part in modern life. The term engineering is applied very widely and covers many branches of scientific, technical and manufacturing industries including civil, mechanical, structural, electrical, aeronautical, naval, mining, chemical, fuel and sanitary engineering. In the West, engineering has made a wide appeal to young people as the profession has provided attractive opportunities for enterprise and achievement. The achievements of engineers in many fields of activity have cast a glamour on the title and have proved an attraction for ambitious young men. In the industrially advanced countries engineering provides a wide range of employment from the seagoing engineer to the one engaged in making printing machinery or in the building trade. The growth of the engineering industry in this country in general and in the Province of Bombay in particular has not so far been commensurate with the growth in some other fields of industrial activity such as the textile industry. The growth of heavy engineering in particular has not kept pace with the industrial requirements of the Province. The Metals and Engineering Industries Sub-committee appointed by the Provincial Industries Committee has recommended that Government must place the greatest importance on the development in this Province of the Iron and Steel, Non-Ferrous

Metals, Prime Movers, Electrical Machinery and Machine Tools Industries. They have further stated :—

“ Whilst the Non-Ferrous Metals Industry, excepting refining of virgin metals, is developed to some extent in the Province, the Province does not possess a basic Iron and Steel Industry. Further, there are very few modern steel re-rolling units operating in the Province and the production of such associated industries like screws, bolts, nuts, rivets, etc., which are so important in the manufacturing and engineering industries, is next to nothing. These two industries should engage very closely the attention of Government for on their development will hinge our future industrial progress. In the Prime Movers Industry we are really backward as compared to Western standards. This is not so in the quality of products turned out, but in the range of production which is admittedly very narrow. The manufacture of light electrical machinery and other types of electrical accessories is quite well established. The need of the moment in this section is the development of heavy electrical machinery and switch-gear. The Machine Tool Industry is also comparatively well developed in the Province although manufacturing operations are controlled by a few firms. In this industry, there is more than a need to continue the present concentration on quality and gradually turn out heavier and special purpose machine tools. In General Engineering there is an urgent necessity for turning out good quality castings, both steel and cast iron, and increasing the capacity of forging and welding work done. All these industries involving as they do a vast outlay of capital and manufacturing technique, would require a great deal of Government help and encouragement.”

3.3. Technical education will have to be provided for the personnel required for the existing engineering industries as well as for the expansion of the industry as envisaged in the Committee's recommendations and a very wide range of instruction will be necessary for all grades of employees from the manager, designer, and the research worker to the operatives engaged in routine production.

ELECTRICAL ENGINEERING.

3.4. The Government of Bombay are making a considerable headway with their Electric Grid Scheme. It is anticipated that the first stage of development will be over in the very near future. Not only will a number of small power plants spring up all over the Province, but power supply in the Northern Division will considerably increase. Transmission lines of the North Gujerat and South Gujerat Grid Scheme will be ready and according to the Grid Scheme there will be a number of power lines branching off to numerous villages. Two 15,000 K. W. steam turbo sets will be installed in addition to the existing sets at Ahmedabad and a steam station will be established in the vicinity of Surat comprising initially of two 7500 K. W. turbo alternator sets. This development will be of great benefit in fostering new large-scale

industries as well as small-scale and cottage industries in the agricultural areas in the Northern Division and will also benefit the agriculturists for lift irrigation and for other purposes. It is expected that with the supply of electricity in the rural areas, cottage industries will receive a fresh impetus and the rural population in the Province will prosper as it can undertake work in the leisure hours.

3.5. We have made above a reference to the industry for making electrical machinery for the manufacture of generators, switchgear etc., and the personnel required for that purpose is excluded from this heading. We consider here the need of the electrical engineering industry for the heavy engineering, the radio communication engineering, and the telephone and the telegraph services. With the development of the Grid Scheme referred to above there will be an increased demand for the trained personnel for the power-house staff, for inspection of transmission lines, for installation, operation, maintenance and repair of power house machinery. Besides staff will be required for carrying out the wiring and installation of house-hold electrical appliances. The Industries Committee have recommended the establishment of the radio industry in the Province, manufacturing in the beginning low power local reception sets. Private agencies have also come forward for setting up this industry and trained personnel will be required for the manufacture of radio sets and for their maintenance and repair. With the opening of additional radio broad-casting stations there will be also an increased demand for technical personnel. The Posts and Telegraphs Department also require a large number of trained wireless telegraphists, as also the civil aviation, the mercantile marine, and the overseas communication departments.

3.6. The industry for making light electrical equipments such as table and ceiling fans, geysers and other household appliances has not yet progressed beyond the initial stage in the Province. There is considerable scope for expansion in this direction, as well as, for the manufacture of other products such as measuring and indicating instruments, laboratory apparatus, refrigerating equipment, automatic control devices, all of which would be in greater demand with the development of the electric Grid.

BUILDING.

3.7. There is today a very great demand for housing and this should focus attention on training the personnel required for this purpose. In the United Kingdom the Ministry of Works and Planning had requested the Central Council for Works and Building Education to report on the training for the building industry. Their report was published in the year 1943. The Committee has examined the existing systems of apprenticeship for the trades related to the building industry and have suggested suitable revision of the apprenticeship scheme as well as the courses of training for the different trades such as carpenters, masons, plumbers, painters, plasterers etc. In India there are practically

no facilities for apprenticeship or training for these trades except those which were established during war-time under the Central Government Technical Training Scheme, some of which are still continued for the benefit of those, who have been relieved from the army.

3.8. The building industry like many other old established industries has not moved forward with the same rapidity as the newer industries like electrical engineering where the need for scientific knowledge and technical training is perhaps more keenly appreciated. There is no doubt that there is an increased supply of men of ability and proper training at the higher level for executive and administrative jobs. But it is a matter of great importance that the building industry should seek to secure a more adequate proportion of properly trained persons in the lower ranks. A considerable wastage of material and low quality work in building results on account of the inefficiency of the workers and lack of proper training of what are known as the Clerks of Works. In the R. C. C. work particularly, carelessness, lack of training and ignorance of the serious consequences of bad work on the part of the tradesmen, have given us buildings with short lives and heavy annual maintenance bills and in some cases, buildings which on account of unsound construction have proved dangerous to human life.

3.9. Efforts have been made in some places, for example at Ratnagiri, to offer suitable courses to persons who would ultimately be engaged in the building industry. But they have not been successful as the industry does not seem to care for recruiting properly trained persons. We think that Government can give a proper lead in this direction through their Public Works Department by insisting on minimum standards of qualifications and experience of persons engaged by the contractors as Clerks of Works and maistries. Much depends upon the efficiency of Clerks of Works and maistries for whom special training courses are essential.

3.10. Many persons engaged in the building industry have a poor judgment regarding the appearance of what they build. This applies not only to the proportions and materials of the main fabrics, but also to such details as moulding and other decorative efforts. Those who have had the experience of carrying out the design of a good architect learn to appreciate good proportion, suitable use of material and the visual satisfaction derived from a well designed building. In Bombay, definite regulations regarding building construction have given a good chance to trained architects to show their skill in the erection of structures with a beauty of design consistent with safety and efficiency. But outside Bombay City it is still open to builders to construct houses which may prove unsatisfactory both as regards their life and appearance.

TEXTILE INDUSTRY.

3.11. The development of the textile industry in Bombay Province with regard to cotton textiles is far in advance of the rest of India. The growth of the industry dates back to 1854 and the vicinity of

the cotton growing districts, the facilities of the port for the import of cotton and export of the cotton yarn encouraged the development of the industry first in the Bombay City and later in the other chief centres *viz.*, Ahmedabad and Sholapur. The industry is now possibly the most important factor in the economic life of the Province and any deterioration in the position of the industry within the Province may have a serious effect upon its entire economy. The surplus production of the textile industry is the chief means by which the Province is able to make up its deficit in food production.

3.12. The industry in this Province now employs 4,50,000 workers. Both the per man hour production and the per man hour wage are lower than those in the more advanced industrial countries. It is therefore obvious that if the standard of wages in the industry is to increase, the output of the workers both in quantity and quality must also increase. Rationalisation in the industry and the installation of new plants and machinery are two main suggestions of the Textile Industries Sub-Committee for improvement. We would add to these, education and training of the personnel in the textile industry to which the Committee has made only an incidental reference. In this connection we would like to reproduce the words of Andrew Næsmith :—

“An industry like cotton must educate or perish. The future demands craftsmanship and quality of a high order ... No rule of thumb as applied in the old days will fit the age in which we are now living. We have definitely entered a scientific era and the fruits of science can only be secured by preparation, adaptibility and application. ... The encouragement of juveniles to enter the industry is imperative, and it is our business to provide opportunities for training, vocational and technical, in order that they become in turn, as adults, useful workers.”*

3.13. The textile industry in India in the early days imported technical men for the executive jobs mostly from Lancashire. In course of time their places were taken by persons who had obtained their practical training in the textile mills and rose to positions of weaving and spinning masters and managers by dint of sheer ability. Life in the textile mills was very hard and educated men were averse to seeking careers in the industry. There was a time when persons who had obtained education and training in the textile manufactures at technical institutes either in India or abroad were considered as unsuitable for employment. But gradually the outlook of the employers changed and technically trained persons are now in great demand. Entry to the lower ranks was controlled by jobbers and on account of the corrupt practices which used to be the order of the day, entrance to the industry was very difficult for persons who desired to obtain a livelihood through this industry. The importance of this industry and its prosperity are so vital to the economy of the Province that no aspect of it which would undermine its efficiency should be overlooked. We

*Education and Training for the Cotton and Rayon Industry, 1946. Published by the Recruitment and Training Department of the Cotton Board, England.

consider it imperative that Government should take every step to foster and encourage education for the textile industry for all grades from the manager to an ordinary weaver and spinner.

CHEMICAL INDUSTRY.

3.14. Chemical industry has not developed in this Province to the extent to which it should have, considering the industrial and other requirements of the Province. According to the Chemical Industries Sub-Committee there is considerable scope for development of heavy chemicals such as sulphuric acid and allied products, the alkalies and allied products and other chemicals. The Committee has recommended the establishment of sulphuric acid plants with a total output of 35 tons per day in Bombay and Ahmedabad. Similarly it has recommended an increased production of chemicals such as nitric acid, hydrochloric acid, ferric alum, Epsom salt, copper sulphate, sodium sulphate and superphosphates. As regards alkali industry it has recommended location of two factories at Bombay and Ahmedabad with a total output of 35 tons per day. It has also recommended the establishment of factories for the manufacture of chlorinated products for the utilisation of chlorine which is a bye-product of caustic soda industry. In this connection the Committee has suggested the manufacture of potassium chlorate and D. D. T.

3.15. Regarding the location of future units of production of other heavy chemicals, the Committee has recommended the extension of the present production units of bichromates, sodium sulphide and sodium silicates in Bombay, potassium chloride at Kharaghoda and Mithapur, sodium hypo-sulphite, sodium sulphite, sodium bisulphite and sodium thio-sulphate in Bombay and its suburbs. There is scope for the production of inorganic chemicals consumed by (1) the textile industry, (2) photographic and film production, (3) foundries and workshops, (4) leather industry, (5) electroplating industry, and (6) laboratory chemicals and analytical reagents.

3.16. The Committee is of the opinion that there is vast scope for production of drugs and pharmaceuticals and other organic chemicals such as industrial solvents. With a large market for charcoal in the Bombay City the destructive distillation of wood would, according to the committee be a paying proposition and would at the same time make available certain chemicals such as methyl-alcohol and acetone for industrial purposes. There is a move for the establishment of a dyestuff industry in the Province and from the press reports it is understood that the location of the dyestuff factory will be in the neighbourhood of Bombay City. There is also a move on the part of the Government of India for establishing near the ports a petroleum distilling plant. The Chemical Industries Sub-Committee has also made a good case for installation of petroleum refining industry in Bombay.

3.17. The glass industry which is now regarded as a key industry is gaining ground in the Province. The potteries, refractories and ceramic industries however are still in their infancy and there is good scope for their development in the province. The Committee has recommended the establishment of a cement factory in the Province with a target of production of 200,000 tons per annum. There is also considerable scope for the extension of the inedible oil industry and the allied industries *viz.*, soaps, paints and varnishes. With the natural resources of bauxite in the Province, the aluminium industry could be set up at a site such as Kalyan and minor chemical industries such as hydrogen peroxide, could be established in the same locality. There is good scope for plastics industry in the Province, one of the natural plastics, casein being manufactured in the Province by the acid process. The manufacture of rennet and rennet casein is also likely to be taken up in order to open up wider fields for the utilisation of plastics.

3.18. Fundamental training in inorganic and organic and physical chemistry is necessary to students who would ultimately aspire to occupy the managerial and other executive posts in the industry. The application of chemistry to industry is very extensive and rayon, plastics, papermaking and dyeing are only a few of the industries requiring the services of skilled chemists in research and works laboratories for development of their products. In foreign countries in addition to the full time day courses at Universities and Central Technical Institutions, evening classes are available for persons in employment and the examinations of the City and Guilds London Institute and the examinations leading to National Certificates and Diplomas have helped many persons engaged in the chemical works to obtain recognised qualifications by attendance at the evening classes.

3.19. In the lower ranges of employment there are considerable number of routine workers engaged in manufacture and testing for whom a certain amount of scientific training is necessary and the local technical institutions should provide adequate schemes of study for such persons.

PRINTING AND ALLIED TRADES.

3.20. With the growth of literacy it is obvious that there will be greater demand for books, periodicals, magazines and newspapers and the printing trade is looking forward to considerable expansion. There is however practically no arrangement for training persons for the printing industry. Attempts in this direction have been made by schools such as K. E. S. Topiwala Industrial School, Alibag, the K. E. S. V. K. School, Parvel, and the Maharashtra Mudran Shala, Poona, and the Government Apprentice Scheme at the V. J. T. Institute, Bombay. But these are totally inadequate to the requirements of the industry. These schools prepare students for hand composing and printing. The Courses are very elementary in nature, the students are fit only for employment as compositors and they cannot be employed for work

on the modern rotary and other power driven machines, without further specialised training.

3.21. The necessity for a model school of printing has been impressed upon us by the Printing Panel, Bombay, which is a representative body of the printers and publishers of Bombay, and by some representatives of the printing industry in Poona. The Printing Panel at Bombay have prepared a scheme for such a school.

3.22. It was strongly urged upon us that the fundamental condition for success of such a school was the co-operation of employers and employees with the authorities of the school for making the practical training in the printing presses effective. Without such co-operation a scheme imposed from education authorities alone would not have as good a chance of success. With this view, we are in complete agreement and we are satisfied that it is on these lines that real progress could be made. The needs of students of Printing Technology in outlying areas and small towns cannot be adequately met locally. Courses for such students should be provided at the larger and properly equipped schools of printing which we recommend should be started in the Province at suitable centres.

LOCALISED INDUSTRIES.

3.23. The Jari Industry at Surat is an example of a highly specialised local development of an industry which has a wide market for its products at home and abroad. Our attention was specially directed to the great importance of the jari industry for export, the value of the commodity in proportion to its bulk and weight being extremely high. The jari industry has received encouragement and support from the Department of Industries and the Department has helped the industry as far as possible in the solution of its problems. The skill, resourcefulness and the adaptability of the artisans and craftsmen engaged in this industry at Surat is something about which the city can justly be proud. The Cottage and Small Scale Industries Sub-Committee have recommended that a Trade School may be run at Surat for training the hereditary artisans to improve their technique and to produce new designs. They have also recommended the setting up of a research laboratory in the city with a view to improving the quality of jari articles so as to be comparable with the gold thread which used to be produced in France some years ago. We have made recommendations elsewhere for the provision of suitable technical education for Surat area by the establishment of a special local technical institute. We recommend that special stress should be laid in this institute on imparting education for the jari industry. It is very important that the skill which has been developed in this trade should not be allowed to die for want of encouragement as has happened in some cases in the past.

AGRICULTURE.

3.24. We have restricted our inquiries to technical and industrial training as agricultural education is looked after by the Agricultural Department and is outside the scope of our terms of reference.

3.25. In no industry is it so difficult to provide satisfactory technical education as for agriculture. There are three reasons for this: (1) Agriculture is distributed over the whole country and is often carried on in the sparsely populated areas; (2) It is an industry of great complexity touching many trades; and (3) the expenses per head involved in the provision of adequate technical education are very great. The question however is of great importance as agriculture is the main occupation in India and as two-thirds of the population of the Bombay Province are stated to be dependent upon agriculture directly or indirectly. Looking into the question of agricultural education in the lower reaches it is interconnected with the education given in the technical schools as the modern agriculturists would necessarily require knowledge of carpentry, smithy, the working of pumps and of small oil engines. The Cottage and Small Scale Industries Sub-committee has recommended encouragement by Government to such industries as bee-keeping, fruit preservation, gur-making, installation of improved type of *Ghanees* for extraction of vegetable oils, carpentry and wood working, coir-making, hand-loom weaving and hosiery industry. All these industries would work with success in rural areas and bring prosperity to the countryside by providing leisure time occupations to persons engaged in agricultural pursuits. It is obvious that institutions for such industries would come more under vocational education and we therefore recommend that agricultural institutions of the non-collegiate grade should be brought under the control of the Council of Vocational Education, the establishment of which we have recommended in Chapter XII.

RURAL INDUSTRIES.

3.26. From an examination of the statistical data showing the distribution of industries in the Province and the average number of persons employed in them, it will be seen that a fairly large number of industries are located in the rural areas. (*vide* Tables Nos. 1 to 6).

3.27. The character of the Indian villages has changed in the past 25 years and nowhere is a self-contained community to be found. The biggest factor for this change has been the development of road transport which enables the rural population to make periodical visits to the nearest towns and which has also completely changed the market places in the Province. Not only do the people from the rural areas make their purchases while on occasional visits, but a close inquiry will show that they prefer to buy ready timber scantlings for house-building and other purposes from large towns with the result that the village craftsmen, such as carpenters and smiths, on finding less work in the villages have migrated into towns.

3.28. The Small-scale Industries Sub-committee made recommendations for the encouragement of several types of small-scale and cottage industries which if well established in the rural areas will undoubtedly bring prosperity to these areas and give employment to skilled workers and craftsmen in those areas themselves. Concentration

of population in the cities has been a bane of industrial civilisation and we have to find all possible ways and means by which the drain on rural population can be checked, both with a view to lessening the concentration in the cities as well as making the rural areas more productive and prosperous. The Committee has also expressed the view that there is a considerable scope for expansion of the hand-loom industry by (1) converting a good number of ordinary fly-shuttle hand-loom into automatic type of looms and (2) by replacing throw shuttle type of looms by fly-shuttle looms and (3) by installation of power-loom consequent upon the development of electric grid system. The hand-loom industry in India provides 30 per cent of the total cloth produced in this country. The other rural industries recommended by the Committee are woollen textiles, hosiery, sericulture and eri-culture, gold and silver thread manufacture, fibre making, coir-making, hand-made paper, tanning and leather, glue-making, bamboo and cane work, lac cultivation, banglemaking, pottery, bricks and tiles, arts and crafts, essential oils extraction etc.

3. 29. Technical training is necessary for those living in rural areas for training them to follow the rural occupations as well as making them fit for occupations in small-scale and cottage industries as well as for large-scale organised industry, as the large-scale industry is constantly importing its workers from the rural areas. The Junior Technical Schools and Industrial Schools and Trade Schools, the establishment of which we are proposing later, will in future according to our recommendations provide suitable courses of training either locally or in centres with residential facilities. Such specialised institutions are bound to be limited in number. It would, therefore, in our opinion, be necessary to provide training in Agriculture and allied rural occupations mentioned above in the ordinary primary schools located in rural areas. It should be the aim ultimately by concentration of effort in this direction that no young person should be left without a reasonable opportunity of receiving vocational training as well as extended general education. We expect that as a result of this facility in educational training there will be a certain speciality in local industries and a marked increased efficiency in organised industries and possibly in due course a more prosperous country side. It is however very difficult to visualise the final picture as everything will depend upon the planned economy that Government will adopt.

3. 30. The war has brought into prominence the advantages of the mobile truck for a great variety of purposes. Already in this province two such mobile units are working for medical relief in rural areas. In Western countries such mobile trucks are being utilised as mobile workshops. As the facilities provided by the institutions located in district towns or in taluka places would not be of much use to the pupils in villages, the Government may try an experiment of having mobile workshops for the use of rural areas. The mobile units may be useful not only for the training of pupils in schools, but also for giving practical advice and help to the people in the rural areas. Such units

would run more effectively by the Taluka or District co-operative societies or Rural Development Associations on a grant-in-aid basis.

REQUIREMENTS OF TECHNICAL PERSONNEL FOR LARGE-SCALE INDUSTRIES.

3.31. We are happy to state that we found in practically every trade and industry of any magnitude, a realisation of the importance of technical education and in some quarters, particularly in Ahmedabad a willingness to co-operate in providing for employees all reasonable facilities to improve their technical knowledge. The educational requirements of the industry are never static. It is therefore necessary that an administrative machinery should be set up to ascertain them from time to time. We deal with this important subject in Chapter XII wherein we have made our recommendations regarding organisation and administration of technical education.

3.32. The most important fact that we have to realise is that we are an independent nation. In order to establish and maintain a leading position in the comity of nations, we shall have to make great and rapid progress in the industrial development of our country. In this industrial age, the very life of our country will depend primarily upon its industry. We cannot succeed in this task unless we have the means, which we can secure only through planned economy, and a high degree of industrialisation. Our industries, which have so far grown without a plan and which so far have been manned by persons who are supposed to have acquired their skill merely by practice in the industry, will survive and be successful only if they are hereafter served by a large, enterprising and skilled army of workers. We can raise and maintain such a force only if we resolve to devote far more attention to the reorientation of our education and in particular our technical education than we have done in the past.

3.33. The war technical training schemes which were started for supplying the requirements of skilled labour in the defence forces have revealed that India has got a considerable amount of latent ability which with adequate training could be immediately harnessed to munition production. This latent ability must be harnessed now for the peacetime production. The world has progressed considerably during the war, both in technique and organisation in industry and if we are to compete successfully, with the outside world, there must be a total efficiency in industry. Nothing short of this will suffice. The whole of the industrial personnel, from the captain of the industry down to the industrial workers, should be trained adequately to this end.

3.34. It is very often stated that the skilled worker is merely a repetitive worker. But it must be stated that even in these days of mass production there is scope even in the lower ranges of employment for independent thought and judgment. The modern worker is not merely an automaton dependent on orders from above, but he is expected to be both technically skilled and capable of acting independently with

initiative and resources. It is the convinced belief of leading industrialists in the Western countries that with the advancement of science and technology not only will the proportion of highly skilled workers grow larger in many industries, but that invention will more and more eliminate repetitive type of work which has so far been the bane of modern industry. There is also no danger of new inventions reducing the total number of persons engaged in industry. Experience has so far shown that new inventions create new industries without killing the old ones.

3.35. From the foregoing review of the prospects of expansion of industries of various types, it would be clear that there is a very considerable scope for absorption of trained personnel in the industry. According to 1939 figures, Bombay Province with 23 per cent. stood second in India in respect of the percentage of industrial workers, the first being Bengal with 28.7 per cent. According to the 1941 census the percentage of population of Bombay to the whole of India was 5.4 whereas that of Bengal was 15.5. * Bombay Province therefore had in proportion to its population, the highest percentage of industrial workers. The majority of these worked in large industries.

3.36. Large-scale industries are those where power is used and the number employed exceeds 500. Such industries are easily recognisable by their size and capacity. From the point of view of the actual training needed for their personnel they may be divided into two classes: (a) the "manipulative industries, namely certain branches of mechanical engineering, the pottery and glass industries, textiles, tanning and mining, in which wide practical experience is necessary for the supervisor to estimate the working conditions and determine whether the quality and output of the work is satisfactory; and (b) the "non-manipulative or operative industries", namely the manufacture of sugar and chemicals and oil and rice-milling where on account of the automatic and semi-automatic character of the plant or of the simplicity of the process, the necessary knowledge can be more quickly acquired.

THREE CATEGORIES OF TECHNICAL PERSONNEL REQUIRED FOR LARGE-SCALE INDUSTRIES

3.37. The industrial workers employed in large-scale industry may be classified into three classes: (1) Directive or managerial grade, (2) the supervisory grade, the chargehand and foreman grade, and (3) the operative grade including both skilled and semi-skilled artisans. The number of persons of the directing and managing grade employed in any large-scale industry is necessarily small when compared with the other two grades. The personnel is usually drawn from University graduates in engineering or technology with considerable amount of experience in organisation and management of large-scale industry.

* *Vide* page 9, Location of Industry in India. Memorandum prepared by the Office of the Economic Adviser to the Government of India.

The majority of answers to our questionnaire referred to this grade of technical personnel as persons with high academic qualification supplemented by years of training and experience in large industrial establishments. But a few industrialists are of the opinion that by gradual promotion a skilled worker starting his life as a wage-earner could, if sufficient educational opportunities were available for his part-time education, occupy managerial posts. We are inclined to agree with the industrialists on this point. It is however quite obvious that the number of persons who may rise to high rank by this method will be comparatively very small. Facilities for the education and training of the personnel of this grade though very important falls outside the scope of the terms of our reference.

3.38. The supervisory class in our opinion is the one on whose education and training attention should be concentrated at this stage in the evolution of the organised industry in India. It is this grade of workers intermediate between the management and operatives which ought to have sufficient knowledge and intelligence to understand the instructions of the former and sufficient power of expression to communicate and interpret them to the workers. If engaged in the manipulative group of industry they should also have an acquaintance with the theoretical principles underlying workshop operations so as to enable them to understand the functions of the various machines, and sufficient knowledge for adjusting the different parts constituting the machine to different kinds of raw materials or final products. They must necessarily possess sufficient practical skill to earn the respect and confidence of the operatives whose skill they direct, control and supervise.

3.39. If on the other hand they are employed in the non-manipulative group of industries, they should have fairly good knowledge of the theoretical principles underlying work-shop practice, but manipulative skill is obviously less necessary. The importance of sound and adequate training of the supervisory group of workers including foremen and chagemen cannot be overestimated. The foreman holds in fact the key to efficiency in production. This category of technical personnel possessing a sound knowledge of the theory of the special branch of engineering or technology and having as their principal asset a wide practical training and experience is usually recruited from persons who have taken diploma courses in engineering or technology or from persons who have supplemented their practical training with part-time education.

SKILLED WORKERS.

3.40. In any industry by far the largest category of workers belong to this grade. In this country they are mostly people who have probably entered industry with little or no education and have acquired the necessary skill by a long process of learning through doing. Attention has been drawn in many reports on technical education that the lack of education of any kind is the principal reason for the low efficiency of the Indian industrial workers. There is no regular system

of training for the skilled worker and persons entering the industry get trained gradually as skilled workers under such facilities, as may be made available to them. It will be agreed that this process in addition to being slow does not even in the long run yield the desired results, as it often happens that unskilled persons pick up what they can according to their ability with practically no direction or guidance. But a number of industrialists say that this form of training costs them practically nothing. This in our opinion is a short-sighted policy as the industrialists pay for the process by low efficiency and the higher cost of production is ultimately passed on to the consumer.

3.41. We attach very great importance to the provision of training facilities for this category of industrial workers. In progressive countries many large and important engineering firms conduct carefully planned schemes for the training of craftsmen, technicians and foremen. We have given an account of such schemes in their appropriate context later, but we would like to state here that the training facilities thus offered coupled with the system of National Certificate and Diplomas which have been instituted by the Board of Education, England, in co-operation with the professional institutions nearly 20 years ago have resulted in providing opportunities for workers in this category for vertical mobility. Everyone who has a slight acquaintance with manufacturing firms in Great Britain can at once recall instances of men who have entered upon their life work, in humble positions, with few advantages and have built up successful business, or, have risen to the position of high responsibility in business, through their industry and ability. It is stated by an eminent English educationist,

“It is possibly true to say that of the engineers who have *done well* in recent times not more than 1 in 7 has taken an engineering degree.”*
As Messrs. Abbott and Wood have pointed out :

“No industry can possess the flexibility and the strength on which its successful conduct depends unless its directing and supervising personnel is drawing life from every available source.”

It must also be remembered that the maximum efficiency in an industrial undertaking can only be secured if there is a reasonable and legitimate scope for ambitious men of intelligence and ability to rise to higher grades. We therefore urge that a systematic scheme for the vocational training of workers in the operative grade should be put into operation as early as possible in the Province on the lines suggested by us in Chapters VI and VII.

VOCATIONAL EDUCATION FOR WOMEN.

3.42. The present tendency is definitely to afford equality to women in all spheres of life and it is therefore but right to provide opportunities to girls and women for adequate trade and industrial training in order that they may take their place in the business and industrial life of the country. During the last war women in the West had taken places of men as workers in the various industrial spheres and had shown that they could do the type of work involving the use of intricate mechanical machinery as efficiently as men. The following figures will reveal the

* Journal of the Inst. of Mech. Engrs. 1943, page 174.

extent to which women had replaced men in U.S.A. during the war in different occupations exclusive of office workers ;

Industry	Percentage of women engaged in 1941.	Percentage of women engaged in 1943.
1. Aviation ...	1	65
2. Electrical ...	6	35
3. Instruments ...	10	60
4. Tool & Dye ...	0	20
5. Machinery Manufacture ...	10	50
6. Hosiery ...	Not available.	80

Experience with women workers during the war has revealed conclusively that many of them possess or are able to develop manipulative skills of many kinds. Among such may be included the operation of a large variety of machines such as drill presses, grinders, lathes, punching presses, forming presses and screw machines etc. In peace-time also women work normally in many industrial spheres. In the electrical industry armature winding is done by women, in radio industry the assembling of parts, in the pottery industry the preparation, and transfer of artistic designs.

3.43. Notwithstanding what has been stated above although women in this country are showing a tendency for entering independent careers, very few have had opportunities to take up careers in the technical field and their vocational ability finds its best expression in the home making arts. We have suggested elsewhere the establishment of Central Arts and Industries Schools which will be taken advantage of by boys. We have also made suggestions for introduction of suitable courses for girls at certain Centres. (*Vide* Table No. 12) We feel that there is a great need for the establishment of institutes for women which may be designated as 'Kala Mandirs'. Specific work-room crafts such as needlework, embroidery, ladies dress-making, hosiery, tailoring and cookery may be offered in these institutes. This experiment may at the initial stage be confined to major cities of Bombay, Ahmedabad, Poona, Surat, Sholapur and Hubli and may later on be extended to other areas on basis of experience gained. The benefit of education in the various crafts should be extended to adults as well. Such centres should also provide a training ground for teachers of domestic subjects throughout the Province. We recommend that part-time courses of one or more sessions duration should be provided in these institutions for women and girls engaged in full-time employment. The Board of Technical and Industrial Training has already recognised the value of such training by providing examination and certification of these courses. There is however, a wide field for development in this direction as the Board's examinations are at present limited to only tailoring, embroidery and fancy work. We have given an exhaustive list of courses under part-time education which would be suitable for girls and women (*vide* Appendix 'E').

3.44. The problem of special practical courses to serve the requirements of girls was the basis for the establishment of the Women's University by Dr. D. K. Karve. The idea has since then gained ground and a number of educational institutions of secondary school grade for girls providing along with general education, practical courses, have sprung up in different parts of the province. These institutions deserve every help and encouragement. There would however be little chance for them to be established on a sound footing, unless the girls attending them get admission to the Colleges, as lack of such a facility would bring the institutions down in the estimation of the general public. We, therefore, recommend that these institutions should be encouraged to develop into full-fledged Vocational High Schools for girls and should prepare girls for various optional courses provided at the S. S. C. Examination with suitable modifications wherever necessary and the girls should get admission in the Arts Colleges.

3.45. We find that some of the institutions where vocational education is imparted to women are conducted by women's Social and Welfare Organisations. In order that the vocational education of women may proceed as far as possible under the guidance of women themselves, we recommend that Government should give preferential treatment to such associations, to take up such activities and expand them where they exist.

3.46. The establishment of Welfare Centres on the lines run by the labour department at Ahmedabad for the benefit of men in the neighbourhood of mills and factories, if successfully inaugurated, might do much to improve the lot of girls and women employed therein. Such Centres should provide both vocational and cultural education.

TABLE 1.

Factories Registered under Section 2 (j) of the Factories Act. (1934). Number of Factories in the Bombay Province in 1946.

The Factories Act-1934. Government of India. Section -2-(j).

“ Factory ” means any premises including the precincts thereof whereon 20 or more workers are working or were working on any day of the preceding 12 months, and in any part of which a manufacturing process is being carried on with the aid of power, or is ordinarily so carried on, but does not include a mine subject to the operation of the Indian Mines Act—1923.

TITLES OF INDUSTRIES.	Bombay City and Island		East Khandesh	West Khandesh	Kolaba	Ratnagiri	Poona	Ahmednagar	Sholapur	Satara	Ahmedabad	Panch Mahals	Kaira	Surat	Broach	Bijapur	Belgaum	Dharwar	Hubli	Kanara
	Bombay	Suburban																		

Government and Local Fund Factories.

Army Clothing .. ..	..	..	..	1																
Distilleries .. ..	..	..	..	1																
Carpentry .. ..	..	..	..	1																
Dockyard .. ..	..	..	..	1																
Electrical Engineering .. ..	..	..	..	..				1										3		
Engineering (General) .. ..	..	..	..	6			4													
Electric Power Generation and Transmission .. ..	..	..	..	1	1	1														
Engineering (Miscellaneous) .. ..	..	..	..	1																
Forage Presses .. ..	..	..	..	..	1									1						

Mints .. .. .	..	..	..	..	1													
Ordnance Factories .. .. .	..	..	..	1	1	1		13	1									
Printing Presses .. .. .	..	..	..	4		2		3										
Railway Workshops .. .. .	..	..	..	12	2	2	4	2	3		3	3	2	2		4		1
Saw Mills .. .. .	..	..	..	1														2
Telegraph .. .. .	..	..	..	1														
Water Pumping .. .. .	..	..	..					4		1		1						
Miscellaneous .. .. .	..	..	..	7	2	1	1	4	1			2						

*All Other Factories
(TEXTILE)*

Cotton Spg. Wvg. and other factories. ..	83	9	16	27	5	2	1	3	2	13	3	86	1	5	3	3	6
Hosiery	9	2	1					3				12					
Silk Mills	10											7		63		1	
Woollen Mills	3		2														
Miscellaneous	55	2	3						1		1	40		3			

Engineering

Coach Building and Motor Car Repair. ..	21	2						9									
Electrical Engineering	14	1															

TABLE 1—*contd.*

TITLES OF INDUSTRIES.	Bombay City and Island		Bombay Suburban											Thana	Nasik	East Khandesh	West Khandesh	Kolaba	Ratnagiri	Poona	Ahmednagar	Sholapur	Satara	Ahmedabad	Panch Mahals	Kaira	Surat	Broach	Bijapur	Belgaum	Dharwar	Hubli	Kanara			
	Bombay	Island	Bombay	Suburban	Bombay	Suburban	Bombay	Suburban	Bombay	Suburban	Bombay	Suburban	Bombay	Suburban	Bombay	Suburban	Bombay	Suburban	Bombay	Suburban	Bombay	Suburban	Bombay	Suburban	Bombay	Suburban	Bombay	Suburban	Bombay	Suburban	Bombay	Suburban	Bombay	Suburban		
<i>Engineering—Contd.</i>																																				
Electrical Power Generation and Transmission.	4				1		1	3				2	1	1		1	1		1	1		1		1		1	1	1								
General Engineering ...	76	7	2	1	1							5	3	2	2	34						3	5		1			3	4							
Kerosene Tins and Packing ...	11											1																								
Metal Stamping ...	47	3		2					2	4				1									2													
Railway Workshops ...																1																				
Ship-building and Engineering ...	7																																			
Steel, Trunk, Lock and Cutlery ...	4																				1													1		
Tramway works ...	2																																			
Miscellaneous ...	89	5	2									6										1											1			

MO. V. B. No. 18-3

Minerals and Metals.

Foundries ... ..	... 22				1		3	2		1
Miscellaneous ... ..	... 14	4		1						

Food, Drink and Tobacco.

Bakeries, biscuits and confectionery ...	8	1								1
Coffee	2									
Dairy Produce	2							1		1
Flour Mills	7							4	2	
Food Canning and Bottling	1									
Ice and Aerated Water	11							2		
Rice Mills			2		2	1				
Tobacco	4	3				1				
Miscellaneous	3	1	1	1			4	2	1	4
										1

Chemicals and Dyes.

Chemicals	5	6	2							2
Dyeing and Bleaching	26	7	1			1	2	2		

TABLE 1—contd.

TITLES OF INDUSTRIES	Bombay City and Island		Bombay Suburban		Thana	Nasik	East Khandesh	West Khandesh	Kolaba	Ratnagiri	Poona	Ahmednagar	Sholapur	Satara	Ahmedabad	Puneh Mahals	Kaira	Surat	Broach	Bijapur	Belgaum	Dharwar	Hubli	Kanara
	Gas Works	...	1																					
Matches	...	2	2																					
Soaps	...	4	1							1											1			
Oil Mills	...	22		11	30	24			2	1	6	3	6	14	3	3					2	5		
Paints	...	4																						
Miscellaneous	...	37	10	1					1	4	1				1									
<i>Paper and Printing.</i>																								
Paper Mills	...	3	2				1		2						2									
Printing & Book-binding etc.	...	99	2	1			1		22					19		12							2	
Miscellaneous	...	10													1									

<i>Process Relating to Wood, Stone and Glass.</i>														
No. of Bk No. 18-36	Bricks & Tiles	...	...	...	7		1		2	1	1	1	1	1
	Carpentry & Cabinet making	...	...	...	10			1	10	1	1	1	1	
	Cement, Lime & Potteries	...	...	...				1						
	Glass	...	...	...	4	13		1			1			
	Saw Mills	...	...	...	20	2	3	5	3	1	1		1	1
	Stone dressing	...	...	...										2
Miscellaneous	...	...	...	25	23	4	1	6	1	2	1	3	3	1

Process connected with Skins and Hides.

Leather & Shoes	...	...	...	1				1						
Tanneries	...	...	...	2	1			1	1	1				
Miscellaneous	...	...	...	1					6		2			
<i>Miscellaneous.</i>														
Brushes	...	...	...	4										
Canvas Proofing	...	...	...	1	1									
Fodder	...	...	...				1							
Gramophone Records	...	...	...	1										
Laundries	...	...	...	2										
Rubber Goods	...	...	...	7				2						
Rope works	...	...	...	1	1									
Miscellaneous	...	...	...	63	21		1	7	1	4	2		1	

TABLE 2.

Average number of workers employed in the Factories under Table—1.

Title of Industries *Average No. of Workers
per day*

Government and Local Fund Factories.

Carpentry ...	2734
Dockyard ...	9241
Electrical Engineering ...	83
Engineering (General) ...	4405
Electrical Power Generation and Transmission	605
Engineering (Miscellaneous)	22
Forge Presses	105
Mints ...	2051
Ordnance Factories	20259
Printing Presses	4074
Railway Workshops	26491
Saw Mills ...	260
Telegraph ...	233
Water Pumping	290
Miscellaneous	1335

All Other Factories.

(TEXTILE)

Cotton Mills	385278
Hosiery ...	2083
Silk Mills ...	4789
Woollen Mills	6273
Miscellaneous	10282

Engineering

Coach Building and Motor Car repairs	4320
Electrical Engineering ...	1651
Electrical Power Generation & Transmission	1319
General Engineering ...	12491
Kerosene Tins and Packing	2530
Metal Stamping	5994
Railway Workshops	488
Ship Building and Engineering	7071
Steel Trunk, Lock and Cutlery	1750
Tramway Works	947
Miscellaneous	6735

Minerals and Metals

Foundries ...	2494
Miscellaneous	2149

TABLE 2—*contd.*

<i>Food, Drink and Tobacco</i>			
Bakeries, Biscuits and Confectionery	...	...	871
Coffee	...	...	101
Dairy Produce	...	...	251
Flour Mills	...	...	1098
Food Canning and Bottling	...	...	23
Ice and Aerated Water	...	...	625
Rice Mills	...	...	319
Tobacco	...	...	2120
Miscellaneous	...	...	2513
<i>Chemicals and Dyes</i>			
Chemicals	...	...	2411
Dyeing and Bleaching	...	...	11188
Gas Works	...	...	798
Matches	...	...	1992
Soaps	...	...	1829
Oil Mills	...	...	9494
Paints	...	...	342
Miscellaneous	...	...	4518
<i>Paper and Printing</i>			
Paper Mills	...	...	1927
Printing and Book-binding etc.	...	...	10265
Miscellaneous	...	...	686
<i>Process relating to Wood, Stone and Glass</i>			
Bricks and Tiles	...	...	919
Cement, Lime and Potteries	...	...	34
Glass	...	...	3806
Saw Mills	...	...	2138
Stone Dressing	...	...	202
Miscellaneous	...	...	5148
<i>Process connected with Skins and Hides.</i>			
Leather and Shoes	...	...	41
Tanneries	...	...	682
Miscellaneous	...	...	312
<i>Miscellaneous</i>			
Brushes	...	...	181
Canvas Proofing	...	...	258
Fodder and Gramophone Records	...	...	54
Laundries	...	...	122
Rubber Goods	...	...	1517
Rope Works	...	...	162
Miscellaneous	...	...	10318

TABLE 3.

Number of Factories in the Bombay Province in 1946, notified under Section 5 (1) and (2) of the Factories Act, 1934.

TITLES OF INDUSTRIES	Bombay City and Island	Bombay Suburban.	Thana	Nasik	East Khandesh	West Khandesh	Kolaba	Ratnagiri	Poona	Ahmednagar	Sholapur	Satara	Ahmedabad	Panch Mahals	Kaira	Surat	Broach	Bijapur	Belgaum	Dharwar	Hubli	Kanara
<i>Government and Local Fund Factories.</i>																						
Saw Mills	1
Miscellaneous	1	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>All Other Factories. (Textile).</i>																						
Cotton Spinning, Weaving and other factories:	..	8	4	2	12	1	..	1	11	7	380	..	68	..	1	17	13	5	..	1	..	4
Silk Mills	1
Miscellaneous	3	..	..	1	..	..	..	..	..	..
<i>Engineering.</i>																						
Coach Building and Motor Car repair	..	1	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..

Electrical Engineering .. ..	..	..	1															
Electrical Generation and Transmission .. ..	..	..		1														1
General Engineering .. ..	..	..	41	3	1	1	1	5	2	1		49						2
Metal Stamping .. ..	..	..	11					1				2						
Railway Workshops .. ..	..	..					1											
Steel Trunk, Lock and Cutlery .. ..	..	..	5									1						2
Miscellaneous .. ..	..	..	41					7		4								

Minerals and Metals.

Foundries .. ..	..	..	7	1				1				4						
Lead Mills .. ..	..	..	1															
Miscellaneous .. ..	..	..	12									1						

Food, Drink and Tobacco.

Bakeries, Biscuits, Confectionery .. ..	..	..	38	3				7		1		1						
Rice Mills .. ..	..	..			5	4		19							2	7		7
Tobacco .. ..	..	..	19		31	3	7		1	41	64	31	2	19	2	4	6	19
Miscellaneous .. ..	..	..							9				3	2				2

TABLE 3—*contd.*

TITLES OF INDUSTRIES.																							
	Bombay City and Island	Bombay Suburban	Thana	Nasik	East Khandesh	West Khandesh	Kolaba	Ratnagiri	Poona	Ahmednagar	Sholepur	Satara	Ahmedabad	Panch Mahals	Kaira	Surat	Broach	Bijapur	Belgaum	Dharwar	Hubli	Kanara	
<i>Chemicals and Dyes.</i>																							
Dyeing and Bleaching					1									4									
Oil Mills	1			2	3	1		1		5				1	1								
Paints	2	1																					
Miscellaneous	2	1																					
<i>Paper and Printing.</i>																							
Printing and Binding	91			1			1	15		2	1	9			3		2			3		5	
Miscellaneous	4																						

Process relating to Wood, Stone and Glass

Bricks and Tiles	..	..	..	5	21		1	39	6	1	1	27	2	7
Glass	..	..	..	2	5									
Saw Mills	..	..	..	20	2	1	5	3	3	1			2	3
Miscellaneous	..	..	..	2										1

Process connected with Skins and Hides.

Leather and Shoes	..	..	..	20				4						
Tanneries	..	..	..	7				2			1			1
Miscellaneous	..	..	..	18							10			

The Factories Act—1934. Government of India. Section—5(1) and (2).

5(1). The Provincial Government may by notification in the Official Gazette, declare that all or any of the provisions of this Act applicable to factories shall apply to any place wherein a manufacturing process is being carried on or is ordinarily carried on whether with or without the use of power wherever ten or more workers are working therein or have worked therein on any one day of the twelve months immediately preceeding.

5 (2). A notification under sub-section (1) may be made in respect of any one such place or in respect of any class of such places or generally in respect of all such places.

TABLE 4.

Average number of workers employed in the Factories under Table 3.

	Government and Local Fund Factories.				Average No. of Workers per day.
Saw Mills	59
Miscellaneous	10
<i>All Other Factories (Textile)</i>					
Cotton Mills	3449
Silk Mills	563
Miscellaneous	178
<i>Engineering</i>					
Coach Building and Motor Car Repair	32
Electrical Engineering	7
Electric Power Generation and Transmission	52
General Engineering	1189
Metal Stamping	167
Railway Workshops	16
Steel Trunk, Lock and Cutlery	127
Miscellaneous	626
<i>Minerals and Metals</i>					
Foundries	180
Lead Mills	3
Miscellaneous	153
<i>Food, Drink and Tobacco</i>					
Bakeries, Biscuits and Confectionery	256
Rice Mills	854
Tobacco	14723
Miscellaneous	1119
<i>Chemicals and Dyes</i>					
Dyeing and Bleaching	135
Oil Mills	243
Paints	36
Miscellaneous	45

TABLE—*contd.**Paper and Printing*

Printing and Binding	1665
Miscellaneous	83

Process relating to Wood, Stone and Glass

Bricks and Tiles	3608
Glass	257
Saw Mills	554
Miscellaneous	39

Process connected with Skins and Hides

Leather and Shoes	461
Tanneries	258
Miscellaneous	575
<i>Miscellaneous</i>	657

TABLE 5.

Distribution of Factories according to Working Strength.

Industries.	Number of Factories with Average number of Workers per factory as shown below.						
	20 to 49 Workers	50 to 99 Workers	100 to 499 Workers	500 to 999 Workers	1000 to 4999 Workers	5000 and over Workers	
Textile	.. 180	55	62	15	155	7	
Engineering	.. 244	90	88	12	20	6	
Minera's and Metals	.. 25	9	11	..	..	..
Food, Drink and Tobacco	.. 45	13	16	2	1	..	

TABLE 6.

*Growth of Population and Industries in the Bombay Province.*1. *Growth of Population in certain large towns.*

Towns.	Population (000).	
	1921	1941
Bombay ...	1176	1490
Ahmedabad ...	271	591
Poona ...	164	258
Sholapur ...	120	213

2. *Distribution of the increase in the number of workers employed in Large Industrial Establishments.*

Province or State.	Number of Workers in 1921	Number of Workers in 1939
Bombay ...	3,71,731	4,80,301
Bombay States ...	3,740	30,391

3. *Distribution of Population and Industrial Workers.*
(Based on All-India Figure of 100.)

Province or State.	Percent- age of Popula- tion in 1921 (P)	Percent- age of Industrial Workers in 1921 (I)	I		Percent- age of Population in 1941 (P)	Percent- age of Industrial Workers in 1939 (I)	I	
			—	P			—	P
Bombay ...	6.3	25.3	4.01		5.4	23.0	4.26	
Bombay States ...	2.3	0.3	0.13		2.3	1.5	0.65	

4. *Electrical Generation and Distribution.*

		Units Generated.		Units consumed for Industrial purposes.	
		1938—1939	1942—1943	1938—1939	1942—1943
		Bombay ...	9,50,479	1,114,377	4,91,375	6,69,315

Reproduced from the *Location of Industry in India*, prepared by the Office of the Economic Adviser to the Government of India.

TABLE 7.

Location of new industries in the Bombay Province as recommended by the Provincial Industries Committee.

Nature of Industries.	Location.
<i>Metals and Engineering—</i>	
Basic Iron and Steel Industries.	Kalyan, Bombay.
Rolling Mills (Steel) ...	} Bombay.
Non-ferrous Metal Industries ...	
Aluminium Smelting and Refining.	Bombay Province.
Diesel Engines and Prime Movers	Satara District.
Machine Tools ...	Bombay Province.
Electrical Machinery and Accessories.	Bombay and Province.
Textile Machinery ...	Bombay and Ahmedabad.
Safes, Cabinets, etc. ...	Bombay Province.
Cycles ...	Bombay Province.
Radio Receivers and Transmitters.	Bombay Province.
Refrigeration Industry.	Bombay and Province.
Scientific and Surgical Instruments.	Bombay.
Agricultural Implements ...	Bombay Province.
Railway Wagons ...	Manmad.
Ferrous and Non-ferrous Castings.	Bombay, Poona and Bombay Province.
(Test houses and Commercial Pilot Testing Plants.	} Bombay Province.
General Engineering Industry ...	
Miscellaneous Industries ...	Bombay Province.
Electrical Power (generation and transmission).	Bombay Province.
Road Transport ...	Bombay Province.
Iron Ore ...	Redi near Vengurla. Banda-Savantwadi State.
<i>Cottage and Small Scale Industries—</i>	
Automatic power looms ...	Bombay Province.
Spinning Mills ...	Surat, Dhulia, Jalgaon, Malegaon, Sholapur, Bagalkhot, Gadag, Hubli, Belgaum.
Central Dye-houses ...	Sholapur, Malegaon, Bagalkhot.
Woollen Mills ...	Gadag, Dharwar and Ahmednagar.
Carpets ...	Bombay Province.

TABLE 7—contd.

Nature of Industries.	Location.
<i>Cottage and Small Scale Industries—contd.</i>	
Hosiery	Bombay Province.
Sericulture	Belgaum, Dharwar, Nasik, Satara, Poona and Ahmedabad.
Jari thread Research Laboratory.	Surat.
Copper wire-drawing Mill.	Surat.
Fibre Development and Research Institute.	North Kanara, Ratnagiri, Kolaba and Thana.
Coir Industry	North Kanara, Ratnagiri, Kolaba and Thana.
Hand-made Paper	Ahmedabad, Erandol and Junnar.
Tanning, Leatherworking and Glue.	Bombay Province.
Mechanical and Metal workshops.	Khandesh, Kaira, Broach, Panch- Mahals.
	*Baramati.
	*Karad.
	*Bijapur, Sholapur and Hubli,
Carpentry and Wood working ...	Khandesh, Kaira, Broach, Panch- Mahals.
	*Karad, Khed, Roha and Bagal- khot.
Lac	Panch-Mahals, Surat, Khandesh, Dharwar, Bijapur, Godhra.
Glass Bangles	Bijapur, Ahmednagar, Bel- gaum, Nasik.
Pottery, Bricks, etc.	Derol-Panch Mahals District. Khanapur-Belgaum District.
	Honavar-North Kanara.
	Jalgaon-West Khandesh.
Fruit Canning	Surat, Ratnagiri, Ahmednagar.
Essential Oils, Confectionery, Bis- cuits, Bidi, Snuff and Incense.	Bombay Province.
<i>Chemical Industries.—</i>	
Acid plants	Bombay and Ahmedabad.
Organic Fine Chemicals	Bombay, Baroda and Ahme- dabad.
Coal Gas	Bombay, Ahmedabad, Surat, Poona and Sholapur.

* To be given effect to immediately.

TABLE 7—*contd.*

Nature of Industries.	Location.
<i>Chemical Industries.—contd.</i>	
Wood Distillation ...	North Kanara and Billimora.
Dye Stuffs. ...	Bombay.
Aluminium refining and rolling ...	Bombay.
<i>Food and Forest.—</i>	
(One Research Station for the Province.)	
<i>Miscellaneous.—</i>	
Tanning, Leather goods. (Mechanised production)	... Bombay Province.
<i>Courses.—</i>	
Metallurgical Degree Course. ...	University of Bombay.
Artisans for manufacture of Toys. ...	School under the auspices of the Bombay Society of Model Engineers.
Jari Thread Trade School. ...	Surat.
Research Laboratory (Silk and Jari).	Surat.
Fibre Research Institute. ...	North Kanara, Ratnagiri, Kolaba and Thana.
Fruit Canning Research Institute.	Poona.
<i>District Industrial Research Schools for:—</i>	
Coir, Paper (Hand-made), Tanning, Leatherwork, Glue, Mechanical Work- shops, Carpentry, Lac, Glass, Pottery and Bricks, Fruit Canning, etc.	

CHAPTER IV

THE EDUCATIONAL BACKGROUND.

“The object of education is to cause us to like and dislike what we ought to do.”

Aristotle

“The life of man is founded on technology, science, arts and religion. All four are interconnected and issue from his total mentality.”

A. N. Whitehead.

4.1. What strikes one most forcibly when one surveys the educational scene, is the disparity between the importance of the subject and the scanty attention it has received in the past. It may be said without exaggeration that it was the report of the Central Advisory Board which focussed public attention on the educational problems of the country and showed boldly for the first time the enormity of the problem. Since its publication it has evoked considerable discussion, and has led to the publication of a number of memoranda and pamphlets. The Education Departments in the Provinces have been stirred into activity, to look into their own educational problems and attempts are being made to implement the recommendations made in the report.

AIMS OF EDUCATION.

4.2. Education affecting as it does every citizen in a democratic state is a highly controversial subject and one can hardly expect unanimity of opinion regarding its primary aims. The following may however be taken to be the major aims of education in a democratic country :—

(1) *To equip a boy or a girl to earn his or her living.*—Regarding this, very little need be said as upon the efficiency of a people in a country in their respective spheres of work, the standard of life of the nation as a whole will depend. It is therefore a first obligation on a community that it should equip its citizens to earn their living. This does not imply merely a provision of good general education, but it also means a provision of technical instruction in the mysteries of a particular trade, craft or a profession such as engineering, textile or chemical manufacture, medicine or law. Whereas it is not possible for a person to hold positions of responsibility requiring technical knowledge in the industry or in the engineering profession or the other learned professions such as law and medicine without adequate professional education, very little education, either general or technical, is deemed to be necessary for persons who enter the industry in the lower rungs of the ladder and yet on the proficiency of these latter depends the prosperity of the industry and trade. Whereas in all the industrially advanced countries every possible step is now being taken to provide general and technical education to craftsmen, artisans and skilled operatives in all industries, practically nothing is

done in this country for this large category of industrial workers. In the United Kingdom according to the Education Act of 1944 there will be adequate provision for the part-time day education of young people between 15 and 18 who are not in full-time attendance at any school. This means that every young person below 18 will be receiving some formal instruction in school and such education will be given for the development of varied capabilities for the young, to extend their knowledge, to increase their skills and to develop their social interests. Further education will be imparted through the institutions maintained by the local authorities or through other agencies run by youths organisations. The aim of the 1944 Education Act is to secure (a) full-time and part-time education for persons of compulsory school age, and (b) leisure time occupation in such organised cultural training and recreative activities as are suited to their requirements for any persons over the compulsory school age who are able and willing to profit by the facilities provided for that purpose.

The greatest joy that a person derives is from his work which he believes he has done to his own satisfaction. This by itself goes a long way to make a man a good citizen. No amount of educational training for citizenship will make a person a good citizen if he is frustrated in his work by his incapacity. The provision of proper vocational education thus serves a double purpose.

(2) *To equip a person to play his part as a citizen in a democracy.*—It has been stated above that the first pre-requisite for a useful citizen is that the person should find satisfaction in his work. Education for citizenship is a very difficult problem because the modern world itself is complex and the issue upon which the affairs of nations turn is hard to understand. The effect of education as it is given to-day in most cases at any rate, of boys and girls leaving schools and colleges is to give them the ability to read without ability to criticise. The effectiveness of education for citizenship is measured by its ability to enable the citizen to sift and if necessary to resist the influences of the written and the spoken word. Such education should also make us conscious that for the healthy growth of a democratic society some part of the leisure which science has made possible should be given in one way or another to the community to which we belong.

(3) *To enable a person to develop all the latent powers and faculties of nature so as to enjoy a good life.*—In other words we must receive education which will enable us to make a constructive use of our leisure, for on the degree of maturity we achieve in our private life depends in the last analysis the quality of our civilization. Education is a device for helping a man to grow to his full stature. A truly educated man with his faculties well trained and tastes well developed is able to see in the world around him, more beauty, more variety, more scope for his sympathy and understanding than he saw before. Modern education has however failed to make us truly educated.

Most of us are ignorant of the supreme art of living. A reform in our educational system would be incomplete unless it teaches us how to make intelligent use of our leisure hours.

4.3. Education in this country which was planned with a view to meeting the requirements of a foreign rule has of necessity to undergo a change to suit the needs of a democratic free nation. It needs also to be refashioned to suit the complex pattern of our life which has been brought about by the advancements in science and technology. Responsibility to plan the way ahead rests both on the community and Government. The discharge of this duty will require a very great effort from all concerned. To help to quicken the pace of the cultural, industrial and social life of the people requires co-operation from all those in the Universities, educational associations and voluntary organisations who are striving to that end. To develop a system of vocational preparation to meet the exacting needs of to-day, requires continuous co-operation with leaders in industry and commerce.

4.4. The enormity of the educational problem in India is revealed by the figures in the Sargent Report. India has now a population of 330 millions which is exceeded in the whole world by China alone and the country next in order of population is U.S.S.R. whose citizens probably number 200 millions at the present time. The U.S.S.R. which has great achievements to her credit for education of her citizens during the past 30 years, has compulsory education between the ages of 8 and 12 in rural areas and from 8 to 15 in the urban areas. The United States of America which comes next in population with 134 million inhabitants has a compulsory education system extending to 6 years in elementary school and 3 years more in the senior high schools. This means 12 years of compulsory education. In many urban areas this has been extended to 14 years with the result that the American boy or girl receives compulsory education until the years 18 to 20. In the United Kingdom with the Education Act of 1944 education will be compulsory until the age of 18 which may be part-time or full-time.

4.5. This will show that the lee-way that has to be made in India is enormous. From the statistical returns of 1936-37 it is seen that only 20% of the children in the age group of 5 to 14 were attending school. If these figures are further analysed, it would be seen that out of 100 children starting in the first form only 23 reach the fourth form and only 6 reach the eighth form. From this one may conclude that of the money spent on primary education throughout India, (About 10 crores of rupees in 1942-43) at least 75% is completely wasted since less than 25% of the children who enter the school remain in it for a full period of four years and four years is the minimum period in which there is any reasonable probability of permanent literacy being established in a child.

4.6. We would like to refer here to Table No. 8 accompanying this Chapter which gives the classification of pupils in the schools and colleges of this Province at particular stages of training from

the beginning of school life at the age of 6 plus upto the age of 22 plus, at which pupils leave colleges as graduates in Arts, Science, Agriculture and Engineering.

(a) A glance through the figures in the table would show that nearly $\frac{1}{8}$ th of the total number of pupils leaving lower primary schools, follow up the study in the upper primary schools, and nearly $\frac{1}{6}$ th of them join secondary schools. Thus we find that nearly 30% of the total number of pupils are able to take advantage of further education after leaving the lower primary school and that 70% of the pupils do not continue their studies further than the lower primary stage for lack of facilities. The figures for all India are 23 and 77 per cent. respectively, as will be seen from the preceding paragraph.

(b) The proportion of boys to girls in the lower primary stage is 2.3 to 1 and the proportion of boys to the total number of pupils is 1 to 1.44.

(c) The proportion of boys to girls in the upper primary stage is 3.5 to 1 and the proportion of boys to the total number of pupils is 1 to 1.28 for the year 1944-45. The corresponding figures for the year 1945-46 were 3.4 to 1 and 1 to 1.05.

(d) The proportion of boys to girls in secondary schools excluding European schools, is 3.6 to 1 for the year 1944-45 and 3.66 to 1 for the year 1945-46. The proportion of boys to the total number of pupils is 1 to 1.28 for 1944-45 and 1 to 1.14 for 1945-46.

4.7. It is evident that with a large number of pupils, their education until recently stopped at the lower primary stage and for another 12 per cent. at the upper primary stage, leaving a small percentage of nearly 18 for higher studies. The Government of Bombay have decided to introduce compulsory primary education in the course of the next ten years within the whole of the Province so that all children in the age group 5-11 would be literate. The total number of children of school going age in this Province according to latest statistics will be about 32 lakhs, of which about 16 lakhs are already in schools and the other 16 lakhs would be attending schools under the Compulsory Education Act. With immediate effect a little over 1,50,000 children between the ages of 7 and 8 have been brought into schools under Government's scheme of compulsory primary education, which has been in operation in 14 out of 20 districts of this Province. Taking an average of 30 pupils per teacher, this would involve the recruitment of nearly 5000 teachers of which nearly 2000 have already been recruited and the rest, it is understood, would be selected in due course. In addition about 160 special officers have been appointed to enforce the attendance of children in primary schools with a view to giving effect to the programme of compulsory education. With the whole scheme coming into operation during a period of nearly five years from now, the total number of additional teachers required would be

approximately 47,000 who will have to be found from the better educated classes of population. Government is at present spending about two crores of rupees on primary education. With the application of compulsion throughout the Province (excluding the merged States) and taking into account the increase in pay and dearness allowance the total expenditure on primary education is calculated to be over 8½ crores of rupees per year.

4.8. Government have also converted some of the primary schools into Basic schools in some compact areas. The experiment was started with the introduction of basic education in standards I and II in 1939-40. The scheme of basic education contemplates activity-centred teaching co-related to the environment of the child. The subjects are to be so treated that they have direct bearing on actual situations in life and so, it is stated there is a complete elasticity in the order of topics in each subject and also in the time-table. Originally the time devoted to craft was 3 hours and 20 minutes which by now has gradually been reduced to two periods of 40 minutes each every day. Originally it was contemplated that the children's produce would pay for the full or part of the teacher's salary but this idea has now been given up at least for the time being.

4.9. There is a certain amount of confusion as regards the term 'Basic Education'. In the Wardha system of Basic education, for the age group 7 to 14 education centres round a craft; and according to the Central Advisory Board's Plan of National Education, the term 'basic' is used in the sense of primary education for the age group 6 to 14 consisting of lower basic from 6-11 and higher basic from 11-14. Some of the principles of the Basic Education as accepted by the Central Advisory Board and which are pertinent to the question of providing post-primary or post basic education may be stated here :

(1) 'Basic' education should comprise a course of eight years from the age of six to fourteen years and that this course while preserving its essential unity should consist of two stages—the first stage, the 'junior' stage, covering a period of five years and the second stage, 'senior', three years.

(2) The transfer of children from the 'basic' school to other forms of post-primary education should be allowed after the 5th grade, *i.e.* at the conclusion of the 'junior basic' stage.

(3) The various types of post-primary school (other than the 'senior basic' school) to which suitable children may be transferred at the end of the 'junior basic' stage should provide a variety of courses extending over a period of at least five years after the age of eleven. These courses, while preserving an essentially cultural character, should be designed to prepare pupils for entry to industrial and commercial occupations as well as to Universities.

(4) Special arrangements should be made in these schools for assimilating pupils who decide to continue their education after completing the full course in the 'basic' school, *i.e.* after reaching the 8th class.

We have dealt with the above questions as our terms of reference require us to examine and make recommendations on the increasing requirements of industrial and technical education consequent on the expansion of primary education.

4.10. It will be seen from the above that pupils, on leaving the primary school will enter the upper primary or the middle school (the senior basic stage) at the age of 11 plus. There is some difference of opinion among educationists regarding the desirability or otherwise of directing pupils at this stage into vocational schools instead of continuing their education in a general way. The Central Advisory Board's report advocates direction of 20 per cent. selected students at the age of 11 to high schools. This problem is now complicated by the question as to the stage where English should be introduced for those who wish to go in for higher education later. Some people advocate that English must be taught at least for six years in the schools for persons who would later go in for higher education and others are of opinion that four years of the high school stage are quite enough for the mastery of English to the extent to which it is required at the University stage. We are not concerned with the transfer of students to the high schools, but we are of opinion that no attempt should be made to direct a child to a vocational type of school until he has completed the full course of general education upto the age 13 plus or 14. Education at this stage should be general education coupled with 'purposeful activities' as envisaged in the central Advisory Board's report and with no attempt at direct vocational training. In this context it would be interesting to note the findings of the committee of the Association of Technical Institutes and Association of principals of Technical Institutions in England which has come to the conclusion that for transfer to appropriate types of schools selection of students could be adequately made at about 13 years of age. With the tests and technique so far developed and employed in England, the above committee was not persuaded that it could be done earlier.* In our plan, we have shown the division of middle and upper primary school only as an indication that provision for this second stage of education could be made either in the lower forms of the high schools or the upper forms of the primary schools according to convenience. As eighty per cent. of the pupils are expected on completion of this education to go in for occupations of various types, the content of education should be considered as a complete unity, capable of fulfilling within its sphere the three main aims of education stated in para. 2 above.

4.11. The Central Advisory Board has insisted upon this essential unity. Their report states that the whole basic course of eight years should be considered as a unit. "The main reason for the division of the basic course in two stages, is that at about the age of 11 or 12, with the onset of adolescence, certain mental and physical changes occur in the boys and girls which necessitate a corresponding adjustment both

*Testing for the secondary technical school-Report by joint Committee of A. T. I. and A. P. T. I. England.—1945.

in the content of the curriculum and the methods of instruction. Hence the need arises for treating the instruction given before and after this psychological break as forming two well defined stages each with its own scope, aims and technique though inspired by the same fundamental aim." (*vide* Central Advisory Board's Report, p. 7).

4.12. Basic (Primary and Middle) education as envisaged by the Central Advisory Board embodies many of the educational ideas contained in the Wardha scheme though it differs from it in certain important particulars. The main principle of learning through activity has been endorsed by many educationists all over the world. At the lower stages this activity would take many forms leading gradually upto a basic craft suited to local conditions. As far as possible the whole of the curriculum would harmonise with this general conception. The three "R's" by themselves are no longer to be regarded as an adequate equipment for a citizen. The Central Advisory Board were, however, unable to endorse the view that education at any stage and particularly in the lower stages could or should be expected to pay for itself through the sale of articles produced by the pupils. The most that could be expected in this respect was that sales should ordinarily cover the cost of the additional materials and equipment required for practical work. The general feeling also was that crafts should be selected on the basis of their educational possibilities and not so much on economic considerations.

4.13. We attach very great importance to the introduction of hand-work in the primary and the middle stage of education as envisaged in the Central Advisory Board's Plan for, (a) the intrinsic merit of hand-work; (b) creating an atmosphere in the school by which the wastage in school will to a very great extent be eliminated; (c) developing the full and well integrated personality of the pupils; and (d) the discovery of the aptitudes of the pupils during the middle school stage.

4.14. One of the most obvious defects of the present system of education in India is that when a child has completed the primary course he has no alternative before him except to join a middle school or to bring his education to an end. The ordinary type of middle school education under the existing system offers him nothing beyond mere book learning with perhaps a little drawing. Experience has shown that those who undergo such instruction are almost irresistibly drawn into sedentary occupations and become unfit for jobs of a more active nature. In order to attract and retain a larger number of pupils in the middle schools (the middle stage of basic education) we recommend that a variety of optional subjects involving manual work and skill should be introduced in all middle schools as a part of general education.

ACTIVITY CENTRES FOR HIGH SCHOOL PUPILS.

4.15. The natural process of learning proceeds from the known to the unknown, from the concrete to the abstract and from the familiar

environment of the child to the unexplored fields of knowledge. It is generally acknowledged that engaging the child in an interesting activity helps to entice him to explore unknown fields. Headmasters and associations connected with education and individuals and bodies connected with industry and business agree with us that this principle should be extended from the primary and middle schools where it is now intended to be applied to the higher standards of the high school. It was the considered opinion of many teachers that teaching pupils to do things in an orderly and methodical way would produce good results from an educational point of view. We recommend that craft education should be extended to the high school stage as it is done in some other countries and to a small extent in this country. From our visit to two schools where craft is taught to high school boys, we are convinced that it has shown very good results. In view of the fact that it may not be possible for individual school managements to provide their own workshop and equipment and as it will not be possible for Government to give adequate grants to all schools separately, we consider it desirable that Government should establish at important towns *Activity Centres* for the benefit of high school boys in the locality. Such Centres should be established in places where there are about half a dozen schools in the vicinity of the proposed centre. We suggest that a variety of activities should be provided at these Centres. The pupils from such schools should be given instruction in the activity centres for about two continuous periods twice a week. These centres may be called "Arts & Industries Centres." The capital and recurring cost of different units in such a Centre and data from which cost of further expansion can be computed are given in Appendix F.

4.16. In our discussion with the headmasters of the various schools in the towns we visited, we found that they were in full agreement with us regarding the very great educational value of craft training and were completely in favour of such Centres being established for the benefit of high school pupils. We recommend that such Centres should be established in the first instance in the places recommended by us in Table No. 12—Chapter--V, and should be made available for pupils of the local high schools according to a pre-arranged plan.

4.17. In England the teaching of handicrafts in the modern schools has been raised to a high level of dignity, both because of the importance of handicrafts as a subject in the curriculum and because of its direct and almost inestimable bearing on other subjects and on the general tone of the school itself. The craft room of the modern school fulfills a wide function in that, it influences the school as a whole and is definitely alive to its general, aesthetic and cultural development. The success of the introduction of handicraft in the school curriculum would naturally depend upon the ability of the craft teacher and his resourcefulness in addition to his knowledge and technical skill. In the brief report on the progress of basic education in the Province of Bombay from November 1938 to April 1945 it is stated that the slow

progress made in this field was mainly due to lack of suitably trained teachers. This would perhaps apply with greater force when teachers are to be found for the teaching of craftwork at the higher stage. If there is one thing which the craft teacher would recognise and fully appreciate, it is the freedom for experiment and pioneer work. This should be encouraged and developed so long as it is educationally sound and does not leave the pupils educationally impoverished. This does not mean that the training should not be on strict and orderly lines.

AIMS AND PURPOSES.

4.18. The chief aims of handicrafts teaching at the high school level should be the development of the pupil's mental powers of initiative, self-reliance, sense of order, neatness and accuracy, development of aesthetic sense and will to persevere. The handicrafts training should have thus as much cultural value as any of the other subjects included in the academic high school curriculum. The teaching of handicrafts would in our opinion help to bridge the gap between book-learning and practical life, making the pupil's more or less abstract education more real and concrete to him. Subjects like arithmetic and geometry become more real after workshop training. The pupil's reasoning faculties are developed even though his practical achievement in a handicraft room may be moderate, although every effort should be made to get good practical results. "There is no surer test of the mental ability to visualise and to give evidence of clear and accurate conception than by expressing through the building up of a drawing of an object from a written description of its size, shape and position. Consequently this ability should be fostered and developed by this means. In addition to the value of such exercises from educational aspect, it has a practical application in life, as is the everyday experience of such people as engineers and contractors."*

4.19. We would like to emphasise that we are recommending the introduction of handicrafts at the high school level mainly with a view to stimulating the interest of the pupil in his studies, as such training stands for efficiency in work and thoroughness in production. In woodwork for example the planning must be good, the joints should be accurately made and properly set. Careless, slipshod work is not educationally sound. It not only throws away good material but it spoils the pupil by giving him bad education, making him inefficient by not persuading him to put in his best effort in the work. There was a unanimous evidence that craft work in our basic school did not tire out children. In our discussions, the headmasters and teachers in the High Schools have assured us that the additional hours we have suggested *will not* be a burden on the pupils. We expect a rich return from the expenditure incurred on such Centres, in an educational sense, since it will ensure the full development of the students. Secondly, although

*Handicraft in Senior Schools, by W. B. White and T. Watson, published by University of London Press, Page—3.

we do not expect these Centres to be self sufficient, a good many articles turned out in the craft section of such a school will have a cash value. In fact a good deal of the equipment which the schools require for their own use in the class-room and in the laboratories should be made in the craftrooms either by individual pupils or by groups. The making of an article which is appreciated and is to be used for a definite purpose through the application of specific craft, demanding from the students resourcefulness, ingenuity and perseverance constitutes really valuable craftwork practice in schools.

4.20. The principle of providing a satisfying activity with a view to developing the latent faculties of the pupil should not, in our opinion, be confined to craft work or manual work alone. Children and adolescents manifest their abilities for academic, technical, art or music studies which are not mutually exclusive. On the academic side a division may be possible between pupils who show literary or scientific abilities which again may not be mutually exclusive. In technical ability a distinction should be made between those who show marked practical ability along with ability in academic studies and others who have a marked practical ability but where the academic ability is not high. The latter would go in for training as craftsmen. It should be obvious from the above that at 13 plus or 14 children should be sorted out according to their type and abilities and transferred to one of four types of schools: (1) Academic, (2) Vocational, (3) Arts and Music, and (4) Trade. It is also obvious that for such students, who go to the academic high schools, as they definitely possess academic ability, as well as, ability in any one or more of the above, provision should be made for the full development of their faculties. It is for this reason that we recommend that art education, which is closely allied to craft education should be encouraged in the "Art and Industries Centres". The gift in some children of a sense of the beautiful in form or colour will find an expression in such centres. The teaching of drawing and painting which some schools are unable to provide for satisfactorily would also be fostered here.

4.21. It is also necessary in our opinion to make some provision for those students who have special abilities in science for pursuing interesting experimental work in science in all its branches. The opportunities offered in the science laboratories of individual schools are too inadequate for the purpose. The Art and Industries Centres will therefore have a craft section, an art section and an experimental science section.

4.22. We would like to utter at this stage a word of caution. It is fashionable in these days to say that our education is too literary and bookish and that the remedy was the introduction of more manual work in the curriculum of the school implying thereby that all the present evils of the high school education would thereby disappear. We do not believe the solution to be so easy. The main object of education is the training of the intellect and if this is to grow to its full stature it requires to be both disciplined and nurtured. Learning does not come

easily to human beings. Dr. Zakir Hussein in his speech at the All India Conference of Education Ministers held at Poona said, "I have found young children doing spinning for hours and they wanted to do more, not wishing to go back to books. It is really the three R's that cannot be taught continuously. They tire out children. They do not want books. We force books on them when they want to do things with their own hands." Dr. Zakir Hussein very correctly described the natural inclination of the child. Very few children show a markedly keen desire to know anything which in the opinion of the elders is likely to be useful to them in their later life and learning what one does not keenly want to know is repugnant. Yet unless the intellect is trained to master what is difficult or dull it cannot engage in any intellectual pursuits in later life. Children have to learn the multiplication table by repetition day after day. They have to master all the intricacies of Sanskrit grammar and it is better that they should learn to master these things while they are young, while their habits can be formed and tastes can be moulded. It is not "because these things are interesting and can hold the intellect, but because they are not and the intellect must be trained to hold them."*

*C. E. M. Joad—About Education, page 48.

TABLE 8.

Distribution of Boys and Girls in the various Schools and Colleges of the Bombay Province.

Description.	1941—1942.			1942—1943.			1944—1945.			1945—1946.		
	Boys.	Girls.	Total.	Boys.	Girls.	Total.	Boys.	Girls.	Total.	Boys.	Girls.	Total.
No. of pupils in Lower Primary Schools ..	1010107	306446	1406553	979308	395995	1375303	965867	424083	1389950	995842	437400	1433242
No. of pupils in Upper Primary Schools ..	127769	30298	158067	128496	32512	161008	135854	38391	174245	135209	39787	174996
No. of pupils in Secondary Schools..	140402	43299	102701	141725	44708	186433	179594	52595	232189	205042	58472	263514
<i>Other Schools.</i>												
Art Schools ..	626	100	726	469	95	564	642	117	759	720	126	846
Medical Schools ..	772	91	863	724	108	832	754	130	884	783	153	936
Commercial Schools ..	1453	151	1604	1559	206	1765	1940	176	2125	2956	283	3239
Agricultural Schools ..	122	—	122	139	—	139	189	—	189	183	—	183
Engineering Schools ..	275	—	275	275	—	275	331	—	331	363	—	363
Technical and Industrial Schools ..	2953	2004	4957	2643	1864	4507	3286	2774	6060	3872	3813	7685
TOTAL ..	6201	2346	8547	5809	2273	8082	7151	3197	10348	8877	4375	13252
Arts and Science Colleges ..	12304	2727	15031	10372	2618	12990	16107	3870	19977	16771	4118	20889
Engineering Colleges..	314	1	315	312	—	312	338	1	339	428	1	429
Agricultural Colleges.	234	—	234	220	—	220	305	2	307	437	2	439

CHAPTER V.

TECHNICAL AND INDUSTRIAL EDUCATION AT THE SECONDARY STAGE.

5.1. A distinction formerly made between the educational value of academic and technical education is fortunately slowly disappearing, but there are still some who are inclined to put academic education on a higher plane than technical education. General and vocational education ought not to be regarded as essentially different branches of education, but rather as the earlier and later stages of a continuous process fostered with the object of helping the adolescent to mature his intellectual, practical and emotional faculties so as to develop him into a useful citizen of the country. To quote Lord Eustace Percy, "The true function of education is a creative one—to create new forms of skill and by so doing to confer a higher social status upon occupations which do not at present possess it, or as is the case in some crafts, have lost or are tending to lose it. By fulfilling that function education can, at one and the same time, enlarge human capacities and change the whole texture of human society. Educational reformers have too often contended themselves in the past with what is really a servile view of education making our schools the slaves of existing social standards instead of the creators of new ones and demanding exclusively a development of those parts of our educational system which can admit men to the coveted social status at present belonging to the professions and the middle and higher walks of commerce."* It is our view that while making provision for technical education, due care should be taken to avoid the past mistakes implicit in the above remarks and for this reason technical education should be based on a broad foundation of general education and at every stage of technical education due provision should be made for the cultural development of the student.

5.2. Any plan for vocational education should make provision for two types of training: (1) pre-employment training or trade preparatory training and (2) post-employment training or trade extension training. Pre-employment training is mostly full time training in technical institutions. The courses of instructions in such cases extend over a definite period to enable pupils to receive whole day or part-time train-

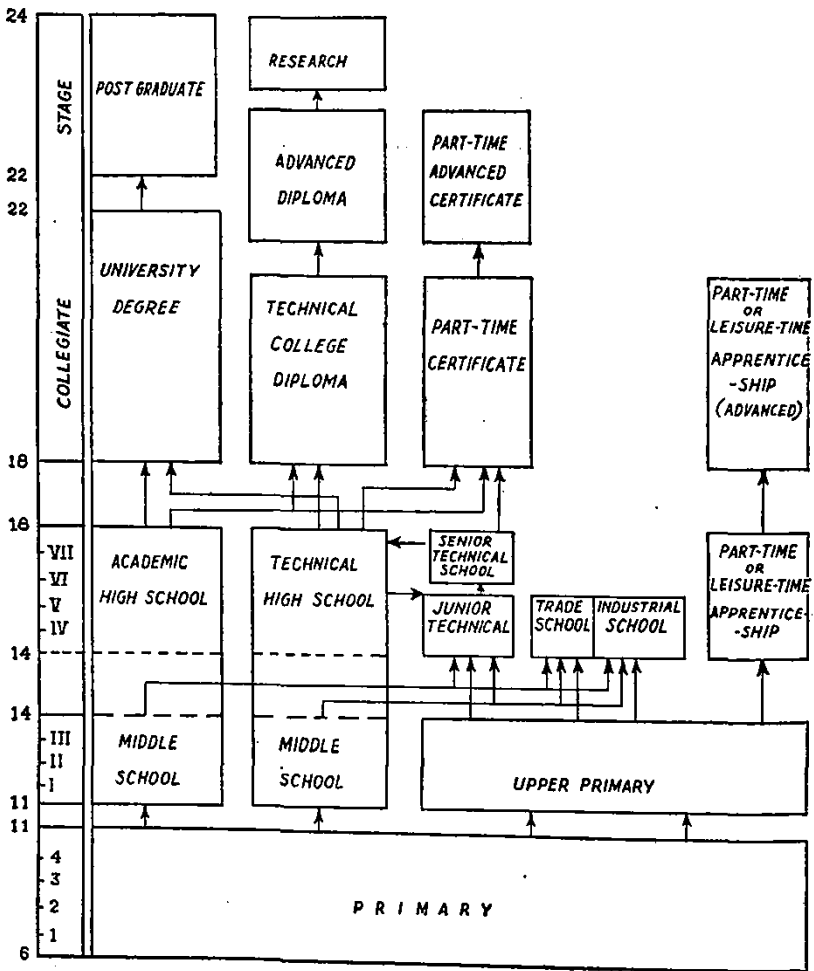
*Page 61, Education at the Cross Roads—Lord Eustace Percy.

ing before they enter wage-earning posts. Post-employment training on the other hand comprises mainly part-time instructions or training for regular workers in the industry, trade or business. Such instruction is generally given to industrial apprentices and workers in special schools or in the regular technical institutions as an additional activity. Although the courses of instruction to such students would extend over a definite period, instruction is never whole-time as in the case of pre-employment training. Part-time instruction is given either during a part of the working time or during a part of the leisure time of the pupils. Such education is intended mainly for persons actually engaged in wage-earning jobs. Both forms of education may be elementary or advanced depending upon the calibre and capacity of the pupils or in other words upon their standard of attainment. Likewise in both, the degree of specialisation in any subject or subjects may be small or great depending particularly upon the precise vocational aim of the pupils and upon the type of instruction. A very important thing to be borne in mind while planning vocational education is that the plan should not contain water light compartments but that it should be sufficiently flexible and elastic so as to afford openings for deserving and ambitious scholars at every stage.

5.3. The present picture of technical and industrial education below the collegiate grade can be visualised from Tables Nos. 9 to 12 at the end of this Chapter. It will be seen from Table No. 10 that the number of technical schools in the Bombay Province has grown from 29 in 1921 to 90 in 1943 and the students attending such institutions have increased from 1315 to 6001. The figures for 1947 as seen from Table No. 11 are 94 and 6391 respectively. It will also be seen from Table No. 11 that out of a total of 31, 467 students attending engineering and technical schools in India in 1947, 6391 were from Bombay *i.e.* of the total number of students attending engineering schools 23 per cent. were from this province. This is an index both of the industrial progress and the facilities provided for technical education in the province. In the various institutions under the control of the Board of Technical and Industrial Training, 43 different courses are offered ranging from ladies' tailoring to higher courses in radio communication. The classification for the standard of admission shows that it varies from the completion of the primary stage to passing the Inter Science Examination. The following table shows the number of courses available at different stages. Table No. 9—(a)].

Admission standard requiring completion of		No. of Courses Available.	
IV	Standard, primary ...	...	18
V	Standard, primary ...	...	2
	Primary School Certificate or		
III	Standard English ...	...	3
IV	Standard Secondary ...	...	2
V	Standard, Secondary ...	...	1
VI	Standard, Secondary ...	...	6
	S. S. C. E. ...	...	10
	Inter Science ...	...	1
Total...			43

5.4. The growth of these courses appears to have been somewhat fortuitous and their proper co-relation with industry neglected. Recognition by the Board of many institutions in the province has been probably accorded with a view to encouraging the growth of technical education and in the hope that the institutions would gradually develop until they reach a stage when standardisation of courses and their co-ordination with industry could be throughout conveniently adopted. The Board of Technical and Industrial Training had appointed a sub-committee to go into the question of standardisation of the courses and the recommendations of the sub-committee were accepted by the Board. On examining the various courses of the Board however we found that no standardisation has been effected and with a view to making recommendations regarding the fitting in of the present courses with the general plan of technical education we have in view, we appointed a sub-committee consisting of Mr. R. U. Patel, Chairman, Mr. S. S. Desnavi, Mr. P. E. Chichgur Superintendent, Mahomed Haji Saboo Siddik Institution, and Mr. C. E. Krishnamurti, Secretary. The recommendations of the sub-committee were considered by the main committee at its meeting held on the 9th August 1947. The recommendations, as finally approved by the committee for bringing all the courses under the Board in line with the general plan as recommended by us, are incorporated in Table No. 9 where in column 5 our suggestions regarding modifications of the courses are given along with the institutions where such courses are offered. It is not expected that the modifications that we have suggested would be brought into effect immediately and we therefore recommend that the suggestions that we have made will be borne in mind while giving effect to the general plan of technical education which we have recommended. The standards of admission to the different courses should conform with those laid down in our general plan.



G.P.E.C. FORM 1242

PLAN 1

5.5. *General plan of education.*—(a) A reference to the general plan of education (Plan-1) will show the various avenues open for obtaining education, general or vocational, from the lowest to the highest stage. A satisfactory vocational education must be based on adequate general education. As was pointed out earlier the Provincial Government has already made a beginning to give effect to the scheme of compulsory and free primary education in this province up to 11 plus. We understand that it is Government's desire to extend the scheme of compulsory and free education up to the age of 13 plus or 14. We have suggested in Chapter IV that there should be a variety of purposeful activities in the form of handicrafts intended for children of this age group.

(b) A child should not be committed to a particular career at an age and stage when his/her inclinations and aptitudes cannot be ascertained.

(c) Entrance standard to a vocational school should not be less than the Primary School Certificate or the middle school III standard. Pupils at an approximate age of 14 after completion of senior basic course (upper primary and middle school) would be fit for transfer after selection to a technical high school or to a junior technical school, a trade school, an industrial school, or would be continuing their studies in the academic type of high school referred to later on. Pupils whose education stops at this stage will be able to enter industrial establishments as apprentices. Such persons can supplement their education by further part-time or leisure time instruction.

(d) Pupils on successful completion of the junior technical school course or the industrial school course can enter the senior technical school at almost the age of 16 plus or can get transferred to technical high schools.

(e) On successful completion of the technical high school course pupils can join technical colleges for a diploma or go in for a University degree course in engineering or technology after two years in a college of science. We have indicated later that preference should be given to technical high school students for admission to technical institutes and engineering colleges.

(f) Pupils of the academic high schools on passing the S.S.C. Examination will be admitted to the courses in technical institutes or after two years in a science college would enter the University degree course in engineering or technology. Pupils passing out of senior technical school could enter industry and attend part-time school for advanced training.

(g) Provision has been made in the general plan for a three year part-time certificate course and a part-time advanced certificate course of two years duration or less for those, who, on leaving the academic high school, the technical high school and the senior and junior school, enter industry. The standard attained in the part-

time courses should be equivalent to the ordinary or higher national certificate courses in England.

(b) A number of young persons will join industry immediately after their completion of the senior basic (upper primary or middle school) school as apprentices or workers. Provision has been made in the plan for their part-time education in two stages, ordinary and advanced. The aim of these courses should be to increase the skill of the workers in their trade as well as to impart a general type of education with a view to giving the worker education for citizenship and to enable him to make a better use of his leisure time.

(i) The part of the plan not pertaining to education below the collegiate stage is self explanatory.

5.6. We now proceed to explain in detail the plan for technical education outlined above so far as it relates to the different categories of technical institutions falling within our purview.

TECHNICAL EDUCATION AT THE HIGH SCHOOL LEVEL.

5.7. The report of the Consultative Committee of the English Board of Education (The Spens Report) laid very great stress on the importance of the establishment of technical high school as quite distinct from academic grammar schools having in every respect equality of status with the grammar schools. The report of Abbott & Wood and the report of the Central Advisory Board also, very strongly recommended the establishment of such schools in this country. Technical subjects have, these reports stated, been found to be capable of providing an all round education or culture as distinct from the vocational training for many young people, not necessarily by any means less intelligent, but whose mental faculties are more actively stimulated and more fully satisfied by practical rather than by academic studies. In this sense the technical high school has a valuable contribution to make towards the introduction of a greater variety into education at its higher stages and towards satisfying the need of industry, for by providing suitable avenues of employment to a reasonable share of the best brains of the community which under the influence of the conventional high schools seek professional occupations and too often find unemployment.

5.8. In the United States of America schools of the above type are highly developed and are very popular with the American boys. In some of these schools the machinery installed is such as one would expect to find only in a manufacturing concern. These schools accommodate a very large number of pupils, and they are also utilised for the training of the adult workers.

5.9. There are at present four such technical high schools in the Bombay Province. The first high school to be converted into technical high school was the Northcote High School at Sholapur. The experiment of conversion did not first prove to be very successful as the parents

and guardians did not have any information regarding the nature and functions of the technical high school and the future prospects of pupils undergoing the course. Even though four more schools have been established subsequently, there still seems to be a considerable amount of misunderstanding and general ignorance both in the industrial and educational spheres regarding the aim and scope of these schools and their undoubted contribution to education.

5.10. We would, therefore, like to stress the real function of such schools. The technical high school does not aim at training specifically for entrance to wage-earning occupations in the trade or industrial field. The syllabuses and courses in the schools are designed not only to form a link between education and industry but at the same time to provide a form of mental training which is especially suitable to certain types of intelligence, irrespective of their future occupations. Its real purpose is thus to provide an alternative method of education for pupils who prefer technical high schools to the academic high schools, as the practical approach to learning appeals to them. Many young boys like to know how to construct, repair and use the common appliances that form part of our modern life. The syllabus therefore while having a general technical bias provides very adequate amount of humanistic studies. It will prepare pupils for entry to a University or a technical institute or a group of industries (e.g. engineering and textile) without restriction to any particular occupation within those industries. It may also be possible that a number of students leaving technical high schools may for economic or other reasons be unable to pursue University or technical institute courses or may not choose to enter industry. For such persons the training and the general education received in a technical high school may prove to be a valuable asset for the discharge of their duties as citizens or a source of profitable employment of leisure. Since a number of pupils from the technical high school will pass to technological departments of the University or to technical institutions, the technical training imparted in technical high schools may be considered as pre-engineering training. For those who get recruited to industry, it is a pre-employment training. It is expected that persons entering industry would continue their further education by part-time attendance at technical institutions and colleges. It will thus be seen that the technical high schools, when established in larger numbers with adequate equipment and properly trained staff, will evolve a type of secondary school providing an alternative method of imparting liberal education for those to whom this method of approach makes a greater appeal.

5.11. The Central Advisory Board has recommended that the transfer of pupils from the academic high school to a technical high school and *vice versa* should be made as easy as possible at any rate up to the end of class VIII in the high school course comprising classes VI to XI, (age group 11 to 17). In the technical high schools in this province bifurcation of studies begins with standard IV of the high school and

in our plan we have recommended that transfer from either type of school should be possible up to and inclusive of standard V.

5.12. In the syllabuses of study for the technical high school there are naturally a number of subjects such as languages, mathematics, science, geography which are common both to academic and technical high schools. The technical high school has in addition to these general and science subjects, technological subjects such as wood and metal work, elementary engineering, drawing etc. Although in the matter of subject titles there is a close approximation in both the types of schools we feel that in the methods of approach, treatment and interpretation of the curriculum, there should be a difference in the technical high school with opportunities for demonstrating the applications of science, both to the processes of manufacture and to the operation of the devices for manufacturing plant. In technical high schools it is possible to lay emphasis on applications of science and the desire of the pupils to know "how things work" can be more readily satisfied there.

5.13. The present syllabus of the secondary school examination for technical high school requires revision in the light of the experience gained in the last few years. It is considered to be rather heavy. It is also capable of being widened by inclusion of more technical subjects as options. We recommend that the S. S. C. E. Board be requested to go into this question.

5.14. We recommend that a number of new technical high schools should be started in this Province and Government should encourage partial or full conversion of private high schools by giving grant-in-aid for such conversion in accordance with our recommendations in that behalf. We have indicated some centres where such schools could be located (*Vide* Table No. 12).

5.15. It is necessary in our opinion to maintain a proper balance between academic and technical high schools. We recommend that technical high schools should be opened in the towns in the first instance where the number of students attending the high school classes (IV to VII) is more than two thousand. We recommend that technical high schools should also be started in industrial towns even though the number of high school students does not come up to two thousand.

5.16. We were given to understand in some quarters, during our visits to places, that the former School Leaving Certificate Examination for which pupils from technical high schools appeared did not command the same recognition as the former University Matriculation. As now there will be only one examination to be conducted by the S. S. C. E. Board providing for options, we feel confident that any such prejudice will automatically disappear. Steps have already been taken to secure for the boys taking the examination with technical subjects for entrance into science colleges and technical institutions. It is necessary in our opinion to give the students from technical high schools some credit for entrance into Engineering and Technological Colleges.

JUNIOR TECHNICAL, TRADE AND INDUSTRIAL SCHOOLS.

5.17. The requirements of the personnel of the industry for the skilled artisans, craftsmen, and junior supervisors, will be drawn from those who have completed their courses at the junior technical, trade or industrial schools, for in most cases, a two year full-time course. The chargemen and foremen would also be recruited from these persons after they have undergone a course of thorough practical training, coupled with part-time instruction in a senior institution. In view of the importance which is to be attached to craft work in the school curriculum upto the high school stage it is expected that after a course of training in a junior technical, trade or industrial school, boys will have attained a standard of skill sufficient to warrant their admission to skilled trades as apprentices or learners. Pupils from these schools are expected to enter employment at about the age of 16 in the skilled artisans category. According to the Central Advisory Board's plan, 2,00,000 of places are to be provided in these schools on the basis of a normal two year course. The report of the Central Advisory Board is rather vague about the differentiation among these three types of schools, but it is only clear that they are schools for training of skilled craftsmen. The Abbott and Wood report has given a more precise idea about the scope of work of these schools.

5.18. The Junior Technical School according to para 80 of the Abbott and Wood report aims at giving a boy such a realistic pre-apprenticeship training that when he enters a branch of industry in which machinery is made or used or indeed almost any branch, dependent on the application of science to industrial practice, he rapidly becomes a skillful and reliable workman. The junior technical school is intended for those entering highly organised industries of the manipulative kind such as certain branches of mechanical engineering, the pottery and the glass industry, textiles and mining.

5.19. Trade Schools on the other hand train their pupils specifically for entrance to a single occupation. They differ fundamentally from junior technical schools in that they are schools for apprenticeship which provide real trade experience for boys who intend to qualify as handicraftsmen. Mr. Abbott particularly advocates the setting up of trade schools in the artistic crafts.

5.20. Industrial Schools aim at preparing students to carry on small scale industry on their own account. It is interesting to note that whereas Mr. Abbott recommends passing of Matriculation or the junior technical school course as a pre-requisite for admission to the industrial school, the Board recommends the completion only of the upper primary or middle school.

5.21. As the idea of a Junior Technical school is new to this Province and also as the functions of the Junior Technical school and of Trade School do very often overlap, it is essential to define their scope. For this purpose we are giving here a brief account of Junior Technical Schools in England, where, the Spens Report states "they are doing valuable work within their own province and should be encouraged wherever they

needs and requirements of local industry provide an adequate demand.”* The growth of the junior technical schools in England is the result of a tendency to throw up experiments in post-primary education in a highly industrialised country to evolve a type of school, providing education designed to fit boys and girls to enter the various branches of industry, commerce and agriculture at the age of fifteen. The number of students attending these schools in England is stated to be over 30,000. The schools are usually run in what are known in England as Technical Colleges as a recognised part of their work. The numbers attending the junior technical school courses are in comparison to the whole school population small, the highest number being about 200 and the average number about 100. The junior technical schools in England are of two types. In the first type are included those schools which are frankly and definitely preparing their pupils for entry into a specific occupation in the industry such as, the engineering trades, the building trades, the mercantile marine, mining etc. They aim at continuing and enlarging the general education of their pupils and also at developing a substantial measure of personal skill in the manufacturing processes for which the pupils are being prepared. As a rule about 50 per cent. of the curriculum is devoted to general education and the other half to the acquirement of the skill in a particular craft. The number of school hours are however longer than the normal school hours for a secondary school so that the general educational content is more extensive than would appear on first view. The age of entrance to these schools is 13 and as a general rule the schools provide a two year course. These types of schools are mostly confined to the London area and till recently they were known as trade schools though the London County Council now describes them as the Junior Technical schools. We have recommended later the establishment of trade schools which cover the features of this type of school.

5.22. In the second type of Junior Technical School there is a more generalised technical training and industry for which the school exists is unspecified. The aim is to provide an educational foundation and background for those pupils, whose broad intention is to enter industry, on leaving school, at about the age of fifteen. “The object of these schools is to provide a wide and general education which will enable their pupils to adapt themselves to whatever conditions they may meet and upon which they can build their further education, in more specialised direction, according to the branch of industry and the form of application which they select.”** Schools of this type are considered suitable where there are a number of small industries.

5.23. It will be evident from above that there is a great difference between a deliberate preparation of a pupil for entry to one specific occupation or trade within an industry and the provision of an educational foundation for entry to an industry or a group of industries. The engineering industry which provides many occupations and trades is a very good example and many junior technical schools in England

*The Report of the Consultative Committee on Secondary Education with special reference to grammar schools and Technical High Schools, Board of Education, England, page 268.

**Spens Report, page 271.

have drawn up their curriculum with, entry into engineering, as the broad objective of their pupils.

5.24. The Junior technical schools have received in England the commendation of parents, employers and educational authorities. Their usefulness has been endorsed by Chambers of Commerce, the Committees that drew up the Hadow, Malcolm and Spens reports and other bodies. Inspectors of the Board of Education have spoken of them from time to time in most favourable terms, for they have been impressed with the keenness and interest with which the pupils tackle their work. The pupils from such schools are readily absorbed in the industry and starting from a low rung in the ladder rise gradually to higher positions by further part-time study leading to National Certificate. It is estimated that only 9 per cent. of the students entering industry remain in the ranks of craftsmen. The usefulness and success of this type of schools is well established in England.

5.25. As stated earlier both the Abbott and Wood report and the report of the Central Advisory Board, have recommended the establishment of such schools. Mr. Abbott recommends the replacement of some of the high school courses, by well planned instruction of the junior technical school type. He adds that before it is done, a survey of the needs of the local industries be made, in order to learn, how many pupils of the school they can absorb each year and to require, in the first instance, the employers in industry to undertake to recruit annually a specified number of the pupils. The Central Advisory Board have recommended that pupils for the junior technical school should be recruited from the senior basic schools, on completion of their basic course in class VIII which approximates to the completion of the upper primary or middle school stage. This age of entrance viz., 14, is lower than that recommended by Abbott & Wood Report and we agree with the view taken by the Central Advisory Board. It will be seen from the general plan, that we are recommending a two year course for the junior technical school after the completion of the upper primary or middle school course. The Central Advisory Board's plan makes provision for 200,000 places in junior technical, trade or industrial schools on the assumption that 4 per cent. of the boys leaving senior basic schools would seek entry into such schools. The number of places in the Bombay Province could be arrived at by two alternative methods. The population of Bombay was roughly 6 per cent. of the whole of India when the Board's plan was formulated. On that basis the figure for Bombay will come to 12,000. On the other hand it is estimated that under the Compulsory Education Act, the number of children attending the primary schools in the Province would be 30,00,000. (This does not take into account the population of the merged States.). According to the findings of the Central Advisory Board, the wastage in the middle school stage is such that only about 25 per cent. of the students who enter the post-primary stage of education complete their education to the middle school stage. With 30,00,000 of pupils attending the primary stage of education, there

will be 7,50,000 of leavers from such schools and on the above basis there will be about 1,87,500 pupils who will have completed their middle school course and 4 per cent. of these, the male students, i.e. 6,000, are likely to seek admission to the junior technical, trade or industrial school. It is however anticipated that consequent on the compulsion of primary education the wastage in post primary stage will not be as high as it is to-day and after the Act has been in operation for a few years it may be safely assumed that twice the number of students will complete their middle school education and the Central Advisory Board's figure of 12,000 places may be assumed as fairly correct, for making the necessary provision for places in Junior Technical, Trade, and Industrial Schools. It is assumed that the present ratio of boys and girls 3·5 : 1 would continue for some time.

5.26. The curriculum of the Junior Technical Schools must be arranged to follow the curriculum of the senior basic or the middle school and lead up to the part-time trade or senior courses some of which are already in existence and others which might be instituted as a result of our recommendations. A careful balance must be preserved between subjects constituting general education and technical or trade instruction that may be necessary. There is no reason why a carefully designed syllabus should not provide an education which, while imparting the necessary vocational instruction, is also truly cultural. "There is no subject in the curriculum of any type of vocational school for any age of boy or girl that might not be liberalised while at the same time furnishing the highest degree of vocational effectiveness."* Certainly in any subject worthy of inclusion in a school curriculum, it should be possible to lead the pupil to look beyond the immediate processes in which he is engaged to a wider human and social background. "The anti-thesis between a technical and a liberal education is fallacious. There can be no adequate technical education which is not liberal, and no liberal education which is not technical; that is, no education which does not impart both technical and intellectual vision—in simpler language—education should turn out the pupils with something he knows well and something he can do well. This intimate union of practice and theory aids both. The intellect does not work best in a vacuum. The stimulation of creative impulse requires, especially in the case of the child, the quick transition to practice. Geometry and mechanics, followed by workshop practice gain that reality without which mathematics is verbiage."** We give below in a tabular form the curriculum of different types of schools in England.

*Dr. John L. Tildsley of New York Education Board, p. 269 of Spens Report.

**Prof. A. N. Whitehead, "The Aims of Education and Other Essays," (1929), page 74.

CURRICULA OF DIFFERENT SCHOOLS COMPARED.

Curriculum.	Number of Hours per Week.				
	Secondary School.		Technical Secondary School.	Junior Technical School.	Trade School.
	Literary.	Scientific.			
General Subjects ...	8	7	9	6	5
Foreign Language ...	7	4	4	0	0
Mathematics ...	4	4	4	6	3
Science ...	2	6	3	6	2
Practical Subjects ...	3	3	5	10	13
Physical Training ...	2	2	5	2	2
Total Hours per Week.	26	26	30	30	30

It will be seen from the above table that the amount of time given to general subjects is about the same in all types of schools. By the elimination of Foreign Language in the junior technical and trade school more time is made available either for mathematics in the junior technical school or for practical subjects in both. The amount of time devoted to practical subjects, is the greatest in the trade school. The junior technical school includes a larger proportion of science and mathematics which enables the best students to qualify for the grade of junior engineering apprentice and also to pursue higher studies by part-time education.

5.27. Having in mind all the factors relating to the needs of the students of the junior technical school we would recommend the following approximate allocation of time to the various subjects during the two years of the course.

<i>Subjects.</i>	Approximate No. of Hours of instruction per Week.
1. Mathematics ...	5
2. Science ...	4
3. Mother Tongue ...	5
4. English ...	4
5. Technical Drawing ...	4
6. Workshop Practice ...	5
7. Technical Subjects. ...	3
8. Physical Training ...	2
Total Hours per Week	32

The whole of the instruction should be given in the mother tongue with the retention of the English technical terms wherever necessary. English

has been included as a subject of study for the benefit of those pupils who would continue their studies after leaving the junior technical school and also benefit by being able to read engineering and technical books written in English.

5.28. As in the case of the technical high school opportunity should be provided for bright pupils from the junior technical school for transfer to the technical high school or to a senior technical school at the end of their course. Messrs. Abbott and Wood have recommended the provision of a third year course for pupils who would like to continue their education or would like to get specialised training for a particular branch of industry. In our opinion provision of a third year course may be deferred until the junior technical school has been established on a sound footing.

5.29. The success of the junior technical school will depend very largely upon its flexibility and the co-operation it will receive from the industry in providing employment for the school leavers. The Principal of the school must keep in close touch with the members of the various firms in his neighbourhood who are potential employers of his pupils and by learning both the nature and the volume of their requirements in the way of recruits. Experience has shown that by establishing right kind of relationship with the prospective employers, the Principal is able to place his pupils in satisfactory employment.

5.30. Messrs. Abbott and Wood have pointed out that the cost of this type of education in India is unduly high. It varies in Punjab from Rs. 165 to Rs. 625 per pupil and in the United Provinces from Rs. 155 to Rs. 869. The average pre-war cost in the English Junior Technical School for 5600 pupils in 42 different schools amounted to £.23 - 2s. (Rs. 308). The receipt from fees was less than 10 %. The Central Advisory Board have estimated the cost at Rs. 150/- per place per annum. Our estimates of expenditure per Capita for different types of schools are given in chapter XIII.

5.31. As the Junior Technical School is new to this Province we recommend that in the initial stages the schools should form a part of the technical high schools in order that the cost of their establishment both capital and recurring could be minimised.

5.32. It is very much desirable that a student who has completed satisfactorily a full course of training should have a certificate to show the value of his attainment. There is a considerable amount of difference of opinion regarding the real value of an external examination, but it is at the same time quite clear that unless the examination is external the certificate is not likely to have a proper significance and wide recognition. The external examination has the disadvantage in that the work done by the student in the school throughout his course does not get any recognition in the final assessment. There is today a greater realisation in other countries regarding the credit that such work should receive in the final examination. We recommend that the 'Provincial Vocational Education Council' the formation of

which we are recommending later should be requested to go into this question.

SENIOR TECHNICAL SCHOOL.

5.33. There are in this Province certain institutions which are offering courses of training framed by the Board of Technical and Industrial Training which would appropriately fall in a category of what may be termed as the Senior Technical Schools. The objective of such a school is to provide vocational education to boys who have had a more prolonged general education and who intend to enter one of the non-manipulative industries such as spinning or weaving with a view to holding junior supervisory positions. The higher grade courses in spinning and weaving until recently offered at the R. C. Technical Institute with the passing of the VI standard of the high school as the minimum entrance qualification may be cited as an instance. As the object of education is to produce a person above the rank and file, it is necessary in such institutions to provide a curriculum in which science, mathematics, technical drawing, engineering and technological subjects and experience in handling machinery are included.

TABLE—9

Institutions in the Bombay Province offering the approved courses of the Board of Technical and Industrial Training, with suggested modifications.

(1946-47)

No.	Name of the Course.	Standard of Admission.	Duration of Course.	Existing Institutions under the Board of Technical and Industrial Training.	Suggested Modifications.
1	Mechanical Engineering	.. VI Secondary	.. 3 Years	.. 1. King Edward VII Technical School, Dhulia .. 2. R. C. Technical Institute, Ahmedabad. 3. F. S. Parekh Technical Institute, Surat. 4. Morvi Technical Institute, Morvi.	The duration of the existing course should be reduced to two years or the course should be modified to lead to a Diploma.
2	Automobile Engineering	.. VI Secondary	.. 3 Years	.. 1. Mahomed Haji Saboo Siddik Technical Institute, Byculla, Bombay. 2. F. S. Parekh Technical Institute, Surat. 3. S. N. Paruck Parsi Polytechnic Institute, Surat.	Do.
3	Internal Combustion Engineering	. VI Secondary	.. 3 Years	.. 1. S. N. P. Parsi Polytechnic Institute, Surat ..	Do.
4	Mechanical Apprentice	.. IV Secondary or P. S. C. E.	.. 2 Years	.. 1. School of Industry, Ratnagiri. 2. Mahomed Haji Saboo Siddik Technical Institute, Byculla, Bombay. 3. V. J. Municipal Technical School, Poona. 4. Municipal Technical School, Sholapur. 5. King Edward VII Technical School, Dhulia. 6. F. S. Parekh Technical Institute, Surat. 7. Morvi Technical Institute, Morvi.	The course should have theoretical instruction in workshop technology and workshop mathematics.
5	Automobile Apprentice	.. IV Secondary or P. S. C. E.	.. 2 Years	.. 1. F. S. Parekh Technical Institute, Surat .. 2. Mahomed Haji Saboo Siddik Technical Institute, Byculla, Bombay.	Do.

6	Junior Carpentry	..	.. IV Primary	.. 2 Years	..	1. K. E. S. Topiwalla Industrial School, Alibag. 2. I. P. Mission Industrial School, Borsad.	Trade Course
7	Agricultural Carpentry and Smithy.	..	Literate	.. 2 Years	..	1. David Sassoon Industrial School, Bombay. (Agricultural Smithy only.) 2. Yerwada Industrial School, Yerwada. (Agricultural Smithy only.) 3. Government School of Industry, Satara.	Do.
8	Carpentry "A"	..	.. V Primary	.. 3 Years	..	1. Primary Handicraft Class, Girgaum 2. R. H. Patuck Industrial School, Andheri, 3. School of Industry, Ratnagiri. 4. Barnabas Industrial School, Manmad. 5. Secretary Schools Committee, Bombay. 6. B. N. Gamadia Parsee Hunnarshala, Bombay. 7. Marine College and Seamen's Orphanage, Novha. 8. Private High School, Rajapur. 9. V. J. Municipal Technical School, Poona. 10. Government School of Industry, Satara. 11. Municipal Technical School, Sholapur. 12. Robertson School of Industry, Pandharpur. 13. King Edward VII Technical Institute, Dhulia. 14. Modern High School, Ahmednagar. 15. F. S. Parekh Technical Institute, Surat.	Do.
9	Carpentry "B"	..	.. IV Primary	.. 3 Years	..	1. Mission Workshop and Industrial School, Poona.	Do.

TABLE 9—contd.

No.	Name of the Course.	Standard of Admission.	Duration of Course.	Existing Institutions under the Board of Technical and Industrial Training.	Suggested Modifications.
10	Carpentry "C"	Literate	3 Years	<ol style="list-style-type: none"> School of Industry, Ratnagiri B. N. Gamadia Parsee Hunnar Shala, Bombay. J. N. Petit Parsee Orphanage, Bombay. David Sassoon Industrial School, Bombay. Marine College and Seamen's Orphanage, Novha. Yerawda Industrial School, Yerawda. Industrial Settlement School, Sholapur. Mission Workshop and Industrial School, Poona. Vocational Training College, Ankleshwar. Industrial Settlement School, Hubli. 	Trade Course.
11	Wood Turning and Lacquering	Literate	2 Years	<ol style="list-style-type: none"> R. H. Patuck Industrial School, Andheri 	Industrial Course.
12	Trained Maistry	Carpentry 'A' V Primary	1 Year. 3 Years.	<ol style="list-style-type: none"> School of Industry, Ratnagiri V. J. Municipal Technical School, Poona. Municipal Technical School, Sholapur. Robertson School of Industry, Pandharpur. King Edward VII Technical School, Dhulia. 	Trade Course.
13	Electrical Engineering	VI Secondary	3 Years.	<ol style="list-style-type: none"> Morvi Technical Institute, Morvi S. N. Parsee Polytechnic Institute, Surat. 	The duration of the existing course should be reduced to two years or the course should be modified to lead to a Diploma.

14	Electrical Technology	...	S. S. C. E.	...	3 years.	1. Sir Cusrow Wadia Institute, Poona	...	To be revised as in V. J. Technical Institute, or Engineering College Poona or to be split up into Electrical Engineering and Advanced Radio Communication.
15	Advanced Radio Communication	InterScience		...	2 Years	1. Abdulla Fazalbhoj Technical Institute, Bombay 2. School of Radio Physics and Electronics, Poona.	...	Collegiate or Senior Technical Institute Course.
16	Sound Recording	...	S. S. C. E. or Equivalent	...	2 Years ...	1. Abdulla Fazalbhoj Technical Institute, Bombay.	Do.	
17	Radio Servicing	...	S. S. C. E. or Equivalent	...	1 Year ...	1. Abdulla Fazalbhoj Technical Institute, Bombay. 2. Radio Electric Institute, Bombay. 3. Institute of Radio Technology, Bombay. 4. Mahomed Haji Saboo Siddik Technical Institute, Bombay. 5. Sir Cusrow Wadia Institute, Poona. 6. School of Radio Physics and Electronics, Poona. 7. Radio School, Poona. 8. Radio Engineering Institute, Poona. 9. C. N. Industrial School, Ahmedabad. 10. Morvi Technical Institute, Morvi.	Senior Technical School Course. Also as trade or industrial course.	

TABLE 9--*contd.*

No.	Name of the Course.	Standard of Admission.	Duration of course	Existing Institutions under the Board of Technical & Industrial Training.	Suggested Modifications
18	Wireless Telegraphy	... S. S. C. E. or Equivalent ...	1 Year ...	1. Abdulla Fazalbhoy Technical Institute, Bombay	Senior Technical School course. Also as trade or industrial course.
19	Electricians	... Wiremen's Certificate	1 Year ...	1. Abdulla Fazalbhoy Technical Institute, Bombay 2. Radio Electric Institute, Bombay. 3. Instituto Indo-Portuguese, Bombay. 4. Mahomed Haji Saboo Siddik Technical Institute, Bombay. 5. V. J. Municipal Technical School, Poona. 6. Morvi Technical Institute, Morvi.	Trade Course. (To conform with P.W.D. Licensing Board's syllabus).
20	Wiremen's Apprentice	... Literate	... 6 months.	1. Abdulla Fazalbhoy Technical Institute, Bombay 2. Radio Electric Institute, Bombay. 3. Instituto Indo-Portuguese, Bombay. 4. Mahomed Haji Saboo Siddik Technical Institute, Bombay. 5. V. J. Municipal Technical School, Poona. 6. Municipal Technical School, Sholapur. 7. King Edward VII Technical Institute, Dhulia. 8. Mechanical and Electrical Engineering School, Pandharpur. 9. Lokmanya Mills Technical Institute, Barsi, Sholapur. 10. R. C. Technical Institute, Ahmedabad. 11. F. S. Parekh Technical Institute, Surat.	Trade Course. (To Conform with P.W.D. Licensing Board's syllabus).

12. S. N. P. Parsi Polytechnic Institute, Surat.
 13. C. N. Industrial School, Ahmedabad.
 14. Morvi Technical Institute, Morvi.

21	Electroplating and Battery Charging.	Literate	... 1 Year ...	1.	S. N. P. Parsi Polytechnic Institute, Surat.	Industrial School Course.
22	Projectionist	... S. S. C. E. or Equivalent.	6 months ...	1.	Abdulla Fazalbhoj Technical Institute, Bombay.	Trade Course.
23	H. G. Cotton Spinning	.. VI Secondary	3 years ..	1.	R. C. Technical Institute, Ahmedabad	... The duration of the existing course should be reduced to two years or the course should be modified to lead to a Diploma.
24	H. G. Cotton Weaving	.. VI Secondary	.. 3 years ..	1.	R. C. Technical Institute, Ahmedabad	... Do.
25	L. G. Cotton Spinning	.. Literate	.. 3 years ..	1.	Textile Technical School, Parel, Bombay	... Industrial School Course.
26	L. G. Cotton Weaving	.. Literate	.. 3 years ..	1.	Textile Technical School, Parel, Bombay	... Industrial School Course.
				2.	Mahomed Haji Saboo Siddik Technical Institute, Bombay.	
27	Powerloom Weaving	.. V Secondary	.. 1 year ..	1.	Government Power Weaving Instructional Institute, Sholapur.	Industrial School Course.

TABLE 9—contd.

Institutions in the Bombay Province offering the approved courses of the Board, of Technical and Industrial Training with Suggested modifications.

No.	Name of the Course.	Standard of Admission.	Duration of Course.	Existing Institutions under the Board of Technical and Industrial Training.	Suggested Modifications
28.	Handloom Weaving	IV Primary or Literate.	2 years	1. R. H. Patuck Industrial School, Andhori 2. A. R. Sonawalla Industrial School, Bordi, Thana. 3. K. E. S. Topiwalla Industrial School, Alibag 4. Marine College and Seamen's Orphanage, Novha. 5. School of Industry, Ratnagiri. 6. Municipal Technical School, Sholapur. 7. Salvation Army Boy's Industrial School, Ahmednagar. 8. King Edward VII Technical Institute, Dhulia. 9. Salvation Army Boy's Industrial School, Kaira. 10. School of Industry, Satara.	Trade Course.
29	Paints Technology	S. S. C. E. or Equivalent	2 years	1. D. E. Society's Technical Institute, Poona	Collegiate Course.
30	Advanced Leather Manufacture	S. S. C. E. or Equivalent.	2 years	1. Government Tanning Institute, Bandra	Collegiate Course.
31	Cine Photography	S. S. C. E. or Equivalent	2 years	1. Abdulla Fazalbhoy Technical Institute, Bombay.	Senior Technical School Course (also as trade course).
32	Artisans Leather Manufacture	Literate	1 year	1. Government Tanning Institute, Bandra	Industrial School Course.

33	Photography	.. S. S. C. E. or Equivalent ..	1 year ..	1. Abdulla Fazalbhoy Technical Institute, Bombay.	Senior Technical School Course. Also as Industrial School Course.
				2. Godbole's Foto-Graphics, Poona.	
34	Handmade Paper making	.. IV Primary ..	1 year ..	1. F. S. Parekh Technical Institute, Surat ...	Industrial School Course.
				2. Private High School, Rajapur.	
35	Advanced Leather Goods and Footwear Manufacture.	S. S. C. E. ..	2 years ..	1. Government Leather Working School, Bandra.	Senior Technical Institute Course.
36	Artisans Footwear Manufacture	Literate ..	2 years ..	1. Government Leather Working School, Bandra.	Industrial School Course.
37	Artisans Leather Goods Manufacture.	Literate ..	2 years ..	1. Government Leather Working School, Bandra.	Industrial School Course.
38	Typography	.. III English or P. S. C. E. ..	3 years ..	1. K. E. S. Topiwalla Industrial School, Alibag. 2. K. E. S. V. K. High School, Panvel ... 3. Maharashtra Mudran Shala, Poona.	Trade Course. Also as Industrial Course.
39	Tailoring and Cutting	.. Literate ..	1 year ..	1. New Rex Tailoring Class, Bombay ... 2. Zarapkar Tailoring and Cutting Institute, Bombay. 3. Marine College and Seamen's Orphanage, Novha. 4. Saraswatibai Godbole's Tailoring Institute, Poona. 5. Variety Tailoring and Cutting Academy, Poona. 6. Ideal Tailoring and Cutting Institute, Ahmedabad.	Industrial School Course or Trade Course.

TABLE 9—*contd.*

No.	Name of the Course.	Standard of Admission.	Duration of Course.	Existing Institutions under the Board of Technical and Industrial Training.	Suggested Modifications.
40	Ladies Tailoring ...	... Literate	2 years	<ol style="list-style-type: none"> 1. Primary Handicraft Institute, Bombay 2. Bhagini Samaj, Bombay. 3. K. E. S. Topiwala Industrial School, Alibag. 4. Mahila Kala Mandir, Bombay. 5. Gujrati Hindu Stree Mandal, Bombay. 6. Lokmanya Seva Sangh, Vile-Parle. 7. Mahila Shivan Kala Mandir, Malvan. 8. Mahila Kala Bhuvan, Bombay. 9. Kumarika and Stree Mandal, Vile-Parle. 10. Bharatiya Kala Vikas, Khar. 11. Ladies Industrial Home, Khar. 12. Gujerati Hindu Stree Mandal, Santa Cruz. 13. Stree Jain Mahila Samaj, Bombay. 14. Dawoodbhoy Fazalbhoy Muslim Women's Handicraft Institute, Bombay. 15. Young Men's Hindu Association, Bombay. 16. Mahila Kala Niketan, Bombay. 17. Saraswatibai Godbole's Tailoring Institute, Poona. 18. Mahilashram High School, Hingne, Poona. 19. Talimi Kendra Jyoti Sangh, Ahmedabad. 20. Jamnabai Saraswati Mandir, Ahmedabad. 21. Vikas Griha, Ahmedabad. 22. Kamlalaxmi Khedyata Stree Udoyoga Shala, Ahmedabad. 	... Trade Course
41	Practical Tailoring ...	... V Vernacular	3 years	<ol style="list-style-type: none"> 1. David Sassoon Industrial School, Bombay 2. Marine College and Seamen's Orphanage, Novha. 3. Secretary, School's Committee, Bombay. (Municipal Schools, Bombay.) 	... Trade Course

				<ol style="list-style-type: none"> 4. Yerwada Industrial School, Yerwada. 5. Primary Handicraft Institute, Bombay. 6. Modern High School, Ahmednagar. 7. I. P. Mission Industrial School, Borsad. 8. Certified School, Hubli.
42	Embroidery and Fancy work ... Literate	1 year		<ol style="list-style-type: none"> 1. Gujerathi Hindu Stree Mandal, Bombay ... Industrial Schools Course or Trade Course. 2. Bharatiya Kala Vikas, Khar. 3. Dawoodbhoy Fazalbhoj Muslim Women's Handicraft Institute, Bombay. 4. Mahila Kala Niketan, Bombay. 5. Mahila Kala Mandir, Bombay. 6. Saraswatibai Godbole's Tailoring Institute, Poona. 7. Talimi Kendra Jyoti Sangh, Ahmedabad. 8. Vikas Griha, Ahmedabad.
43	Dyeing and Calico Printing ... IV Primary	1 year		<ol style="list-style-type: none"> 1. Bai Avabai Framjee Potit Parsée Female Orphanage, Bandra ... Industrial School Course.

TABLE 9 (a)

Courses under the Board of Technical and Industrial Training open at various standards of education.

Stage.	Age.	Standards.	Serial Number of the Courses under the Board <i>vide</i> Table-9.
College	19+	Inter Science	15.
	18+	Inter Arts	
Secondary Stage (High School)	17+	S. S. C. E.	14, 16, 17, 18, 22, 29, 30, 31, 33, 35.
	16	VI	1, 2, 3, 13, 23, 24.
	15	V	27.
	14+	IV	4, 5.
Upper Primary or Middle School.	13	III English or P. S. C. E.	12, 19, 38.
	12	II English or 6th Primary	
	11	I English or 5th Primary	8, 41.
Primary	10+	4th Primary	6, 7, 9, 10, 11, 20, 21, 25, 26, 28, 32, 34, 36, 37, 39, 40, 42, 43.
	9	3rd Do.	
	8	2nd Do.	
	7	1st Do.	
	6		

TABLE 10.

Progress of Technical Education in India. (1921 to 1943)

Province or State.	No. of Technical Schools.				No. of Students in Technical Schools.				No. of Technical Colleges.				No. of Students in Technical Colleges.			
	1921	1935	1939	1943	1921	1935	1939	1943	1921	1935	1939	1943	1921	1935	1939	1943
Assam	9	14	17		119	552	864		*	*	*		*	*	*	
Bengal	1	141	169	210	302	7214	8417	9837	1	1	1	1	338	260	337	233
Bihar	4	48	47	53	178	1023	2713	3321	*	1	1	1	*	244	297	273
Bombay	29	83	84	90	1315	3633	7599	6001	1	1	1	1	191	377	197	494
Central Provinces	7	13	13		130	873	976		*	*	*		*	*	*	
Delhi	2	4	4		443	454	501		*	*	*		*	*	*	
Madras	40	79	86		1924	6526	7966		1	1	1		526	259	361	
N. W. F. P.	*	*	*		*	*	*		*	*	*		*	*	*	
Orissa			11	11	*	*	409	408					*	*	*	
Punjab	29	51	63	71	2478	3634	3819	3703	*	1	1	1	*	247	304	323

TABLE 10—*contd.*

Province or State.	No. of Technical Schools.				No. of Students in Technical Schools.				No. of Technical Colleges.				No. of Students in Technical Colleges.			
	1921	1935	1939	1943	1921	1935	1939	1943	1921	1935	1939	1943	1921	1935	1939	1943
	Sind *	6	9	*	*	231	521			*	1	1		*	219	188
U. P.	29	90	93		1281	3926	4008		1	1	1		290	651	739	
Hyderabad	1		3		91		359									
Kashmir	1		8	8	80		359	33								
Travancore		12	17	11		1155	1899	1101					2			310
Mysore		13	15	13		1681	1417	1344		1	1	1		209	222	366
Baroda	2	3	3	3	88	594	1107									

- Note:—1. Asterisk indicates absence of Institution.
 2. Vacant square indicates that information is not available.

Reproduced by courtesy of the Central Bureau of Education, India.

TABLE 11.

Number of Vocational Institutions in India and Number of Students on Roll. 1947

Name of Province.	Commercial Schools.		Commercial Colleges.		Engineering and Technical Schools.		Engineering Colleges.			
	Number	Enrolment	Number	Enrolment	Number	Enrolment	Number	Enrolment		
Assam			4	192	18	642				
Bengal	9	3,443	14	1,633	193	5,532		
Bihar					14	635	52	3,224		
Bombay	4	2,860	30	2,125	94	6,391		
C. P. and Berar			1	397			13	859		
Madras					235	8,410	83	5,823		
N. W. F. P.										
Orissa					2	4	9	313		
Punjab	1	187	2	247	68	4,104		
Sind					3	327	8	670		
U. P.					1	15	89	3,490		
Ajmer-Merwara							1	44		
Baluchistan										
Bangalore							2	57		
Coorg										
Delhi							3	318		
Administered Areas in Indian States.										
Total for British India	15	10,094	305	13,027	633	31,467	7	2,769

Reproduced from "TEXTILE AGE" 1947. Table III, Page 99. (Indian Year Book—1947).

TABLE 12.

*Locations of Institutions & Courses of Study suitable at Each
as recommended by the Industrial & Technical Secondary
Education Committee.*

Districts.	Description of Institutions.	Suggested Courses of Study.
<i>Bombay City.</i>	<i>Fort Area.</i>	
	School of Printing Technology. Arts and Industries Centre.	Printing and Allied Trades. Handicrafts for Middle School and High School Pupils. Experimental Science.
	<i>Kalbadevi and Girgaum Area.</i>	
	Industrial School for Girls.	Tailoring, Knitting, Embroidery and Homecrafts.
	Arts and Industries Centre at Kalbadevi and also at Girgaum.	Handicrafts for Middle School and High School pupils. Experimental Science.
	<i>Pydhonie Area.</i>	
	Arts and Industries Centre.	Handicrafts for Middle School and High School pupils. Experimental Science.
	<i>Lalbaug-Parel Area.</i>	
	Textile and Engineering Trade School (Textile Technical School Parel, to be encouraged with grant-in-aid to offer such courses).	Trade Courses for textile mill- workers and general engineering for workshop personnel.
	Arts and Industries Centre, Parel.	Handicrafts for Middle School and High School pupils. Experimental Science.
	<i>North Bombay: Dadar and Mahim.</i>	
	Industrial School for Girls, Dadar.	Tailoring, Knitting, Embroidery and Homecrafts.
	Arts and Industries Centre, Dadar.	Handicrafts for Middle School and High School pupils. Experimental Science.
<i>Thann.</i>	Industrial and Trade School, Bussein.	Pottery and Clay Work.
	Industrial and Trade School, Bhiwandi.	Weaving and General Engineer- ing.
	Industrial and Trade School, Bordi.	Fruit Canning, Agricultural Products.
<i>Nasik.</i>	Industrial and Trade School, Nasik.	Weaving, General Engineering, and Metal Work.
	Industrial and Trade School, Malegaon.	Weaving, General Engineering, Dyeing, Bleaching, Printing, etc.

Districts.	Description of Institutions.	Suggested Courses of Study.
<i>East Khandesh.</i>	Arts and Industries Centre, Jalgaon.	Handicrafts for Middle School and High School pupils.
	Industrial and Trade School, Bhusawal.	Engineering Apprentice Courses.
<i>West Khandesh.</i>	Technical High School, Dhulia (K.E.Ed.M. Technical School should also be supplemented with equipment for an Arts and Industries Centre).	Garud High School and other High Schools in Dhulia to offer technical high school courses in collaboration with K.E.Ed.M. Technical School, Dhulia.
<i>Kolaba.</i>	Industrial and Trade School, Panvel.	Auto and General Engineering. Apprentice Courses.
<i>Ratnagiri.</i>	Technical High School, Ratnagiri (To serve also as Arts and Industries Centre).	Technical High School Courses, Handicrafts for Middle School and High School Pupils.
	Industrial School for Girls at Ratnagiri.	Tailoring, Knitting, Embroidery and Homecrafts.
<i>Vijaydurg.</i>	Junior Naval School, Vijaydurg.	Naval School Courses for Ratings.
<i>Poona.</i>	Industrial Training Workshop, Poona. (Adult Education). or Municipal Technical School, Poona, may be converted into an Industrial School for general engineering school courses.	General Engineering, Ordnance Factories, Motor body and Coach Building and Repair, Printing, Bricklaying, Decorating and Civil Trained Maistries.
	Two Arts and Industrial Centres. One in the City and the other in the Cantonment Area.	Handicrafts for Middle School and High School Pupils. Experimental Science.
	Technical High School, Poona.	Technical High School Courses.
	Industrial School for Girls Poona. (Two such schools for girls, one in the City and the other in the Cantonment Area).	Tailoring, Knitting, Embroidery, Homecrafts.
	School of Glass Technology, Talegaon.	The school contemplated by the Paisa Fund Glass Works, to be suitably aided by Government.
<i>Ahmednagar.</i>	Industrial and Trade School at Ahmednagar.	Weaving and General Engineering.
	Industrial and Trade School at Belapur.	Fruit Canning, Confectionery and General Engineering. Apprentice Courses.
<i>Sholapur.</i>	Industrial Training Workshop at Sholapur. (Adult Education).	Weaving and General Engineering for Mill and Factory workers.
<i>Satara.</i>	Arts and Industrial Centre, Satara.	Handicrafts for Middle School and High School Pupils.
	Industrial and Trade School, Karad.	General Engineering.

Districts.	Description of Institutions.	Suggested Courses of Study.
<i>Ahmedabad.</i>	Two Technical High Schools at Ahmedabad. Trade School for the Textile and Engineering Industry at Ahmedabad. Arts and Industries Centre, Ahmedabad (These should be located in the premises of the technical high schools). Industrial School for Girls at Ahmedabad. (May be started in the Government Girls High School).	General Engineering and Textile subjects. Training of operatives for the textile and Engineering industries. Handicrafts for Middle School and High School Pupils. Tailoring, Knitting, Embroidery and Homecrafts.
<i>Panch Mahals.</i>	Industrial and Trade School, Dohad.	General Engineering.
<i>Broach.</i>	Industrial and Trade School, Broach.	Textile and General Engineering.
<i>Kaira.</i>	Industrial and Trade School, Anand. Industrial School for Girls at Nadiad. Industrial and Trade School, Nadiad. (The Arts and Industries Centre may also be started in the above school).	Milk Products, Casein Products and General Engineering. Tailoring, Knitting, Embroidery and Homecrafts. Handicrafts for Middle School and High School Pupils.
<i>Surat.</i>	Arts and Industries Centre, Surat. (To be a part of the technical high school). Industrial Training Workshop at Surat. (Adult Education).	Handicrafts for Middle School and High School Pupils. Weaving, General Engineering, Printing, Carpentry, Cabinet-making and Confectionery. (Special stress should be laid in the school for training the different types of workers required in the Jari Thread Industry). Diploma Courses.
<i>Bijapur.</i>	Technical Institute, Surat. (Referred to us specially). Arts and Industries Centre, Bijapur. (To be a part of the Industrial School).	Handicrafts for Middle School and High School Pupils.
<i>Belgaum.</i>	Industrial and Trade Schools at Bagalkot and Guledgad. Technical High School, Belgaum. (Also a trade school in the same premises. Arts and Industries Centre in the same school).	General Engineering, Weaving and Stone-dressing. Carpentry and Cabinet-making can be introduced as trade and industrial subjects. Special emphasis on glass and ceramics.
<i>Kanara.</i>	Industrial School for Girls at Belgaum. Technical High School and Industrial School, Karwar. Industrial School for Girls at Karwar. Junior Naval School at Karwar.	Tailoring, Knitting, Embroidery and Homecrafts. General Engineering, Carpentry and Wood-work. Tailoring, Knitting, Embroidery and Homecrafts. Naval Training Courses for Ratings.

Note.—We have not been able to suggest locations of institutions in territories which have now merged in the Bombay Province as the Committee did not have sufficient data for these areas.

CHAPTER VI.

TRADE SCHOOLS.

6.1. Whilst the Junior Technical Schools described previously are pre-occupational and do not aim at preparing pupils for particular trades or occupations, the Trade Schools prepare them for a definite skilled trade or occupation and hence their selection should be based on their interest and aptitude for a particular occupation and this should be more carefully done. Trade Schools have not developed in this country to the same extent as they have done in industrially advanced countries such as the U. S. A., England, and other European countries. In England the trade schools are recognised by the employers and the trade unions as fulfilling part of the period of apprenticeship and are analogous to the Apprenticeship Schools of the Continent. The development of such schools should, in our opinion, form an essential feature of the programme of development of Technical Education and Training in this Province.

6.2. *Training of Craftsmen* :—No matter how well designed an engineering product may be, its final excellence depends on the accuracy and the skill of the craftsman. The skilled workers and craftsmen form a large bulk of the industrial works and may come to as much as 80 to 90 per cent. of the total personnel engaged in the engineering and other industries. An improvement in the training facilities for this large proportion of the engineering employees and a general improvement in the standard of craftsmanship in this country are therefore most important and urgent problems. It has been shown earlier that nearly 85 per cent. of our population is still illiterate and the programme of expansion chalked out in the Sargent report would take 40 years before literacy is fully established. Consequently a very large number of craftsmen in engineering and other industries in India are at present illiterate and the position is not likely to improve materially for some years to come. Judged by the Western Standards, craftsmanship in this country will remain at a low level for a very considerable period unless positive efforts are made to improve it.

6.3. In our opinion the present time is the most opportune to consider the whole matter of training for craftsmanship. Our people possess inherent craft ability which is a source of our potential wealth. This ability has however not been encouraged so far by provision of regular systems of training, with the result that the standard of craftsmanship is very low. Some industrial concerns have formulated training schemes and have provided facilities for training workshop personnel, but such facilities are few and far between and there does not exist what may be called a general framework for craftsmanship training and certification. Those concerned with technical education and the professional institutions have focussed their attention mainly on the development of higher technical education. The provision of the vitally important craft courses has been neglected. The status

of the craftsmen in the industry with regard to their remuneration and general conditions has improved considerably during recent years. This is therefore the most appropriate time for insistence upon certain minimum standards of attainment for employment as a skilled worker. This can be done only if there is adequate provision for training and certification.

6.4. By craftsmanship training is meant the training of the tradesmen or craftsmen, for industry—the men whose work is concerned mainly with the use of their hands in a manner requiring a high degree of skill. The training imparted may be for making the person suitable for employment in the Engineering, Building, Textile, Printing or any other industry. The main principles of training are common to all industries. It would be necessary to state here what in our opinion constitutes the essentials of craftsman training. It is obvious that a craftsman should have acquired a high degree of skill in the manipulation of the hand and machine tools related to his particular craft. He should possess a good knowledge of the main characteristics of the materials on which he works. He should be able to read and understand instructions relating to the operations he has to carry out. He should be able to read mechanical drawing and layout charts and be able to make simple calculations relating to the operations and adjustments of machines. A good craftsman should also have acquired a judgment in the choice of the correct tools and operation for producing a given result. It is obvious that he should have a knowledge of the applications of science as related to his industry. It is also essential that he should have a knowledge of the various stages required for the manufacture of a finished article and an appreciation of the relative cost of his work to the total cost of the product. The degree to which such attainments are expected depends upon the nature of the work with which the craftsman is entrusted. A fitter engaged on maintenance and repair work is not required to have as high a knowledge and skill in the use of his tools as a fitter engaged on the making of jigs. The former however should not be considered in any way inferior, as, he is expected occasionally to work at high speed, to show resourcefulness and have a familiarity with a wider range of tools. Similarly in the electrical industry, an electrician is required to have more knowledge of the applications of electricity than a person who is engaged in the erection of electrical machinery. The necessity of a good general education for persons who enter the industry as craftsman is well recognised. In England on account of compulsory primary education for the last 80 years young persons entering trade schools or large industrial concerns for craft training have already had a fairly good general education.

6.5. Messrs. Abbott and Wood in their report have stressed the point of the low level of education of persons entering for craft training in this country and have recommended that entry to craft training should not be below the educational level of class VIII or the completion of the middle school stage. They recognise however that insistence

on such standard of preliminary education would, in the present circumstances, result in craft training centres having few or no pupils. We believe, however, that as a result of the compulsory Primary Education Act and further of the elimination of English from the middle school stage there will be a greater number of pupils going through the middle schools who at the end of this stage will have to be provided with suitable opportunities of vocational training. We would therefore recommend that admission for craft training in the trade schools should normally be for persons who have completed the middle school stage of education.

6.6. Qualities which are expected of a person undergoing his apprenticeship for craftsmanship training are mental, physical and personal. The requirements of mental characteristics have been outlined above. The physical qualities include sound physical condition, ability to do hard work and to stand long hours of manual work. Personal qualities include willingness to obey instructions, readiness to do team work, understanding and tolerance towards others. All these qualities are capable of being developed directly or indirectly by suitable education and training systems. At present young persons pass into industry with their various abilities and characteristics as influenced by their schools, homes and the general environment. The nature of the industrial environment, the attitude of the personnel in the industry and the type of training facilities which an apprentice comes across on his first entrance into industry have their lasting effects on the adolescent and his first personal reactions have an important bearing both in the development of his personality and his manual ability. It is therefore important that the facilities for training in the industrial establishments as well as the general environment should be so improved that their first impact upon the new entrants produces a salutary effect.

6.7. *Method of Training*: We have therefore to consider whether a craft apprenticeship under the present industrial conditions would be the most suitable means for imparting instruction in craftsmanship. It is already observed above that craftsmen in the industry today are mostly illiterate and unwilling to impart their skill to the apprentices. Even if they were willing they may not be capable of doing so, as practical instruction requires teaching ability and familiarity with training methods, just as much as in the case of theoretical instruction. Effective practical training can be imparted by a method consisting essentially in explanation, demonstration, imitation and repetition. An operation in a machine shop, has first to be explained to the apprentice and demonstrated by the instructor. The apprentice by doing the operation himself imitates the instructor, the latter correcting his faults. Thereafter the trainee repeats the operation under frequent supervision and thus acquires the skill in a particular operation. It is very essential that initiation in practical training should be by simple stages, a more difficult operation being added when the simple operations have been completely mastered. It has been found that in this

way an apprentice of average ability can acquire quite an appreciable degree of skill in a comparatively short period. The usual tendency of a skilled craftsman in the industry is to show off his skill to the novice, very often by doing the operation by methods which are not considered as always correct, *e.g.* by taking a very deep cut on the lathe where ordinarily the operation should have been achieved by a succession of smaller cuts.

6. 8. Messrs. Abbott and Wood in their report have stated that unwillingness on the part of the craftsman to impart his knowledge to an apprentice is due to his fear that the younger and lower paid apprentice on being trained may replace him. They state that there is no such misgiving in England as there is a strong Trade Union Movement to guard the interests of the craftsmen. They further observe that in Great Britain it is sufficiently usual for the burden of training the recruits to industry, to be shared between the industry and the school. The Industry is expected to give its potential skilled workers during their earlier years of employment good practical experience, while the school devotes itself in the main to teaching them scientific and other principles on which the practice of the workshop is based. The workshop and the school in England are thus complementary agents. Both of them are responsible in the training of the skilled workers. On the continent of Europe, on the other hand, it is stated, this sharing of the task of training industrial workers is not so widespread as it is in Great Britain, it being a common practice for the schools to give both theoretical and practical training. Messrs. Abbott and Wood, after taking into consideration the conditions in India at the time, had recommend the continental plan rather than the English one as the best to suit Indian conditions. With this view however we do not agree. We find that there is now a sufficient realisation in industry regarding the obligation of the industry for the training of workers and operatives of the craftsmen type. In our discussions with the industrialists, educationists, and labour leaders, we observed a unanimity of opinion that the training of skilled workers and craftsmen should be on a co-operative basis, the training being carried out partly in school and partly in the industry. We agree with this view.

6.9. We are of the opinion that the abilities which are desired in a craftsman can best be developed by a combination of a good practical training system organized in a factory or a workshop and a good technical education system organized in a suitable teaching institution. For example, the training in the use of machine tools and the knowledge of manufacturing operations can be most satisfactorily given in the industrial workshops, while the use of hand tools, the knowledge of the characteristics and use of different materials and of scientific principles and the development of the ability to understand drawing and schedules, can best be obtained in a technical institution. It is, of course, obvious that to a limited degree the entire training can be imparted either exclusively in the factories and workshops or in the technical institutions. Thus, although the development of judgment

in the choice of correct tools and operations comes with experience in the works, the education imparted in a technical institution in this respect is also equally helpful. Then again, both the factory and the technical institute environments play their part in the development of personal qualities. It is therefore emphasised that there must be the fullest co-operation between the industrial establishments and the technical institutions in the planning of training schemes and in their operation.

6.10. The Advisory Committee of Technical Training appointed by the Government of India, Department of Labour, submitted their report on the training and apprenticeship of craftsmen for industry in 1944. The Committee advocated a scheme which visualises that the first part of the training should be given in specially designed training centres and the second in workshops actually engaged in production, thus co-ordinating training and production to the greatest possible degree. The Committee has recommended that the duration of training should be three and half years of which the trainee should spend the first two years in a training centre and the balance as an apprentice in a factory.

6.11. We are of opinion that the distribution of time of a trainee for the first two years in a trade school between the institution and the industrial establishment should vary according to the stage of his training and the facilities available in the workshop. Under the present conditions we would suggest that the trainee should spend the first four months entirely in the trade school and of the remaining period of two years, half should be spent in the school and the other half in the factory. After completion of the trade school course, when the trainee is placed in the industry his contact with the institute during the remaining period of one and a half years should be by part-time evening (leisure time) study or by part-time day release in the case of promising persons. In the engineering industry, the first year course of the training scheme should be so devised as to develop a fair degree of competency in the range of operations fundamental to bench work, machine work or foundry work. During the first four months a preliminary sorting-out training should be given, with a view to determining the suitability of the pupil for a particular trade. This should be followed by what may be called 'basic training' in the chosen trade for the remaining period in the trade school for giving a sound training in the use of the various tools of the trade as well as theoretical instruction relating to the trade. We give below a suggestive outline for a few trades which may form the basis on which each centre may build its own detailed programme of training to cover other trades.

Bench Work	...	1. Maintenance and use of hand tools.
		2. Use of workshop measuring instruments.
		3. The principles of marking out.
		4. Metal-plate work, gauges and gauge fitting, soldering and brazing.

- Machine Work ... 1. Centre Lathe, Approximately half the time available for machine tool instruction.
2. Drilling, shaping and plain milling.
- Foundry Work ... 1. Simple Examples involving pattern making, core-making, moulding and casting.

It is expected that the apprentices will make the majority of the tools which they are required to handle, such as callipers, scriber, square etc., during their first year. They would in this way cover most, if not all, the operations referred to above and thus avoid doing work of exercise value only. The advantages of keeping up the apprentice's interest during the earlier stages in this way are obvious.

6.12. The second year course should provide opportunity for more difficult work in the fundamental processes dealt with in the first year and for an extension of the work to other processes not previously covered. Whilst it is undesirable to detail the exact nature of the content of the course, the following items are given for the purpose of general guidance :

- Bench Work ... 1. Further work to include brazing, welding, pipe bending and electric wiring, use of hand taps and dies.
2. Heat treatment of tools.
- Machine Work ... 1. More difficult lathe work, including use of set of tools.
2. Universal milling.
3. Grinding.
4. Capstan and turret lathes.
5. Automatic lathe.
- Foundry Work ... 1. More complicated examples of moulding and casting.

In all sections of the work, the educative value of the process for the purpose of training an adaptable type of apprentice should be the predominant factor in the organization of the course.

6.13. During the whole period of training the progress of each apprentice should be kept through a system of monthly records kept by the instructors both in the school and in the industry. These records should be of a simple character, dealing with work undertaken, time-keeping, discipline, attainment and progress. These records should be supplemented by periodical tests in the workshops as well as by training school examinations.

6.14. Factory training of apprentices should be carefully planned. At a certain stage of his training the apprentice should be considered as capable of productive work and should be given work involving responsibility. In its final stage the training should, as far as possible, include experience in handling of plant and equipment in actual industrial

use and proper record maintained of the work done, from day to day and in each department. In Western countries the apprentices are looked after by the Educational Officers in order to smoothen out their difficulties either in technical matters or in personal relations with their fellow workers or superiors and we have recommended elsewhere that Government should appoint Educational Officers whose duty should include the supervision of the work of the apprentices and giving them the necessary help and guidance. In the case of works located within a manageable area one Educational Officer may look after the apprentices in a number of factories.

6. 15. We recommend that some of the present courses offered under the Board of Technical and Industrial Training, *e.g.* Mechanical Apprentice, Automobile Apprentice, should be re-organised on the lines suggested above so that the training offered in such courses could be made realistic trade training. We also recommend the introduction of new trade courses particularly for the Electrical Industry. It is further recommended that the proposed Provincial Vocational Education Council should be requested to go into the question of an adequate system of certification for the trade courses.

EDUCATION FOR TEXTILE OPERATIVES.

6.16. The textile industry is the largest industry in the province and although it is acknowledged that weavers and spinners do require training, very little effort has been made for training skilled textile operatives. Our discussion with the Millowners Association Committee, Ahmedabad, and individual millowners like Mr. Ambalal Sarabhai, has revealed to us that the industrialists do now realise that the efficiency of the textile industry will in future very largely depend upon the provision of suitable and adequate training facilities for the workers. At present the industry both as a whole, or in its individual units takes no responsibility for this training. There are some schemes for the training of the rank and file of skilled workers in the industry, but they are quite inadequate and in some cases do not serve their proper purpose. Thus, the Bombay Government Apprentice Scheme which purports to train the rank and file skilled workers, in actual practice succeeds in training a lower grade of the supervisory staff and the persons who attend the evening classes of the Social Service League, Bombay, do so with the object of going above the status of the rank and file worker. There are practically no facilities which can be said to meet the demand for the training of textile operatives. In the textile industry there appears to be an urgent need for starting special trade courses, for the two main branches of the industry, *viz.* (1) spinning and (2) weaving. It is easier to arrange for the training of weavers as it costs less by way of first capital expenditure and recurring costs, and as the trade lends itself easily to teaching. The job of weaving, even of plain weaving, is by no means an easy task and when complicated designs, finishing,

MO-V Bk Na 18-7a

colouring and more than one shuttles are used, it becomes more difficult still. To obtain the best results a very careful manipulation of the loom is absolutely necessary as the loom is a complicated mechanism. If the weaver is careless he will produce not only faulty cloth, but may even damage the loom itself, thus involving great loss to the manufacturer. An average weaver is not expected to remove the faults in his loom, this being the work of the loom tackler. But it is obvious that the weaver should at least become aware that his loom has become faulty. Modern inventions have now reduced the possibilities of producing faulty cloth, but even then it has been found that the production of faultless cloth ultimately depends upon the skill and efficiency of the weaver even where automatic looms have been installed.

6.17. It has therefore been generally accepted that both preliminary or pre-employment training and post-employment training or, training while in employment are essential to mill workers, especially in the spinning and weaving sections to increase their efficiency and thereby their earning capacity. Facilities for post-employment training on a very small scale are available at Parel at the Textile Technical School of the Social Service League, but they are quite inadequate, and more schools of this type are necessary in the various mill centres, not only in Bombay City but also at Ahmedabad and Sholapur. In the spinning section of the industry a certain amount of preliminary training is given as the new recruit in that section is first admitted as a doffer-boy on a basic wage ranging between Rs. 18 to Rs. 22. It takes him at least 2 to 3 months to pick up this work. His next promotion is to the job of a tarwalla or a follower and then as a single-sider. An efficient single-sider is promoted as double-sider who in turn becomes an oiler and bander and then a doffer-jobber. In this manner the entrant has an opportunity of becoming an efficient spinning operative. Such opportunity is not however offered to a recruit in the weaving section. In the past, those desirous of becoming weavers were allowed to go into the loom-shed to learn the work on looms under the guidance of their relatives already employed as weavers. The system appears to have been discontinued for some time in most of the mills. To-day admission to the weaving department of a mill is possible if the new comer is qualified to do the weaver's work. This has created a dearth of good weavers in mills which has had an adverse effect on the industry. To get over this difficulty a few mills have arranged to give preliminary or pre-employment training to the intending weavers by admitting them first as helpers and then promoting them as weavers after they have made themselves sufficiently acquainted with the work of a weaver. The training imparted however is neither systematic with a regular syllabus nor is the standard to be attained for promotion to the weaver's post definitely laid down. The instructors are also insufficiently qualified for trade training. It is therefore necessary to introduce facilities for pre-employment training first in the weaving section as early as possible, as it will prove beneficial

not only to the workers themselves, but will also benefit the industry as it will enable the industry to obtain more efficient and properly trained workers, thus avoiding wastage of material and increasing the efficiency in the mills.

6.18. We have discussed with the Millowners in Ahmedabad both individually and with a committee of their Association, the question of the starting of such schools. They appeared to be convinced that the provision of such pre-employment training would greatly assist the industry. Some of them went so far as to say that when provision of this type has been made for training an adequate number of workers, no person who did not possess a certificate of being a skilled operative should be recruited to the textile industry. The number of schools to provide pre-employment training for the textile industry will be quite large as it is computed that on an average 5000 new-comers per annum are drafted to the textile mills in the province. It is evident that several schools for pre-employment training in different centres will be required. We recommend that a beginning should be made by starting at least three schools of this type at Bombay, Ahmedabad and Sholapur respectively. The distribution of the time should be on the basis of 50% in the school and 50% in the industry as in the case of the Engineering Trades. In order that the machines or plant on which the trainees will work in the factories may not be kept idle while the trainee is at school and in order that the school may also run continuously without break the trainees should be divided into two batches, one batch attending the school and the other attending the factory. Detailed arrangements regarding allocation of time between the school and the industry and other matters, will, we believe, be looked after by the Joint Director of Technical Education and Educational Officers. It has been suggested that provision should also be made for hostels for the trainees as the hostel life would be more conducive to the formation of good habits both as regards study and social behaviours and that such hostels should also be utilised for persons who come to the industry for vacation or college apprenticeship so that the contact of trade apprentice and the college apprentice would be mutually beneficial, the college apprentice learning something of practical side from the trade apprentice and the trade apprentice learning something of the underlying scientific principles regarding trade practice.

6.19. From the statement regarding the location of institutions in the Province (*vide* Table No. 12) it will be seen that we have recommended the establishment of industrial training workshops at certain centres such as Surat, Poona and Sholapur. The workshops of this type for the training of industrial workers are found to exist in large numbers on the continent. The duration of the courses in the workshop is of four years and terminates with a practical examination. Such workshops have found favour in Europe as it is realised that the planning and supervision of trade apprentice training differ greatly from firm to firm. The first two years of the course in such workshops

are generally spent in special workshops which operate quite independently of the main workshops and in which the trainees are responsible under supervision for their own stores, supplies etc. At the end of this period they are regarded as capable of productive work in the main shops where they spend the second period of two years. Throughout the course of training the apprentices keep a diary including drawings of the work carried out. During the early part of the course their books are inspected by the foreman instructor once a week and marks are entered according to the quality of the work done. The note-book thus forms a complete record of the boy's practical training. The programme of practical training is usually divided into three sections. The apprenticeship commences with a probationary period of four months, the object being to introduce the trainees to fundamental operations and to develop ability in the use of hand-tools. By insisting on high quality workmanship above all else an effort is made to give the trainees pride and pleasure in craftsmanship. The work done in the first six months is usually unproductive and is much the same for all apprentices regardless of the trade they are to adopt. During the succeeding $1\frac{1}{2}$ years they follow a course appropriate to their intended trade and become acquainted with all the relative operations whether carried out by hand or by machine. For this purpose the apprentice workshop is equipped with sufficient modern machines of high quality. The work now takes on a semi-productive form and involves the manufacture of limited number of small parts ordered by the main shops although quality in preference to speed is still insisted upon. The third stage of the training is a factory course lasting two years during which the apprentice works at his trade in various workshop departments in much the same way as is usual in England. Finally the apprentice returns to the special workshop for about two months during which he must design and construct his exhibit for the journeyman's examination. Having passed through, he becomes eligible for employment at 19-20 years of age as a full-fledged journeyman.

6.20. The Post War Planning Committee of the Institution of Electrical Engineers in their report ("Education and Training for Engineers, 1943.") have advocated the adoption of such a scheme in England in order to raise the status of craft employment and in their opinion its adoption would bring immense benefit to the industry in that country.

6.21. The Department of Labour, Government of India, had appointed a standing Committee to report on craft training and the recommendations of the Committee which met in 1945, are available. The Committee has recommended the establishment of a training centre on very much the same lines as described above. In order to secure co-operation from the industry they have suggested that $33\frac{1}{3}$ per cent. of the candidates to be admitted to the training centres should be from amongst the applicants who are sons or near relatives of employees of firms participating in the scheme and that the remaining $66\frac{2}{3}$ per cent. of vacancies should be filled up by open competition.

The employers who participate in the scheme will have the advantage of obtaining workmen who will have been trained partly at the expense of Government. In return the employer will be required to provide apprenticeship training not only for those candidates who were admitted to the Government training centre at his recommendation but also to an equal number of other candidates who have satisfactorily completed their training at a Government training centre. Thus states the standing Committee's report, "Arrangements would automatically be provided for the factory apprenticeship training of 2/3rds of the candidates passing out from Government Training Centres and for the remaining 1/3rd of the candidates Regional Committees will make necessary arrangements in other factories with the help of the employers' association." The Standing Committee envisages a scheme whereby it will be possible ultimately to have a co-operative system of training fully developed throughout the country. The recommendations of the Standing Committee, if accepted by the industry, will no doubt pave the way towards full co-operation which the Standing Committee had as its goal, and we hope that the industry will come forward and offer co-operation for the successful working of the scheme.

6.22. The Industrial workshops which we have recommended to be established at Poona, Sholapur, etc., should be worked on the lines indicated above.

CHAPTER VII.

PART-TIME EDUCATION.

7.1. The schools we have described so far are intended for pupils who have not yet entered employment and are only preparing themselves for their future careers which they may have decided upon. The provision of such schools is, however, not sufficient to meet the requirements either from the points of view of the personnel engaged in the industry or the employers. To limit provision of education to full-time studies in the pre-employment stage implies that experience in an industrial workshop or factory will give all the further training needed when a person enters it after completing his formal education. It will be seen from the general plan of education envisaged by us that young persons will enter industry at various age levels and after completion of different stages of education. From the point of view of such persons and particularly of those who are ambitious of promotion either within the grade in which they start work or to a higher grade, provision of part-time education is a great necessity. A skilled worker is all the better for understanding the principles underlying practice and a young man aiming at promotion must necessarily gain further knowledge to achieve his ambition.

7.2. Part-time education has not developed in this country to the same extent as it has in other industrially advanced countries. In those countries provision is made for part-time education which may be imparted either in part-time evening classes or in part-time day classes. In the former the youth usually gives up his own time to attendance at school after the end of the day's work. In the latter case he can only attend if he is released from his work for the purpose. In Great Britain the great bulk of part-time attendance is in the evening, though the number of employers who are willing to allow "time off" during the day is slowly increasing. In at least one European country the whole of the part-time instruction is provided before 6 p. m. and employers are under a legal obligation to release their apprentices for attendance at school for not less than eight hours a week for at least two years, during their employment, although in many instances they are being released for as many as four years.

7.3. One of the features peculiar to the English arrangement is voluntary attendance. There is neither compulsion on the students to attend nor on the employer to send his young recruits for instruction. This is stated to be both a strength and weakness of the system. Only few young persons possessing the grit and ambition are attracted by the part-time evening classes and fewer still stay on for the full period of the course. This is considered to be a method of selecting the best by a process of survival of the fittest. On the other hand the system as Sir Michael Sadler put it, "fails to touch the idler or the less strenuous." The proportion of wastage in part-time evening education in England is stated to be quite serious. Nevertheless the statistics for further educa-

tion in England show that over 90 per cent. of those attending some form of further education, do so at night classes. The general opinion with regard to part-time education in England is now veering round to replacement of the voluntary system by a compulsory one. The reasons given are that (1) attendance at evening classes is spasmodic, (2) the students who register an enthusiasm gradually drop off resulting in great wastage, and (3) the strain of attendance of three nights in the week for 2½ or 3 hours per week is detrimental to the health of the student and those who show the grit to continue to the final stage are almost only those endowed with extra-ordinary good health and ability.

7.4. In the Bombay Province there is provision for part-time education which is imparted either during the day by part-time release by the employers or in the evening where the apprentices and workers obtain part-time education mostly during their leisure hours. The part-time day education is given in the Victoria Jubilee Technical Institute on Saturday mornings to apprentices and industrial workers who are released from their work by the employers, the "time off" being paid for in most cases on receiving a satisfactory attendance and progress report from the Principal of the Institution. Arrangement for the classes was made at the request of the employers, particularly the two railway companies, the Bombay Mill-owners Association, and the Port Trust. The Institute is at present running the following courses :

1. Mechanical Engineering—duration two years.
2. Textile Manufacture—weaving—duration two years.
3. Textile Manufacture—spinning—duration two years.
4. Wireman's Course—duration six months.
5. Electricians—duration one year.
6. Radio Servicing—duration one year.

There were 557 students attending the classes mentioned above during 1946-47. Recently on account of the reduction in the working hours in the textile mills, the school run by the Social Service League at Parel, has also started classes during the day for textile workers. The workers, however, attend the classes exclusively during their leisure time. Experience gained with the running of the classes at the Victoria Jubilee Technical Institute has shown that considerable benefit is derived from concurrent workshop experience and theoretical training. In the engineering and textile industry the employers are, as a result of such training facilities, able to get good practical men who have had also the benefit of theoretical instruction, for employment in the foreman and the junior supervisory grades. Quite a number of persons who received their practical and theoretical training in this way are also running their own small workshops or businesses.

7.5. This should not however be taken to mean that the content of education in the courses referred to above or its duration is adequate.

The part-time education given in other countries extends to about nine hours per week and it is stated that a diligent student reaches a standard, in his subjects of study, approximating to about the intermediate level for the pass degree in engineering. To reach such a standard the duration of the courses would necessarily have to be increased and as these classes are mainly intended for persons who are released from employment by their firms, it would raise the question of additional time off. A number of other questions would arise if the present duration of the course is raised. For example whether the concession should be given irrespective of merit to all or only to those who show that they are worthy of it. Should wages be paid for the time of attendance at the school; should students released for one or two half days a week be expected to give up some of their own time for the evening attendance? We are of opinion that in general only those students should be granted the privilege of time off with pay who have shown by their industry and ability in their work that they are worthy of assistance and encouragement. That the "time off" allowed to them should normally be two half days a week, that the full time required for training should be made up by the apprentices being required to give up from their own leisure-time once a week, a minimum of two hours for attendance at the evening class. The continuance of the privilege should be always conditional on the apprentice giving satisfaction both in his work in the factory and in his studies. The apprentices or workers should be paid for their attendance at the Technical Institute during the day.

7.6. Government Apprentice Scheme comprising the acceptance of young men for being apprenticed to industrial establishments for a period of 3 to 4 years according to the nature of skilled work or industrial trades for which they are apprenticed, was introduced by the Government of Bombay in the year 1935, with two objectives: (1) to provide industry with young persons of education as skilled workers; and (2) to reduce the middle-class unemployment. The scheme has been operating in the Victoria Jubilee Technical Institute, Bombay and the R. C. Technical Institute, Ahmedabad. Throughout the period of apprenticeship, attendance at the evening technical classes for the study of technical subjects related to the industrial trade is compulsory. The aim is to turn out skilled workers having the benefit of practical training as well as theoretical instruction related to their trades. The experience gained during the last 14 years has shown that a comparatively few of them remain ultimately in the ranks of the skilled workers, the majority being selected for the positions of the junior supervisory staff. The number of apprentices admitted annually depends upon the vacancies available in the industrial establishments co-operating with the scheme in Bombay and in Ahmedabad and these usually state individually the number that is likely to be absorbed in their own establishments after completion of the apprenticeship. The subjects offered and the duration of apprenticeship for them are given below :

Subjects of Training.	Duration of Apprenticeship.
1. Mechanical Engineering Trades	4 Years.
2. Electrical Engineering Trades	3 Years.
3. Spinning (Cotton)	3 Years.
4. Weaving (Cotton)	3 Years.
5. Dyeing and Bleaching	3 Years.
6. Typography	5 Years.

Each of the above courses except typography can be extended by one year for higher training. Candidates for admission must have completed the pre-matriculate class. The admission is by selection at an interview and each selected candidate is required to sign a bond agreeing to serve as an apprentice in the establishment fixed by the Joint Directorate of Technical Education whose department is responsible for the administration of the scheme. The Joint Director is assisted by an Advisory Committee in such matters as (1) selection of boys for training, (2) training apprentices in factories, (3) types and duration of courses of training and syllabuses in the evening classes, and (4) absorption of trained apprentices in the various industrial establishments.

7.7. The employers have generally agreed to give time off to the apprentices during the first year of the apprenticeship on the days on which they have to attend the evening technical classes. No concession is given in subsequent years, when the apprentices attend the evening classes during their leisure-time. The number of students attending the Government Apprentice classes in the various sections at Bombay and Ahmedabad during the year 1946-47 are given below :—

	Bombay.	Ahmedabad.
1. Mechanical Engineering	137	25
2. Electrical Engineering	36	7
3. Spinning	46	57
4. Weaving	75	56
5. Dyeing and Bleaching	60	34
6. Typography	18	—
Total No. of Apprentices in G. A. Scheme.	372	179
7. Marine Engineering for Ex-Dufferin	33	
Cadets.		
Total :	405	

7.8. Experience, where both the part-time day and part-time evening classes are being run, viz., at the Victoria Jubilee Technical Institute, has shown that generally speaking the apprentices who attend evening classes show greater keenness and ultimately attain a higher standard than those who attend the Saturday apprentice classes. The higher standard attained is the result of longer duration of training, i.e. 3-4 years for the evening attendance as against two years for the Saturday apprentice classes. The standard of admission is approxi-

mately the same. The greater keenness is an unexpected and pleasant surprise as the apprentices who attend the evening classes do so after a full day's work in the industrial establishments whereas the Saturday Apprentices are fresh when they attend their classes in the morning. There may be some element contributing to this factor in the fact that the selection for the Government Apprenticeship Scheme is made by selection committees consisting of both teachers and industrialists whereas the selection for Saturday Apprentices is done by the individual employers. This fact is an argument in favour of our recommendation for the establishment of a machinery for vocational guidance and selection which we have made in Chapter X.

7.9. As stated above the general opinion is tending towards provision of most of part-time education during the day when the mind of the apprentice is more fresh and receptive. We agree with this view. There are however circumstances in which evening attendance is appropriate. As we have stated earlier even with the provision of the part-time day education which may be given during the working time of the apprentice with arrangement for paid "time off" additional arrangement for evening classes which the apprentice will attend during his own leisure-time will have to be made. There are also in larger towns of India, large number of persons working in work-shops on their own account who might find difficulties in giving up much of their working time to attendance at day-classes. We would however recommend that part-time instruction given during the evening sessions may as far as possible be provided during the day, with paid "time off".

7.10. We do not contemplate that part-time education should be carried on in buildings of their own, but the classes may be held as is done in European countries, as well as in this province for the last 14 years, in the same premises where full-time education is imparted, full use being made of the equipment and accommodation of the full-time institutions. We are aware that difficulties occasionally arise if two sets of students have to use at different times the same laboratories, work-shops and drawing offices. Such difficulties can usually be readily overcome by having one principal for both the types of classes at one and the same institution. In the Bombay Province experience has shown that part-time education can be imparted successfully by taking full advantage of buildings, equipment and the staff of existing institutions, the latter being often supplemented with advantage by persons drawn from the industry who, though not experienced teachers, are able to make up what they lack in skill in teaching by the realistic atmosphere they bring to the class-room.

7.11. In industrially advanced countries a very large number of persons holding responsible positions in the industry have obtained most of their technical education by attendance at part-time evening or day classes. In a country like India where people are unable to pursue technical education on account of financial stringency,

there is all the more reason why adequate facilities for part-time education of both the types should be provided. Arrangement should also be made for a countrywide recognised system of examination and certification for persons undergoing part-time education, in order to make part-time technical education popular throughout the country.

CHAPTER VIII.

THE TRAINING, RECRUITMENT AND CONDITIONS
OF SERVICE OF TEACHERS.

8.1. Teachers are the backbone for the success of any educational reform and many educational schemes have failed in the past on account of lack of teachers of the right type. To carry out the extended programme which has been outlined by us it will be obvious that the greatest possible care will have to be exercised in the recruitment and training of staff. The scope of work of a teacher in technical institutions however is such that it is difficult to standardise methods of training and recruitment.

8.2. The training colleges have throughout their existence devoted their attention to training teachers for work in schools which provide either general education only or education with a bias towards *basic* crafts. There is at present no arrangement for imparting training to teachers in vocational schools and institutions either before recruitment or after entering the profession on lines similar to the B. T. or T. D. courses for teachers in secondary schools. We think that such training is of equal value to teachers in vocational schools and arrangements should be made for imparting it.

8.3. Training of vocational school teachers has been insisted upon in Germany perhaps earlier than anywhere else*. It is stated that up to 1929 three thousand trade teachers were trained in vocational pedagogical institutes at Berlin, Cologne and Frankfurt in connection with the University and Commercial High Schools. Of these 1300 had taken courses in technical schools of all kinds, 1200 were elementary school teachers, 200 University men and 200 were master craftsmen. The importance of training teachers for technical institutes was so well realised that even during the war, extensions to the existing vocational pedagogical institutes took place and the number of students at these institutes increased during the war.

8.4. In England in 1936 Nottingham University College inaugurated a full time one year post graduate course, for the training of technical teachers on lines similar to the course for secondary teachers' diploma. This course included school practice as well as lectures on the principles of education and method. The student was required to be a graduate in some technological branch such as commerce, textiles, or engineering. Industrial experience prior to entry was not insisted upon but the student was urged to obtain such experience before accepting an appointment in a technical college. Teaching practice was arranged for 15 weeks, three of which were to be spent in ordinary academic schools.

*Vocational Training in Germany by Helmut Von Rauschenplat. This is one of a series of pamphlets by a body known as German Educational Reconstruction founded in England in 1943.

8.5. During 1939 the Regional Advisory Council for technical and other forms of further education for Manchester and District had decided to run an experimental course for part-time teachers in their area. But the out-break of war caused the postponement of the scheme. It was however revised in 1945 in response to the plan of the Ministry of Education to meet the need of the enormous shortage of teachers expected at the end of the war. A full account of the working of this scheme is given in "The Training of Technical Teachers," by A. J. Jenkinson, published by the Association of Technical Institutions, England.

8.6. The chief problem in the training of technical teachers is the difficulty of attracting the right kind of candidates in sufficient numbers. In the first place for most of the posts in technical colleges, good industrial experience is a qualification of the utmost importance. If therefore training in teaching is to be given to a prospective teacher it must be given either before obtaining industrial experience or after. If a technically trained person elects to take his training before entering the industry, he has no assurance that an appointment in a technical college will be ultimately available. Such a person on entering industry may find the prospects in the industry good and congenial and may not be tempted to enter the teaching profession with the result that the teaching profession would not attract the better type of graduate unless he finds an educational career sufficiently attractive. This unsatisfactory state of affairs is intensified by the nature of the varied demand in the technical teaching profession. The number of teaching posts in the field of technical education are and will remain quite limited, and very often for the various appointments, specialists in some branch of technology may be required. Thus in electrical engineering there may be a post for an electrical engineer with experience in radio communication, or another with experience in power distribution; in mechanical engineering a person may be required who is a specialist in heat engines and thermodynamics or in applied mechanics, or a person with experience in drawing office. It will thus be seen that the chance that a teacher possessing the right type of technical training, with experience in just the special branch and who has also undergone the teacher training course, will be available, is very small. The case of the teacher serving in a technical institute has also to be considered. It is unlikely that he will go in for training in teaching at his own expense, foregoing his salary for the period of training. We are however of the opinion that candidates from both the categories should be encouraged to take training courses by provision of adequate stipends for the fresh candidates by Government and full salary for the teachers undergoing such training. The expenditure incurred by the technical institutes in this behalf should be admissible for grants-in-aid.

8.7. We do not think it necessary to provide long term training for teachers in charge of technical subjects. As the number of teachers and prospective teachers undergoing training will be small, for some time to come, at any rate, it is probable that a single institute of the kind we have in mind would meet the need for some years to come.

8.8. A vocational teacher like the academic teacher must have pedagogic knowledge and skill. He must be able to handle a class and interest his pupils. He must be familiar with the ordinary routine of the school. During the period of training he should have opportunities of visiting works in a small party and should have by such contacts as well as by reading books and attending lectures on the subject, a general idea of the organization of the industry into which his pupils will enter. We recommend that Government should make arrangements for running short term courses in Bombay preferably in collaboration with the *Victoria Jubilee Technical Institute*. The location is suggested on account of the facility that the Institute can afford for teaching practice both in the class-room and in the workshops, as well as the existence of three technical high schools in Bombay and the facility for visits to industrial establishments. The curriculum of the course may include, (1) general principles of education, (2) educational psychology, (3) class management, (4) general methods and teaching problems in technical institutions, (5) methods of teaching applied to special subjects, (6) conducted visits to industrial establishments and technical institutions, and (7) general administration of a technical institution. The duration of the course should ordinarily be of not more than one term concurrent with the term of the Institute.

8.9. Whereas the above arrangement would to some extent meet the training facilities for full-time teachers it would be advisable to afford additional facilities for training for full-time teachers who for administrative reasons cannot be spared during term time and for part-time teachers who will be required in greater numbers in future to participate in part-time instruction. We recommend that short courses for both full and part-time teachers should be arranged for by Government in co-operation with a local Institution. These courses should consist of, (1) a series of lectures on topics of general educational interest, (2) a series of talks bearing on the theory or practice of teaching a particular branch of technology, (3) discussion on class-room management and teaching methods, and (4) discussions relating to school administration. The course should preferably be confined to a definite branch of technical education. It should be of 10 to 15 days duration and should be offered preferably during vacation. There should be also opportunities for social contacts through organised excursions, sporting events, etc. The expense of attending the course should, we recommend, be shared by the Government, the institution and the teacher. For the success of the short courses we think it necessary that a panel should be formed of suitable and experienced lecturers who have shown themselves able to deal with different aspects of the problem of teaching technical subjects from which persons can be drawn for organising these courses.

8.10. The minimum qualification for a teacher in charge of teaching the theory of technical subjects in any technical high school or

industrial and trade school should be an approved diploma in engineering, technology or accepted equivalent qualifications for the work entrusted to him.

8.11. The post of the Head of a technical high school which provides substantial portion of general education need not necessarily be filled by persons with technical qualifications. But where the Head of the institution happens to be a non-technical person there should be placed under him a technical superintendent holding a sufficiently high position. These technical superintendents should be responsible for the general organisation and supervision of the technical institution, under the general direction and control of the Head. As regards the other types of institutions such as the Junior Technical School, the Senior Technical School, the Industrial School and the Trade School, the Head should be a person with technical qualifications and suitable industrial experience.

8.12. In the interest of the success of the various vocational and technical institutions which we are recommending to the Government, it is essential that the Heads of these institutions be appointed with due care and thought and it should be seen that the persons thus appointed possess the necessary qualifications and enthusiasm, for the execution of the work entrusted to their care. The minimum educational qualification should be a good diploma or degree and we would like to make it clear that there should be no insistence on a candidate holding a degree when a person with a good diploma and adequate industrial experience and ability is available. If technical education of a non-university type is to succeed in this country, the place of university degree as one method, *but not the only method* of qualifying an engineer or a technologist either for employment in industry or in the teaching profession, must be appreciated.

TRADE INSTRUCTORS.

8.13. A technical trade instructor should be, (1) a practical man thoroughly familiar with up-to-date workshop practice, (2) conversant with the elementary theory connected with his trade, and (3) able to impart his knowledge. Experience in connection with the Technical Training Scheme of the Government of India showed that the above type of instructor was not easily available in India. About 2300 instructors were employed with the Technical Training Scheme but only a few of them were regarded as really suitable. In any scheme of technical training there is obviously a need for trade instructors and since persons who are good craftsmen are not necessarily good instructors it is necessary to make arrangements for their training. The Advisory Committee on Technical Training, Department of Labour, Government of India, in their report (1944-45) have estimated that at least 2500 instructors would be required for the country in the post war period. They have recommended the setting up of a training centre for trade teachers with a capacity of 256 seats. The Committee estimated that the required number of instructors could be trained in the centre in a period of five years, the centre providing

also training for new instructors for replacement. The Committee also recommended refresher courses to ensure that instructors are always up-to-date and conversant with the latest methods of production and teaching. They have recommended that every three years all instructors should attend a refresher course of about two months duration.

8.14. The duration of the course for trade instructors should be of five and a half months with 48 working hours a week. The training should provide in addition to craft training, instruction in drawing, theory pertaining to particular trades, methods of instructing and language. On an average half the training time should be spent in class-room instruction and half in the work-shop and practical training. The Committee has worked out the capital and recurring costs and the full details regarding these are given in the Appendices of their report. The cost as worked out by them is given below:—

	Rs.
(1) Capital Expenditure	7,81,102
(2) Recurring Expenditure per annum	2,05,035
	<hr/>
Total ...	9,86,137
	<hr/>

8.15. It would be seen from above that the number of trade instructors required in the technical institutions would not justify the establishment of a provincial training centre for trade instructors. We recommend that the trade instructors required for technical institutions in this Province may receive their training by arrangement with the Labour Department in a training Centre which has now been established at Koni, Bilaspur by the Government of India. It would be possible however to arrange for short courses of instruction for the benefit of trade instructors and we recommend that a training centre should be established from time to time at larger engineering colleges for imparting the necessary training to the trade instructors.

8.16. It is very essential that both the technical teacher and trade instructor should refresh their knowledge by actual works experience periodically. We recommend that the technical teachers and trade instructors should be deputed to works for experience for three months every four years. This recommendation can be implemented only by co-operation with industry as some system of remuneration for the teachers so deputed will have to be worked out in consultation with industry.

8.17. With the expansion of part-time education which is envisaged in our report it would be necessary to recruit a large number of part-time teachers from the industry for the part-time day or part-time evening courses. The present experience in this matter shows that the industrial establishments are not very willing to allow their employees to participate in such part-time instruction and the remuneration offered also is not quite adequate to attract the better type

of persons from industry for part-time work. The co-operation of the industry would be necessary in this matter in respect of releasing the better type of persons from their establishments and Government and educational institutions shall have to make the remuneration for such work more attractive. In addition to the efforts made by the technical associations of the institutes, there seems to be a need for arranging special courses of lectures by persons engaged in industry with a view to acquainting the pupils with the latest developments in industrial practice and technique.

8.18. We have stated above our views regarding the minimum qualifications of teachers in technical institutions. We would however like to emphasise that we attach very great importance to a teacher having requisite industrial experience and this for a teacher should not ordinarily be less than three years and for a trade instructor not less than five years. The existing maximum and minimum scales of pay for teachers and other staff in the institutions under the Board of Technical and Industrial Training, Bombay Province, are given in Table No. 13 and our recommendations regarding scales of pay for teachers and instructors and other staff for places outside Bombay City are given in Table No. 14.

8.19. In order to attract candidates with higher qualifications than the minimum laid down *e.g.* degree holders in engineering and technology to take up teaching profession, we recommend that such candidates may be given advanced increments, not exceeding four, in the prescribed scales for the senior grade teachers of technical subjects.

8.20. We recommend that the candidates who have obtained certificates from the Training Classes proposed by us in paragraph 8.8 above should be given two advanced increments in the respective scales of pay.

8.21. We recommend that recommendations Nos. 61, 69, 70, 72, 74 and 75 of the Ghate-Parulekar Report as accepted by the Government should be made applicable, with suitable modifications, to the Technical High Schools and Institutions.

8.22. In large size technical institutions where it is necessary to have more than two senior grade teachers in a particular department, one of them may be considered as the Head of the Department and an allowance ranging between Rs. 10/- to Rs. 25/- may be attached to that post.

8.23. We recommend that the rules of Provident Fund applicable to the Secondary Teachers should also be made applicable to the staff of the Technical High Schools and Institutions.

TABLE 13

Scales of pay of Staff in the Institutions under the Board of Technical and Industrial Training

Post	Minimum	Maximum
	Rs.	Rs.
<i>Teaching Staff.</i>		
Head of Institution	... 150-5-200	300-25-500
Assistant	... 75-5-140	130-10-200
Assistant	... 70-3-130	90-5-190
Assistant	... 60-3-90	100-5-150
Assistant	... 60-3-75	75-5-150
Assistant	... 75-5-120	75-5-150
Assistant	... 70-5-130	75-5-150
Assistant	... 65-5-110	75-5-150
Assistant	... 60-3-108	75-5-150
Laboratory Assistant	... 60-3-75	75-5-150
<hr/>		
<i>Workshop Staff.</i>		
Foreman	... 60-3-75	75-5-125
Machinist	... 60-2-80	60-3-108
Turner	... 45-2-60	60-3-108
Fitter	... 55-5-75	60-3-108
Blacksmith	... 45-2-65	60-3-108
Pattern-maker	... 35-2-45	60-3-108
Moulder	... 40-2-50	60-3-108
<hr/>		
<i>Other Workshop Staff.</i>		
Engine Driver	... 45-3-60	60-3-75
Electrician	... 60-3-90	60-3-108
Wireman	... 30-2-50	60-3-90
Oilman	... 25-1-40	40-2-72
Coolies and Hammals	... 25-1-40	40-2-72
<hr/>		
<i>Clerical Establishment.</i>		
Head Clerk	... 50-3-98	80-5-160
Cashier	... 35-2-80	80-5-160
Clerks	... 35-2-80	50-3-98
Clerks	... 35-2-80	35-2-80
Peon	... 20-1-35	20-1-35
Watchman	... 20-1-35	20-1-35

TABLE 14.

*Recommended Scales of Pay for Places outside Bombay City for
Technical High Schools.*

1. Head of the Institution ...	Rs. 220—15—400, E.B.—20—550, E.B.—25—650.
2. Technical Superintendent of Technical High School.	Rs. 200—10—300, E.B.—15—420.
3. Teachers for Technical Subjects. (Senior Grade). (Victoria Jubilee Technical Institute or Poona Engineering College Diploma).	25% over and above the scale prescribed by Government for trained graduate teachers, viz., Rs. 80—5—130, E.B.—6—160 —8—200.
4. Teachers for Technical Subjects. (Junior Grade). (Diploma of Institutions under B. T. I. T.).	25% over and above the scale prescribed by Government for undergraduate secondary tea- chers, viz., Rs. 62—3—92, E.B. —4—140.
5. Foreman or Head Mechanic. (5 years works experience and certificate from recognized technical school).	Rs. 56—2—80, E.B.—4—120.
6. Trade Instructors; (Mechanics, Fitters, Turners, Smiths, Carpenters, Moulders, Elec- tricians, Plumbers etc., with five years works experience).	Rs. 52—3—80, E.B.—5—110.
7. Workshop Assistants. ... (Assistants to Category 6 above).	Rs. 46—3—85.
8. Craft Instructors at Arts and Industries Centres.	Rs. 46—3—85.
9. Storekeeper. (Matriculate) ...	Rs. 50—4—90, E.B.—5—110.
10. Hammals and Peons ...	Rs. 30—1—50.

(a) The above scales are provisional scales exclusive of allowances admissible under G. R., F. D. No. 6567/33/IV dated 15th January, 1948. We have recommended the above salary scales and allowances as provisional for a period of five years. The situation should

be reviewed after five years. The scales recommended above are for Government Institutions and should serve as a model for private institutions as well.

(b) The salary scale of the Superintendent of a Senior Technical School should be the same as the Technical Superintendent of a Technical High School, viz., Rs. 200—10—300, E. B.—15—420. The same scale should also apply to Heads of Industrial and Trade Schools.

(c) The salary scales of teachers and other staff given under Technical High Schools are also recommended for similar staff in Senior Technical, Industrial and Trade Schools.

(d) We recommend that the teachers of academic subjects in the Technical High Schools should receive the same emoluments as recommended by Ghatte-Parulekar Report and as accepted by Government.

CHAPTER IX.

CO-OPERATION WITH INDUSTRY.

9.1. Replies to our questionnaire showed that perfect co-ordination between industrial establishments and technical institutions was a vital necessity for the development both of the industry and of technical education. The discussions we had with representatives of most of the important industries showed that a number of them were interested in a close co-operation between industry and education and stated that they would offer their co-operation in this respect. Some frankly stated that a change of outlook had taken place and that whereas formerly the industry was not particularly interested in technical education they were now willing and anxious to help its development.

9.2. We were however struck by a general ignorance of the facilities available and of the avenues by which education can be secured. To give a specific instance, a number of teachers in secondary schools including principals and headmasters did not have sufficient knowledge about Government's Apprenticeship Scheme and this we attribute to a lack of effective publicity for technical education. We also came across industrialists who considered that the time spent in part-time education was a burden upon rather than a benefit to the industry.

9.3. Industrial and technical education in this country has suffered very greatly on account of lack of co-ordination between the education imparted in colleges and practical training imparted in works. In the Universities, as well as, in the technical institutes, courses of studies have, to a large extent, been modelled on the lines of those in western countries. But whereas in the western countries there is a reasonably close co-ordination between technical institutes and the industry, whereby industry provides a systematic practical training which is complementary to the theoretical instruction at the institute, the same is not the case in India. In western countries large industrial establishments encourage their employees to undergo further education on part-time basis and offer opportunities for industrial experience to students who have either completed a course of technical education or who want to undergo a short course in an industrial establishment during the vacation. The Metropolitan Vickers Ltd., for example offer the following different types of courses for each of which an appropriate stipend is given :

1. Trade Apprentices and Probationer Trade Apprentices.
2. Probationary College Apprentice (for pre-University training or Vocational apprenticeship.)
3. College Apprentices for two years Post-Graduate Training,
4. Summer Vacation Apprentices,
5. School Apprentices,
6. Erection Engineer Trainees, and
7. Assistant Foreman Trainees.

The Marconi Wireless Telegraph Company offer apprenticeship and training courses in four groups :

1. Craftsmen,
2. Works Technical and Superivisory Staff.
3. Technical Assistants, and
4. Draftsmen, Designers and Estimators etc.

with appropriate stipends and facilities for further education to those who wish to qualify further. Sir Arthur Flemming and Mr. K. R. Evans, both of the Education Department of Metropolitan Vickers Ltd., have described in "Education Schemes in Industry"* the general outline of such schemes with special reference to the practice followed in the Metropolitan Vickers Company Limited.

9.4. We would like to draw special attention to the very valuable work which the Metropolitan Vickers Company is doing for the benefit of teachers in the technical colleges apart from the facilities given for practical training in the various categories described above. Modern industry is characterised by rapidly changing methods of production and the continuous introduction of new materials. It is most desirable that those responsible for the technical training of young people in industry should be quickly responsive to these changes if their work is to bear the fullest fruit. It is now commonplace to say that our national future depends to an increasing extent on the quality of our industrial personnel. It is a responsibility of industry to provide opportunities for the principals and staff of technical institutions to keep themselves abreast of current products and production methods. The Meropolitan Vickers Engineering Company Limited, had organised summer schools in 1928 and in 1936 and in the spring of 1949 the next summer school will meet. At these schools the Company's senior staff make available to those responsible for teaching engineering and allied subjects in Universities and colleges the latest practice in design, the use of materials and methods of production. The company also invites periodically University and technical college lecturers to spend a vacation in the works, working in the shops under conditions similar to those of graduate apprentices, at the same time having opportunities to meet the senior staff and in particular to those engaged in engineering design. Such summer schools are also conducted by other engineering firms. It will thus be seen that in England co-operation between education and industry for practical training has reached a level whereby the benefit of that co-operation is derived by every one from the craftsman to the professor in a technical college.

9.5. In India, on the other hand, the co-ordination between industry and technical education is comparatively very poor. In fact the only co-ordination is that effected through the representatives

* Education Schemes in Industry—by Sir A. P. M. Flemming and Mr. E. R. Evans—
Published by A. T. I., 1945, Page 15.

of industry on the governing boards and its ancillary bodies and through the heads of such technical institutes as seek contacts with industrialists and ascertain their views regarding the requirements of industry on their own initiative. This lack of co-ordination results firstly in the courses followed in technical institutions being sometimes divorced from the actual requirements of the industry and secondly in creating a prejudice among the employers against the courses in the framing of which they have had no voice. It is true that industry has its representatives on the Board of Technical and Industrial Training who approve all the syllabi of studies and courses of practical instructions, but we would nevertheless suggest that the Boards of Studies which in the first instance draw up the syllabuses and courses of practical instruction should directly consult official associations of employers and industrialists and professional engineering and technological associations. For craftsman training courses the labour associations should also be consulted.

9.6. We next come to the facilities available to candidates to obtain practical training in works on completion of their courses or during long vacations. Industrialists do not appear to look upon candidates desirous of obtaining such training with any great favour. They state that the candidates do not make proper use of their opportunities, show a marked disinclination to do certain kinds of work, are not amenable to factory discipline, and show no sense of responsibility in sticking to their period of apprenticeship when they get a slightly better chance elsewhere. There is no doubt some truth in this charge. Many candidates unfortunately do exhibit a surprising lack of responsibility during the period of their apprenticeship even when it is a paid apprenticeship. They soon tire of repeating any particular job, hanker after what they call interesting work and as soon as they come up against any difficulty either in their work or in their relation with their superiors want to leave the job at once.

9.7. To some extent the remedy lies in inculcating in these apprentices a stronger sense of discipline and responsibility, teaching them proper values and generally forming and developing character while they are still students. This is an additional argument for improving the quality of the teaching staff in all technical institutions. After all the aim of all education including Technical and vocational education should be to prepare one for life and not merely for a living.

9.8. But while we admit the defects of the students we do not think that the employers are free from all blame. The irresponsibility of the students very often results from the lack of interest shown by the employers in their apprentices. Very few industries with the possible exception of railways and one or two larger concerns such as the Tata Iron and Steel Company and the Bombay Electric Supply and Tramways Company Limited, Bombay, have made any attempt to provide a systematic practical training on the lines of apprenticeship systems as they obtain in foreign countries and certainly industry as a whole makes little or no attempt to provide the engineering students with any kind

of systematic practical training. The course of practical training is often so completely unplanned that apprentices are allowed to move about the workshops picking up what useful information they can. Students often complain that they are actually expressly forbidden to touch the plant and sometimes they are set to do work properly intended for unskilled labour. There have been instances where college apprentices have been asked continuously for long periods, to do work of shifting and stacking materials, removing rust and breaking scrap under the specious pretext that they are being given real practical training. No trained technician could be expected to endure such treatment indefinitely. We are happy to record that in our conversation with industrialists and managers and executives of big works we have noticed a realisation in them that in the interest of the industry itself they must not only provide proper facilities to the pupils for obtaining practical training but must also ensure that those facilities are properly used.

9. 9. In the light of what has been stated above it is obvious that for practical training in works there should be a well arranged programme for systematic courses of training inside the factory. The old fashioned policy of leaving the boy to pick up what he can, how he can must be replaced by a systematically planned series of periods in different departments or sections of the works. There is such a variety in the requirements and methods of different industries that no general plan can be laid down. The plans will also differ according to the persons for whom they are intended, craftsmen, foremen and college apprentices etc. The training in the final stages should include as far as possible experience in handling plant and equipment and proper records should be maintained of the work done from day to day in each department.

9.10. As industry in this country has not generally been ready to play its proper part in the training of its personnel, we are of opinion that Government should themselves institute a centralised systematic and co-ordinated apprentice scheme covering all classes of apprentices. All works should be required to take a stipulated number of apprentices of specified category for a given period and they should be required to put them through a planned programme of training adjusted to the needs of each category and the standing of the apprentices in the category.

9.11. We further recommend that duly qualified Educational Officers should be appointed by Government to supervise the detailed operation of the apprenticeship scheme. These officers would serve as liaison officers between industrialists, the technical institutes and the apprentices. We believe that most industrialists will agree to a comprehensive centralised Government apprentice scheme, but there may be some difficulty in securing their acquiescence in the appointment of Educational Officers specially if they have to pay for them. But it seems to us that this is a case where a certain measure of State control is absolutely necessary and as we have pointed out already, whoever

pays these Officers and bears the other expenses of the scheme, the final benefit will accrue to the industry.

9.12. In order that the needs of the industry might be brought home to the educational institutions we recommend that industry should be given a substantial representation on the governing bodies and advisory bodies of institutes for technical education. We have later recommended the establishment of a Council for Vocational Education and Regional Advisory Committees and have recommended that industry should be adequately represented on the Council and the Committees.

9.13. Apart from the valuable help and advice that industrialists and their organisations can give in the planning of vocational education, industry can also assist the development of technical education by other methods. Employers can recognise in a more positive fashion than they have done in the past qualifications obtained by the employees. Personal qualities which are not always measured by certificates rightly merit promotion, but employees should also be made to feel that the possession of suitable certificates will also improve their prospects of promotion.

9.14. Technical education is a very costly form of education. Its expansion cannot be brought about without heavy capital expenditure for buildings, equipment and apparatus. In some countries notably in the United Kingdom and France technical institutions obtain substantial help by voluntary contribution from the industry for their capital expenses. Some industries help the institutions by donations of equipment and replacement of obsolete equipment. It has been computed that the value of the equipment received by the technical institutions in England ranges between £. 40,000 to £. 50,000 per annum.

9.15. We would like also to refer to another feature of industrial establishment in the Western countries which is not much in evidence in this country. We refer to "the works schools" which is run by a number of industrial establishments abroad. In the "Work Schools" arrangement is made for both general and technical education and in many of them students are prepared for national certificate courses. In addition to the class-room and workshop instruction the students receive physical training and arrangements are also made for games and other social activities. We quote from the synopsis of the Works College conducted by Messrs. Newton Chambers and Company Ltd., Thorncliffe,

"We feel that we shall have failed unless the boy is turned out not only as a competent workman but one with 'a gleam in the eye'. We are trying now methods of achieving this and we hope by this experiment to demonstrate to industry that such efforts are worth while alike from the point of view of the employers and of the entrant to the industry."

Newton Chambers and Company Ltd., specialises in 18 different businesses so that there is a great variety of training and facility for interchange. We recommend that industry in this country can do a

great service to the workers by the establishment of such schools within the industry.

TEACHERS AND CO-OPERATION WITH INDUSTRY.

9.16. The co-operation received from industry and trade would very much depend upon the interest taken by the members of the teaching staff in keeping in touch with the local organisations and with the local branches of industrial, scientific and professional societies. Actually a keen staff alive to the possibilities of social contacts is a great asset to an institution. The teachers can help the maintenance of such contacts by giving popular lectures on technical subjects and technical lectures to groups of local organisations. The teachers thus get better known and their work is better appreciated by the leaders of local affairs.

9.17. The Principal of a technical institution should by virtue of his position be able to do more in these ways than any other member of the staff and much of his useful work lies in this direction. As the Head of the Institution he is able to join such organisations of businessmen as the local branch of the Rotary Club and he should utilise such opportunities where contacts with employers can be made. The Principal should occasionally therefore address industrial and commercial organisations as also branches of professional institutions and employees' welfare societies whereby contacts with employees of all grades can be made. Like other members of the staff he is expected to join such local professional and scientific societies, with which he is allied by training. In this manner, the Principal and his staff may cover the various interests in the town and generally add to the reputation of the institutions. It is obvious that contacts like this are easier to make and are effective in centres of moderate size than in larger cities.

9.18. In the more well-known technical institutions in the Province it has become now quite a common practice for representatives of firms to select students who are likely to finish their course in consultation with the staff of the institution. In institutions where evening apprentice class work or part-time day class work is done the contacts between the industry and the institution are greater than those in which education is restricted only to day scholars.

TECHNICAL SERVICE TO INDUSTRY.

9.19. Very useful service can be rendered to industry if the equipment of the technical college and scientific training of the staff are made available to local concerns in conducting routine tests and investigations of special problems that arise in the works. It is possible for larger firms to install scientific and testing apparatus and employ trained scientists, but the smaller works could hardly afford to do so. Even in the case of larger concerns the availability of another local body of trained experts is an advantage. The tests carried out by

the technical institutions are very often regarded as independent and therefore as acceptable certificates. The teaching staff of a technical institute should be encouraged to engage in such work provided always that there is no interference in their normal duties. Apart from serving as a valuable link to the industry, the successful completion of such work enhances the reputation of the institution in the eyes of the industry and business houses. Every means whereby closer contacts and co-operation between technical institutes and industries can be secured, should be actively explored and utilised unofficially by means of personal relationship and officially through the machinery whereby businessmen and employers' representatives take part in the work of the institute.

CHAPTER X

VOCATIONAL GUIDANCE AND SELECTION.

NEED FOR VOCATIONAL GUIDANCE.

10.1. Expert vocational guidance is necessary if individuals are to choose a vocation which is not only in accordance with their interests, but also with their gifts and capacity. The principle of fitting the work to the man is indeed one which immediately commends itself to commonsense and does not stand in need of reasoned justification. The importance of occupational fitness and the serious and far-reaching harmful consequences of an occupational 'misfit' do not however receive the attention that they deserve. The choice of a career is such a vital thing for a young person, that he should receive all possible help, when the time comes for making it. Looking from another point of view, technical and vocational education is so costly that wastage should be eliminated as far as possible by preventing 'misfits' from entering upon technical education. Vocational guidance is therefore necessary for the giving of information, experience and advice in regard to choosing an occupation, preparing for it, entering it, and making progress in it.

10.2. Motives for the choice of a vocation are various and often have nothing to do with aptitude. The influence of parents and teachers or young people of the same age, the chance example set by a neighbour or school fellow are sometimes the determining factors. Very often the decision is taken for the immediate opportunities for making money in an otherwise blind-alley job and the conditions of demand and supply prevailing at the time. An inquiry conducted in Germany in 1938 showed that only 18% of persons were really well suited to their jobs, 50% were fairly suited and 20% were not suited to their jobs. Different investigators in England have recently estimated the percentage of misfits from 5 to 50 clearly showing that they had used different standards to obtain such widely divergent results.

10.3. Vocational guidance should with advantage precede the entry into a vocational school or institute, since vocational education seeks to prepare persons for their chosen careers or to make them more proficient in the trade or calling concerned. It should continue during the time that vocation is being learned, and after employment begins to the time when it is reasonably certain that the learner is prepared to take his place in Industry or wherever he finds his work.

10.4. Messrs. Abbott and Wood were somewhat sceptical regarding the progress made in many countries in the direction of determining vocational suitability and they were not convinced that investigations had yet reached the stage at which their results were of general applicability. This may probably be due to the fact that until 1941 the prevailing tendency in Great Britain was to scoff at psychological tests. Psychological tests were used to some extent during the two

world wars by all the fighting services and in particular by the R. A. F. But it was only when the Second Great War had considerably advanced that psychological tests began to be used on a large scale on the dawning realisation that the enemy had already been using them with considerable advantage. The Senior Psychologists Department at the Admiralty and the Directorate of Selection of Personnel at the War Office were set up and then there began, what was perhaps the most important step forward, in vocational testing, ever taken in Great Britain and one which incidentally led to the standardisation of certain tests, which a short while ago would have seemed quite impracticable.

10.5. The case for admission to various types of education at the Secondary stage would appear to turn largely on the possibility of recognising the practical or technical aptitudes at the age of transfer which according to our recommendations would be 13 plus to 14 and on assessing practical capacity as readily and accurately as academic ability. The Joint Committee of the Association of Technical Institutions and the Association of the Principals of Technical Institutions in England* on "Testing for the Secondary Technical School has gone into this question very thoroughly and has reached certain conclusions and has made some valuable recommendations. They state:

"(1) On the evidence at their disposal they are unable to go further than to assert that selection of pupils (for secondary technical education) can be adequately made at about 13 years of age. With tests and techniques so far generally developed, they are not yet persuaded that it can be made at an earlier age.

(2) The primary school record used in conjunction with periodical standardised intelligence tests, should play a vital part in the allocation process. Suitable standard record cards have been devised and if these are put into use much valuable information can be made available for the itinerant psychological 'testers' who should be serving with each Local Education Authority. Those experts should conduct courses for selected primary and secondary school teachers on the keeping of school records.....

Much investigating work is being done with the intention of finding the right human material for the new secondary technical schools. There should be no hesitation in carrying out further experiments, . . . such work might well help the secondary technical school to establish itself as surely as, but far more extensively than, the junior technical school, which has already proved itself and prepared the way for its need and perhaps more respectable relative."

10.6. It is evident from the foregoing that authoritative opinion in England is now emphatic upon the importance of the application of aptitude tests in the selection of boys for transfer to technical schools. We feel that the success of technical and vocational education below the collegiate stage will very largely depend upon proper young persons being selected for training and misfits being avoided. The secondary technical high school, the junior technical school and the industrial

*Testing for the Secondary Technical School—Report by a Joint Committee of the Association of Technical Institutes and the Association of Principals of Technical Institutes, 1945.

school should be regarded in every sense as important as the secondary academic schools. They should receive their fair share of entrants of high intelligence, who also show, plain evidence of technical abilities and aptitudes, as well as a lively interest in the practical application of knowledge to constructive and productive industry. The firm establishment of the new type of technical schools will depend very greatly on the efficiency of the tests as a basis of selection in the diagnosis of practical ability and aptitude at the time of test and in progress over the subsequent years. These schools should not be considered as the second best alternative designed to receive the overflow of the academic type of high schools. We therefore recommend that Government should take immediate steps to have aptitude tests formulated for Indian conditions by a body of experts.

10.7. We have indicated above that vocational guidance should begin in guiding children in the various forms of education available after the senior basic or middle school stage and that its function should end only when the young person has found his appropriate niche in the industry. In Germany in 1926-27 as many as 31% of all pupils ending their fourteenth year received vocational guidance, in 1931-32 the figure rose to 67 per cent., and in 1941 to 90 per cent. Since 1941, the offices for vocational guidance have been working with "the plan for the Recruiting of Young Labour" and helped to direct boys into the various German industries. In 1941 the vocational guidance offices directed 15000 boys into the mining industry, 117,000 into agriculture and 120,000 into the metal industry.

10.8. Vocational guidance based on the recruitment plan consists in general information given to those leaving school, their parents and the population in general and in individual guidance. The task of vocational guidance officers consists in interesting as well as deterring people. They must work against too many persons going in for what may at the time be fashionable professions. On the other hand propaganda must be made for the neglected professions and professions which may become increasingly important but which at the time are not well developed. The aim should be to influence the wishes of the young persons in such a way, that they should coincide collectively with the recognised demand of the various branches of national life.

10.9. From the foregoing it is clear that some of the immediate objectives of vocational guidance would be:

(1) To gather information about different occupations and to prepare occupational literature giving qualifications and training required, prospects and conditions of employment in different occupations (*vide* para. 10 below).

(2) To provide exploratory and try out opportunities for discovery of aptitudes through the workshops, craftshop and laboratories of the schools.

- (3) To provide guidance related definitely to the occupation selected after a vocational choice is made; this will include diagnostic and testing service to check on progress being made.
- (4) Placement in employment.
- (5) To check up progress made in service.

OCCUPATIONAL LITERATURE.

10.10. The Unemployment Committee of the United Provinces presided over by the late Right Honourable Tej Bahadur Sapru recommended that Government should undertake the publication of a series of pamphlets, describing the careers for boys as is done by the Ministry of Labour in England. The latest (1941) Career Guides give detailed description of qualifications, training required and prospects of employment in forty-five different occupations requiring generally education beyond the secondary school standard. The Ministry has prepared the pamphlets with the co-operation of professional and educational organisations, Government Departments and other interested bodies. The Federal Board for Vocational Education and a number of other individual State educational authorities in the U. S. A. have published a large number of standard texts on vocational information. These pamphlets are serving a very useful purpose in England and the U. S. A. The Rotary Club of Bombay has also published eight guides to careers and six more are stated to be in preparation.

10.11. The Government should encourage such publications by active co-operation with such bodies. We understand that the Rotary Club of Bombay and other associations and institutions in the province would be very glad to be of assistance in the vocational guidance of young persons.

EXPLORATORY TRAINING.

10.12. We have recommended that the activity principle should be extended to the high school stage and activity centres should be opened for the benefit of pupils of the academic type of high schools. The experience gained by the pupil will be among the most helpful that the school can provide from a guidance standpoint. The courses offered at such centres would probably show mechanical ability or the lack of it in a rather general way because the instruction itself may be somewhat general. It would perhaps be difficult enough to achieve precision in this matter even in schools where vocational education is given for pre-employment purposes and for this reason we have recommended earlier that transfer of pupils from one type of school to another should be made easy by an elastic framework of the educational system.

TESTING SERVICE.

10.13. It is evident from the recommendations made by the Joint Committee of the Association of Technical Institutions and the

Association of the Principals of Technical Institutes that in the allocation of places in technical schools, the school record in conjunction with periodical standardised intelligence test should play a vital part. The provision in our junior and senior basic schools of a variety of handwork and craftwork and the use of simple machines etc., will bring out the latent powers and aptitudes of our children. This will facilitate testing for vocational guidance. It would be necessary for the body of experts referred to above to give clear directions to school teachers in the matter of maintaining proper records of school children for the purpose of diagnostic testing.

THE EMPLOYMENT BUREAU.

10.14. The Central Advisory Board's report considers the employment bureau as an essential adjunct to any educational system. This necessity is felt even more keenly in technical schools. The products of technical schools are trained for specific vocation and unless places are found for them in the industry the educational effort spent on them is a waste. The Central Advisory Board's report has stated some of the functions of the employment bureau as follows:—

(a) to establish contacts with all schools from which on completing the course boys and girls normally enter employment and to advise parents and head teachers in the light of (1) school records, (2) aptitude and other tests, (3) openings for employment available in the area as to the occupations which leavers should seek to enter;

(b) to place in suitable employment those school leavers who have not already obtained posts for themselves;

(c) to arrange for the after-care of the young workers especially in order to deal with misfits.

10.15. We have to indicate at this stage the difference between vocational guidance and vocational selection. Vocational selection differs from vocational guidance since it is concerned with the choice of the most suitable candidate among a number of persons presenting themselves for employment in a particular kind of work. A number of large industrial undertakings abroad have organised methods of testing candidates for posts. During a time of unemployment when there are fewer jobs available than applicants, selection of the best is attempted. On the other hand when there is a shortage of applicants, an attempt is made to distribute the small number over the available jobs in such a way that on the whole an increase in production might result. There is some difference of opinion regarding whether such tests should be carried out by individual industrial concerns or by public vocational guidance offices. Objectively it will appear that if the available persons are to be equitably distributed for the required jobs the best machinery for selection is that of public vocational guidance officers. Suitability tests made by individual industrial concerns have the disadvantage that they only establish whether the youth

concerned is fitted for their works or not. They do not give an opinion as to whether he would be better fitted for another vocation and if so, for which vocation.

10. 16. We are, therefore of opinion that Government should consider the question of vocational guidance and selection as one which should engage their serious attention. With the limited resources of the country every effort should be made to fit square pegs in square holes.

CHAPTER XI.

MEDIUM OF INSTRUCTION.

11.1. The question of medium of instruction in the various grades of technical education requires consideration and this too in a much wider context than that of the jurisdiction of the Province. Very little attempt has so far been made to teach technical subjects in modern Indian languages and this perhaps has prevented to some extent technical education from being wide spread and filtering down to the masses. As regards the medium of instruction the majority of the persons consulted seem to favour the adoption of the mother tongue in the primary and secondary stages of education which in the case of technical training would include the technical high schools, the junior technical schools and the industrial schools. There are also some who advocate the adoption of the mother tongue as a medium of instruction for the higher studies including University education and cite as an example that higher education is being imparted in Urdu even for University degree courses at the Osmania University. As we are however not concerned with higher technical education we will content ourselves by saying that knowledge of English is necessary even to those who would be receiving their instruction in technical and industrial schools, where the medium of instruction, however, should be the mother tongue. It should however be realised that before an attempt is made to impart instruction in languages other than English, the preparation of the necessary text-books in the regional languages will have to be considered as the first step in this direction. Till then it appears to us that instruction will have to be given as heretofore in English and in the regional language according to the grades and types of courses. When we switch over to the mother tongue at the high school stage, English should be taught as a compulsory second language in the technical high school and the junior technical school.

11.2. The number of books on technical subjects so far published in modern Indian languages is extremely small. Their preparation would involve the question of technical terminology. In our opinion the problem can at least for the time being be got over by borrowing the necessary technical and scientific terms from English and by making the fullest use of current and easily understood expressions pertaining to science and technology. The question of providing a sufficient amount of scientific and technical literature in the regional languages has been shelved for a long time. This has proved to be a serious handicap to persons engaged in the industry who on account of their lack of knowledge of English do not have the means to increase their knowledge in science and technology. As the efficiency of industry in its last analysis depends upon the knowledge and skill of the industrial worker, the urgency of providing this type of literature is obvious. We therefore recommend that the Provincial Government should set up a permanent body to be styled "The Provincial Technical Book Committee" which should be entrusted with the work of preparing suitable technical books in

regional languages. Dictionaries (English-Regional Language) dealing with technical and other terms should also be prepared in due course and suitable text-books and technical and scientific literature in the regional languages may either be specially written and prepared or existing English books should be translated into regional languages. The staff of technical and science institutions and well-known writers should be encouraged to co-operate with the Text-book Committee in the preparation of technical text-books.

CHAPTER XII.

TECHNICAL AND INDUSTRIAL EDUCATION SURVEYS.

12.1. One of our terms of reference requires us to examine and make recommendations on the desirability of carrying out surveys to determine the needs of industry in the way of technical personnel. A starting point for determining the nature of future development in technical education must in our opinion necessarily involve a systematic investigation of the distribution and the social and occupational characteristics of the population of different areas. We have found that in some localities institutions have been established by local authorities or by educational societies without due regard to the above factors with the result that the institutions are struggling for their existence.

Types of Surveys:

12.2. Surveys in the field of technical and industrial education may be broadly classified into the following categories :

- (1) General surveys with a view to long range planning ;
- (2) Periodic surveys ; and
- (3) Specific surveys to ascertain the need of any industry and/or region.

A general survey is one which covers the whole field of technical education imparted through public, private and local effort. The aim of such surveys is to make an overall study of the various factors that would determine a programme of technical and industrial education which without such a survey cannot be clearly or definitely visualised. Periodic surveys to review the local economic trend and the likely demand of different categories of workers are valuable, as the needs of the personnel, required by the industry are never static either with respect to types or the number. A specific survey deals with a definite problem such as the education of the industrial apprentices or even more specifically of those engaged in a particular trade such as building, the metal trades or textile manufacture. Certain specific needs are known to exist and the surveys are undertaken in order to assess all available facts, relating to the particular type of industry and technical education required for it.

The Need for Surveys:

12.3. The justification for undertaking such surveys arises from the fact that technical education is intended to prepare pupils for a specific purpose and it is obvious that no technical institution should be started unless a need for it has been justified by an analysis and evaluation of the various factors, which can be done only by means of a survey. Before entering upon a programme of trade

training for example, it would be advisable to find out just what the need or the absorbing power for skilled or semi-skilled workers in the various occupations would be. Similarly it is advisable to determine what particular form or forms of trade or industrial education are necessary for a particular locality taking into consideration its industrial and other environment. In some localities it may be desirable to give part-time education by the establishment of evening classes. In others it may be possible to give this part-time training on a co-operative system whereby the trainee spends a few days in works alternating with a few days in the school. In some localities again the requirements may be such as to make both the above types of training successful. These and many other factors that influence the choice between different types of training can be ascertained through an industrial survey.

12.4. In a country where industry is firmly established and technical education well developed, surveys of this kind may not appear to be quite necessary; but it appears from the pamphlets issued by the Ministry of Education, England, and the Federal Education Board in the U. S. A. that need for periodic surveys is felt even in those highly industrialised countries. In India, where industrial organisations have not yet made considerable headway, surveys of this kind should prove even more helpful. The work of this committee could not be done as thoroughly as would have been possible with the information that such surveys would have put at our disposal. The recommendations we have made have been based on our own enquiries as regards existing facilities for technical education and the existing features of the industries in the Province. With regard to the latter we have received considerable help from the reports of the Industries Sub-Committees. We recommend therefore that general, periodic and specific surveys should be carried out by Government to ascertain the needs of technical and industrial education for the different categories of industrial workers. We recommend that general surveys should be carried out every 25 years, periodic surveys every 10 years and specific surveys as and when the need arises.

12.5. In order that a survey of this kind may receive the desired support and co-operation, certain interests should be associated with the initiation of the programme as well as with the final recommendations. The obvious interests are: administrators of educational institutions, manufacturers, professional men and teachers. Additional support should also be brought to such surveys by the inclusion of one or more persons in the survey staff from outside the area concerned. A person with a broad teaching, administrative or industrial experience will bring a detached attitude which would be a valuable corrective to a body representing mainly of local interests. The local representatives will be helpful with their knowledge of local conditions and their willing co-operation in launching an educational scheme, resulting from such a survey to which they will be a party. The actual persons required for the staff for undertaking the investigation can be found from local technical institutions who may be familiar with the special requirements

for industrial education surveys. We recommend that such surveys should be carried out by special committees, representing the above interests under the auspices of the Provincial Vocational Education Council and the Regional Advisory Committees, the establishment of which we have recommended below.

12.6. It is important that those who are responsible for vocational education, should establish strong links with the industry and the recognised professional bodies, with a view to enlisting their support, for the different kinds of diplomas and certificates, awarded at different stages of technical education. Such consultation between educationists and industrialists about the training appropriate to a particular kind of employment ought to be close and continuous and it should relate to the training and education required for all categories of industrial workers. At present such consultation is neither constant nor comprehensive. This is because no consultative machinery has been set up for this purpose. In our opinion the success of any scheme of technical education would primarily depend upon :

(a) the enthusiasm and confidence it evokes in the public at large ;

(b) the co-operation it enlists from the industry ; and

(c) the extent to which it turns out products to meet the needs of the industry and the readiness of the latter to absorb such products.

12.7. To ensure that the industrial and educational planning goes together we are of opinion that consultative bodies should function at three different levels :

1. A National Technical Education Council for consultation between the Ministry of Education and other Government Departments, representatives of particular industry or group of industries, representatives of education, the professions, and employers and employees' associations.

2. A Provincial Vocational Education Council for consultation, between Department of Education and other Government Departments, representatives of industry, of employers and employees' associations, education and the professions.

3. Local Advisory Committees for consultation between representatives of the Department of Education and other departments, representatives of regional technical institutions and engineering colleges, the technical and industrial schools and representatives of industry, business and labour.

12.8. The Government of India by their Resolution No. F. 16-10/44-E-III dated the 30th November 1945, established an All India Council for Technical Education with the object of setting up a body who would advise Government regarding policy on technical education

in general. The functions of the All India Technical Education Council as stated in the Resolution are as follows :—

(a) to survey the whole field of technical education in consultation with Provincial Governments and such Indian States as may be willing to co-operate with it ;

(b) to consider such immediate projects as are already under consideration by various departments of the Government of India, *e.g.* the provision of senior All India Polytechnics on the lines of the Massachusetts Institute of Technology or the establishment of a Technical College for Electrical (Power) Engineering, and to assign to these their appropriate place in an All India Scheme ; and

(c) to conduct preliminary investigations with a view to ascertaining the conditions on which the authorities in control of existing technical institutes would be prepared to co-operate in an All-India Scheme.

12.9. The constitution of the Council provides for representatives of the different Government Departments, from the Provincial Governments, from the Legislative Assembly and Council of State, the Indian States, Industry, Commerce and Labour, the Inter-University Board and the Professional Institutions. The total number of members was originally 60 and it has been recently increased by about 4 or 5.

12.10. There is no consultative machinery dealing with all stages of vocational education either on a Provincial or a Regional basis, corresponding to the consultative body set up by the Government of India.

12.11. To create enthusiasm and confidence in the public at large and to enlist the active co-operation from the industry as well as to ensure that the products of the technical schools are readily and suitably absorbed by the industry we consider that it is essential to have a close liaison between industry and technical school and institutions both on a provincial and regional basis. We are of opinion that the desired liaison between industry and schools can be secured effectively by establishing regional advisory committees and a provincial vocational education council with adequate representation of all interests.

12.12. The committee presided over by Sir M. Visveswarayya in 1922 had recommended that the Committee of Direction for Technical and Industrial Training should make room for a more representative body with a strong non-official majority in keeping with the pace and requirements of the times. We feel that with the development of industry and technical and engineering education in the Province the time is now ripe for setting up a Council for Vocational Education including technical, engineering, agricultural and commercial education and training. We therefore recommend the setting up of Provincial Vocational Education Council and Regional Advisory

Committees with functions mentioned here below. The functions of the Council would be to advise Government on :

- (a) the Provincial requirements in vocational education and research;
- (b) the co-ordination of work of regional advisory committees ;
- (c) the broad requirements of the collegiate and non-collegiate types of vocational institutions ;
- (d) to conduct general, periodic and specific surveys to examine local economic trends and likely demand for the different categories of workers. (*Vide* para 4 above.)
- (e) to appoint different sub-committees which should include if necessary persons outside the Council to report upon specific problems relating to the different branches of engineering, agriculture and commerce ; and
- (f) to appoint the Boards of Studies for the various branches of engineering and technology.

12.13. We would indicate only in a general way the composition of the Council. The membership of the Council should obviously include the Director of Public Instruction, the Joint Director of Technical Education, the Directors of Industries and Agriculture, the Chairman of the S. S. C. E. Board, representatives of Universities, representatives from the Principals of collegiate and non-collegiate vocational institutions with due weight to non-Government institutions, representatives of industry, agriculture and commerce and of professional institutions and a representative of labour. The membership should be about 25 and the educational and other interests may be represented in the proportion of half and half. The Chairman of the Council should be a non-official and the Council should have a non-official majority. The Provincial Vocational Education Council so constituted will thus be able to integrate the educational planning with the industrial, commercial and professional needs of the Province. The educationists would suggest the arrangements for specialised instruction and indicate the ancillary subjects necessary as a complement of the specialised instruction and the representatives of the industry would indicate the need for particular types of training and would also provide the data for visualising coming economic developments and through the individual industrial concerns secure co-operation for the provision of technical education of their workers.

12.14. We recommend the establishment of three Regional Advisory Committees, one for each of the Commissioner's Division of the Province, the needs of Bombay City being directly looked after by the Council.

itself. The functions of the Regional Advisory Committees should be as follows :

(1) To promote and co-ordinate official and private efforts in regard to vocational training, selection and guidance in the Region ;

(2) To advise the Provincial Vocational Education Council regarding the curricula and to ensure that they are adjusted to changes in practical requirements ;

(3) To advise the Provincial Vocational Education Council on the type and scope of work pertaining to education and training and the working conditions in the school, particularly the trades schools, so as to ensure that the work done by pupils is suitably controlled and is necessarily educative in character and has not been included with a motive of commercial profit ;

(4) To advise the Provincial Vocational Education Council on the conditions of work in industry of young persons who spend part-time in school and part-time in works, so as to ensure that the work is suitably restricted and is essentially educative in character ;

(5) To supervise the working of regional employment bureaux set up by the Government to supply technical personnel to industries in the region ;

(6) To make recommendations for the provision of adult education for workers engaged in industry ;

(7) To advise the Council of Vocational Education as regards the requirements of technical education in the region ;

and

(8) To advise on such other matters as may be referred to them by the Provincial Vocational Council from time to time.

12.15. We would like to mention that authorities in industrially advanced countries like U. S. A. have gone a step further than contemplated by us in as far as they insist on appointment of local school committees representing employers and employees as a matter of routine procedure and as a necessary condition for approval and recognition of vocational schools.

12.16. The functions and scope of the Council recommended to be set up will not be confined to the Secondary Technical Education, but also extend to the collegiate courses. It may appear that while making the recommendations, we have transgressed the limits of the terms of reference. We would however point out that it would neither be possible nor desirable to detach one section or stage of the educational system and provide a self contained organisation for it without reference to

the rest of the system. The fact is that education and more specially technical education must be considered as an organically knit-up system to be planned as a whole. The need for such an advisory council for the Province is already being felt and would be felt all the more with the development of technical and vocational education in the province. The question of standards of diplomas and certificates awarded in technical subjects under the aegis of different bodies is likely to be further complicated by the different regional Universities instituting the courses for diplomas and certificates and thus having within the Province difference in standards in this respect. The time has now come for all vocational education at different stages to be viewed from a broader perspective and for this the Provincial Vocational Education Council, as we have recommended will be a step in the right direction. In making these recommendations we do not wish to minimise the pioneering work which the Board of Technical and Industrial Training has done for over 36 years. The partial failure of such a small body can perhaps be attributed to its not being fully representative of all interests, its limited scope and the fact that it never enjoyed the prestige of a statutory body. We therefore recommend that in order to inspire the necessary confidence and support from the public and the industry both the Council and the Regional Advisory Committees should be established by an Act of legislature.

CHAPTER XIII.

FINANCE.

13.1. We give below a general picture of the financial implications for implementing our recommendations for the establishment of the different types of technical and industrial schools. It has not been possible for us to compute the total expenditure but we have given an idea of the probable expenditure for the establishment of the following types of schools.

THE NUMBER OF TECHNICAL HIGH SCHOOLS.

13.2. The number of places to be provided in the technical high schools could be arrived at by making certain assumptions. With the opening of the new engineering colleges it is estimated that the average annual admissions to the degree classes in Civil, Mechanical, Electrical and Communication Engineering would be in the neighbourhood of 900. Adding this to the present number of admissions to the Diploma Classes in the various institutions, which at present is in the neighbourhood of 560 the total number of admissions to the Degree and Diploma Classes comes to 1460 per annum. The number of students entering for degree and diploma as calculated above appear to us unusual as compared with corresponding figures in other industrially advanced countries. There the number entering for degree courses is a small proportion of those going in for technical training. Perhaps this is a temporary phase and in due course a reasonable proportion will be maintained between those going for degree and for diploma. It may be reasonably assumed that 40% of the students who are admitted to these courses will, in future have received their previous education in the Technical High Schools which brings us to the figure of 584. If allowance is made for wastage at 15 percent, the places to be provided for annually would be about 670. This means that in the Technical High Schools provision will have to be made for admissions of 670 students annually who would ultimately go for higher technical education leading to a degree or diploma. It is obvious that this is only a fraction of the total number of students who will be receiving their education in the technical high schools, as a number of them would, on completion of their education, go directly into different occupations. At present it is found from the statistical returns published by the Director of Public Instruction that about 18 per cent of the students who successfully complete their High Schools education enter colleges. On this basis the number of places for which the provision will have to be made in the Technical High Schools works out to 3720. The 1944-45 Annual Report of the Department of Public Instruction gives 23745 as the number of male students who passed the Middle School stage of examination. This number is bound to increase at least, by 50% consequent on the application of the principle of compulsion in

the primary stage, so that the number of middle school leavers would be not less than 36,000. The Committee is of the opinion that the ratio between students following the academic courses in High Schools and those following the courses in Technical High Schools should be 8 : 1. The places to be provided in the Technical High Schools on this basis would come to roughly 4000. It will be seen that this figure is in agreement with the calculation arrived at above. There are at present six Technical High Schools taking into account those which have been recently opened. The number of Technical High Schools to be provided will be about 90 according to the first calculation. There are at present about 1100 secondary schools of the academic type. As these are also bound to increase with the growth of general education, the percentage of Technical High Schools will be less than 8 if the total number of schools increases. This would work out to four Technical High Schools per District. We understand that Government have already sanctioned the establishment of two more schools in 1949 and four in 1950. This would bring the total number of Technical High Schools to 12. We recommend that Government should aim at establishing one Technical High School in each District within the next five years. An estimate giving the capital and recurring expenditure for a school of this type is appended. (*Vide Appendix-G.*)

13.3. We have recommended that the Junior Technical School being a new type of pre-employment school to India, it should be started as a part of Technical High School or a well-developed Industrial School. The cost of additional capital expenditure would be thereby also curtailed. The average cost per pupil being the same as for Technical High School, the recurring cost for running such schools can be easily computed. It is stated in para 26 of Chapter V that the number of boys likely to be trained in the Junior Technical the Industrial and the Trade Schools in the immediate future would be 6,000 and few years after the Compulsory Education Act has been in force this figure may go upto 12,000. Looking to the requirements of industrial personnel, we would allocate 2000 places to Junior Technical School, 3000 places to Trade School and 1000 places to Industrial School. The recurring expenditure for 2000 places in the Junior Technical Schools is estimated to be Rs. 8,00,000.

13.4. We have also recommended in Chapter IV the establishment of "Art and Industries Centres" at places where there are about half a dozen schools in the vicinity. Our specific recommendations regarding the places where such centres should be established in the first instance are given in Table No. 12 Chapter V. The cost of different units is given in Appendix F.

13.5. From the figures obtained by us we find that the range of average annual recurring expenditure of the institutions under the Board of Technical and Industrial Training is as follows :—

	Rs.
(a) Institutions of I Grade	... 80,000 to 1,50,000.
(b) Institutions of II Grade	... 25,000 to 35,000.
(c) Institutions of III Grade	... 8,000 to 12,000.

The lowest figure quoted by a private institute was Rs. 604 and the highest figure was Rs. 1,78,959.

13. 6. According to the figures collected by us the average annual expenditure per pupil in different types of schools is as shown below :—

	Rs.
(1) Primary School	... 17 to 33 Per Annum.
(2) Middle School	... 38 to 65 Per Annum.
(3) Technical High School	... 300 to 500 Per Annum.
(4) Trade School	... 100 to 200 Per Annum.
(5) Industrial School	... 150 to 300 Per Annum.
(6) Collegiate Type	... 600 to 1000 Per Annum.
(7) Senior Technical Institutions	... 400 to 600 Per Annum.
(8) Teachers Training (Estimated)	... 150 to 300 Per Annum.
(9) Recreation, Social, Museum, Library, etc.	5 to 15 Per Annum.
(10) Examinations	... 8 to 80 Per Annum.

13.7. Technical education is generally costlier than academic education. The average cost per pupil in an academic high school in 1944-45 was Rs. 63 as against Rs. 300 to Rs. 500 in the two technical high schools that existed. Similarly whereas the average cost per pupil in an Arts College was Rs. 209 in 1945 the average cost in a senior technical institute ranged from Rs. 400 to Rs. 600 and in post-graduate institutions exceeded Rs. 1200 per annum. It is nevertheless admitted on all hands that expenditure on technical education would be a sound investment in the long run and would act as one of the factors contributing towards the removal of the proverbial poverty of this country.

13.8. On the continent of Europe it is customary for the State to finance education including technical education. The Municipalities may make a contribution, but technical education is centralised, controlled and financed by the State. This results in a uniform policy being applied throughout the country and it is said that the educational system prevailing in European countries was greatly responsible for the high standard of workmanship and efficiency in industry on the continent prior to the war.

13.9. In England education including technical education is controlled by the Local Education Authorities which receive grants from Education Ministry on a percentage of their approved expenditure. The total grant made by the Ministry of Education to the Education Authorities in 1938-39 was £.45,500,000 this being about half of the total expenditure incurred by the Authorities. The grants given for elementary education were governed in the pre-war years by a somewhat complicated formula which for the sake of simplicity may be stated thus: 60 per cent. of the teachers' salaries, 50 per cent. of the special services, (Medical service, meal service, physical training, play centres, etc.), 40 per cent. of the cost of conveyance and 20 per cent. of the remaining net expenditure. For higher education *i.e.* secondary technical

and training of teachers; the grants were based on recognised expenditure at the rate of 50 per cent.* During the war-years the rate of grants for higher education continued at 50 per cent. For the elementary education a simplified formula had been arrived at to meet the wartime dislocation of educational services. The rate of grant for expenditure on school meals was raised by 30 per cent. The expenditure on milk was wholly met by Government. The approved expenditure on establishing and equipping premises obtained grants at the rate of 100 per cent. The estimated expenditure on grants to local education authorities during the year 1944-45 was £. 57,500,000.

13.10. Separate grants to Local Education Authorities for elementary and higher education ceased on 31st March 1945, when the Education Act of 1944 came into force. Instead a single combined grant is now payable to the authorities for all forms of education. The effect of this change as well as of the special concessions made due to increased expenditure on salaries the Ministry now makes a grant of over 55 per cent. of the total recognisable expenditure for the Local Education Authorities. It is estimated that the general effect of the reforms under the 1944 Act, will be to raise the total expenditure on education from the public funds progressively over a period of 10 years, from 1944-45 figure of approximately £. 120,000,000 to a figure of £.200,000,000 annually.

13.11. According to the Bombay Plan it is estimated that at the end of the Second Five Year Plan, the expenditure on education will be Rs. 80 crores and at the end of the Third Five Year Plan it will be Rs. 370 crores for the whole of India. The Central Advisory Board estimates the total gross expenditure on all types of education at Rs. 312.6 crores, out of which it is estimated that Rs. 277 crores will have to be met from public funds and Rs. 35.6 crores from other sources. The annual recurring cost of the Board's Plan for certain stages of education is given below :

Head of Expenditure.	Estimated gross annual expenditure,	Estimated income from other than public funds.	Estimated net expenditure to be met from public funds.
	Rs. In lakhs.	Rs. In lakhs.	Rs. In lakhs.
1. High School Education.	7900	2900	5000
2. University Education	960	290	670
3. Technical, Commercial and Art Education	1000	200	800

13.12. If we are to go by the examples of the industrially advanced countries in the West it is apparent that Government should either bear the whole cost of technical education and control it or leave it in the hands of private agencies giving them substantial grants-in-aid.

*Ministry of Education, England, Pamphlet No. 2, A Guide to the Educational System of England and Wales, pages 53-55.

As technical education is costly at the initial stage, when technical institutions of new patterns are to be established and developed, it would, in our opinion, be advisable for Government to establish their own institutions at suitable centres in the province which would serve as models for private organisations to adopt and follow. These private efforts should be encouraged by Government by the award of substantial grants, both recurring and non-recurring.

13.13. The Grant-in-aid Code, 1939 of Government lays down the rules and conditions for recognition and/or grant-in-aid to schools and colleges. The methods of grant-in-aid and the different heads under which schools and colleges could receive Government grant are also laid down in the Code. Although the rates regarding the grant on recurring expenditure of schools and colleges could be interpreted in different ways, in actual practice the method adopted by the Director of Public Instruction results in a grant not exceeding $\frac{1}{3}$ rd of the admitted expenditure, whereas the Director of Industries, (Now the Joint Director of Technical Education) sanctions grants to vocational schools upto 50 per cent. of the admitted salaries of teachers.

13.14. The Grant-in-aid Code also allows grant on furniture and equipment upto $\frac{1}{4}$ th of the admitted expenditure in the case of colleges and upto $\frac{1}{3}$ rd in the case of secondary schools. In the case of vocational schools the $\frac{1}{3}$ rd limit could be raised to $\frac{1}{2}$ of the actual expenditure under this head. The Code also provides grant on buildings and sites upto $\frac{1}{4}$ th of the admitted cost. Besides, the Code lays down grants to special schools, schools for defectives and night schools.

13.15. We are of the opinion that the recurring grant to vocational institutions should not be less than 50 per cent. and grants on buildings, sites, furniture and equipment should be between 50 to 75 per cent. of the admitted expenditure. Over and above the grants, Government should make available to governing bodies of aided institutions interest-free loans for buildings, equipment, etc., to encourage them to establish vocational institutions in different regions. We recommend that the recurring grant to vocational schools should not be less than 50 per cent. of the admitted expenditure and within 50 to 75 per cent. of the non-recurring expenditure depending upon the areas and the resources of the management. It is expected that 30 per cent. of the expenditure may be met from the fees and 20 per cent. from Local sources.

13.16. We recommend that Government should provide adequate number of scholarships and free places for poor but deserving students in technical institutions of different grades so that they should be able to receive their education in such institutions and continue their studies in higher institutions.

13.17. We also recommend that in the administration of the system of grant-in-aid due regard should be given to ensure that the governing bodies of aided institutions would in all circumstances be able to conduct the institutions with full efficiency combined with reasonable economy. Much of the difficulty of maintaining the equipment in

technical and industrial schools up-to-date is due to the fact that there is no specific provision for grant in respect of replacement of obsolete equipment. Such a provision in our opinion is necessary. We further recommend that the management of the institutions should be empowered to build up depreciation and obsolescent funds from which additions or replacements could be made. The approved annual contribution to this fund should rank as admissible expenditure for the purpose of grant-in-aid.

13.18. A number of schools conducted by local municipal authorities are struggling hard for their existence and we recommend that such schools should be taken over by Government after stipulating the liabilities of the municipal authorities for the maintenance of these institutions by proper assessment of the capacity of the district local boards or the municipalities.

13.19. It is found increasingly difficult by the pupils coming from mofussils to secure suitable accommodation in the towns where vocational schools are established. We anticipate that this difficulty will not diminish even with the establishment of technical high schools, junior technical schools and trade schools in other areas. We recommend that Government should make available interest-free loans to institutions managed by private agencies to build hostels for students. The loans should be repayable within a period of thirty years. Alternatively Government may give 50 per cent. grant for the purpose of erecting hostel buildings.

FINANCIAL AID FROM INDUSTRY.

13.20. In foreign countries business and industry have in many instances given to local institutions gifts of equipment and machinery and have even undertaken the responsibility of removing the obsolete machinery and of replacing it with the latest product. The co-operation of the industry particularly of manufacturers of machinery should be sought in this direction for reducing the initial cost of equipment and also of replacement.

13.21. Trust Funds have been created in other countries for the encouragement of technical education in general and for the welfare or education in a particular industry. Mention may be made in this connection of the Carnegie United Kingdom Trust, The Cassel Trust and Miners' Welfare Fund, the Scottish Country Industrial Development Trust, and the Scottish Rural Industries Equipment Fund and Training Scheme. Government should encourage the formation of such educational trusts by suitable means such as remission of income-tax on the amount of money paid for such charitable purpose.

13.22. In France the help given by business is very substantial and is on a compulsory basis. Every employer who pays more than 10,000 francs, i.e. about Rs. 1300 a year in wages is bound by law either to pay a special tax of 2 francs per 1000 francs of the wages he pays, or show that he is entitled to be excused from the whole or a part of this tax because he is already contributing in

other approved ways for the proper education of the young persons in his employ. The total yield of the tax in pre-war years, after all proper exemptions having been made, came to nearly 3 crores of rupees and this was devoted to vocational education and related purposes. In this connection reference may be made to the fund created by the Central Government by the levy of a tax on the export of cotton and cloth. We feel that Government will be able to raise a part of the necessary funds for the promotion of technical, industrial and vocational education including higher technical education from a levy of this kind, as Bombay is a great centre of industry and commerce. It is seen from "The Indian Labour" issue of May-June 1948 that the total wages paid in Bombay Province during the year 1946 were Rs. 48,66,55,130. By imposing a levy on the above basis Government will be able to realise approximately Rs. 10,00,000 for technical education per year.

13.23. We are aware that industry has shown its interest in technical education by helping the larger and more advanced institutions in the Province with substantial donations. The success achieved along these lines in the past has been the result of personal interest and activity on the part of members of the governing body and heads of the institutions. Big industrialists with interests in many parts of the country tend to refuse assistance to local institutions because of possible repercussions in other areas. Local firms tend to be more generous, since they have observed in their own experience, the benefits accruing to their employees and to their own organisations. We would like to stress the fact that technical education cannot achieve realistic and purposeful direction at every stage, unless industry takes a real and effective interest in its promotion and development. The evidence we have gathered in respect of a general tax on industry for technical education is not conclusive. We found the Ahmedabad Millowners to be in favour of such a levy particularly for the training of the skilled workers.

13.24. Technical education being costly cannot be adequately supported from the funds of the Provincial Governments alone. It also meets more than a Provincial need. It is therefore but right to expect that the Central Government should make a contribution to meet the needs of technical education schemes of the provinces. Experience in other countries has shown that practically nowhere have the Provincial efforts alone been found capable of meeting the entire burden unassisted by Central Government. The Federal Government of U.S.A. passed the Smith Hughes Act providing for annual disbursement of seven million dollars to the States in support of their programme of various forms of vocational education. The Dominion Government of Canada enacted an Education Act in 1890 appropriating a sum of ten million dollars in ten years for the purpose of assisting and promoting technical education in Canada. It is superfluous to state that far stronger reasons exist in this country for a similar financial assistance being rendered by the Central Government for promotion of technical education in the Provinces which are very much poorer than the States in America and Canada.

CHAPTER XIV.

SUMMARY AND RECOMMENDATIONS.

CHAPTER III.

1. Although it would be impossible to forecast with any degree of precision the extent of industrial expansion in the Province and the development of technical education needed for it, it would be safe to assume that there will be sufficient industrialisation to create an urgent and growing need for facilities for technical education. We have surveyed probable expansion of industry in the various branches such as mechanical, electrical and civil engineering, textile manufacture, chemical manufacture, printing, small-scale industries and rural industries and have stated the categories of technical personnel required for the large and small-scale industries.

2. Technical education will have to be provided for the personnel required for the existing engineering industries as well as for the expansion of the industry as envisaged in our recommendations and a very wide range of instruction will be necessary for all grades of employees from the manager, designer and the research worker to the operatives engaged in routine production. (R.1—3.3.)

3. In the building industry much depends upon the efficiency of the Clerks of Works and Maistries for whom special training courses are essential. (R.2—3.9.)

4. It is also necessary that Government should take every step to foster and encourage education and training for the textile industry for all grades from the manager to the ordinary weaver and spinner. (R.3—3.12.)

5. The courses for students of printing technology should be provided at larger and properly equipped schools of printing, which we recommend, should be started in the Province at suitable centres. (R.4—3.22.)

6. We recommend the establishment of a special local technical institute at Surat where special stress should be laid on imparting education for the Jari Industry. (R.5—3.23.)

7. It is very important that the skill which has been developed in this trade should not be allowed to die for want of encouragement as has happened in some cases in the past.

8. The cottage and small-scale industries related to agriculture properly planned and encouraged by Government will bring prosperity to the country-side. We recommend that agricultural institutions of the non-collegiate grade should be brought under the control of the Council of Vocational Education, the establishment of which we have recommended in Chapter XII. (R. 6—3.25.)

9. The lack of education of any kind is a principal reason for the low efficiency of the manipulative class of workers in this country. We attach very great importance to the provision of training facilities for this category of industrial workers. Maximum efficiency in industrial production cannot be obtained if there is no reasonable and legitimate scope for ambitious men of intelligence and ability to rise to higher grades. We recommend that a systematic scheme for the vocational training of workers in the operative grade should be formulated and should be put into operation at an early date in the Province. (R.7—3.41.)

10. The present tendency is to afford equality to women in all walks of life and it is therefore but right to provide opportunities to girls and women for adequate trade and industrial training in order that they might take their place in the business and industrial life of the country.

11. As however women in this country had few opportunities to take up independent careers in the technical fields and as their vocational ability finds its best expression in the home-making arts, we recommend the establishment of institutes for women which may be designated as Kala-Mandirs where courses in specific work-room crafts such as needle-work, embroidery, ladies dress-making, tailoring and cookery may be offered. Such Centres should also provide a training ground for teachers of domestic subjects. (R. 8—3.43.)

12. We recommend that part-time courses of the duration of one or more sessions should be provided in these institutions for women and girls engaged in full-time employment. (R. 9—3.43.)

13. We recommend that in addition to tailoring, embroidery and fancy work for which the Board of Technical and Industrial Training offers courses, provision should be made for instruction and examination in other similar subjects. (R. 10—3.43.)

14. The problem of special practical courses to serve the requirements of girls was the basis for the establishment of the Women's University by Dr. D. K. Karve. The idea has since then gained ground and a number of educational institutions of Secondary School Grade for girls, providing along with general education, practical courses, has sprung up in different parts of the Province. These institutions deserve every encouragement and help. There would, however, be little chance for them to be established on a sound footing unless the girls attending them get admission to the colleges as lack of such a facility would bring the institutions down in the estimation of the general public. We therefore recommend that these institutions should be encouraged to develop into full-fledged Vocational High Schools for Girls and should prepare girls for various optional courses provided at the S. S. C. Examination with suitable modifications wherever necessary and the girls should get admission in the Arts Colleges. (R. 11—3.44.)

15. In order that the vocational education of women may proceed as far as possible under the guidance of women themselves we recommend

that Government should encourage Women's Social and Welfare Associations to take up such activities and expand them where need exists. (R. 12-3.45.)

CHAPTER IV.

16. The aims of education may be stated to be—

- (1) To equip a person to earn his livelihood ;
- (2) To equip a person to play his part as a citizen in a democracy ;
- and
- (3) To enable a person to develop all the latent powers and faculties so as to enable him to enjoy a good life.

17. The present state regarding the development of education in its various stages is described (in paras 4.3. to 4.12.) giving the views of the Wardha Committee, and of the Central Advisory Board regarding education at the age-level 6 to 14. We attach very great importance to the introduction of handwork in the primary and middle stage of school education as envisaged in the Central Advisory Board's plan for—

- (a) the intrinsic merit of hand-work ;
- (b) creating an atmosphere in the school by which the wastage in school will to a very great extent be eliminated ;
- (c) developing the full and well integrated personality of the pupils ; and
- (d) the discovery of the aptitudes of the pupils during the middle school stage.

In order to attract and retain a larger number of pupils at the middle school stage, we recommend that a variety of optional subjects involving manual work and skill should be introduced at this stage as a part of general education. (R. 13-4.14.)

18. We recommend that craft education should be extended to the high school stage as it is done in some other countries and to a small extent in this country. (R. 14-4.15.)

19. In view of the fact that it may not be possible for individual school managements to provide their own workshops and equipment and as it will not be possible for Government to give adequate grants to all schools separately we consider it desirable that Government should establish at important towns activity centres to be named "Arts and Industries Centres" for the benefit of high school pupils in the locality. (R. 15-4.15.)

20. Such Centres should be established in places where there are about half a dozen schools in the vicinity of the proposed Centre. (R. 16-4.15.)

21. We suggest that a variety of activities should be provided at these Centres. The pupils from such schools should be given instructions

in the activity centres for about two continuous periods twice a week. (R. 17 — 4.15).

22. The capital and recurring costs of different units in such a centre and data from which costs of further expansion can be computed is given in appendices. (*Vide* Appendix—F). We recommend that such centres should be established in the first instance in places recommended by us in Table No. 12. (R. 18—4.16).

23. We would like to emphasise that we are recommending the introduction of handicrafts at the high school level mainly with a view to stimulating the interest of the pupil in his studies, as such training stands for efficiency in work and thoroughness in production. The principle of providing a satisfying activity with a view to developing the latent faculties of the pupil should not be, in our opinion, confined to craft work or manual work alone. Children (adolescents) manifest their abilities for academic, technical, art or music studies which are not mutually exclusive. It is for this reason that we recommend that art education which is closely allied to craft education should be encouraged in the Arts and Industries Centres. (R. 19—4.20).

24. It is also necessary to make provision for those students who have special abilities in science for pursuing interesting experimental work in science in all its branches. The Arts and Industries Centres will, therefore, have a Craft Section, an Art Section, and an Experimental Science Section. (4.21).

CHAPTER V.

25. It is our view that while making provision for technical education, due care should be taken to see that the true function of education which is a creative one should be kept in view so as to create new forms of skills and by so doing to confer a higher social status upon occupations and that past mistakes in this respect should be avoided. Technical education should, therefore, be based on a broad foundation of general education and at every stage of technical education due provision should be made for the cultural development of the student.

26. In the planning of vocational education a very important thing to be borne in mind is that the plan should not contain water-tight compartments, but that it should be sufficiently flexible and elastic so as to afford openings for deserving and ambitious scholars at every stage.

27. We have examined the various courses offered under the Board of Technical and Industrial Training and we found that these courses required standardization. Our recommendations in this respect are incorporated in Table No. 9 where in column 5 our suggestions regarding modifications of the courses are given along with the institutions where such courses are offered. It is not expected that the modifications that we have suggested could be brought into effect immediately and we therefore recommend that the suggestions

that we have made should be borne in mind while giving effect to the general plan of technical education which we have recommended. The standards of admission to different courses should conform with those laid down in our general plan. (R. 20—5.1—5.4).

28. The general plan of education as we visualise it, is given in Chapter—V and explanation of the plan is given in paragraph 5.5. (R. 21—5.5).

29. The report of the Consultative Committee of the Board of Education, England (The Spens Report) as well as the Reports of Abbott and Wood and of the Central Advisory Board have very strongly recommended the establishment of technical high schools as quite distinct from academic grammar schools having in every respect equality of status with the academic high schools. Technical subjects have, these reports state, been found to be capable of providing an all round education or culture as distinct from the vocational training for many young people, not necessarily by any means less intelligent, but whose mental faculties are fully stimulated and more fully satisfied by practical rather than academic studies. We are fully convinced of the need of opening schools of this type in order that a greater variety may be introduced into education at the secondary stage and also with a view to diverting a reasonable share of the best brains of the community into industrial occupations. There are at present four such technical high schools in the province. We recommend that technical high schools should be opened in the first instance where the number of students attending the high school classes (IV to VII) is more than 2,000. (R. 22—5.15).

30. We recommend that such schools should be started in industrial towns even though the number of high school students does not come up to 2,000. (R. 23—5.15).

31. We recommend that Government should encourage partial or full conversion of private high schools by giving grants-in-aid for such conversion in accordance with our recommendations in that behalf. The ultimate aim should be to have a technical high school in every district. (R. 24—5.15).

32. The present syllabus of the Secondary School Examination of Technical High School requires revision in the light of the experience gained in the last few years. It is considered to be rather heavy. It is also capable of being widened by inclusion of more technical subjects as options. We recommend that the S. S. C. Examination Board be requested to go into this question. (R. 25—5. 13, 15).

33. We recommend that transfer from the academic high school to technical high school and *vice versa* should be as easy as possible and that it should be possible for a pupil to be transferred from either type up to standard V (inclusive). (R. 26—5.11).

34. We recommend that the students from technical high schools should be given some credit for entrance into engineering and technological colleges and institutions. (R. 27—5.16).

35. Requirements of the personnel for industry for skilled artisans, craftsmen and junior supervisors will be drawn from those who have completed their course at the Junior Technical, Trade or Industrial School which in most cases will be a two-year full-time course. In view of the importance which is to be attached to the craft work in the school curriculum up to high school stage it is expected that after a course of training in a Junior Technical, Trade or Industrial School, boys will have attained a standard of skill sufficient to warrant their admission to skilled trades as apprentices or learners. Pupils from these schools are expected to enter employment at about the age of sixteen in the skilled artisans category.

36. Junior Technical Schools in England are reported to have done very valuable work within their own province. We recommend the establishment of Junior Technical Schools as an experimental measure where provision will be made ultimately for about 12,000 pupils. The curriculum to be followed is outlined in paras. 5.27 and 5.28. (R. 28—5.25, 26).

37. The whole of the instruction in the junior technical school should be given in the mother tongue with the retention of English technical terms wherever necessary. (R. 29—5.28).

38. English has been included as a special subject of study for the benefit of those pupils who would continue their studies after leaving Junior Technical School and also benefit by being able to read engineering and technical books written in English. As in the case of technical high schools, opportunities should be provided for bright pupils from the junior technical schools for transfer to technical high schools or to a senior technical school at the end of their course. (R. 30—5.29).

39. After the completion of the course in the junior technical school the pupils should be awarded certificates and we recommend that the Provincial Vocational Education Council should be requested to go into the question of giving credit for the work done by the pupils in the school throughout the course. (R. 31—5.33).

40. As the Junior Technical School is new to this country we recommend that in the early stages the School should form a part of a Technical High School in order that cost of their establishment both capital and recurring could be minimised (R. 32—5.32).

41. There are in this province certain institutions which are offering courses of training framed by the Board of Technical and Industrial Training which could properly fall in a category of what may be termed as a Senior Technical School. The object of such a school is to provide vocational education to boys who have had a more prolonged general education and who intend to enter one of the non-manipulative industries, such as spinning or weaving, with a view to holding supervisory positions. As the object of education is to produce a person above the rank and file worker it is necessary in such institutions to provide a curriculum in

which science, mathematics technical drawing, engineering and technological subjects and training to handling machinery are included.

CHAPTER VI.

42. Trade Schools prepare pupils for a definite trade or occupation and the development of such schools should, in our opinion, form an essential feature of the programme of development of technical education and training in this Province. (R. 33—6.1).

43. An improvement in the training facilities for the large proportion of the engineering employees and a general improvement in the standard of craftsmanship in this country are, from the point of view of future industrial development, the most important and urgent problems.

44. Judged by the Western standard the craftsmanship in this country will remain at a low level for a considerable period unless positive efforts are made to improve it.

45. As a result of the Compulsory Education Act and further of the elimination of English from the middle school stage there will be greater number of students going through the middle schools who at the end of the middle school stage will have to be provided with suitable opportunities for vocational training. We would, therefore, recommend that admission for craft training in the trade schools should normally be for persons who have completed middle school stage of education. (R.34—6.5).

46. It is important that the facilities for the training of craftsmen in industrial establishments as well as the general industrial environment should be so improved that their first impact upon the new entrants produces a salutary effect upon them.

47. Effective practical training can be imparted by a method consisting essentially of explanation, demonstration, imitation and repetition.

48. Messrs. Abbott and Wood had recommended the Continental Plan rather than the English one, as the best to suit the Indian conditions for the craftsman training. We do not agree with this view.

49. In our discussions with industrialists, educationists and labour leaders, we observed a unanimity of opinion regarding the training of skilled workers and craftsmen in that it should be on a co-operative basis; the training being carried out partly in school and partly in the industry. We are inclined to agree with this latter view.

50. We are of opinion that the abilities which are desired in a craftsman can best be developed by a combination of a good practical training system organized in a factory or a workshop and a good technical education system organized in a suitable teaching institution.

51. It is, therefore, emphasised that there must be fullest co-operation between the industrial establishments and the technical institutions in the planning of training schemes and in their operation. (R. 35—6.9).

52. Under the present conditions we would suggest that the trainee should spend the first four months entirely in the trade school and of

the remaining period of the first two years, half should be spent in the school and the other half in the factory on a part-time basis. During the whole period of training, the progress of each apprentice should be the subject of a system of monthly records kept by the instructors both in the school and in the industry. At a certain stage of the factory training the apprentice should be given work involving responsibility. The total period of Trade Training should extend to three and a half years, the last $1\frac{1}{2}$ years being spent in a factory as an apprentice. (R. 36—6.11, 6.13).

53. We recommend that some of the present courses offered under the Board of Technical and Industrial Training should be re-organised to form trade courses. We also recommend the introduction of new trade courses particularly for the Electrical Industry. It is further recommended that the proposed Provincial Vocational Education Council should be requested to go into the question of an adequate system of Certification for the trade courses. (R. 37—6.15).

54. In the textile industry there appears to be an urgent need for starting of special trade courses for the two main branches of the industry *viz.*, spinning and weaving. At present the industry, both as a whole or in its individual units takes no responsibility for this training. Facilities for post-employment training on a very small scale are available at Parel at the Textile Technical School of the Social Service League. But they are quite inadequate and more schools of this type are necessary in the various mill centres not only in Bombay City but also at Ahmedabad and Sholapur. It is therefore necessary to introduce facilities for pre-employment training first in the weaving section as early as possible as no opportunities exist for training this category of skilled workers. We agree with the views of the Millowners in Ahmedabad that in course of time after provision has been made for adequate training facilities, no person who does not possess a certificate of being a skilled operative should be allowed to work in the textile industry. We recommend that a beginning should be made by starting at least three pre-employment schools at Bombay, Ahmedabad and Sholapur respectively. (R. 38—6.16, 6.17 and 6.18).

55. It has been suggested that provision should also be made for hostels for the trainees as hostel life would be more conducive to the formation of good habits both as regards study and social behaviour and that such hostels should also be utilised for persons who come to the industry for vacation or college apprenticeship so that the contact of trade apprentice and the college apprentice would be mutually beneficial. (R. 39—6.18).

CHAPTER VII.

56. Part-time education has not developed in this country to the same extent as in other industrially advanced countries. Part-time education may be either in part-time evening classes or in part-time day classes.

57. In this province provision exists for part-time day education at the V. J. Technical Institute on Saturday mornings where apprentices and industrial workers released from their work by the employers utilise their time in attending the institute for necessary theoretical instruction to supplement their practical training. Recently on account of the reduction in the working hours in the textile mills, the Textile Technical School at Parol has also started classes during the day for textile workers.

58. There is no general system of selection of apprentices to attend these classes with paid "time off" and we recommend that in general only those students who have shown by their industry and ability their worthiness for assistance and encouragement, should be granted the privilege of "time off" with pay. The "time off" allowed to them should normally be two half-days a week and that full time of eight hours per week required for training should be made up by the apprentices being required to give up from their own leisure time once a week, a minimum of two hours for attendance at evening classes. (R. 40—7.5).

59. The Government Apprentice Scheme comprising the acceptance of young men for being apprenticed to industrial establishments for a period of 3 to 5 years according to the nature of the industrial trades for which they are apprenticed was introduced by the Government of Bombay in the year 1935, with two objectives: (1) to provide industry with young persons of education as skilled workers; and (2) to reduce the middle class unemployment. The Scheme has been operating at the V. J. Technical Institute, Bombay and the R. C. Technical Institute, Ahmedabad.

60. The selection of pupils for the Government Apprentice Scheme is made by selection committees consisting both of teachers and industrialists and probably this accounts for the greater keenness the evening apprentices show in their work, as against the Saturday apprentices who are selected by their employers.

61. Even with the provision of part-time day education which may be given during the working time of the apprentice with arrangement for paid "time off", additional arrangement for evening classes which the apprentice will attend during his own leisure-time will have to be made. (R. 41—7.9).

62. A large number of persons working in workshops who might find difficulties in giving up much of their working time to attendance at day classes would benefit by either part-time day release or by attendance at the evening classes. We recommend that part-time instruction given during the evening sessions may as far as possible be provided during the day, with paid "time off". (R. 42—7.9).

63. We do not contemplate that part-time education should be carried on in buildings of their own, but the classes may be held in the premises of institutions where full-time education is imparted. We recommend the appointment of one Administrative Head

(Principal) for both the types of classes at one and the same institution. (R. 43—7.10).

64. Experience gained during the last 12 years has shown that part-time education could be imparted successfully by taking full advantage of buildings, equipment and the staff of the existing institutions, the latter being often supplemented with advantage by persons drawn from the industry who though not experienced teachers are able to make up what they lack in skill in teaching by the realistic atmosphere they bring to the class-room. (R. 44—7.10).

65. In industrially advanced countries a very large number of persons holding responsible positions in the industry have obtained most of their technical education by attendance at part-time evening or day classes. In a country like India where people are unable to pursue technical education on account of financial stringency, there is all the more reason why every adequate facilities for part-time education of both the types should be provided. Arrangements should also be made for a country wide recognised system of examination and certification for persons undergoing part-time education, in order to make part-time technical education popular throughout the country. (R. 45—7.11).

CHAPTER VIII.

66. There is at present no arrangement for imparting training for teachers in vocational schools and institutions either before recruitment or after entering the profession on the lines similar to the B. T. or T. D. Courses open for teachers in Secondary Schools. We think that such training is of equal value to the teachers in vocational schools and arrangements should be made for imparting it.

67. Taking into consideration the special circumstances pertaining to teachers in technical subjects we recommend that candidates who have obtained a degree or diploma and wish to be teachers in technical institutions as well as teachers serving in technical institutions, who have had no training in methods of teaching, should be encouraged to take training courses. (R. 46—8.6).

68. The teachers undergoing training should be paid stipends equal to their full salary. (R. 47—8.6).

69. The expenditure incurred by technical institutions in this behalf should be admissible for special grants-in-aid. (R. 48—8.6).

70. It is not necessary, in our opinion, to provide long term training for teachers in charge of technical subjects. In view of the small number of teachers undergoing training it would be possible to impart such training in a single institution for a few years to come. We recommend that Government should make arrangements for running short term courses for the training of teachers in Bombay preferably in collaboration with the V. J. Technical Institute, as this location would facilitate visits to industrial establishments and

will afford facilities for teaching practice both in the class-rooms and workshops. (R. 49-8.8).

71. The general outline of the curriculum is stated in paragraph 8.8. The duration of the course should ordinarily be of not more than one term concurrent with the term of the institute. (R. 50-8.8).

72. For full-time teachers who for administrative reasons cannot be spared during term time as well as of the part-time teachers who will be required in greater number in future for participating in part-time instruction we recommend that short courses for both full and part-time teachers should be arranged by Government in co-operation with a local institution. Such courses should preferably be confined to a definite branch of technical education. They should be of 10 to 15 days duration and should be offered preferably during vacation. The expense of attending the course should, in our opinion, be shared between the Government, the Institution and the teacher. (R. 51-8.9).

73. A panel of experienced lecturers who have shown themselves able to handle different aspects of the problem of teaching of technical subjects can be drawn for conducting these courses.

74. The minimum qualification for a teacher in charge of teaching the theory of technical subjects in any technical high school or industrial and trade school should be an approved diploma in engineering, technology or accepted equivalent qualifications for the work entrusted to him. (R. 52-8.10).

75. The post of the Head of a Technical High School which provides substantial portion of general education, may be held either by a non-technical or by a technically qualified person. In the interest of the success of the various vocational and technical institutions which we are recommending to the Government, it is essential that the Heads of these Institutions be appointed with due care and thought and that the persons thus appointed possess the necessary qualifications, suitable industrial experience and enthusiasm for the execution of the work entrusted to their care. (R. 53-8.11).

76. A technical trade instructor should be (a) a practical man thoroughly familiar with upto-date workshop practice, (b) conversant with the elementary theory connected with his trade, and (c) able to impart his knowledge. (R. 54-8.11).

77. We recommend that the trade instructors required for technical institutions in this Province may receive their training by arrangements with the Labour Department in a Training Centre which is established by the Government of India at Koni, Bilaspur. (R. 55-8.15).

78. We recommend that short term courses of instruction should be provided for the benefit of trade instructors from time to time at larger engineering colleges for imparting the necessary training. (R. 56-8.15).

79. We recommend that technical teachers and trade instructors should be deputed to factories for experience for three months every four years. (R. 57-8.15).

80. A teacher in technical subjects should have good industrial experience and we recommend that ordinarily three years industrial experience for a teacher and five years industrial experience for a trade instructor should be considered as the minimum. (R. 58-8.18).

81. Recommendations regarding scales of pay for teachers and instructors and other staff for places outside Bombay City are given in Table No. 14. (R. 59-8.18).

82. The scales of pay recommended are non-fussil scales exclusive of allowances admissible under G. R. F. D. No. 6567/33/IV dated the 15th January 1948. We have recommended the salary scales and allowances as provisional for a period of five years. The situation should be reviewed after five years. The scales recommended are for Government Institutions and should serve as a model for private institutions as well. (R. 60-8.).

83. The salary scale of the Superintendent of a Senior Technical School should be the same as the Technical Superintendent of a Technical High School, *viz.*, Rs. 200—10—300, E.B.—15—420. The same scale should also apply to Heads of Industrial and Trade Schools. (R. 61).

84. The salary scales of teachers and other staff recommended for Technical High Schools would also apply for similar staff in Senior Technical, Junior Technical, Industrial and Trade Schools. (R. 62).

85. We recommend that the teachers of academic subjects in the Technical High Schools should receive the same emoluments as recommended by Ghate-Parulekar Report and as accepted by Government (R. 63).

CHAPTER IX.

86. Industrial and Technical Education in this country has suffered very greatly on account of lack of co-ordination between the education imparted in colleges and practical training imparted in works. In the West the industrial establishments provide systematic practical training to students from technical institutions, this being complementary to the theoretical instruction given at the institutions and in addition an encouragement to boys to undergo further education on a part-time basis. Certain firms have also gone a step further in providing special courses for the benefit of the teachers in technical colleges by organising summer schools in which the senior staff of the company make available to those responsible for teaching engineering and allied subjects, the latest practice in design, the use of materials and methods of production. Co-operation between education and industry in the west has reached a level whereby the benefit of that co-operation is derived by every one from the craftsman to the Professor in a Technical College. We would recommend the following measures for effecting a greater co-operation between education and industry in this country.

87. The Boards of Studies which in the first instance draw up the syllabuses and courses of practical instruction should directly consult official associations of employers and industrialists and professional engineering and technological associations, and for craftsmen training courses, the labour associations as well. (R. 64-9. 5).

88. That well arranged programmes for systematic courses of training inside the factories should be formulated. The programme will differ according to the requirements of different industries as well as for persons for whom they are intended, craftsmen, foremen and college apprentices etc. The training in final stages should include as far as possible experience in handling plant and equipment and proper records should be maintained of the work done from day to day in each department. (R. 65-9. 9).

89. That Government should institute a centralised systematic and co-ordinated apprentice scheme for covering all classes of apprentices. All industrial establishments should be required to take a stipulated number of apprentices for a given period and they should be required to put them through a planned programme of training adjusted to the needs of each category and the standing of the apprentices in the category. (R. 66-9. 10).

90. That duly qualified Educational Officers should be appointed by Government to supervise the detailed operation of the apprenticeship scheme. These Officers should serve as *Liaison Officers* between the industrialists, the technical institutions and the apprentices. (R. 66-9. 11).

91. That industry should be given a substantial representation on the governing and advisory bodies of institutions for technical education, in order that the needs of the industry might be brought home to the educational institutions. (R. 67-9. 12).

92. The establishment of "Works Schools" within the industry should be encouraged. (R. 68-9. 15).

93. The teachers in technical institutions should be required to maintain contacts with professional and scientific societies as well as with local organisations of the industry. (R. 69-9. 16).

94. The teaching staff of technical institutes should be encouraged to undertake work of technical tests and investigation of special problems that arise in the works, provided always that such work does not interfere with their normal duties. (R. 70-9. 19).

CHAPTER X.

95. Government should consider the question of Vocational guidance and selection as one which should engage their serious attention. Vocational guidance is necessary for giving necessary information, experience and advice in regard to choosing an occupation, preparing for it, entering it, and making progress in it. Vocational guidance should with advantage precede the entry of pupils into vocational

schools or institutions and should be continued during the time the pupils learn the vocation and after employment begins, to the time when it is reasonably certain that the learner is prepared to take his place in industry or wherever he finds his work.

96. Psychological tests were used on a large scale during the second great war by the fighting forces and in particular by the Royal Air Force. The Senior Psychologists Department at the Admiralty and the Directorate of Selection of Personnel at the War Office in Great Britain were set up, and their tests led to the standardization of psychological tests for the selection of personnel for the various fighting services.

97. The report by the Joint Committee of the Association of Technical Institutions and the Association of Principals of Technical Institutions in England on "Testing for the Secondary Technical School" has made some valuable recommendations. It is seen from their report that the selection of pupils for secondary technical education can be adequately made at about the age of 13 plus.

98. We feel that the success of technical and vocational education below the collegiate stage will very largely depend upon proper young persons being selected for training and misfits being avoided. We therefore recommend that Government should take immediately steps to have aptitude tests formulated for Indian conditions by a body of experts. (R. 71 — 10.6.).

99. The aim of conducting vocational guidance should be to influence the wishes of young persons in such a way that they should coincide collectively with the recognized demand of the various branches of economic life. (R. 72 — 10.8.).

100. Government should encourage the publication of occupational literature which would be of assistance in the vocational guidance of young persons, preferably in co-operation with such bodies as the Rotary Club of Bombay and other Clubs in the Province. (R. 73—10.11.).

101. The provision in our junior and senior basic schools of a variety of hand work and craftwork and the use of simple machines etc., will bring out the latent powers and aptitudes of our children. This will facilitate testing for vocational guidance. (R. 74 — 10.13.).

102. It would be necessary for the body of experts referred to above to give clear directions to school teachers in the matter of maintaining proper records of school children for the purpose of diagnostic testing. (R. 75 — 10.13.).

103. With the limited resources of the country every effort should be made to fit a square peg in a square hole by concentrating attention on vocational guidance and selection. (R. 76 — 10.16.).

CHAPTER XI.

104. The question of medium of instruction in the various grades of technical education requires consideration and this too in a much wider context than that of the jurisdiction of the Province. The majority of

opinion seems to favour adoption of the mother tongue in the primary and secondary stages of education. There are some who advocate adoption of regional language as the medium of instruction, even for University education. Technical education and training in technical high schools, in junior technical schools and industrial and trade schools would require knowledge of English for those receiving training in these schools.

105. Attempts to impart instruction in languages other than English would call for preparation of necessary text-books in the regional languages as the first step in this direction. The number of books on technical subjects so far published in modern languages is very small.

106. The question of providing sufficient amount of scientific and technical literature in the regional languages should be taken up by the Government, which should set up a permanent body to be styled "The Provincial Technical Book Committee" and it should be entrusted with the work of preparing suitable technical books in regional languages. Dictionaries (English—Regional Language) dealing with technical and other terms should also be prepared. (R. 77—11.).

107. Co-operation of the staff of technical and science institutes and well-known writers should be sought by the "Text-Book Committee" in the preparation of text-books and other literature. Until publication of the necessary text-books and literature, instruction will have to be given as heretofore in English in Technical High Schools and the Senior Technical Institutions. (R. 78—11.1.).

108. When instruction gets switched over to the regional languages upto the high school stage, English should be kept as a compulsory second language in the technical high school, the senior technical institutions and junior technical school. (R. 79—11.1.).

CHAPTER XII.

109. The nature of future development of technical education would necessarily involve a systematic investigation of the distribution and the social and occupational characteristics of the population of different areas. The needs of industry in the way of technical personnel could be determined by carrying out suitable surveys. The justification for undertaking such surveys arises from the fact that technical education is designed to prepare pupils for a specific purpose and it is obvious that no technical institution should be started unless the need for it has been justified by an analysis and evaluation of the various factors, which can be done only by means of a survey. In India where industrial organisations have not yet developed, surveys of this kind should prove helpful. We recommend that general, periodic and specific surveys should be carried out by Government to ascertain the needs of technical and industrial education for the different categories of industrial workers.

110. We also recommend that general surveys should be carried out every 25 years; periodic surveys every 10 years; and specific surveys as and when the need arises. (R. 80—12.4).

111. We recommend that such surveys should be carried out by sub-committees represented by administrators of educational institutions, manufacturers, professional men and teachers under the auspices of the Provincial Vocational Education Council and the Regional Advisory Committees. (R. 81—12.5).

112. To create enthusiasm and confidence in the public at large, and to enlist the active co-operation from the industry as well as to ensure that the pupils from technical schools and institutions are readily and effectively absorbed by the industry it is essential to have a close liaison between industry and technical schools and institutions both on a provincial and regional basis. We therefore recommend the establishment of a Provincial Vocational Education Council and three Regional Advisory Committees. (R. 82—12.11 and 12.12).

113. The membership of the Council should include the Director of Public Instruction, the Joint Director of Technical Education, the Directors of Industries and Agriculture, the Chairman of the S. S. C. Examination Board, representatives of Universities, representatives from the Principals of Colleges and non-collegiate vocational institutions with due weight to non-Government institutions, representatives of industry, agriculture and commerce and of professional institutions and a representative of labour. (R. 83—12.13).

114. The Regional Advisory Committees would cater for the Commissioner's Divisions of the Province, the needs of the Bombay City being directly looked after by the Council itself. (R. 84—12.14).

115. With the possible growth of industry and development of technical and vocational education in this Province, the question of proper control and direction cannot be taken up by any other body than such a council and in order to inspire the necessary confidence and support from the public and the industry, both the Council and the Regional Advisory Committees should be established by an *Act of Legislature*. (R. 85—12.16).

CHAPTER XIII.

116. A general picture of the financial implications for implementing our recommendations for the establishment of different types of technical and industrial schools is given in Appendices—F, G, H and I. The average annual admissions to the degree classes in Civil, Mechanical, Electrical and Communication Engineering would be about 900 and to the diploma classes in the various institutions, about 560. This appears unusual as compared with the figures in other industrially advanced countries where the number entering for degree classes is a small proportion of those going in for technical training.

117. It is likely that of this number, more than half would be pupils from technical high schools where provision will have to be made for about 670 admissions every year. This figure is bound to increase in future consequent on the application of compulsory Primary Education.

118. The Committee is of the opinion that the ratio between students following the academic courses in High Schools and those following the courses in technical high schools should be 8 : 1 and on this basis the places to be provided in technical high schools would come to roughly 4000, (R. 86—13.2).

119. The number of technical high schools to be provided will be about 90 or about 4 per district of the province. By 1950 the total number of technical high schools in the province would be about 12 and we recommend that Government should aim at establishing one technical high school in each district within the next five years. The capital and recurring expenditure for a technical high school are given in Appendix—G. (R. 87—13.2).

120. It is stated in para 26, Chapter V, that the number of pupils likely to be trained in the Junior Technical, the Industrial and the Trade Schools in the immediate future would be 6000 and a few years hence, it would be 12,000. Looking to the requirements of industrial personnel we would allocate 2000 places to Junior Technical School, 3000 places to Trade School and 1000 places to Industrial School. The recurring expenditure for 2000 places in the Junior Technical School is estimated to be Rs. 8,00,000. (R. 88—13.2).

121. The locations of "Arts and Industries Centres" are given in Table No. 12—Chapter V, and the cost of different units is given in Appendix—F. (R. 89—13.4).

122. Vocational education is many times costlier than general education and adequate expenditure on vocational education would contribute towards the removal of the proverbial poverty of this country. On the continent of Europe technical education is centralised, controlled and financed by the State, although other bodies make a contribution. This counts for the high standard of workmanship and efficiency in industry on the continent. In England general and technical education is controlled by the Local Education Authorities which receive grants from the Education Ministry. The figures published from time to time by the Ministry of Education, England, would serve to indicate how much the expenditure on general and technical education has increased in recent years. If we are to go by the example of the industrially advanced countries in the West it is apparent that Government should bear either the whole cost of education and control it or leave it in the hands of private agencies giving them liberal grants-in-aid. As technical education is costly

and as the private agencies are not likely to come forward to the desired extent, we recommend that Government should foster technical education both by establishing technical and industrial schools and higher technical institutions entirely financed and controlled by Government and by encouraging private efforts by substantial grants-in-aid both recurring and non-recurring. (R. 90—13.13).

123. The Grant-in-aid Code, 1939, of Government lays down the rules and conditions for recognition and/or grants-in-aid to schools and colleges. We recommend that the recurring grants to vocational institutions should not be less than 50 % and grants on buildings, sites furniture and equipment should be between 50 and 75 % of the admitted expenditure. (R. 91—13.15).

124. Over and above the grants the Government should make available to governing bodies of aided institutions interest free loans for building, equipment etc., to encourage them to establish vocational institutions in different regions. It is expected that 30 % of the expenditure may be met from the fees and 20 % from the local sources. (R. 92—13.15).

125. We recommend that Government should provide adequate number of scholarships and free places for the poor but deserving students in technical institutions of different grades so that they should be able to receive their education in such institutions and continue their studies in higher institutions. (R. 93—13.17).

126. Governing bodies of aided institutions should be empowered to build up depreciation and obsolescent funds and contribution towards such funds should be admissible for grant-in-aid. (R. 94—13.18).

127. Government should make available interest free loans to institutions managed by private agencies to build hostels for students. (R. 95—13.20).

128. In the administration of the system of the grant-in-aid due regard should be given to ensure that the governing bodies of aided institutions would in all circumstances be able to conduct the institutions with full efficiency combined with reasonable economy. (R. 96—13.18).

129. In foreign countries business and industry have helped technical institutions by gifts of equipment and machinery. Co-operation of industry in this country should be sought for reducing the initial costs of equipment and of replacement. We recommend that Government should examine the possibility of raising a part of the necessary funds for promotion of technical, industrial and vocational education including higher technical education from a levy of a special tax on the export

of raw material, from this country and on the wages paid by the employers of industrial establishments. (R. 97—13.23).

130. The evidence we have gathered in respect of general tax on industry for technical education is not conclusive. Technical education cannot be adequately supported from the funds from the Provincial Governments alone and we recommend that the Central Government should be requested to make a contribution to meet the needs of such educational schemes of the Provinces. (R. 98—13.24 and 25).

131. We also recommend that Government should encourage the formation of educational trusts such as the Carnegie United Kingdom Trust, the Cassel Trust and Miner's Welfare Fund, the Scottish Country Industrial Development Trust and the Scottish Rural Industries Equipment Fund and Training Scheme, etc., existing in other countries, by suitable means. (R. 99—13.22).

Note.—In this chapter 'R' means RECOMMENDATION and the numerical figures, the number of the recommendation and paragraph reference.

APPENDIX A.

No. I-C/

From

Dated

THE CHAIRMAN,
 INDUSTRIAL AND TECHNICAL SECONDARY EDUCATION COMMITTEE,
 C/o, V. J. TECHNICAL INSTITUTE,
 BOMBAY 19.

To

Sir,

I am forwarding herewith a copy of the general questionnaire of the Industrial and Technical Secondary Education Committee, appointed by Government as per Resolution No. 7653 dated 1st May, 1947, for favour of reply at an early date and not later than 25th August, 1947.

The terms of reference of the Committee are as follows:—

To examine and make recommendations on—

1. the pace and nature of progress in technical, industrial and vocational training in the Province below the collegiate stage, bearing in mind particularly,
 - (a) the prospective needs of the Province,
 - (b) the increasing requirements of industrial and technical education consequent on the expansion of primary education,
2. the locations of the institutions that may be necessary and the courses of study suitable at each,
3. the extent and method of financing the scheme of industrial and technical education and in particular the field for Government and private efforts and the methods of grant-in-aid to private institutions.
4. methods of recruitment and terms of remuneration of the staff for the institutions,
5. desirability of carrying out surveys to determine the needs of industries in the way of technical personnel, and
6. establishment of Local Advisory Committees.

The Committee will welcome any statements of views or suggestions within the field of enquiry referred to it. While replying to the questionnaire you may cover the whole of the field or any particular part of it which lies within your special knowledge. The Committee will, however, feel specially grateful if you will give detailed answers to those questions in which you are particularly interested or with which you are specially well acquainted.

Your obedient servant,

Chairman.

APPENDIX A.

Industrial and Technical Secondary Education Committee,
Bombay Province.

QUESTIONNAIRE--'A'.

I GENERAL ORGANISATION.

1. Is it desirable that the various Government and private institutions which are imparting technical and vocational training, should be co-ordinated and developed on the basis of a Provincial programme, which in turn, may be based on a National programme.

2. Is it desirable that this programme should take into account:—

(a) the development of general education, vocational selection and guidance, changes in technique and organisation, the existing and future needs of the industry for technical personnel ?

(b) the occupational, cultural and moral interests of the industrial workers, the personnel requirements of the employers, the economic and social interests of the community and the economic policy of the country ?

3. In order to promote this co-ordination and facilitate this development should there be a Technical Education Council in the Province ?

4. If so, would it be adequate to include representatives of:—

(i) General education ?

(ii) Vocational guidance ?

(iii) Technical education ?

(iv) Planning and Economic Policy ?

(v) Organisations of employers and workers ?

II. VOCATIONAL AND TECHNICAL EDUCATION.

5. Is it desirable to provide for all children, on reaching a specified age, an initiation into the occupational life, within the compulsory educational system by developing the idea of and the taste for manual work, so as to facilitate their future vocational guidance ?

6. If so, what should be:—

(a) the importance of manual work in the school curriculum ?

(b) the nature of such work ?

(c) the age of commencement of the preparatory course ?

(d) the duration of the course ?

7. (a) Is it desirable in drawing up programmes to avoid any vocational specialisation and that practical work should nevertheless take into account the nature of the principal occupations and industries of the district ?

(b) Do you consider that this preparation may be wholly included in the period of compulsory school attendance ?

(i) if the school leaving age is 14 years.

(ii) if the school leaving age is above 14 years.

(c) What should be the nature of the preparation, specially as regards:—

(i) the relation between the theoretical courses and practical work ?

(ii) the degree of specialisation ?

(iii) the relation between the preparation and the duration of subsequent vocational training ?

8. (a) Is it desirable that young workers should receive a full-time vocational education before they enter employment ? (Please indicate for which classes of workers such education appears desirable to you.)

(b) Is it preferable that young workers who are already in employment should receive a part-time vocational education ? (Please indicate in which branches of activity and for which classes of workers such education appears desirable to you.)

(For purposes of this question, young workers may be taken to include semi-skilled and skilled workers, charge hands, and foremen.)

9. Where vocational training is given before employment, do you consider that :—
- (a) performance of practical work should take place under conditions as similar as possible to those of an actual industrial establishment and under the supervision of persons with practical experience of the trade ?
 - (b) periods of training in the schools should be continued with periods of practical work in an industrial establishment ?
 - (c) some economic assistance should be granted to young and meritorious persons attending the courses of training ?
10. Where vocational training is given during employment, do you consider that :—
- (a) co-ordination should be ensured between workshop and school ? If so, what means would appear the best suited to ensure the co-operation.
 - (b) separate workshops specially adapted for the purposes of giving training should be set up in such industrial establishments as would find it feasible ?
11. Is it desirable to recommend the establishment in each region of a network of vocational and technical schools, adjusted to meet the industrial requirements of each region ?
12. In order to make attendance at vocational schools possible for young people, who would not otherwise afford it, is it desirable :—
- (a) to effect admission without fees ?
 - (b) to grant scholarships ?
13. Among the three categories of workers, [viz. (i) skilled workmen and craftsmen (ii) staff in intermediate grades, and (iii) managerial staff] needed by your firm :—
- (a) What is the manner in which the three classes of workers are at present recruited ?
 - (b) What is the approximate number of each category of workers required ?
 - (c) Do you think that the present system of recruitment could be improved ? If yes, in what way ?
14. Should there be courses organised in several grades for the training of :—
- (a) skilled workers and craftsmen ?
 - (b) staff in intermediate grades ?
 - (c) managerial grades ?
15. In the interest of industrial workers, is it desirable that facilities should be given for transfer from one school or grade, to another, including access to higher technical education at a University or equivalent institution ?
16. Do you consider that measures should be taken to protect future vocational adaptability of industrial workers ?
- If so, should these measures in particular :—
- (a) aim at developing theoretical knowledge ?
 - (b) avoid excessive or premature specialisation ?
17. (a) Do you consider that subjects of general and social educational value should be included in all curricula for vocational and technical education of all grades ?
- (b) Do you consider that questions connected with domestic science should be included in the curricula for vocational education particularly for women ?
18. With regard to supplementary education do you consider it desirable that :—
- (a) the educational establishments should be sufficiently near to the industrial establishments, to be accessible to workers in employment ?
 - (b) should the attendance of workers at school, be included in their normal working hours in the works, especially :—
 - (i) of apprentices ?
 - (ii) of young workers who enter industry at an early stage, to enable them, to obtain better posts later ?
 - (iii) of adult workers who wish to acquire a definite technical qualification or to extend or improve their technical knowledge ?

III. VOCATIONAL EDUCATION FOR WOMEN.

19. (a) Is it desirable that a sufficient number of vocational schools including schools for domestic science, should be established for the occupations in which women and girls are mainly employed ?
- (b) what are the main occupations in which women and girls could be employed ?

(c) should the workers of both sexes have equal rights of admission to all other vocational and technical schools, provided that women and girls are not required to undertake work prohibited by law ?

IV. CERTIFICATES AND EXCHANGE OF STUDENTS.

20. (a) Is it desirable that certificates issued after examination should be co-ordinated and recognised on a National basis ?

(b) Should there be representation of employers in the organisation of examinations ?

21. (a) Should there be a regional and National exchange of students and apprentices on completing their training, to enable them to acquire wider knowledge or experience ?

(b) Do you consider that the organisation of employers and workers should collaborate in such exchanges ?

V. RECRUITMENT AND EXCHANGE OF TEACHERS.

22. (a) With regard to the teachers responsible for theoretical or practical training what should be the method of recruitment :—

(i) for theoretical subjects ?

(ii) for practical subjects ?

(b) What qualifications should be required, particularly in respect of industrial experience and teaching ability, for the various types of service ?

(c) What methods should be used for training teachers, recruited for teaching in technical institutions ?

(d) Among methods of improving qualifications of teachers and of keeping their knowledge upto date, should the following be included ?

(i) establishment of contacts between industrial establishments and teachers,

(ii) courses in educational institutions for individual teachers,

(iii) travel and research,

(iv) short vacation courses for groups of teachers.

(e) Is it desirable to extend financial assistance and other facilities for teachers with a view to improving their qualifications ?

(f) If so what measures would you suggest :—

(i) grant of special leave at regular intervals ?

(ii) stipends ?

(g) Do you consider that regional and National exchange of teachers should be organised.

(i) to improve the standards of instruction in different regions ?

(ii) to afford opportunities for the staff to work under different environments and to acquire wider knowledge and experience ?

23. Do you consider that persons normally engaged in industry and commerce should be appointed to part-time positions of teachers ?

VI. REGIONAL ADVISORY COMMITTEES.

24. (a) Is it desirable that collaboration between the competent administrative departments, vocational and technical educational institutions, and organisations of employers and workers, should be ensured through local or regional advisory committees ?

(b) Do you consider that the duties of these committees should be :—

(i) to promote and co-ordinate official and private efforts in regard to vocational training, selection and guidance, in the locality or region ?

(ii) to supervise the curricula and to ensure that they are adjusted to the changes in practical requirements ?

(iii) to supervise the conditions of work of young persons in vocational schools and to ensure that the work done by them is not intended for commercial profit ?

(iv) to supervise the conditions of work of young persons who spend part-time in school and part-time in works and to ensure that the work is suitably restricted and is essentially educative in character ?

(v) to organise regional employment bureaux to supply technical personnel to local industries.

25. Should there be propaganda to direct the largest possible number of pupils towards technical or vocational education ?

If so would you indicate what forms such propaganda should take ?

APPENDIX B.

Industrial and Technical Secondary Education Committee,
Bombay Province.

QUESTIONNAIRE—'B'.

1. What other courses in addition to the existing ones do you consider necessary to be introduced in your institution ?
2. Do the existing courses satisfy the needs of industry, trade or profession in the District, served by the institution ?
3. Will the new courses meet the requirements ?
4. What is the scope of employment of candidates passing out of your institution ?
5. What are the main industries or vocations of people in the District ?
6. *A Tabulated Statement* (for the years 1943 to 1947) with the following particulars may please be furnished.
 - (a) Existing courses.
 - (b) Number of students admitted to each course.
 - (c) Number of successful candidates.
 - (d) The nature of the job or positions held by the past students.
 - (e) The names of the teaching staff, including workmen, with grades of pay.
 - (f) *Finance*.—Income from—
 - (i) Municipality,
 - (ii) Local Body or District Board,
 - (iii) Private Body,
 - (iv) Grant-in-aid from Government,
 - (v) Fees and other sources.
 - (g) *Expenditure*.—
 - (i) Salaries and Provident Fund,
 - (ii) Administration,
 - (iii) Rent, Municipal Taxes, Insurance, Repairs, Gas, Electricity, Consumable stores, Miscellaneous.
7. Have you any suggestions to make regarding the mode of assessment of grant-in-aid to recognised institutions through Government and the extent of such grant-in-aid ?

Name of institution.

Postal Delivery District.

Head of institution.

APPENDIX C.

List of Individuals and other bodies who sent in written replies to
Questionnaire 'A'.

*MEANS THAT ORAL EVIDENCE WAS ALSO OBTAINED.

GROUP A—EDUCATIONISTS.

1. * Mr. B. Sengupto, Head, Mech. Eng. Dept., V. J. T. Institute, Bombay.
2. * Dr. P. K. Kelkar, Head, Elec. Eng. Dept., V. J. T. Institute, Bombay.
3. * Mr. P. W. Dharap, Deputy Head, Elec. Eng. Dept., V. J. T. Institute, Bombay.
4. * Mr. G. R. Bhide, Gen. Senior Lecturer, Mech. Eng. Dept., V. J. T. Institute.
5. * Mr. P. E. Chichgur, Superintendent, Saboo Siddik Tech. Institute, Bombay,
6. * Principal, Saboo Siddik Institution, Bombay.
7. * Mr. R. D. Sathe, Head Master, Elphinstone Tech. High School, Bombay.
8. Mr. C. L. Parmar, Head Master, Northcote Tech. High School, Sholapur.
9. Mr. V. K. Kelkar, Prof. of Mech. Eng., College of Engineering, Poona.
10. Mr. C. A. Christie, Principal, Robert Money High School, Bombay.
11. Mr. S. R. Tawde, Educational Inspector, Central Division, Poona.
12. * Mr. D. G. Dhavle, Superintendent, D. E. Society's Tech. Institute, Poona.
13. * Mr. M. K. Paranjpe, Superintendent, School of Radio Physics, Poona.
14. Mr. V. L. Sawant, Superintendent, King Ed. VII Tech. School, Dhulia.
15. Mr. K. Kardile, New Engineering, College, Sangli.
16. Mr. M. R. Bhise, Inspector of Tech. and Ind. Schools, B. P. Bombay.
17. Mr. V. R. Kamath, Dept. of Chemical Technology, University of Bombay.
18. Mr. A. G. Bhate, Director, A. F. Tech. Institute, Bombay.
19. Mr. S. Raja, Superintendent, Government Tanning Institute, Bandra.
20. * Mr. R. M. Desai, Principal, F. S. Parekh Technical Institute, Surat.
21. Mr. A. L. Saigal, Principal, Kalbahavan Technical Institute, Baroda.
22. * Mr. T. A. Desai, Principal, R. C. Technical Institute, Ahmedabad.
23. Mr. L. A. Dave, Retd. Head Master, R. C. C. High School, Ahmedabad.
24. Mr. S. O. Chakravarty, Principal, Morvi Technical Institute, Morvi.
25. Rev. S. Bonet, St. Xavier's High School, Bombay.
26. * Mr. K. M. Patil, Superintendent, School of Industry, Ratnagiri.
27. Mr. A. A. Mackay, Scottish Orphanage, High School, Mahim.
28. * Mr. S. R. Bhise, A. R. Sonavala High School, Bordi.
29. * Mr. V. K. Joag, Principal, Nowrosjee Wadia College, Poona.
30. * Dr. D. D. Karve, D. E. Society, Poona.

31. Secretary to Government, Educational and Judicial Dept., Kolhapur.
32. Hon'ble Minister for Education, Baroda State.

GROUP B.—ENGINEERING AND OTHER ASSOCIATIONS.

33. The Institution of Engineers (India), Bombay Centre.
34. The Textile Association (India) Bombay.
35. The Association of Electrical Undertakings, B. P., Bombay.
36. The Indian Merchants Chamber, Bombay.
37. The Millowners Association, Ahmedabad.

GROUP C.—INDIVIDUALS AND OTHERS CONNECTED WITH INDUSTRY.

38. Mr. Foster Guthrie, Century Spg. and Manufacturing Co., Ltd., Bombay.
39. Mr. B. M. Borkar, Ramnarsin Sons, Bombay.
40. Mr. Chaturbhujdas Chimanlal, Baroda.
41. Mr. T. G. Choudhari, Madhowji Dharamsey Mills, Ltd., Bombay.
42. Mr. N. V. Ullal, Khatau Mills Ltd., Bombay.
43. Mr. M. P. Kanga, Director of Industries, Bombay.
44. Mr. D. M. Khatau, Khatau Mills Ltd., Bombay.
45. Mr. M. V. Pant Viadya, Bombay.
46. Mr. V. V. Gupte, Central Cotton Committee's Technological Lab., Bombay.
47. Mr. V. A. Ajagaonkar, Bombay.
48. Mr. J. S. Malik, Municipal Engineer, Ahmedabad.
49. Mr. M. A. Babyoon, Arvind Mills, Ltd., Ahmedabad.
50. Mr. M. M. Vyas, Rajnagar Mills Ltd., Ahmedabad.
51. Mr. S. K. Patil, Bombay P. C. C., Bombay.
52. Mr. S. B. Datta, Lakshmi Cotton Mills, Ltd., Sholapur.
53. Mr. J. B. Sane, Khatau Mills Ltd., Bombay.
54. Mr. B. D. Kulkarni, Modern Mills Ltd., Bombay.
55. Mr. D. T. Mama, Scindia Steam Navigation Co. Ltd., Bombay.
56. Mr. S. C. Banerjee, Hindustan Construction Co., Ltd., Bombay.
57. Mr. D. B. Katrak, Khatau Mills Ltd., Bombay.
58. Mr. N. M. Dave, New Standard Engineering Co., Bombay.
59. Dr. D. B. Kirtikar, Bombay.
60. Mr. A. L. Guilford, B. E. S. and T. Co., Ltd., Bombay.

GROUP—D. ENGINEERING AND INDUSTRIAL ESTABLISHMENTS.

61. * Calico Mills Ltd., Ahmedabad.

62. Godrej and Boyce Manufacturing Co., Ltd., Bombay.
 63. Autogenous Welding and Repairing Co., Bombay.
 64. Imperial Chemical Industries, Bombay.
 65. Investa Machine Tools and Engineering Co., Bombay.
 66. The Kohinoor Mills Ltd., Bombay.
 67. Volkart Brothers, Bombay.
 68. The Parasuram Pottery Works, Morvi.
 69. Alcock and Ashdown Co., Ltd., Bombay.
 70. * Paisa Fund Glass Works, Talegaon.
 71. Ama Ltd., Bombay.
 72. Mather and Platt Ltd., Bombay.
 73. Sholapur Spinning and Weaving Co., Ltd., Sholapur.
 74. The Swastik Oil Mills Ltd., Bombay.
 75. * The Indian Institute of Art in Industry, Bombay.
 76. Burma Shell, Bombay.
 77. Firestone Tyre and Rubber Co., Ltd., Bombay.
 78. Babcock and Wilcox (India) Ltd., Bombay.
- VOCATIONAL INSTITUTIONS WHICH RESPONDED TO QUESTIONNAIRE A AND/OR B.
79. King Ed. VII Technical School, Dhulia.
 80. The New Rex Tailoring Class, Bombay.
 81. P. K. V. S. Mahila Kala Niketan, Bombay.
 82. Kumarika and Stree Mandal, Vile Parle.
 83. K. E.S. Topiwala Industrial School, Alibag.
 84. Talimi Kendra Jyoti Sangh, Ahmedabad.
 85. Jain Mahila Samaj, Bombay.
 86. K. P. Stree Udyogshala, Ahmedabad.
 87. Instituto Indo Portuguese, Bombay.
 88. Mahila Shivan Kala Mandir, Malwan.
 89. Dawoodbhoy Fazalbhoy Muslim Women's Handicraft Institute, Bombay.
 90. Gujerati Hindu Stree Mandal, Bombay.
 91. The Morvi Technical Institute, Morvi.
 92. Government Leather Working School, Bandra.
 93. Yeravda Industrial School, Poona.
 94. D. M. Petit Industrial School, Sirur.

95. Primary Handicraft Classes, Bombay.
96. Ladies Industrial Home, Khar.
97. School of Industry, Satara.
98. Bharatiya Kala Vikas, Khar.
99. * Nowrosjee Wadia College, Poona.
100. Government Power Weaving Instructional Institute, Sholapur.
101. Gujerati Hindu Stree Mandal, Santa Cruz.
102. Robert Money School, Bombay.
103. * Maharashtra Mudran Shala, Poona.
104. * S. N. P. P. Polytechnic Institute, Surat.
105. Abdulla Fazalbhoy Technical Institute, St. Xavier's College, Bombay.
106. C. N. Industrial School, Ahmedabad.
107. K. E. S. V. K. Printing Press, Panvel.
108. Vocational Training School, Ankleswar.
109. Khalsa College Technical Institute, Bombay.
110. * Private High School, Rajapur.
111. I. P. Mission Industrial School, Borsad.
112. * School of Radio Physics and Electronics, S. P. College, Poona.
113. Radio School, Poona.
114. R. H. Patuck Industrial School, Andheri.
115. Government Tanning Institute, Bandra.
116. Ideal Tailor and Cutter Institute, Ahmedabad.
117. J. N. Petit Parsee Orphanage, Bombay.
118. S. A. Boys Industrial School, Ahmednagar.
119. The Poona School and Home for the Blind.
120. David Sassoon Industrial School, Bombay.
121. Textile Technical School, Bombay.
122. * Deccan Education Society's Technical Institute, Poona.
123. * R. C. Technical Institute, Ahmedabad.
124. * F. S. Parekh Technical Institute, Surat.
125. Northcote Technical High School, Sholapur.
126. * School of Industry, Ratnagiri.
127. Mahomed Haji Saboo Siddik Institution, Bombay.
128. * V. J. Municipal Technical School, Poona.

APPENDIX D.

Centres Visited and Meetings Held, With Dates.

Centres.	Date.	Meeting with.	Witnesses Examined.
Bombay	.. 3rd July 1947	.. Committee meeting.	Mr. R. D. Satho, Head Master, Elphinstone Technical High School, Bombay.
Bombay	.. 8th August 1947	.. Committee meeting.	Mr. P. W. Dharap, Deputy Head, Electrical Engineering Department, Victoria Jubilee Technical Institute, Bombay. Mr. G. R. Bhide, General Senior Lecturer, Mechanical Engineering Department, Victoria Jubilee Technical Institute, Bombay.
Bombay	.. 9th August 1947	.. Committee meeting.	Mr. B. Sengupta, Head, Mechanical Engineering Department, Victoria Jubilee Technical Institute, Bombay. Dr. P. K. Kelkar, Head, Electrical Engineering Department, Victoria Jubilee Technical Institute, Bombay. Mr. V. H. Acharya, Head, Sanitary Engineering Department, Victoria Jubilee Technical Institute, Bombay.
Poona	14th October 1947	.. Principal and staff.	Principal V. K. Joag and staff of Sir Cusrow Wadia College, Poona.
Poona	.. 14th October 1947	.. Superintendent and staff.	Dr. G. S. Mahajani, Fergusson College, Poona. Mr. V. G. Dhavle and staff, D. E. Society's Technical Institute, Poona.
Poona	.. 14th October 1947	Principal and staff. ..	Dr. Khair, Principal, Poona Anath Vidyarthi Griha. Mr. Gangal, Superintendent, Maharashtra Mudran Shala, Poona.
Poona	.. 15th October 1947	.. Superintendent and School Committee.	Mr. R. T. Satho, Superintendent and the Chairman and members of the Municipal Technical School Committee, Poona.
Poona	.. 15th October 1947	.. Principal and staff.	Mr. J. A. Taraporevala, Principal. Professor B. B. Sarkar, Professor T. N. Tolani, and Professor Chandrasekaraya, College of Engineering, Poona.

APPENDIX D—*contd.*

Centres.	Date.	Meeting with.	Witnesses Examined.
Poona	.. 16th October 1947	Principal and staff.	Principal Dandekar, S. P. College, Poona. Professor Paranjpe, Superintendent and staff of School of Radio Physics and Electronics, Poona.
Poona	.. 16th October 1947 ..	Head Masters ..	Mr. V. K. Koparkar, Modern High School. Mr. V. N. Virkar, New English High School. Mr. S. R. Godbole, M. H. S. Sathe High School. Mr. N. V. Kinkar, Deccan Gymkhana High School. Mr. B. V. Bapat, Nutan Marathi High School. Mr. S. R. Kanetkar, Progressive Education Society's High School. Dr. Khair, Anath Vidyarthi Griha. Rev. D'Souza, Ornell High School. Rev. P. Rilkein, St. Vincent's High School. Mr. Lunn, Bishop's High School. Dr. D. D. Karve, Fergusson College. Mr. G. P. Sohoni, Raja Janarasingh High School.
Talegaon	.. 17th October 1947 ..	Manager and staff.	Manager and staff of Paisa Fund Glass Works, Talegaon.
Ahmedabad	20th October 1947 ..	Local representatives.	Mr. S. L. Handa, Superintendent, Industrial Training Workshop. Mr. R. M. Nayak, Principal, Saraswati High School. Mr. N. K. Patel, Manager, New India Engineering Works. Mr. S. G. Karandikar, Engineer, Jubilee Mills. Mr. Jinabhai Desai, C. N. High School.
Ahmedabad	20th October 1947 ..	Superintendent and staff.	Mr. B. L. Handa, Superintendent, and staff of Government Industrial Training Workshop.

APPENDIX D—*contd.*

Centres.	Date.	Meeting with.	Witnesses examined.
Ahmedabad .	20th October 1947 ..	Local Textile Representatives	Mr. Ambalal Sarabhai, Calico Mills. Mr. Gautam Sarabhai, Calico Mills. Mr. S. A. Kher, Manager, Calico Mills. Mr. B. K. Muzumdar, Arvind Mills Ltd. Mr. C. H. Desai, Manager, Arvind Mills Ltd. Mr. Babycon, Engineer, Arvind Mills Ltd. Mr. Wilson, Spinning Master, Arvind Mills Ltd. Mr. Desai, Sizing Master, Arvind Mills Ltd. Mr. Jhaveri, Dyeing and Printing Master, Arvind Mills Ltd.
Ahmedabad .	21st October 1947 ..	Local Representatives.	Mr. Dube, Chief Engineer, Jehangir Vakil Mills.
Ahmedabad .	21st October 1947 ..	Principal and staff.	Principal T. A. Desai and staff of R. C. Technical Institute.
Ahmedabad .	21st October 1947 ..	Members of the Millowners' Association.	President, eight members and Secretary of the Millowners' Association.
Ahmedabad .	21st October 1947 ..	Members of the Textile Labour Association.	President and six members
Surat	... 22nd October 1947 ...	Members of the Surat Chamber of Commerce.	Vice-president and 15 members
Surat	... 22nd October 1947 ...	Representatives of S. N. P. P. Polytechnic.	President, Parsi Panchayat. Mr. F. E. Bharucha. Mr. B. B. Pradhan, Principal, S. N. P. P. Polytechnic.
Surat	... 22nd October 1947 ...	Principal and staff.	Principal R. M. Desai and staff. F. S. Parekh Technical Institute.
Surat	... 23rd October 1947 ...	Representatives of Surat Borough Municipality.	President, other Officers, and members of the Surat Borough Municipality.
Surat	... 23rd October 1947 ...	Representatives of local industries	Representatives of the Jari Industry. Representatives of the Wire Drawing Industry. Representatives of the Textile Industry. Representatives of the Engineering Workshops.

APPENDIX D—contd.

Centres.	Date	Meeting with.	Witnesses examined.
Surat	... 23rd October 1947 ...	Local representatives.	Mr. Brown, Surat Electricity Co. Mr. B. J. G. Shastri, Industrialist. Mr. R. J. Popawala, Industrialist. Mr. K. C. Kapadia, Industrialist. Mr. N. H. Kharwar, Industrialist. Mr. R. M. Desai, Principal, F. S. Parekh Technical Institute.
Surat	... 23rd October 1947 ...	Local Philanthropist.	Dr. Saresh S. Gandhi.
Bordi	... 24th October 1947 ...	Principal and staff.	Principal and staff of Gokhale Education Society's High School.
Bangalore	... 3rd January 1948 ...	Superintendent and staff.	Mr. D. S. Venkanna and staff of the Sri Jayachamarajendra Occupational Institute, Bangalore.
Hubli	... 5th January 1948 ...	Members of the B. V. Bhoomraddi Polytechnic and local businessmen.	Mr. L. Y. Tonannavar, Director, B. V. Bhoomraddi Polytechnic, Principal Mahajan, Prof. Kankaraddi and Mr. H. F. Kathimani, Life Member, K. L. E. Society. Mr. R. V. Shirur and G. S. Yelemati,—Cotton merchants
Hubli	... 5th January 1948 ...	Members of the Head-Masters Association.	Mr. B. B. Mundapur, G. A. High School. Mr. G. B. Koppal, City High School, Hubli. Mr. S. G. Shenolikar, Karnatak High School, Dharwar. Mr. N. L. Bapat, K. E. B's. High School, Dharwar. Mr. L. K. Muzumdar, Vidyananya High School, Dharwar. Mr. R. R. Kupsad, M. H. High School, Haveri. Mr. B. P. Kaliwal, Middle School, Haveri.
Hubli	... 5th January 1948 ...	Members of the Head Master's Association.	Mr. S. V. Kalmath, M. H. High School, Gadag. Mr. S. Y. Gungol and Mr. V. S. Kollop, R. L. S. High School, Dharwar.

APPENDIX D—*contd.*

Centres.	Date.	Meeting with.	Witnesses Examined.
Belgaum ...	6th January 1948 ...	Principal and staff,	Principal G. S. Paramasivayya, and staff Lingaraj College, Belgaum.
Belgaum ...	6th January 1948 ...	Members of the Head Master's Association.	Mr. B. B. Mumdapur, Chairman of the Head Master's Association. Mr. C. V. Shirol, G. A. High School. Mr. S. B. Potdar, B. K. M. High School. Mrs. Banubai Aho, Mahila Vidyalaya. Mr. A. R. Pandit, Tallakwadi High School. Mr. Yadav, M. M. High School. Mr. Koppikar, Sardar High School. Mr. B. A. Mundas, Gokak High School. Mr. S. V. Jogalekar, Mahila Vidyalaya. Mr. C. S. Bagi, Vice-President, Lingaraj College. Mr. V. V. Jatti, Head, Science Department, Lingaraj College Mr. M. R. Molya, Secretary, Board of Headmasters.
Belgaum ..	6th January 1948 ..	Members of the K. L. E. Society	Dr. B. S. Jirge, Chairman, Board of Management, K. L. E. Society. Mr. M. S. Bagali. Mr. B. V. Jakati. Mr. R. S. Mahantahatti. Rao Sahib M. P. Wali. Mr. S. B. Kubsad. Mr. V. M. Uppin. Mr. M. R. Patil. Mr. M. B. Inamati. Dr. K. G. Mundagnur. Mr. Niyappa Auna Hattarki. Mr. V. V. Jatti. Mr. B. S. Hanchinal. Principal G. S. Paramasivayya, Secretary.
Kirloskarwadi.	7th January 1948 ..	General Manager	Mr. Shankarrao Kirloskar, General Manager and other representatives of Messrs. Kirloskar Bros. Ltd.
Kirloskarwadi.	8th January 1948 ..	Staff of Kirloskar Works.	The Managerial and Supervisory staff of Messrs. Kirloskar Bros. Ltd.
	8th January 1948 ..	Local Agriculturists.	The Agriculturists in and around Kirloskarwadi.
Ogalewadi ..	9th January 1948 ..	Managing Agent.	Mr. S. P. Ogale, Mr. V. P. Ogale, Mr. N. P. Ogale, Mr. A. P. Ogale, and Mr. S. G. Padhye,

APPENDIX D—concl'd.

Centres.	Date.	Meeting with.	Witnesses examined.
Ogalewadi ..	11th January 1948..	Head-masters of Karad and Ogalewadi.	Mr. G. S. Altekar, Chairman, Shikshan Mandal, Karad. Mr. P. N. Valavade, Tilak High School. Mr. D. P. Phatak, Kanya Shala. Mr. S. S. Vaidya, Maharashtra High School. Mr. M. S. Deshpande, M. S. High School. Mr. V. R. Joshi, Bala Vidyalaya.
Kolhapur ..	12th January 1948..	Staff of O'brien Technical Institute, Kolhapur.	Mr. J. M. Badhe, Superintendent and staff of O'brien Technical Institute.
Kolhapur ..	12th January 1948..	Hon'ble Chief Minister and Officers of Kolhapur State.	Hon'ble Mr. V. K. Bagal, Mr. M. R. Desai, Shikshana-dhikari. Mr. B. B. Latte, Secretary, Education Department. Mr. J. M. Badhe, Superintendent, O'brien Technical Institute.
Rajapur ..	13th January 1948..	Principal and staff of Private High School, Rajapur.	Principal, S. B. Kulkarni, Mr. D. J. Sardeshpande.
Ratnagiri ..	14th January 1948..	Collector and members of the Committee of Management, School of Industry, Ratnagiri.	Mr. S. P. Mohite, Collector. Mr. Y. G. H. Munshi. Mr. A. V. Modak. Mr. M. D. Joshi. Rao Bahadur R. B. Shirke. Mr. R. N. Shinde. Rao Bahadur S. N. Surve. Mr. S. L. Raje. Mr. S. S. Rajadvhaksha. Mr. S. M. Subhodar. Mr. G. G. Patankar. Mr. Y. B. Shinde. Mr. A. S. Anand. Mr. K. M. Patil.
Ratnagiri ..	14th January 1948..	Superintendent and staff of the School of Industry, Ratnagiri.	Mr. K. M. Patil and staff.
Bombay ..	8th and 9th November 1948 ..	Committee Meeting.	
Bombay ..	31st December 1948 ..	First editing Committee Meeting.	
Bombay ..	17th, 18th, 19th and 20th February 1949.	Second Editing Committee Meeting.	
Bombay ..	18th March 1949 ..	Final Committee Meeting.	

APPENDIX E.

Part-time Trade or Industrial courses for Men and Women.

- | | |
|--|--|
| 1. Carpenter. | 36. Armature Winder. |
| 2. Wood carving. | 37. Radio Maintenance. |
| 3. Furniture & Cabinet Making. | 38. Wireless Operator. |
| 4. Wood-turning & Lacquering. | 39. Telephony. |
| 5. Motor Body Building & Upholstery. | 40. Motor Mechanic. |
| 6. Smith (Black, Tin & Copper). | 41. Engine Artificer. |
| 7. Foundryman. | 42. Air-conditioning & Refrigerator
Mechanic. |
| 8. Draughtsman. | 43. Masons & Bricklayers. |
| 9. Turner. | 44. Plumbers. |
| 10. Fitter. | 45. Surveyors. |
| 11. Grinders. | 46. Aircraft Operation. |
| 12. Machinist. | 47. Aircraft construction & Repair. |
| 13. Tool Maker. | 48. Watch Repair. |
| 14. Vulcaniser. | 49. Horology. |
| 15. Welder (Gas & Electric). | 50. Optician. |
| 16. Boiler Maker. | 51. Glass Blower. |
| 17. Boiler attendant. | 51. Ornamental Glassware Design. |
| 18. Boiler Inspection. | 52. Cine Projection. |
| 19. Ship Building. | 53. Painting & Interior Decorating. |
| 20. Wiremen. | 54. Laundrywork. |
| 21. Electrician. | 55. Typist, Steno and Clerk. |
| 22. Spinner. | 56. Hair Dressers. |
| 23. Weaver. | 57. Boot Maker, & Leather Goods. |
| 24. Dying & Calico Printing. | 58. Bakery. |
| 25. Textile Designer. | 59. Canteen Worker. |
| 26. Book Binder. | 60. Nursing. |
| 27. Compositor. | 61. Midwifery. |
| 28. Printing Machine Operator. | 62. Knitting. |
| 29. Colour Printing. | 63. Embroidery & Fancy Work. |
| 30. Lithography. | 64. Domestic Science. |
| 31. Block Maker. | 65. Costume Tailoring. |
| 32. Colour Photography. | 66. Animal Husbandry. |
| 33. Cable Jointer. | 67. Horticulture. |
| 34. Overhead Linemen & Faultmen. | 68. Sericulture. |
| 35. Instrument Mechanic. (Mechanical,
Electrical & Scientific). | |

APPENDIX-F—contd.

Occupations in which women could replace men...	Business Training for Girls & Women.
1. Book-binding, gilding & decorating	1. Salesmanship.
2. Envelope manufacture.	2. Religious, Charity & Welfare workers
3. Tag manufacture.	3. Librarians.
4. Paper industries.	4. Teachers.
5. Paper bag or box manufacture.	5. Decorators & Designers.
6. Cardboard box manufacture.	6. Draftsmen & Tracers.
7. Candy Factories.	7. Dressmakers.
8. Clothing industries.	8. Upholsterers.
9. Knitting mills.	9. Photographers.
10. Lace & Embroidery Mills.	10. Compositors.
11. Linen & Silk Mills.	11. Block makers.
12. Paint, Varnish & Colour manufacture.	12. Commercial Artists & Sign Writers.
13. Food (Tinned & Preserved) Industries.	13. Mat & Carpet Weavers.
14. Pharmaceutical Industries.	14. Watch Repairers.
15. Ferrous & Non-ferrous metal Industries.	15. Compounders.
16. Automotive & Electrical Industries.	16. Launderers.
17. Dyeing, Bleaching & Calico printing.	17. Nursing & allied Medical Occupations.
18. Tanning & Leather industries.	18. Insurance agents.
19. Plaster & Clay industries.	19. Estate agents.
20. Wireless apparatus industries.	20. Stock & Share brokers.
21. Refrigerator & Air Conditioning Factories.	21. Laboratory attendants.
22. Toys manufacture.	22. Surveyors & Estimators.
23. Mat, Carpet, Hat & Cap industries.	23. Cooking, Catering & Speciality Service.
24. Litho & Power Printing Machine Industries.	24. Textile Designers.
25. Match Industries.	25. Cosmetology & Beauty Parlour Practice.
26. Oil & Soap Industries.	26. Millinery & Flower making.

APPENDIX F.

Art and Industries Centre.

ESTIMATED COSTS OF UNITS.

Industrial Art.	Articles likely to be made.	Equipment.	Staff.	Approximate Expenditure Per Annum.
1. Carpentry (20 pupils)	Simple joints, wedge, paper, weight, door, handles, foot-rule, round ruler, name board, hat and coat rack, key board, letter file, wall bracket, book rack, stool, ping pong bats, book rest sitting plank (pats), roti pat and roller, tea tray, towel rail.	10 Work benches, 10 Bench vises, 20 sets of hand tools 1 Power saw, 1 power planer, 5 water grinding stones, 10 Oil stones, 5 Cupboards, 5 racks, 10 rip saws, 10 tennon saws, 10 keyhole saws, 20 mallets, 20 joiner's hammer 10 G Cramps, 5 joiner's cramps 5 glue pots.	1 Instructor 1 Hammal	Raw Material— Rs. 4050 Staff salary— Rs. 1452 Equipment— Rs. 10,220
2. Wood Carving. (10 pupils)	Chip carving and other decorative carving in relief. Making wooden animals and human forms.	10 sets of hand tools, 1 water stone 4 oil stones, 2 cupboards, 2 racks, 10 mallets, 10 hammers— $\frac{1}{2}$ lb.	1 Instructor 1 Hammal	Raw material—Rs.1350 Staff—Rs. 1452 Equipment— Rs. 2450
3. Fret-Work (20 pupils)	Picture and photo frames, animal and bird forms, jig saw puzzles, pen rack, paper rack, trinket boxes, toys and models.	10 treadle fret saws, 20 hand fret saws, 1 gross saw blades, 20 bench clamps, 10 work benches, 3 cupboards, 5 racks, 20 braces with bits, 5 glue pots.	1 Instructor 1 Hammal	Raw material— Rs. 2700. Staff—Rs. 1452 Equipment— Rs. 4280
4. Metal platework. (10 pupils)	Cutting, punching, pressing, bending, beading, soldering, brazing, etc., in the making of square, rectangular and round tin boxes of various sizes for boot polish, biscuits.	5 Hand screw presses, 1 power shear, 5 hand punching machines, 20 soldering irons, 20 sets of hand tools such as— shears, hammers, mallets compasses, punch foot rule.	1 Instructor 1 Hammal	Raw material— Rs. 1080. Staff—Rs.1812 Equipment— Rs. 19,520.

APPENDIX F—*contd.*

Industrial Art.	Articles likely to be made.	Equipment.	Staff.	Approximate Expenditure. Per Annum.
	cigarettes, etc.	try square, etc., 5 work benches, 2 cupboards, 2 racks, 5 gas stoves.		
5. Art Metal Work. (10 pupils)	Carving and etching on brass and copper sheets and vessels, and filling them with coloured lacquer and enamels.	10 sets of hand tools, 5 work benches, 5 hand lathes, 2 cupboards, 2 racks, 5 buffing and polishing machines.	1 Instructor, 1 Hammal	Raw Material— Rs. 810. Staff—Rs.1452 Equipment— Rs. 3720.
6. Black Smithy. (20 Pupils)	Nails, flat spoons, knives, sickles, khurpies, chisels, tongs, door handles, window hooks, chains, segree, cocoanut scraper racks and stands for household utensils.	1 power hacksaw, 1 power blower, 10 smith's hearths, 20 sets of hand tools, 2 swage blocks, 20 anvils (1 owt.) 5 lb. sledge hammers (10 nos.) 20 sets of fullers, top and bottom swages, tongs, hammers, cold chisels, drifts, punches, etc. 3 cupboards, 5 racks.	1 Instructor, 2 Hammals	Raw Material— Rs. 4050. Staff—Rs.1700. Equipment— Rs. 12,000.
7 House Wiring and Jointing. (20 Pupils)	Simple joints, soldering joints, attaching lugs to wires. Rinding wires on to insulators. Simple house wiring for single, two and three point controls, pendant fixings, tests for faults.	6 doz. single and two-way switches and intermediate switches. 3 doz. Twinnobs 6 doz. different types of lamp holders, 5 gross, two, three and four wire cleats, 2 gross, round wooden blocks, 1 gross rectangular blocks, 6 coils, 1/18 V. I. R. wire, 2 coils, 3/32 C. T. S. wire, 2 gross wood screws of 1 1/2", 1 1/4", and 2", No.6.	1 Instructor, 1 Hammal.	Raw Material— Rs. 2160. Staff—Rs.1812. Equipment— Rs.7220.

APPENDIX F—*contd.*

Industrial Art.	Articles likely to be made.	Equipment.	Staff.	Approximate Expenditure Per Annum.
		20 sets of hand tools, 20 soldering irons, 10 gas stoves, 5 cupboards, 5 racks, 20 4'x4' wall boards, (Deal) 20 brace with bits, 2 Meggers, 5 bell and battery testers, 1 gross carbon filament lamps, 6 doz. metal filament lamps (40 w), 1 black board.		
8. Cardboard Modelling (10 Pupils)	Greeting cards, file covers, calendar cards, soap boxes, rectangular boxes for shoes, sweets, pharmaceuticals, etc., photoframes and mounts, letter case, blotting pad, stencil cutting, templet making, toy houses and furniture, presses card trays of different sizes and shapes, lamp shades in coloured cards.	1 Hand shearing machine, 10 sets of hand tools, 5 glue pots, 10 wooden vises, and Cramps, 5 screw hand presses of different sizes, 1 black board, 4 work benches, 10 stools.	1. Instructor 1 Hammal	Raw Material—Rs. 500. Staff—Rs. 1452. Equipment—Rs. 7820.
9. Book-binding (10 Pupils)	Close and open binding, section binding, finishing with flexible and stiff covers, pasting on different coloured marbled paper, calico and leather, decorative and artistic binding, etching and ornamenting on leather and calico.	10 sets of book-binding tools and accessories, 1 hand shearing machine, 5 hand cutting machines, 2 screw presses, 5 work benches, 10 stools, 2 cupboards, 2 racks, 3 glue pots.	1 Instructor 1 Hammal	Raw Material—Rs. 500. Staff—Rs. 1452. Equipment—Rs. 7,000.
10 Artistic Leather Work (10 Pupils)	Transferring designs on leather and colouring them with different stains making of purses, handbags, valet cases, portfolios etc., with	10 sets of leather working tools and accessories 2 sewing machines 2 cupboards, 2 racks, 3 work benches.	1 Instructor 1 Hammal.	Raw Material—Rs. 1080. Staff—Rs. 1452. Equipment—Rs. 2730.

APPENDIX F—contd.

Industrial Art.	Articles likely to be made.	Equipment.	Staff.	Approximate Expenditure Per Annum.
	ZIP fastening according to requirements.	10 stools, Spirit stains and colours according to requirements.		
11 Calico Printing (10 Pupils).	Printing with Rapi-dogen and rapid fast colours and with indigosols colour, and white discharges.	5 working tables, 50 sets of hand printing blocks and accessories, 2 cupboards.	1 Instructor 1 Hammal	Raw Material— Rs. 1350. Staff—Rs. 1452. Equipment— Rs. 2000.
12. Clay and Plaster Modelling. (10 Pupils)	Different kinds of vegetables, fruits, animals and human busts.	10 sets of hand tools, 20 plaster moulds 2 racks, 1 cupboard, 3 work beaches, 10 stools, 20 clay moulds.	1 Instruc-tor 1 Hammal	Raw Material— Rs. 270. Staff—Rs. 1452. Equipment— Rs. 5000.
13. Pottery Decoration (10 Pupils)	Transferring designs on pottery and colouring them. Painting on flower vases, water pots, etc.	10 sets of hand tools and accessories, 3 work benches, 10 stools, 2 cupboards, 2 racks, 1 black board.	1 Instruc-tor 1 Hammal	Raw Material— Rs. 500. Staff—Rs. 1452. Equipment— Rs. 1730.
14. Drawing and painting (20 Pupils)	Freehand and scale drawing and colour work. Commercial art and sign board painting. Poster painting.	20 Drawing boards and T squares, 20 sets of scales and set squares, 20 instrument boxes, 20 colour boxes, 1 gross assorted colour tubes, brushes, dishes, water pots, etc, 1 gross drawing board pins, 5 drawing tables and benches, 3 cupboards, 3 racks, 1 black board.	1 Instructor 1 Hammal	Raw Material— Rs. 540. Staff—Rs. 1452. Equipment— Rs. 4600
15. Mat and Carpet Weaving (10 Pupils)	Straw and willow weaving. Carpet weaving according to set patterns and designs.	10 pit looms, 10 carpet looms, scissors, shears, sticks, shuttles, and accessories. 2 cupboards, 2 racks.	1 Instruc-tor Hammal	Raw Material— Rs. 1080. Staff—Rs. 1452. Equipment— Rs. 5600.
16 Embroidery and Fancy work	Hand embroidery, Different types of stitches used. Transfer of	20 embroidery frames and accessories. 2 cupboards.	1 Instruc-tor 1 Hammal	Raw Material— Rs. 1080. Staff—Rs. 1452.

APPENDIX F—concl'd.

Industrial Art.	Articles likely to be made.	Equipment.	Staff.	Approximate Expenditure Per Annum.
(20 pupils)	designs on cloth. Preparation of table cloth, tea-poy cover, cushion cover, pillow cases, and other useful articles. Patch work, Applique, with different cut pieces of coloured cloth. Fancy stitching. Drawn thread work.	1 black board		Equipment— Rs. 1000.
17. Knitting (10 pupils)	Crotchet, shuttle and needle work in the making of laces, blouse pieces, sleeves, etc. Making Socks, pullovers, caps, etc.	10 sets of knitting needles and accessories. 2 cupboards.	1 Instructor 1 Hammal	Raw material— Rs. 500. Staff—Rs. 1452. Equipment— Rs. 800.
18. Simple Tailoring (20 pupils)	Different stitches. The sewing machine—its care and operation. Cutting paper patterns for chaddi, jabla, sailor suit, umbrella, frook, blouses, pyjama, etc. Making any or all of the above items according to ability and taste, of the pupils.	10 sewing machines, 20 sets of Scissors and tailor's accessories, 5 Drafting tables, 10 stools, 3 cupboards, 2 racks, 1 black board.	1 Instructor 1 Hammal	Raw Material— Rs. 1620. Staff—Rs. 1452. Equipment— Rs. 7000.

Note.

- Each unit will accommodate at a time the number of pupils given under each craft. Each centre is expected to work for 6 hours a day for three shifts, at two hours per shift.
- The head of the centre, the supervisory and other staff required, will depend upon the size and capacity of each centre.
- Cost of land and buildings will depend upon the accommodation required for offering instruction in a stipulated number of crafts. Approximate floor areas for different kinds of shops are given in APPENDIX—K.
- The salaries of staff do not include dearness and other allowances and contribution to the Provident Fund. The recurring expenditure has not been computed to include conservancy charges, pay of watchmen, electricity charges and office contingencies.
- Each centre will have one central stores section from which all the necessary tools and raw material will be drawn for purposes of instruction and the finished products and tools returned to the stores at the end of the day's work.

APPENDIX G.

Technical High School.

(Estimates of costs. Recurring and non-recurring) (40 pupils in each standard.)

I CAPITAL EXPENDITURE.

1. (a) <i>Building.</i>		sq. ft.
4 class rooms (Standards IV to VII) ..	.. 20' x 20' x 4 =	1600
1 Physics and Chemistry Lab. ..	.. 45' x 30' x 1 =	1350
1 Science lecture room ..	.. 25' x 20' x 1 =	500
1 Applied Mechanics Lab. ..	.. 40' x 20' x 1 =	800
1 Applied electricity Lab. ..	.. 45' x 25' x 1 =	1125
1 Drawing Office ..	.. 30' x 20' x 1 =	600
1 Carpentry shop ..	.. 45' x 25' x 1 =	1125
1 Machine and Fitting shop ..	.. 108' x 40' x 1 =	4320
1 Smithy and Foundry shop ..	.. 60' x 40' x 1 =	2400
		<hr/> 13,820 sq. ft.
(b) Principal's office, Office rooms, staff room, library, museum, store room, sanitary accommodation, etc.		According to standard sizes for academic high schools.
		Approximate area = 6,180 sq. ft.
(c) Hostel, conservancy, bathrooms, mess, etc. (according to size and capacity)		Approximate area = 5,000 sq. ft.
		<hr/> Total area = 25,000 sq. ft.
		Rs.
2. (a) Class rooms, laboratories, workshops and office buildings. (20,000 x Rs. 10/- per sq. ft.)		2,00,000
(b) Hostel, mess, bath, etc. (5,000 x Rs. 10/- per sq. ft.)		50,000
(c) Furniture and fittings for class rooms, laboratories and Workshop,		Rs.
4 class rooms		8,000
1 Physics and Chemistry Lab.		4,000
1 Science lecture room		1,200
1 Applied mechanics Lab.		2,000
1 Applied electricity Lab.		2,000
1 Drawing office		2,000
1 Carpentry shop		2,500
1 Machine shop		800
1 Fitting shop		1,500
	Rs. ..	<hr/> 24,000
		Rs.
(d) (i) Furniture for Principal's office, office rooms, library, and staff rooms		15,000
(ii) Museum, store room, etc. with fittings		7,000
(e) Hostel furniture, utensils, etc.		7,000
(f) Gymkhana room		1,200
		<hr/> 30,200

APPENDIX G—contd.

WORKSHOP AND LABORATORY EQUIPMENT.

3. (a) Carpentry shop	Rs.
Set of carpentry tools for 20 pupils	2,000
Miscellaneous equipment	500
(b) Fitting shop	4,000
(c) Machine Shop	Rs.
1 small shaper	5,000
2 Sliding, surfacing and screw cutting lathes, 8' .. bed with individual electric drive	10,000
8 Sliding, surfacing and screw cutting lathes, 3½' .. bed with individual electric drive	24,000
1 Pillar drilling machine	1,500
1 small drill press	500
1 Hacksaw machine	1,000
1 Tool grinder	1,000
Tools and instruments	5,000
(d) Smithy and Foundry	
5 Hearths	2,000
Blower, pipes, vales, etc.	2,000
10 Anvils	2,000
Smithy tools	1,500
1 small cupola with blower, pipes etc.	6,000
Moulding boxes, ladles, tools, etc.	1,000
(e) Physics and Chemistry laboratory apparatus and chemicals	8,000
(f) Applied mechanics laboratory apparatus	8,000
(g) Electric wiring and erection charges	5,000
(h) Miscellaneous stores	800
	<hr/>
Total (3-a to h)	90,800

APPLIED ELECTRICAL LABORATORY.

4. 2 A.C.-D.C. motor generator sets complete with starter, etc.	Rs.
1 Battery charging set	5,400
1 A.C.-D.C. motor generator set	1,700
1 A.C.-D.C. motor generator set	2,500
1 D.C. series motor, 2 B. H. P.	800
5 Transformers	1,000
4 Post office boxes	1,000
Ammeters, voltmeters, Megger, and other meters and measuring instruments and resistances	6,600
Miscellaneous stores	1,000
Wiring and erection charges	3,000
	<hr/>
Total	23,000

Grant total—(Items-1, 2, 3 and 4 above) Rs. 418,000

II RECURRING EXPENDITURE.

(a) Teaching Staff	Rs.
1 Head Master (Rs. 435x12)	5,220
1 Technical Superintendent (Rs. 310x12)	3,720
6 Graduate Teachers (Trained) (Rs. 140x6x12)	10,080

APPENDIX G—*contd.*

	Rs.
1 Technical Draughtsman (Rs. 140 x 12) ...	1,680
1 Assistant Engineering Superintendent (Rs. 140 x 12)	1,680
Total Rs.	22,380

(b) Office Staff.

2 Office clerks (Rs. 81 x 2 x 12) ...	1,944
1 Accountant (Rs. 81 x 12) ...	972
1 Store-keeper (Rs. 81 x 12) ...	972
2 Peons (Rs. 40 x 2 x 12) ...	960
Rs.	4,848

(c) Workshop and Laboratory staff.

1 Foreman ... (Rs. 90x12) ...	1,080
1 Turner ... (Rs. 81x12) ...	972
1 Fitter ... (Rs. 81x12) ...	972
1 Black-smith ... (Rs. 81x12) ...	972
1 Carpenter (Pattern maker) ... (Rs. 81x12) ...	972
1 Moulder ... (Rs. 81x12) ...	972
1 Electrician ... (Rs. 81x12) ...	972
1 Wireman ... (Rs. 81x12) ...	972
1 Laboratory Assistant ... (Rs. 81x12) ...	972
6 Workshop Assistants (Rs. 50x6x12) ...	3,600
2 Hammals ... (Rs. 40x2x12) ...	960
Rs.	13,416

<i>(d)</i> Provident fund contribution on salaries under II (a), (b) and (c) above at 8½ per cent ...	3,379
<i>(e)</i> Scholarships and Prizes ...	3,000
<i>(f)</i> Material for workshop and miscellaneous stores ...	6,850
<i>(g)</i> Office contingencies ...	1,000
<i>(h)</i> Rents and Taxes ...	3,700
<i>(i)</i> Electricity ...	627
<i>(j)</i> Games and Sports ...	1,400
Rs.	19,956

Grant total Items-II (a), (b), (c),
(d), (e), (f), (g), (h), (i),
and (j) above ...

Rs. 60,800

Notes.—

(i) Average pay in the scales recommended in Table No. 14 has been taken for computing the salaries of staff.

(ii) The recurring expenditure does not include conservancy charges, dearness and other allowances, which will be admissible as per rules of Government in force from time to time.

APPENDIX G—concl'd.

Summary of Capital Cost and Recurring Expenditure for a Tech. High School.

I. CAPITAL EXPENDITURE.		II. RECURRING EXPENDITURE.	
1. <i>Land</i>			Rs.
A minimum of 2 acres of land would be required to house the school buildings, workshops, hostel and a playground.	The cost is not worked out as the price of land varies according to locality.	(a) Teaching staff ..	22,380.
		(b) Office Staff ..	4,848.
		(c) Workshop and Laboratory Staff. ...	13,416.
2. <i>Buildings.</i>			
	Rs.	(d) Provident Fund ..	3,379.
(a) Class rooms, Laboratories, workshop and offices.	2,00,000.	(e) Scholarships and Prizes	3,000.
(b) Hostel, mess, etc. ..	50,000.	(f) Material for workshops	
(c) Furniture and Fittings.	24,000.	and miscellaneous stores	6,850.
(d) (e) and (f) Do. ..	30,200.		
3. <i>Workshop and Lab. Equipment.</i>			
(a) Carpentry shop,		(g) Office contingencies	1,000.
(b) Fitting shop,			
(c) Machine shop,		(h) Rents and Taxes ..	3,700.
(d) Smithy and Foundry,			
(e) Physics and Chemistry Laboratory,		(i) Electricity ..	627
(f) Applied Mechanics Laboratory,			
(g) Wiring and Erection charges, and		(j) Games and Sports ..	1,400.
(h) Miscellaneous stores ..	90,800.		
4. Applied Electrical Laboratory.			
Equipment ..	23,000.		

Grant Total ..	Rs. 4,18,000.	Grant Total ..	Rs. 60,600
	_____		_____

APPENDIX H.

List of Equipment for a Mechanical Engineering Workshop and Allied Trades.

(For a class of 20 students)

Pattern making, Carpentry, Woodwork.

Description	Nos. reqd.	Rate Rs.	Total cost Rs.
Work benches, 8'x3'x2' high	12	100	1,200
Grinding wheel, with stand. size: 4"x18" dia. (water)	1	100	100
Sharpening Stone. (Emery)	2	5	10
Oil stone, smooth or blue hone. 8"x2"x1"	1	6	6
Wood turning lathe, max. capacity 6" dia. x 4'-0" bed. Complete with self-driven motor to suit 3 phase A.C. supply, 400 volts, 50 cycles	2	1,600	3,200
Set of turning tools, for wood turning (12 Tools)	2 sets	24	48
Circular Bench Saw. Dia. of Saw—12", complete with motor drive to suit 3 phase A. C. supply, 400 volts, 50 cycles. (one spare Circular-saw)	1	2,500	2,500
Wood working vices 9"	20	40	800
Set of carpentry tools. Chisels $\frac{1}{4}$ ", $\frac{3}{8}$ ", $\frac{1}{2}$ ", 1". Pairing chisels and gouges. $\frac{1}{4}$ ", $\frac{1}{2}$ ". Box-wood four fold foot-rule. 24" Marking gauge, Saw, 12" Wooden Mallet, Wooden plane. 9" Dividers, Joiners hammer	22 sets	40	880
Files, rasp for wood filing. 10"	20	3	60
File, Triangular 6" long	20	2	40
Hand Saws. 24", 18", 12"	1 set	10	40
Cross Axes. 3" width	2	8	16
Jack-iron Planes Stanley's 14" x 14"	2	40	80

FOUNDRY AND SMITHY.

Anvil 2 Cwt. each	10	150	1,500
Forge, complete with stand	10	250	2,500
Sledge hammers. 8 lbs. with handles	10	8	80
Ball pene, Hammer 1 lb. with handle	10	3	30
Ball pene Hammer 1½ lbs. with handle	20	4	80
Swage block C. I.	1	200	200
Chisels Cold	22	3	66
Smith's tools	22 sets	100	2,200
Try Squares, 6" long	22	4	88
Inside and Outside Calipers. 12"	22 pairs	4	88
Water Tanks (C.I.)	12	100	1,200
Moulding Boxes various types and sizes	30	900	900
Moulding tools	22 sets	100	2,200
Showels with handles	5	5	25
Buckets, Galvanised	4	5	20
Kodalies with handles	2	5	10
Watering can	2	6	12
Pick-axe	1	8	8
Pressed Steel Pans (Ghamelas)	10	3	30
Mallets, Wooden	5	1	5
Motor Blower (Centrifugal) complete	1	1,500	1,500
Mason's Trowels (small size)	3	2	6
Moulding sand	15 Cwts.	15	225
Hand sieves, 18" Dia. medium and fine mesh	20	5	100
Materials for preparation of sand .. .. .	....	....	50
Pit Furnace 1 cwt. capacity .. .. .	....	....	500

APPENDIX H—contd.

DRAWING OFFICE EQUIPMENT.

Description.	Nos. Reqd.	Rate	Total amount.
Drawing Boards 24"x15". ($\frac{1}{2}$ Imp. size)	20	10	200
'T' Square to match	20	4	80
Set Squares Celluloid	..	..	..
45°—8" or 6"	20 sets	4	80
60°—8" or 6"	..	..	..
Draughtman's scales	..	..	..
12" long. (wooden)	20	3	60
Steel rule 6" marked in inches and millimetres	10	3	30
Set of card scales	20	2	40
Drawing office tables with Stools.	20	150	3,000
Drawing instrument Boxes	22	50	1,100
Cartridge or Drawing Paper.	..	..	..
Drawing Pins. Brass.	2 gross	3	6
Drawing Pencils, HB	..	..	..
Drawing Pencils H	20 sets	18	90
Drawing Pencils 2H	..	..	..
Indian Ink bottle (black)	3	1	3
Pencils Erasers	2 Doz.	3	6
Brushes, Camel hair, No. 3	6 Nos.	2	12
Water colour boxes	2	3	6
Blue-Printing frame	2	75	150
Drawing Paper, Printing Paper, Tracing Paper, Indian Ink, etc. to be procured according to demand.	..	..	..

MECHANICAL ENGINEERING WORKSHOP

Lathes, sliding, surfacing and screw cutting, 6 $\frac{1}{2}$ " centre, 4 feet gap bed, complete with accessories such as faceplate, chuck, centres, tool holder, counter-shaft speeds and motor drive for 3 phase A.C. supply.	6	3,500	21,000
Planing machines small 4 feet table, 2'-0" feet width of table, complete with tool holder, motor drive for 3 phase A. C. supply	1	5,000	5,000
Drilling machine, Pillar or radial type. Max. capacity 1" to 1 $\frac{1}{2}$ ", with motor drive for 3 phase A. C. supply.	1	2,500	2,500
Small pillar drilling machine, capacity $\frac{1}{2}$ " to 1 $\frac{1}{32}$ " with motor drive	1	600	600
Shaping machine 1 foot stroke, complete with table and accessories and motor drive	4	3,000	12,000
Universal milling machine complete with access- ories and motor drive.	1	6,000	6,000
Tool grinder, Double wheel with stand and motor drive	1	2,000	2,000
Micrometer screw gauge Capacity 0 to 1"	2	80	160
Drill sockets for Morse taper shanks $\frac{1}{4}$ " to 1 $\frac{1}{2}$ "	1 set	200	200
High speed steel tools	30	15	450
Plain carbon steel tools $\frac{1}{4}$ " or $\frac{3}{8}$ " sq.	60	5	300
Twist drills with Morse taper shanks 3/16" to 1 $\frac{1}{2}$ " and parallel shanks 1/32" to $\frac{1}{4}$ "	2 sets	100	200
Steel rules 6" long with inches 1/96, 1/64, 1/32, 1/16, 1/8, 1/10, 1/100 and in millimeters	25	2	50
Steel rules 12" long	3	4	12
Steel rules 18" or 24" long	1	5	5
Machine Saw (Hack Saw machine)	1	500	500
Calipers, outside and inside 9" long	20 sets	5	100

APPENDIX H—concl.

Description.	Nos. Reqd.	Rate Rs.	Total Cost.
Scribing block	5	40	200
Slide Caliper with vernier scale to measure dia. up to 4"	2	20	40
B. S. Whit. Dies and stocks 1/16" to 1 1/2" complete set	1 set	500	500
Taps with handles complete set Whit. 1/16" to 1 1/2"	1 set	150	150
One set B. A. taps and dies	1 set	120	120
Pipe Threads—Dies and taps 1/2" to 1 1/2" complete	1 set	900	900
Fitters benches. 6 ft. x 2'-6" x 2 ft.	10	100	1,000
Parallel vices 6" quick opening	10	60	600
Steel straight edge 4 ft. long.	1	10	10
Double ended spanners to suit B.S.W. Nuts 1/2" to 1 1/2"	4 sets	50	200
Feeler gauges .0015" to .050"	2 sets	10	20
Girder spanner 9" long	4	5	20
Girder spanner 4 1/2" long	2	5	10
Box spanners, complete set for B. S. W. nuts 1/2" to 1 1/2"	2 sets	40	80
Spirit level 12"	1	10	10
Screw Driver. 6", 12" and 18"	3 sets	3	27
Knurling tool	1	20	20
Ball pene hammers 1 1/2 lbs.	10	4	40
Ball pene hammers 1 lb.	2	4	8
Try squares 10"	1	4	4
Try squares 6"	10	4	40
Bevel protractor	1	10	10
Fitters tools, chisels etc.	24	2	48
Centre punches, steel	10	2	20
Hack saw frames different sizes	20	3	60
Hack saw blades assorted	1 gross	20	240
Bastard cut, smooth and rough files, flat, square, round, halfround, triangular and one or two with one edge smooth, without any cut (20 Nos.) each	3 sets	80	240
Handles for files wooden	6 Doz.	5	30
Emery grinding wheel 9"	1	100	100
Tinman's Hand shears, small 9"	2	15	30
Tinman's Hand shears for plates 1/2" thick	1	100	100
Milling cutters. Plain surface mills, Side mills, and gear cutters 14 D. P. one set complete	1 set	500	500
Slitting saws 1 1/2" and 1"	2	25	50
Tachometer, Dial type	1	50	50
Stop Watch	1	100	100
Wooden cupboards with shelves 6' x 3' x 18"	5	150	750
Cupboards for students	4	200	800
Superintendent's table with revolving chair, book rack and side table. Complete set	1 set	500	500
Office tables for clerks, staff, etc.	42	75	900
Chairs for office, library, visitors room, etc.	20	20	400
Stools for Laboratory, etc.	12	10	120
Benches for students	24	30	720
Desks for students	24	100	2,400
Workshop cupboards and students lockers	10	100	1,000
Office equipment (minor items)	...	500	500
Office steel safe	1	400	400
Show case cupboards	4	200	800
Visitors table and library table	2	400	800
Students dining tables	2	50	100
Steel filing cabinet	1	200	200
Steel or wooden rack	4	75	300

APPENDIX I.

Cost of Equipment for Automobile Course.

Description.	No.	Approx. Cost
		Rs.
Motor Car	1	5,000
Stationary Motor Car engine complete with transmission arrangements. (Chassis) Four different makes.	1 set	20,000
Sectioned model of complete chassis with engine and transmission arrangements.	1	8,000
Different types of Carburettors, distributors, fuel pumps, ignition systems, lighting systems, etc. (complete set).		3,000
Motor Compressor set and servicing appliances ...		6,000
Valve grinding cutters, pressure guage, Boring machine, Honning tools, etc.		2,500
Hand tools and accessories, other tools, etc.	6 sets	1,200
Hydraulic hoists.		2,000
Books		500
Charts showing different makes of Cars and commercial vehicles with their particular systems of ignition, fuel, brake, etc.		300
	Total ...	48,500

APPENDIX J.

List of Equipments for a few Courses.

1. AUTOMOBILE REPAIR :	Charts depicting different :-
10 STUDENTS.	(a) Makes of Cars.
Pair of Pliers. Combination type 10	(b) Ignition Systems.
Hammer. Ball pene 1½ lbs ... 10	(c) Brakes.
Screw Driver. 10" long, ¼" and ⅜" blade 20	(d) Fuel Systems.
Flat Chisel ⅜" 10	(e) Wiring Diagrams etc.
Box Spanner 3/16" to ¼" with a tomy 2 sets.	Work Benches with lockers. (8' x 3' x 2') 5
Double Ended Spanners 3/16" to ¼" 2 sets.	Universal Valve Grinder ... 1
Adjustable spanners. 10" ... 4	Oil Injector 1
Feeler Gauges 2, 3, 4, 6, 8, 10, 12 and 15 thousands of an inch 1	Honning Machine (With electric drill) 1
Steel rule 12" with inches and millimeters 10	Cylinder Gauge 1
Calipers 6" inside 10	Valve Cutters 1 set
Calipers 6" outside... .. 10	Magneto Tester 1
Dividers 6" 10	Battery Tester 1
Hermaphrodite calipers ... 10	Tyre and Rim service Wrenches 2 sets
Thread pitch guages. Whitworth & Auto 2 sets	Grease Guns 2
Ring Spanners from ¼" to ¾" ... 2 sets	Compression Tester 1
Cross-cut Chisel ⅜" ... 10	Hydrometers 2
Vernier Calipers 6" ... 4	Foot Pump 1
Micrometer 0" to 1" ... 2	Hand Pump 1
Hackshaw 12" adjustable ... 4	Motor Compressor set 220 V. A. C., S. P. output about 10 c. ft./mt. (with reservoir) ... 1
Combination square with Bevel Protractor 1	Hydraulic Jack (lift) for Servicing 1
Dial Tachometer 1	Condenser 1
Motor Car. (Ford or any other model) 1	Universal Wheel Puller ... 1
Stationary Petrol Engine with all accessories 1	Tyre Pressure Guage ... 2
Section Models of :	Soldering iron, (ordinary) ... 1
(a) Engine	Soldering iron, (electric) ... 1
(b) Transmission Gear.	Bench Vices. (Fitters) ... 10
(c) Clutch.	Bench Drilling Machine ½" capacity 1
Cylinder Reborer. (Motor driven) 2	Cupboards 6' x 3' x 1½' ... 2
Carburettors :-	
(a) Zenith,	
Claudel, Hobson and other makes.	

APPENDIX J—*contd.*

MOTOR BODY BUILDING AND UPHOLSTERY : 10 STUDENTS.		Magnetic Hammer for Upholstery 1 or 1½ lbs.	4
Work Benches with lockers. (8'X3'X2')	5	Leather Sewing Machine. (Medium Type).	1
Bench Vices 8" Jaws.	3	Oil Cans.	2
Trestles.	2	Hand Bench Grinder 6" or 8" Wheel.	1
Brace with Bits and Centre Bit.	2	Oil Stones 6"X2"	2
Joiners Cramp 8 ft.	2	Screw Drivers ¼" blade.	5
G. Gramps 8"	2 pairs	Screw Drivers ½" blade.	5
Adzes.	2	Screw Drivers ¾" blade.	5
Light Bench Axes.	4	Double Ended Spanners ½" to 1¼".	2 sets.
Hand Saws 2'—0"	5	Box Spanners ¼" to 1"	2 sets
Compass Saw 18".	3	Lucas Girder (minor) spanners.	2
Key Hole Saw 9".	5	Lucas Girder. (major)	2
Mallets.	10	Tin Shear 12"	2
Jack Plane 1¼" blade.	10	Soldering iron 1 lb.	1
Smoothing plane 1½" blade.	10	Soldering iron (electric) 500 Watts.	1
Round Sole plane 1½" blade.	10	Cupbeards. 6'X3'X1¼'	2
Rabbit plane, Bevel, Crooving, Tongue, Round.	1 of each.		
Firmer Chisels ¼", ½", ¾", and 1"	10 sets.		
Firmer gouges. 1" and ½"	4 sets.		
Joiners hammers 1 lb. (with nail pillar).	10		
Light Hammers 8 ozs.	10		
Bradawls.	10		
Gimlets ¼", ½", ¾", 1", 1½"	2 sets		
Augers ¼", ½", ¾"	2 sets		
Spoke Shaves.	4		
2'—0" Box Wood four fold foot rule.	10		
Pair of Dividers 6"	10		
Glue Pots.	2		
Try Squares 6"	10		
Masons Square 2'—0" blade.	1		
Marking Gauge	10		
Primus Stove (Etna Burner.)	1		
		SPRAY PAINTING : 10 STUDENTS.	
		Motor Compressor set with air receiver, 2 H. P. motor 220V.	
		A. C., S. P. Complete.	1
		Spray Cans.	10
		Sets Nozzles,	5
		Colour (Paint) Containers.	5
		Exhaust fan. Motor driven.	
		1 H. P. 220 V. A. C., S. P.	1
		Dow Files 10" smooth.	5
		Stones for removing colour and for Scraping body.	10
		Cupboard. 4'X2'X1¼'.	1

APPENDIX J—contd.

VULCANISING: 10 STUDENTS.

Motor Compressor set with Reservoir (220 V. A. C., S. P.) 1/2 H.P.	1
Buffing Machine with Motor.	1
Portable Electric Wire Brush.	1
Tube Plate. (4 Clamps.)	1
Spot Patchers.	5
Tyre Vulcanising Moulds of different standard sizes with air pads.	5
Air Bags of 6 different sizes.	2 of each
Rollers 2" x 2".	2
Tyre Spreader.	1
Corrugated Ball Bearing Stitcher.	2
Smooth B. B. Stitchers.	2
Valve Nut Wrenches.	2
Round Noze Rasps.	2
Small Emery Wheels.	2
Rex File (Rat tail rasp.)	2
Flexible Rule 3'—0".	2
Goggles.	4 pairs.
Sand-Stone 6" x 1".	2
Buffing Brush.	4
Rubber Cutting Shears.	2
Tyre Probe.	2
Flexible Knife.	1
Pointed Knife.	1
Notched Knife.	1
Hollow Ground Rubber Knife.	1
Pair of Pliers.	1
Valve Punch.	1
Pricking Awl.	1
Cementing Brush 3".	1
Round Cement Brush.	6
Cupboard 5' x 2 1/2' x 1 1/2'.	1

BOAT BUILDING: 10 STUDENTS.

Accessories for a steaming Kiln.	
Midship and Fore Body Moulds of various Shapes.	
Trestles.	2
Work Benches with lockers. (5' x 2 1/2').	5
Brace with bits and Centre bit.	2
Metal Clamps 6", 7", 8", and 9" Adzes.	2 of each. 5
Rip Saw, Coarse; 2 1/2'—6"	10
Panel Saws.	10
Compass Saw 18"	2
Jack Plane 1 1/2" blade.	10
Smoothing plane 1 1/2" blade	10
Round sole plane 1 1/2" blade.	2
Rabbit plane, Bevel, Grooving, Tongue, Round.	1 of each.
Mach planes.	5
Firmer Chisels 1/4", 1/2", 3/4", 1".	10 sets
Firmer Gouges 1" and 1 1/2".	5 sets
Mallets.	10
Carpenters Hammers 1 lb.	10
Light Hammers 8 ozs.	5
Bradawls. (fine).	5
Light Bench Axes.	5
Gimlets 1 1/4", 5/8", 3/4", 1", and 1 1/2" 1 set	
Augers. 1/2", 3/8", 1/2".	2 sets
Spoke Shaves.	2
Draw Knives.	2
Electric Hand Drill 1/2" capacity. (Portable).	1
Bench Vices 8" Jaws.	10
2 ft. foot rule four fold (wooden.)	10
Pair of Dividers 6".	10
Straight Edge Steel 4'—0".	2
Cupboard 5' x 2 1/2' x 1 1/2'.	1

APPENDIX J—*contd.*

CARPENTRY: 10 STUDENTS.	AGRICULTURAL CARPENTRY And Smithy: 10 STUDENTS.
Work Benches with lockers (6'X2½'X2')	5
Hand Saws 18"	10
Tennon Saws.	10
Jack Planes 1½" blade	10
Smoothing planes 1½" blade.	10
Round Sole planes 1½" blade.	5
Rabbit plane, tongue, grooving Bevel and Round.	1 of each.
Firmer Gouge. ½", ¾"	5 of each.
Firmer chisels ½", ¾", 1", 1"	10 sets
Mallets.	10
Carpenter's hammers 1 lb.	10
Light bench axes.	5
Gimlets ¼", ½", ¾", 1", and 1½"	2 sets
Augers ½", ¾", 1"	1 set.
Bradawls.	5
Spoke Shaves.	3
Draw Knives.	3
Rip Saw	2
Adzes.	3
Brace with set of bits.	2
Cramps. 6"—0"	2
G. Cramps 9"	2 Pairs
Trestle.	1
Mortice Chisels ¾"	5
Mortice Gouges.	2
Carpenter's Vices 8" Jaws.	5
Oil Sotne 9"X3"	2
2'-0" Rule, four fold, Box wood	10
Steel foot rules 12"	10
Pair of Dividers. 6"	10
Compass Saw 18"	1
Key Hole Saw 9"	5
Marking Gauges.	10
Cupboards: (5'X2½'X1½')	2
	Smiths Hearths complete with Tuyeres, Hoods, Chimneys and Water Tanks.
	5
	Anvils 2 cwts.
	5
	Motor-blower 220 V. S. P., A.C. giving out about 20 c. ft. of air per minute.
	1
	Sledge hammers, 10 lbs. with handles.
	5
	Swage Block 14"X14"X6"
	1
	Hammers 2 lbs. (with handles)
	5
	Flatteners [with handles (2"X2")]
	5
	Set hammers.
	2
	Fullers ½"X1"
	6 pairs.
	Swages tops and bottom ½", ¾", 1", and 1"
	10 pairs. 2 of each
	<i>Tongs</i> :—
	Flat Nose.
	10
	Round Nose.
	5
	Square Nose.
	5
	Bent Nose.
	5
	<hr/>
	WOOD TURNING AND
	Lacquering: 10 STUDENTS.
	Hand Turning Lathes 4" centres. 5
	Wood turning lathes 4" to 6" Centres Complete with counter shafts, stepped Cone Pulley, and belt shifting gears.
	5
	A. C. Motor 220 V. S. P., 3 H. P. with Starter etc., complete.
	1
	Bench Vices 6" Jaws.
	10
	Work Benches with lockers. (6'X2½'X2')
	5
	Wood Turning Tools of different types.
	5 sets.
	Painting Brushes Nos. 3 and 4 (Windsor and Newton).
	10 of each
	Colour Pots ½ lb. capacity.
	10
	Cupboard. (6'X3'X1½')
	1

APPENDIX J—*concl'd.*

<p>ELECTROPLATING AND BATTERY CHARGING 10 STUDENTS.</p>	<p>A pair of buffing machines with motor drive 220 V. A. C., S. P. 1/2 or 1 H. P. motor with 1½" shafting with buffs, pulleys and belt shifting arrangements. ... 2</p>
<p>Electroplating Vats 3' × 2' × 1½' 3 Nos.</p>	<p>Hydrometers ... 2</p>
<p>Electroplating Vats 15" × 12" × 9" 2</p>	<p>Caustic Soda Bath ... 1</p>
<p>Battery Charging Unit for 6, 12 and 24 Volts from 220 Volts A. C., S. P. supply and Vacuum Tube Type. ... 1 each.</p>	<p>Water Bath 3' × 2' × 1½' ... 1</p> <p>Acid Bath. 3' × 2' × 1½' ... 1</p>
<p>(Voltmeter-Charge-discharge type. Knife switch, D. P. D. T. Pilot Lamp on switch board. Amme- ter same as voltmeter) ...</p>	<p>Set of smooth files 6" flat, half- round and round. ... 2 sets.</p>
<p>Motor Generator set from 220 volts A. C., S. P. to 6 V, 250 amps. 1 D. C. with starter, switch board etc.</p>	<p>Cupboard 5' × 2½' × 1¼' ... 1 (Teakwood)</p> <p>Emery Papers Nos. 0 & 1 ... 20</p>

APPENDIX K.

Suggested Floor Area for different types of Shops.

Type of shop	Area in Square Feet.	
	Minimum	Adequate
Automobile	2,000	4,500
Cabinet	1,200	3,500
Carpentry	1,200	3,500
Drafting	1,000	2,000
Electrical	1,200	3,500
Industrial Arts (Unit)	1,000	1,500
Interior Decorating	1,200	3,500
Machine	1,200	3,500
Pattern	1,200	3,500
Print	1,200	2,500
Sheet Metal	1,000	2,000
Trowel Trades	1,500	3,500
Welding	1,200	2,500
Motor body building and Upholstery	3,000	5,000
Smith. (Tin, Copper, Black-smith)	2,000	3,500
Vulcanizing	1,000	3,000
Armature Winder	1,500	3,500
Radio maintenance	1,200	3,000
Motor mechanic	1,500	3,500
Instrument mechanic	2,000	3,500
Watch repair	1,000	2,500
Book binder	1,000	2,500
Block maker	1,200	3,500
Costume Tailoring	1,000	2,500
Boot maker	2,000	3,500
Barbering	1,000	2,500
Catering	2,000	3,500

APPENDIX L.

Bibliography.

Books.—

- (1) "Education at the Cross Roads."—by Lord Eustace Percy.
- (2) "About Education."—by C. E. M. Joad.
- (3) "The Educational Reconstruction of Education."—by C. Black.
- (4) "British Education."—by H. C. Dent.
- (5) "Educational Reconstruction."—Articles by Mahatma Gandhi.
- (6) "Vocational Education for a Changing World."—by F. Theodore Struck.
- (7) "Foundation of Industrial Education."—by F. Theodore Struck.
- (8) "The Technical College."—by W. A. Richardson.
- (9) "Men at Work."—by C. A. Oakley.
- (10) "Educational Administration of the Bombay Province."—by M. R. Paranjpe.
- (11) "Handy Crafts in Senior Schools."—by W. B. White & T. Wattson..
- (12) "The Latest Fad-Basic Education."—by Acharya J. B. Kripalani.
- (13) "On Education."—by Mulk Raj Anand.
- (14) "Vocational Training in Germany." (German Educational Reconstruction Pamphlet No. 2)—by Helmut Von Rauscheplat.
- (15) "Selection of Students for Vocational Training." U. S. Office of Education, Vocational Division Bulletin No. 232—by F. M. Fowler.
- (16) "Vocational Training for War Production Workers." U. S. Office of Education Bulletin 1946, No. 10—by W. Daniel Musser.
- (17) "Location of Industry in India"—Memorandum prepared by the office of the Economic Advisor to the Government of India.
- (18) "Plan for Education."—by F. G. Pearce. (A descriptive and critical commentary on the Report of the Central Advisory Board of Education, otherwise known as the Sergeant Plan.)
- (19) "The Post War Education & Training of Engineering Personnel." A Plan for India—by C. E. Preston.
(Paper published in the Journal of Institution of Engineers (India) September 1944. The paper examines in detail the proposals contained in the Report of the Central Advisory Board of Education, as far as these affect engineering education and training.)

Reports, Pamphlets and Brochures.

- (1) "Technical & Industrial Education in the Bombay Presidency."—Final Report of the Committee, (Visweswarya Committee) appointed by Government, 1921, 22.
- (2) "Secondary Education with Special Reference to Grammar Schools and Technical High Schools."—(Spens Report) 1938.
- (3) "Report on Vocational Education in India."—by Messrs. Abbott & Wood.
- (4) Report of the Technical Education Committee of the Central Advisory Board of Education in India, 1943, together with the decision of the Board thereon.
- (5) Post War Educational Development in India—Report by the Central Advisory Board of Education, (Sargent Report) IV Edn. 1944.
- (6) Report of the Advisory Committee on Technical Training(1944-45)—Training and Apprenticeship of Craftsmen in Industry.
- (7) Report of the Delegation which visited the industrially developed countries of the West (ALMO) 1947.
- (8) Technical Education being a report of the Committee appointed by the Education Advisory Council of Scotland 1946.
- (9) Crafts Apprenticeship—A memorandum on recruitment & training for the Engineering Industry published by the Regional Advisory Council for Technical and other forms of further education for Manchester and District.

APPENDIX L—*contd.*

- (10) The Institution of Electrical Engineers —A Report of the Council from the Post War Planning Committee on Education & Training for Engineers.
- (11) The Institution of Electrical Engineers —A Report of the Council from the Post War Planning Committee on Part-time further Education at Technical Colleges.
- (12) The Practical Training of Professional Electrical Engineers, 1947—Report of a Committee appointed by the Council of the British Electrical and Allied Manufacturers Association, the Radio Industry Council and the Council of the Institution of Electrical Engineers.
- (13) Education and Training for the Cotton and Rayon Industry, 1946—The Cotton Board Recruitment & Training Department, Manchester.
- (14) Further Education—Ministry of Education, England, Pamphlet No. 8.
- (15) Institution of Engineers, India—Report of the Sub-Committee (appointed by the Council of the Institution in (December 1945) on "Technical Education in India in Post War Period."
- (16) Report of the Secondary Schools Committee for the Province of Bombay (Ghate-Parulekar Committee's Report).
- (17) Annual Report on Public Instruction in the Province of Bombay for the year 1944-45.
- (18) Proceedings of the All India Conference of Education Ministers held under the Chairmanship of the Hon. Mr. B. G. Kher in July 1946.
- (19) Reports of the different sub-committees of the Provincial Industries Committee, 1947.
- (20) Report on the Progress of Basic Education in the Province of Bombay from November 1938 to April 1945.

The following publications of the Association of Technical Institutions, England,

- (21) Sir Arther P. M. Flemming and K. R. Evans—"Education Schemes in Industry", 1948.
- (22) "Whither Technical Education."—by T. J. Drakeley.
- (23) "The Training of Technical Teachers," 1946.—by A. J. Jenkinson.
- (24) "Industry as an Educational Force."—by A. P. Young, 1947.
- (25) "Craft Training and Certification," 1948.—by H. L. Haslegrave.
- (26) "Training a Rank and File, 1941."—by T. J. Drakeley.
- (27) "The Trend of Technical Education, 1948."—by J. G. Docherty.
- (28) "Testing for the Secondary Technical School."—Report by the Joint Committee of the Association of Technical Institutions and the Association of the Principals of Technical Institutions, England, 1945.
- (29) "Education for Industry."—by Metropolitan Vickers Co., Ltd.
- (30) "Manual of Training & Educational Facilities."—by Marconi's Wireless Telegraph Company Limited.